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Organizing Migrations:
People and Knowledge Flows in the Global Economy

A dissertation submitted in partial satisfaction of the requirements for the degree Doctor of Philosophy in Management

by Peter D. Norlander

2014
ABSTRACT OF THE DISSERTATION

Organizing Migrations:

People and Knowledge Flows in the Global Economy

by

Peter D. Norlander

Doctor of Philosophy in Management

University of California, Los Angeles, 2014

Professor Christopher Erickson, Chair

Abstract

The globalization of knowledge work includes the physical migration of millions of skilled guest workers. In three essays on this theme, administrative and payroll records are studied to appreciate the scope and consequences of this activity. In the first essay, the large organizational sponsors of skilled guest workers are identified and an analysis is performed on their guest worker sponsoring activities. A positive relationship between guest worker sponsorship and innovation is supported, although increases in guest workers that change the composition of an organization’s workforce are linked with labor abatement. In the second essay, payroll records from five organizations that sponsor skilled guest workers are analyzed to discern whether institutional barriers to labor mobility restrict the freedom of these workers to switch jobs. While claims of indentured servitude are not supported, the labor market for guest workers is heavily influenced by macroeconomic events. In the third essay, interviews and an analysis of occupations suggest that a framework that separates skill and wage dimensions might better predict the offshoring of skilled knowledge work.
The dissertation of Peter D. Norlander is approved.

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CV

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Globalization, employment, migration.

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Honors and Awards
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2001-2005 Meinig Family National Scholar, Cornell University
1 An Organizational Approach to Migration and Globalization

Academic and popular discourse on employment in the 21st Century is divided over whether the ability of knowledge workers to perform a job anywhere in the world represents a substantial change in the economy and a threat to workers in developed nations or the epiphenomena of technological transformation. The conventional wisdom on the offshoring of services is that technology has enabled workers in remote locations to compete for jobs in high-wage countries. This view was articulated most famously by the columnist Thomas Friedman, who authored a popular book arguing that “the world is flat” because computer programmers in Bangalore can now write code for Coca-Cola in Atlanta (Friedman 2007). Friedman proposes policies that would encourage continuous learning on the job, increase employment flexibility to allow for greater job mobility, and invest in education to bring more workers into the Science, Technology, Engineering, and Mathematics (STEM) fields.

In contrast to the perspective of a leveling playing field, technological change itself might be biased toward rewarding those with skills and education, while offshoring involves the movement of routine and less-skilled services work to lower-wage countries (Acemoglu and Autor 2011). This might increase inequality domestically, and suggests policies that would encourage skills development and education for workers in high-wage countries. For exam-
ple, Leamer (2007) argues that economic geography implies vast differences between countries, that frictions in employment relationships create value, and that modern technology is a “megaphone” which raises the returns to the top rather than a “forklift” which enables the weak to lift heavier objects and equalizes wages.

Even in these broad brush strokes, certain postulates regarding the phenomena of the offshoring of knowledge work seem to have been accepted on faith. Both perspectives described above accept that a movement of work is taking place due to market and technological forces, and both largely assume a transfer of knowledge can take place virtually. The research in this dissertation advances a few fundamental truths about the offshoring of knowledge work that run contrary to the assumptions of the dominant narrative.

To be succinct about the evidence this dissertation presents, the unimpeded global movement of complex knowledge work is a myth, and yet the movement is very real and has significant consequences for the economy. The migration of knowledge work under globalization does not involve the fluid transfer of disembodied work from one physical location to another. Rather, the globalization of knowledge work is a highly organized activity that largely occurs within and between organizations. Furthermore, it is a highly physical process that relies on people movement. The basic facts have often been misrepresented or misunderstood: whether it is because or in spite of being the launching pad for the “flat world” doctrine, research that focuses on the globalization of the “unsexy and not-so-visible” business and professional services sector is needed to understand what is truly taking place (Sako 2013).

If nothing else is learned, this dissertation advances the following facts about globalization: first, the movement of people across national borders to facilitate the flow of ideas, services and products has been critical to the advance of globalization in the business and professional services industry. Second, the globalization of knowledge work is still largely a within and between firm activity and is especially focused in large firms. Finally, the globalization of knowledge work has advanced faster than commonly recognized as the ability to break down
complex tasks into smaller components has improved.

The world is not flat; but it is also not spiky or lumpy at random or as generated by deterministic forces of economic geography or genetics. Rather, large organizations have a significant role in producing the spikes observed here and there. They control the levelling of the playing field, create and reduce observed inequalities in education and income, and are the major, yet unsung, heroes and villains of the age globalization. Rather than viewing the organizational and people-based processes as the ephemera of market and technological forces, this dissertation focuses its study around the people and organizations that shape societal and individual outcomes. Organizations contain efficient and bureaucratic structures that perform HR functions such as selection, training, and global mobility. They create skills, set wages, move people around, transfer knowledge, and have the power to fulfill or crush individuals’ dreams. This view does not negate other perspectives; it simply offers an additional perspective to existing views, potentially enriching the academic understanding of globalization and employment relations in the present age.

This perspective emphasizes organizational actors and is informed by the study of labor market institutions, HR, and international and comparative labor relations. This dissertation offers three studies set in the theatre that launched one thousand and one discussions about the globalization of knowledge work and the role of technology in shaping societal outcomes: the offshoring of skilled services work to India. It is written by an author who has not only studied the issues, but at one time played a role in their unfolding. The ties between India and the United States in the era of globalization, and in particular the study of the Business and Professional Services industry occupations of computer professionals, are important to understanding larger trends in the economy and society.
1 An Organizational Approach to Migration and Globalization

1.1 People and Knowledge Flows

The title of this dissertation refers both to the physical movement of people and the global movement of knowledge work in the 21st Century. An emphasis is placed on the argument that the migration of services work involves the mass organizational sponsorship of migration for knowledge workers, a phenomena about which little is known in even descriptive terms. The organizations that recruit these workers, and their motivations for doing so, are subjected here to statistical analysis and modeling. The empirical evidence presented here is based on two unique large datasets that track organizationally sponsored migration and payroll records of skilled temporary migrant workers in the U.S. Additional data presented comes from the analysis of Census records, field interviews, and publicly available financial records and media reports. Much of the analysis reflects the triangulation of data and occasional merger of different datasets. For instance, financial information of publicly traded companies, measures of university size and research budgets, and my own data on migration sponsorship are merged to enable the analysis in the first study in this dissertation.

This research will be of primary interest to those who study or are interested in reading more about globalization and employment. Paper one is particularly relevant for those who want to know more about who sponsors skilled guest workers and why. For those interested in labor market institutions and in particular the role of job mobility and return migration in offshoring, paper two provides new evidence on this question. In addition, researchers interested in intermediation and labor precarity may find a discussion of this topic revealing. The final paper outlines a view for the future of offshoring, focused on the capabilities and present day activities of offshoring firms.

The following section is intended to motivate the need for this dissertation and the study of this phenomenon. As such, it highlights the relevance of this topic for researchers and the public at large. It identifies areas of the existing literature where this dissertation contributes
toward filling gaps in existing knowledge. These knowledge gaps suggest specific research questions that would get to the heart of the matter, which are identified and discussed. Finally, each paper is summarized to illustrate how it addresses the relevant questions. Following this introduction, the three papers included in this dissertation are presented.

1.2 Statement of the Problem

It is easy to mock and abuse popular punditry on the topics of globalization and technology – there is already a very productive industry that provide services for this need – but in the academic literature on these topics, there are specific gaps in knowledge that this dissertation intends to address. One thing Friedman did get right about the broader discussion of globalization and knowledge work is that Information Technology (IT) professionals and the business professional services (BPS) industry should be an important part of the discussion about workers and globalization. As Sako (2013) emphasizes, while BPS is not associated with being the “beacon of technological or management innovation,” more workers are employed in BPS than manufacturing and it is one of the fastest growing sectors of the economy. Additionally, of the 817 occupations that Blinder and Krueger (2013) ranked by offshorability, the only occupation to score a perfect 100 is “Computer Programmer.”

Studies examining the confluence of employment practices and the technology industry, however, have often been narrowly focused on the few companies at the apex of innovation or involving labor practices that affect only a small numbers of workers. Labor markets for computer professionals (especially in Silicon Valley) are depicted as dynamic: amidst a shortage of skilled workers, highly-compensated and in-demand computer professionals switch jobs frequently. Seminal research by Saxenian (1996) argued that networks formed by frequently job-hopping workers played a critical role in the conquest of Silicon Valley over Boston’s Route 128. Meanwhile, the business press regularly lauds the human resources (HR) practices at iconic technology companies (often in Silicon Valley) that lavish massages, car
Table 1.1: Computer Professional Employment by Sector, BLS

<table>
<thead>
<tr>
<th>Year</th>
<th>Services</th>
<th>Information</th>
<th>Finance</th>
<th>Manufacturing</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>34.0%</td>
<td>n/a</td>
<td>10.9%</td>
<td>11.0%</td>
<td>44.2%</td>
</tr>
<tr>
<td>2002</td>
<td>29.3%</td>
<td>11.9%</td>
<td>8.9%</td>
<td>9.3%</td>
<td>40.6%</td>
</tr>
<tr>
<td>2004</td>
<td>28.5%</td>
<td>13.5%</td>
<td>9.4%</td>
<td>9.0%</td>
<td>39.7%</td>
</tr>
<tr>
<td>2006</td>
<td>30.6%</td>
<td>12.7%</td>
<td>9.3%</td>
<td>8.2%</td>
<td>39.2%</td>
</tr>
<tr>
<td>2008</td>
<td>32.0%</td>
<td>12.1%</td>
<td>8.6%</td>
<td>7.8%</td>
<td>39.5%</td>
</tr>
<tr>
<td>2010</td>
<td>32.0%</td>
<td>11.8%</td>
<td>8.8%</td>
<td>7.7%</td>
<td>39.7%</td>
</tr>
<tr>
<td>2020*</td>
<td>38.0%</td>
<td>11.3%</td>
<td>8.3%</td>
<td>2.1%</td>
<td>40.3%</td>
</tr>
</tbody>
</table>

*BLS forecast

washes, free food and other perquisites on their employees to attract and retain the best. A classic study of the organizational culture of one technology firm displayed the contradictions between high-commitment work practices and burnout typical of these workplaces (Kunda 2006). Others have noted, often with concern, the increased use of temporary and contingent labor among leading technology and other firms that employ computer professionals in Silicon Valley (Barley and Kunda 2004, Carnoy, Castells and Benner 1997).

One limitation of the existing discussion of technology and globalization is that the focus has too often drawn from the experiences of Silicon Valley at the expense of an appreciation of trends in the broader labor market. As seen in Table 1.1 the largest employer of computer professionals is the professional, scientific, and technology services industry, not the information or software publishing or computer hardware industries. The computer systems design and related services industry is the largest employer of workers in computer occupations and is the focus of the papers in this dissertation. Nearly 800,000 employees in this industry were in computer occupations, or 55% of the employees in the industry. In total, the industry employed 1.44 million people in 2010, up from 1.25 million in 2000. By contrast, the vehicle manufacturing industry employed 2 million people in 2000 and 1.3 million in 2010. Despite the attention that self-employed technology workers and start-ups have attracted, they are a small fraction of total employment in this occupation. Only 153,000 workers or 4.5% of those
in computer occupations were self-employed, 3.9% were employed by software publishers like Microsoft, and 1.9% were employed by temp agencies and professional employer organizations. In contrast, twenty-three percent of the 3.4 million people employed in computer occupations in 2010 worked in the IT services industry. Furthermore, much of the action occurs in a relatively small number of large firms. Accordingly, this dissertation examines large companies, including those in the computer professional services industry, and as such, it places a special emphasis on the industry and type of firm that are the largest employers of computer professionals.

Although not associated with being the cradle of innovation, the BPS industry is the largest employer of IT workers, and it has taken more readily to globalization than many other parts of the technology industry. Recruiting workers from abroad through the outsourced services of a BPS firm can also do more than provide a cost or talent advantage. Outsourcing enhances labor flexibility and reduces costs by means more subtle than a direct comparison of wages at a given moment. One of the largest changes in employment relations in the U.S. in the last two decades has been the rise of the “peripheralization of employment.” The demise of the vertically integrated corporation, and the attendant increase in the use of secondary firms, or outsourcing firms, has been tied to an increase in precarious employment, which involves lower job security, wages and benefits (Kalleberg 2009). Some HRM theorists have argued that “career jobs are dead” and advocated a move toward flexible HR practices akin to supply-chain management, emphasizing “talent on demand” principles and eschewing traditional internal labor markets (Cappelli 2009, Cappelli 2003). By sourcing workers internationally, and outsourcing the hiring and employment responsibilities to third-party firms in the BPS industry, major corporations can more easily manage their workforce size, ramping the workforce up and down quickly to adjust to rapidly changing business opportunities and the competitive environment.

In contrast to the idea of a leveling playing field, the comparative political economy per-
An Organizational Approach to Migration and Globalization

direct oxidation of a platinum-catalyzed reaction has emphasized that even amidst globalization, there is a persistent role of national institutions, history, and culture in shaping the economic opportunities, employer practices, and outcomes for workers (Katz and Darbishire 2002, Crouch, Finegold and Sako 2001, Jacoby 2005). These forces maintain important regional differences, but multinational corporations have spread their own business and labor management practices throughout the world, often by their own direct activities (Kuruvilla, Frenkel and Peetz 2003). Networks of global value chains are also instrumental in setting labor standards across industries and national boundaries (Gereffi, Humphrey and Sturgeon 2005, Lakhani, Kuruvilla and Avgar 2013). Finally, highly influential networks of global transients establish businesses in developing countries that subsequently enter global markets, indicating a move away from markets and hierarchies and toward these stateless, organizationless actors (Saxenian 2006). These freewheeling international nomads are often born abroad but educated in the U.S., and play critical parts in the development of advanced industries offshore by spreading knowledge and best practices around the world.

In the sociological study of management and organizations, there has been a similar move away from the study of large firms and institutional perspectives in general, as networks are argued to take the place of markets and hierarchies as central organizing mechanisms for the economy (Powell 1990, Adler 2001). Rebuttals have made the case that large firms retain their centrality to the economy, and that the claims of a radical transformation in employment relations are not supported by the number of firms that still maintain long-term commitments and the number of workers who still seek to attain full-time jobs and careers within a single firm (Jacoby 1999, Jacoby 2005). Furthermore, of the research that bears directly on the topic of this dissertation, much of it skips the importance of institutions and organizations in offshoring, and the role of migration. Instead, much of the literature treats trade in services work and technological substitution as a juggernaut rolling through the economy, presumably crushing the past of institutions and the importance of physical co-location through its levelling forces.
as it moves inexorably forward.

Research on work and employment under globalization that emphasizes organizations provides durable insights that can move the broader discussion of globalization forward. While individual contracting is increasing, it is less preferred by workers with families and seekers of job stability, even among skilled workers in high technology industries (Barley and Kunda 2004). Paradoxically, increased flexibility with respect to working hours is often enabled by bureaucratic practices that regularize the flow of work and spread information required for knowledge transfers (Bidwell and Briscoe 2009, Briscoe 2007). Organization-led globalization and the power of organizational actors, however, is not perfect; in fact, quite the opposite. For example, organizational actors continue to stratify and discriminate by both gender and by national origin (Fernandez-Mateo 2009, Castilla and Rissing 2012). This dissertation adds to these efforts by other researchers to understand the consequences of organizational actors in this age of globalization.

Just as these institutional and cultural barriers pose obstacles to globalization, knowledge itself cannot easily be moved because it is tacit or “sticky,” and either physical colocation or consistent interaction is required to get things right (Zucker, Darby, Brewer and Peng 1995, Zucker and Darby 2007). Freeman (2010) points to five fingers of the globalization of the science and engineering workforce that explain the forces leading to knowledge transfer globally: the growth of mass higher education, an increase in international students, the migration of skilled workers, non-immigration short duration trips, and global co-authoring and patenting networks. These are the key factors behind increasing global competitiveness with regards to skilled labor; yet the role of the mass migration of skilled workers through organizational sponsorship has been largely missing from the discussion of the offshoring of services.

Labor mobility is a central problem in globalization. While poor data has limited past research, an additional reason for its omission from discussion is because it doesn’t fit within
existing paradigms. For those who see globalization as a levelling force, the paltriness of labor mobility in the context of the globalization of capital and physical goods is an open contradiction. The loosening of trade barriers between countries and a corresponding growth in the mobility of capital and physical goods such as shampoo, khakis, and pajamas has not been matched by the same freedom of mobility for labor (Freeman 2006b). For those who believe that offshoring services is largely a frictionless trade, the physical movement of workers is an uncomfortable reminder that work products of all kinds, especially in the knowledge services, will not pick up and move on their own. The movement of complex services work – and the transfer of knowledge – occurs through organizations and through networked chains of organizations and people based on both trust and expertise. Nothing occurs in a vacuum.

Where the offshoring literature largely ignores migration, the migration literature largely ignores organizations. Economic studies of immigration traditionally focused on an individual or national unit of analysis, while the “new economics of migration” focused on family, household, or community levels of analysis (Massey, Arango, Hugo, Kouaouci, Pellegrino and Taylor 1993). Fortunately, a growing body of research has started to focus on these organizational actors, although there is still a limited appreciation for the role of organizations in creating both the supply of and the demand for migrant workers.

In the U.S., offshoring and the growing use of temporary workers on H-1B and L1 visas has created worries about the future potential of IT work. With the exception of several good case studies that illustrate the challenges involved with managing global work (Levy and Goelman 2005, Jensen 2009), the conventional narrative of globalization is that the offshoring of services work involves the frictionless provision of services from workers in country A to consumers in country B goes unchallenged. This conventional narrative is wrong not only in the economics literature, but with several notable exceptions (e.g. (Parthasarathy 2000)), also in the existing sociological work on “virtual migration” (Aneesh 2006). Far from the seamless process of moving customer service and routine work with its attendant intense monitoring and quality
control over workers in distant countries (Batt, Holtgrewe and Holman 2007), trade in BPS and particularly of IT work relies on physical migration. Worker migration often occurs precisely because physical proximity is necessary for knowledge transfer to occur.

In a world in which frictionless trade did exist, online markets such as Amazon Mechanical Turk, Task Rabbit, etc. would be places where serious work gets done. While novel in their approach, these crowd-sourcing websites are not the future of services work. Limited task capabilities, no full-time employment or development of expertise, tiny wages, and unknown working conditions all suggest that these crowd-sourcing approaches are not suitable for anything but the most rote work. In the case of more complex work, such as Wikipedia and Mozilla, the explicit nature of the work product as a public good seems to encourage the construction of these free resources.

Over 4 million temporary workers have come to the U.S. between 1993 and 2008 on skilled worker visas. As Hira (2010b) and Hira (2010a) has emphasized, a large number of temporary workers on visas for skilled migrants are prominently engaged in the transfer of knowledge work. The businesses, universities and other institutions that want to operate globally, and the individuals who wish to live, study, and work in a country outside the one of their birth, have found a mutual interest in migration through organizational sponsorship as a means to realizing opportunities for labor mobility under an institutional framework that otherwise falls short of the promised nirvana of globalization. There are several hypotheses about why organizations sponsor migrants to work in the U.S. Most importantly, vast inequality in wages between workers with equal productivity but located in different countries has been demonstrated both by examining workers doing the exact same job in different countries (Ashenfelter 2012), and by examining otherwise similarly positioned computer professionals in India who are then randomly permitted to emigrate or not (Clemens 2013). This wage gap creates an opportunity – often quite large – for labor arbitrage. This inequality constitutes a fundamental reason for the movement of work, but in the long run, these gaps should narrow as labor shortages
emerge in developing nations, wages rise, and exchange rates adjust.

At the same time, there are reasons to believe that more than just a cost advantage is at work. Despite elevated unemployment rates due to the Great Recession, employers continue to report shortages of engineers and employees with specialized talents. If the STEM labor force could not be sourced locally, some labor market analysts warned, firms would find those skills overseas (Lewin, Massini and Peeters 2009). Although many economists would question whether such a labor shortage even exists (e.g. (Salzman, Kuehn and Lowell 2013)), there are concerns about competitiveness regardless of the existence of a shortage. Several labor market analysts, as well as many employers, have argued that not having the best talent in America would harm the country. Freeman (2006a) asks whether the globalization of scientific and engineering talent presents a threat to U.S. leadership. To promote and maintain domestic competitiveness, this analysis suggests more visas for foreign skilled workers will fill the talent gap but also supply a new burst of entrepreneurialism and innovation (Wadhwa, Saxenian, Rissing and Gereffi 2007). The abundant human resource demographics of developing countries could serve as a site for the sourcing this talent – and represent a potential threat to U.S. competitiveness if the U.S. does not obtain the “best and the brightest.”

Between 2003 and 2012, 1.5 million employment-based migrants underwent naturalization; more than 80% of the employment-based recipients of a green card were already in the country on another visa. As these numbers suggest, temporary visas are a pathway to permanent resident status for many of the workers eventually sponsored for a green card, but they have also been important factors behind the population growth of highly educated foreign-born workers. In the largest occupational category for foreign-born college-educated workers, nearly 800,000 college-educated immigrants worked in computer programming and related software occupations in 2012; this population represents 7.8% of all college-educated non-citizens in the U.S. and 30.8% of all college-educated workers in these occupations. Of the foreign-born computer programmers, 42.7% were born in India, the largest single country of
origin for foreign-born workers in this occupation.

A final missing piece from the discussion has been time as a component of globalization and change. As Fiss and Hirsch (2005) note, the conversation over globalization changed substantially over time, and since the publication of that article, even more so. While much of the initial enthusiastic discussion of globalization occurred following the Y2k problem and before the Great Recession, and some involved predictions for the future, there was not much past to study. A decade later, other concerns have supplanted globalization as an area of interest for many researchers of work and labor markets, leaving the academic literature on the offshoring of skilled knowledge work stuck like a mosquito in amber.

**Key Questions**

The first question to grapple with is why organizations sponsor immigrants at all? If the movement of work can be done seamlessly, including advanced services work, R&D, product development, and even “reverse innovation” (when products are developed in emerging markets and then exported to wealthier countries), then organizations and individuals should not need to go through the trouble of physically uprooting and moving people around the world. Yet, they do, and in large numbers too, suggesting that physical co-location and clustering still holds great relevance for economic and research activity. Do organizations recruit workers who increase their innovation or labor productivity? How do foreign-born workers come to be recruited and selected by leading global firms?

To address the larger question of why firms sponsor immigrants, important subsidiary questions include: do firms have market power over immigrant workers and does a wage gap exist between temporary migrants and domestic workers? This second set of questions asks what happens to the workers who are engaged in the offshoring of knowledge work when they are in the U.S.? While those working for large U.S. technology companies, banks, healthcare, industrial and consumer firms, and universities are often seen as being recruited
for particularly rare skills and talents, those who work for offshoring companies attract attention because there is doubt surrounding the labor market practices of these organizations. Do these workers labor under exploitative conditions? Are they underpaid? Does the lack of a mechanism to adjust the number of visas for economic performance indicate a problem in the labor market? The final questions surrounding offshoring of services involve updating the discussion of what is being, what can be, and what will be offshored?

1.3 Unique Contributions

The first paper examines one of the many contradictions between reality and the notion that offshoring of services is a frictionless process: organizationally-sponsored mass migration of knowledge workers. Focusing on the demand side of immigration, and the organizations that have a dedicated role in the migration system, I find that organizations that sponsor workers experience different consequences of sponsorship based upon their own organizational identity. The second paper narrows its focus to a large sector involved in the offshoring of services work, the Indian IT industry, and the workers they employ in the U.S. who participate in the transfer of knowledge to India. This research examines the attachment between workers and their firms, and whether a condition of “indentured servitude” exists due to employees’ inability to move jobs because of labor market regulations. This study reveals that while knowledge workers on skilled worker visas quit frequently in the U.S., limiting the loot taken by rent-seeking employers, and yet, the labor market is not perfect. Furthermore, workers frequently return to their home country, especially during economic downturns. The final paper attempts to connect the pieces between migration and offshoring, and presents a framework for how offshoring has evolved over time and is likely to continue to do so. This review essay captures the relevant literature, appreciates and takes stock of underlying trends, and is informed by conversations with practitioners.

This dissertation aims to inform the ongoing discussion of employment relations in the
age of globalization, including both labor markets and management practices. It does so by focusing on a particular phenomenon – the migration of knowledge workers and knowledge work. The first two papers are stand-alone research papers within this theme that use empirical evidence and economic modeling to delve into the issues the gurus of globalization have surfaced. The third paper is a review essay that examines the offshoring of services. In its emphasis on organizations, institutions, and context for understanding contemporary trends and patterns, these dissertation papers collectively represent a significant contribution to the body of knowledge of both this specific area and the relevant theories addressed.
2 Organizing Migration: Who Sponsors Skilled Guest Workers and Why?

1. Abstract

This paper uses a unique dataset of all organizational sponsors of guest workers from 1993-2008 to identify the largest users of the skilled guest worker programs and ascertain why they sponsor guest workers. In addition to being the first empirical paper based on access to complete records of the two most popular guest worker visa programs and providing new factual information on the skilled migration phenomena, this paper emphasizes how organizational features including business strategy, sector, and country of origin shape the impact of skilled guest workers. While the average within-organization effect of these guest workers is linked with increases in patenting and R&D spending, increases in visa dependence are associated with declines in R&D and patenting. The R&D effect is stronger for high-technology firms, while the effect of skilled migration is influenced by proxies for firm HR strategy and other institutional characteristics. These results illustrate how organizations influence the individual and societal economic outcomes of these programs.
In the last 15 years, more than 4 million migrants have come to the United States under the two most popular skilled guest worker programs. For workers who seek employment outside their country of birth, and for organizations that seek to take advantage of globalization, migration through organizations represents an opportunity to achieve individual and organizational objectives. While the migration of skilled guest workers in the U.S. is recognized as important for growing innovation and productivity (Hunt 2010, Kerr and Lincoln 2010), it has been criticized on grounds that foreign-born workers reduce opportunities for U.S. born workers (Matloff 2013). Despite the relevance of organizational behavior for this phenomenon and a recognition that more research on these organizations is required (Kerr, Kerr and Lincoln 2014), little is known about some of the basic facts regarding this phenomena, beginning with the answer to the question: who are these organizations that sponsor skilled guest workers?

The popular and policy discourse on skilled immigration often makes a coarse distinction regarding whether skilled guest workers are complements or substitutes to the labor market, whether they are “job-takers” or “innovators.” The institutional framework of the two most popular visas for skilled guest workers, the H-1B and L-1 visa programs, creates a situation in which organizations are given wide latitude to control the selection of those who enter the country, and thus control and influence the broader individual and societal impacts of these programs. The organizations that recruit guest workers are the causal agents that therefore determine whether skilled guest workers are complements or substitutes, job-takers or innovators, and should have a primary place in the discussion of the effects of these guest workers. Thus, a second very basic question about this phenomena is: why do organizations that recruit workers overseas sponsor these workers for visas?

The academic theories of the effect of skilled guest workers are more nuanced than the popular discourse; one theory is that the high proportion of skilled guest workers with edu-
2 Organizing Migration: Who Sponsors Skilled Guest Workers and Why?

cation in Science, Technology, Engineering and Mathematics (STEM) fields leads these guest workers to patent, innovate, and contribute to increased labor productivity (Ozgen, Nijkamp and Poot 2012). Likewise, crowding-out effects are a possible negative consequence of the programs as skilled guest workers may discourage natives from entering STEM fields (Borjas and Doran 2012, Bound, Braga, Golden and Khanna 2013). Still, academic studies of skilled guest workers absent the consideration of organizations ignore the causal structure of guest worker migration. While several papers do consider organizations, they focus on only one type of the variety of organizations that sponsor guest workers (U.S. based firms), and largely overlook the myriad of strategic purposes for which employers put these guest workers to work. This leads to a possibility that the literature a) focuses on average effects where contingencies can explain much of the variation and b) suggests that the results of certain studies hold, but only in a limited scope of circumstances that have not been specified. In addition to understanding who sponsors migrant workers and why, this study also examines whether the effects of guest worker sponsorship vary systematically according to organizational characteristics, including aspects of strategy, industry and country of origin.

While nearly all observations of “skilled migration” are a result of organizational actions, organizational analysis has not been pursued in part because of difficulty obtaining good data on the organizations that sponsor guest workers. To answer the above questions, I gathered unique data that opens the black box of firms’ recruitment strategies with respect to foreign born guest workers. The data includes the complete administrative records of the number of H-1B and L-1 temporary worker visas granted to organizations in each year from 1993-2008. The largest migrant-sponsoring organizations are matched with financial data, patent data, and data on institutional characteristics to create a longitudinal panel that permits a thorough study of the fundamental relationship between STEM worker migration and innovation, R&D spending, and labor productivity at the organizational level. With complete data for more than 400 organizations and 15 years included in this study, this research considers a larger sample
2.2 Motivation and Development of Research Hypotheses

Limited people mobility amidst loosening barriers for the international movement of capital and goods has been highlighted as a contradiction of this era of globalization (Freeman 2006b, Clemens 2011, Pritchett 2006, Rodrik 2011). Even so, of the known number of temporary mi-

of the large employers of H-1B and L-1 workers than previously possible. As it is a large dataset with many interesting relationships to be explored, the present analysis is by necessity a preliminary effort.

I find that the effects of guest worker migration vary with the industry and country of origin of the organization. While past research has emphasized the relationship between these workers and innovation, I find that the effect of additional guest workers weakens when controlling for firms’ R&D spending and strengthens when controlling for visa dependence. However, increasing visa dependence is associated with declines in patenting and R&D although increases in labor productivity, suggesting that there is a tradeoff between the two strategies of labor and proximity arbitrage that are described later. While semiconductor companies increase their R&D spending following the sponsorship of guest workers, the second largest category of organizations, universities, increase their sponsorship in conjunction with hiring more post-doctoral scholars, which suggests organizational hiring to meet growth needs. These scope conditions increase knowledge about the circumstances under which guest workers might be complements or substitutes in the labor market.

Section 2.2 provides a motivation for the study of the fundamental relationships at work between guest worker sponsorship and organizational characteristics. Section 2.3 presents a statistical model and describes the data used to demonstrate whether this theoretical approach accurately describes the empirical setting. Section 2.4 presents the results and a discussion of the implications of the analysis. Section 2.5 concludes the paper with implications for policy and directions for future academic research.
grant workers who entered the U.S. through legal sponsorship, those sponsored by organizations – including students on visas, temporary workers and exchange visitors – increased from approximately 400,000 to over one million per year between 1989 and 2008. Over the same period, permits for temporary workers and participants in exchange programs – both requiring organizational endorsements – grew from 27% to over 40% of admissions, while family visas declined from 50% to 33% of admissions, and students on visas were roughly 23% of visas granted for the entire period. In addition to the number of people entering through temporary worker programs, on average, 1 million people became permanent U.S. residents each year from 2003 to 2012; of these, approximately 150,000 were granted permanent residence based on sponsorship through an employer, of whom an average 84% converted their status from a temporary visa to permanent resident status.

The H-1B and the L-1 visas are the creation of legislation intended to promote innovation and growth through increasing the supply of skilled workers in occupations that had experienced labor shortages, and to balance labor market needs for domestic workers in STEM and other skilled worker occupations requiring a college education (Hatch 2000). As a proportion of the population, guest workers are overrepresented in STEM fields and are more highly educated than domestic workers in the same occupations. A growing literature finds that these migrant workers are more likely to patent and start businesses (Hunt 2010, Wadhwa et al. 2007). Kerr, Kerr and Lincoln (2013) write that migrants represented 16% of the U.S workforce with a bachelor’s degree and 24% of the workforce in occupations closely linked to innovation and technology commercialization in 2008. In particular, those who enter the country on H-1B

and L-1 visas in the fifteen years prior to 2009 are thought to be especially overrepresented in occupations linked to innovation, and are thus more likely to innovate compared to citizen workers and migrants on other types of visas and U.S. citizens (Hunt 2011). Despite the importance of organizations in sponsorship and the crucial legal and practical role they play as employer, little is known either in descriptive or statistical terms about the organizations that sponsor migrants to work in the U.S. and the linkages between migrant sponsorship and organizational results. Therefore, the first results reported in Section 2.4 are descriptive statistics of the large organizational users of the programs.

**Why Do Firms Sponsor Migrants?**

There is a stark contrast in the explanations given for why organizations sponsor migrants. Broadly, these can be divided into a skeptical view and an optimistic view that are held by those in the relatively well-defined camps of those who are anti- or pro- migration. Those skeptical of skilled worker migration involving organizational sponsorship (although the issue of organizational sponsorship is often unaddressed) often assume that migrants are substitutes for domestic workers, and so organizations that hire these workers can reduce wages and working conditions for domestic workers by paying substitute foreign-born workers less. In the case of highly-skilled migrant workers, this perspective is most associated with the views of Matloff (2013). Bound et al. (2013) show that wages would have been 2-3% higher and the number of Americans employed in computer professional occupations 7-14% higher if migration had stayed at 1994 levels. This perspective may also view migrants themselves as victims of firms that exploit their labor, paying them less than their native counterparts, and the organizations that employ them as abusers of the visa system whose actions, if not illegal, are contrary to the purpose of the programs (Hira 2010b).

Another view sees migrants as complements to domestic workers, either because they possess skills that are in short supply among the domestic workforce, or because they fill jobs that
domestic workers will not do (Piore 1979). Accordingly, organizations might recruit migrants to fill positions that would otherwise not exist. In the case of highly-skilled foreign workers, reasons for the growing relevance of migration to organizations include: scarcity of talent in particular fields, increased need for innovation and intrapreneurial behaviors to address rapid product delivery cycles and to boost productivity growth in the competitive global business environment, and finally, the need to develop a cadre of global workers who can move between countries to facilitate the operations of multinational and global firms and universities. Firms and nations gain access to workers with unique characteristics by recruiting abroad. Foreign-born workers provide access to markets (Foley and Kerr 2013), co-ordinate the global delivery of products and services (Hira 2010b), and also yield greater per capita innovation and entrepreneurship than domestic workers (Hunt and Gauthier-Loiselle 2010). Migrant workers are also thought to have higher productivity and a more entrepreneurial disposition than the population at large (Kerr 2013), which is likely due to organizations’ selection practices. In addition, global diasporas and networks have played important roles in the spread of globalization throughout the technology industry (Saxenian 2002, Kerr 2008).

Do Skilled Guest Workers Increase Domestic Innovation?

A major claim of supporters of guest worker programs is that they increase innovation in the U.S. Indeed, studying guest workers in the context of innovation is a relatively recent although well-established line of inquiry. Researchers who have examined the relationship between migration and innovation have provided increasingly strong evidence of a causal relationship. Kerr (2008), Hunt (2010), Hunt (2011), Ozgen et al. (2012), No and Walsh (2010) are all examples of this literature.\footnote{Patenting is perhaps the most frequently studied measure of innovation; determinants of patenting that have been examined previously include research and development (R&D) spending, size, age, capital intensity and time (Hall and Ziedonis 2001). In the literature on innovation, there are several studies that have examined the relationship between R&D spending and patenting at the firm level. Previous estimates of the elasticity between patenting and R&D spending have found R&D to be an important predictor of patenting (Bound, Cummins, Griliches, Hall and Jaffe 1982, Griliches 1998, Hausman, Hall and Griliches 1984, Griliches, Hall and Hausman 1986).}
Among college educated workers in the following professions in 2012, more than 45% of medical scientists, 34% of nurses, 28% of physicians, and 25% of physicists, chemists, and mathematicians in the U.S. were born outside of the country. In the largest occupational category for foreign-born college-educated workers, nearly 800,000 college-educated foreign-born workers were employed in computer programming and related software occupations in 2012; these computer professionals represent 8% of all college-educated non-citizens in the U.S. and 31% of all college-educated workers in these computer occupations. Of the foreign-born computer programmers, 43% were born in India, the largest single country of origin for foreign-born workers in this occupation.

Researchers have named several theories for why migration increases innovation: the population size effect, the population density effect, the migrant share effect, the skill composition effect, and the migrant diversity effect (Ozgen et al. 2012). Migrants not only increase the likelihood of innovation by adding workers to a firm’s population (the population density effect), these migrants are particularly known to be innovative and entrepreneurial (the migrant share effect), and are concentrated in STEM fields (the skill composition effect). Migration may also impact innovation through positive spillovers to native workers who benefit from additional diversity of backgrounds in the workplace (the migrant diversity effect). Notably, these theories emphasize the supply of workers; workers’ possession of these skills is taken for granted and these theories do not take into account how organizational demand for these workers might influence the supply.

Hunt (2011) found that work visas such as the H-1B and L-1 have the strongest relationship with patenting, suggesting that this is an especially promising area to test the strength of the migration-patenting elasticity. The relationship between work visa migration and patenting has been found using data from a variety of sources and at a general level overall. Neverthe-

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3 These figures are calculated by the author using Census IPUMS data (Ruggles, Alexander, Genadek, Goeken, Schroeder and Sobek 2010).
less, the study of skilled migration has moved closer to the study of firms that sponsor skilled migrants, due in part to path-breaking work by Kerr et al. (2013). Therefore, both the overall level of patenting and the migration-patenting elasticity are measured to provide evidence supporting or rejecting the specific hypothesis that the average within organization relationship between guest worker sponsorship and patenting is positive.

**Visa Dependence and Firm Strategy**

The competing hypotheses regarding migrant workers suggest organizations have very different uses for skilled guest workers. Consider two strategies that organizations might have with respect to guest workers: labor arbitrage and proximity arbitrage. Labor or wage arbitrage is well understood as the substitution of a worker in a developing country for a worker in a developed country. As an example, Clemens (2013) finds that workers in India at a large international labor market intermediary could triple their wages by moving to the U.S.; for the firm, this location change should also be associated with an increase in revenue per employee and profit. On the other hand, proximity arbitrage builds off the observation that innovation can be increased by co-location. Because physical proximity and co-location offers benefits in knowledge-intensive industries (Zucker and Darby 2007), including enhanced knowledge production and regionalized economic spillovers (Zucker, Darby and Armstrong 1999), there is an opportunity for organizations to increase innovation and productivity by putting workers together in the same location.

While not noted in much of the literature, the relationship between guest worker sponsorship and patenting is unlikely to be linear: at some point, adding guest workers does not increase innovation. Instead, reliance on guest workers after a point may represent the use of guest workers for labor arbitrage purposes. The labor arbitrage strategy can be proxied for by a variable that represents the level of dependence an organization has on the visa programs as represented by the logged and lagged number of new guest workers divided by total em-
2.2 Motivation and Development of Research Hypotheses

ployment in a particular year. As a within-firm variable, changes in the level of dependence on the visa program can indicate shifts in organizational strategy with respect to the use of visas. Firms that increase their visa dependence may not utilize guest workers in ways not consistent with the hypothesis that guest workers are being used for research and patenting. Indeed, the opposite is likely to be the case: when organizations become more visa dependent, such that the global composition of their workforce undergoes a significant increase in the proportion of the workforce that is guest workers, this could signal that their strategy is shifting away from proximity arbitrage and toward labor arbitrage. If firms use guest workers for labor arbitrage, then they are likely to experience an increase in the revenue generated by the employees’ movement from a low-wage country to a high-wage country. Thus, labor productivity should increase in conjunction with visa dependence.

Does Heterogeneity in Labor Demand Shape Guest Worker Effects?

The organizations that sponsor migrants are as varied as the plausible reasons given for organizational sponsorship. Congress has recognized that different types of institutions likely have different needs and motivations for visa sponsorship. Universities and other governmental and non-commercial research institutions were exempted after 2002 from the quotas on H-1B visas that restrict the number of visas available to private firms. This enables the exempted institutions to recruit an unlimited number of H-1B workers for employment in university post-doctoral and other non-commercial researcher positions. Congress has also increased scrutiny of H-1B dependent firms, defined as firms where migrant workers are more than 15% of their U.S. workforce, by requiring them to pay additional anti-fraud fees to obtain visas. All organizations must pay workers the “prevailing wage” in the occupation and region where they exist (Martin, Lowell and Martin 2001).

All organizations must sponsor migrants for a reason; after all, it is an expensive process involving not only legal and visa fees, but also the cost of paying a worker the prevailing
wage in U.S. dollars and paying for their physical relocation. In creating the H-1B visa program, Congress left it to organizations to decide who is worth admitting to the country on guest worker visas. The current mix of organizational actors is not a product of design, as the specific circumstances of today were not envisioned by the lawmakers who last made major revisions to the regulatory structure for skilled guest worker programs in 1990, far before the technology boom. However, in creating a program in which any organization could sponsor migrants in any specialty occupation – from Benihana chefs to Cirque de Soleil acrobats and Microsoft computer scientists – the door was left open for organizational actors to influence, and even create, the consequences of skilled migration that are measured and debated to this day. Therefore, a very preliminary and simple hypothesis is that the effect of skilled guest workers varies by organizational sector and region of origin. The following subsections describe some of the major institutional actors and possible motives for recruiting skilled guest workers.

ILMIs with a Large Indian Workforce

The largest category of guest workers sponsors can be referred to as “International Labor Market Intermediaries” (ILMIs) that subcontract work from lead firms in “global value chains” to produce services for lead firms (Gereffi 2006). Typically associated with cleaning, secretarial, and other frequently outsourced services, labor market intermediaries in the Information Technology (IT) sector practice a form of relational contracting that has been popularly referred to as “body shopping.” ILMIs are frequently involved in offshore outsourcing. In contrast to Internal Labor Markets (Doeringer and Piore 1971), these firms are often seen as implicated in the phenomena of “precarious labor” (Kalleberg 2009). In the present case, the ILMIs are IT services companies with large India workforces. Despite the stigma attached, ILMIs with large India workforces also provide useful functions by meeting client needs and creating opportunities for migration for workers in low-wage countries. These ILMIs offer low-wage

4I consider firms either headquartered in India or those that have an offshoring business model in this category of ILMIs. Notably, this includes Cognizant Technology Services as an Indian ILMI firm because it operates on the same business model despite being headquartered in the U.S.
country workers stable employment opportunities globally, provide extensive training, and offer a host of employee benefits and upward advancement opportunities. These firms serve their U.S. and global clients’ interests by providing capable software programmers at a moment’s notice. They pave the path for low-income country workers to migrate to the U.S. In this way, ILMIs function as people-processing institutions, regulating the intake of workers, signaling trust and reputation to the market, and handling the paperwork (Hasenfeld 1972). This virtuous circle for low-wage country workers and ILMIs’ customers has led in part to the rapid growth of the outsourcing industry.

The economics of information suggest one additional reason why this may be the case: ILMIs function as filtering agents to select the best workers for sponsorship and signal their readiness for employment in the U.S. (Stigler 1961, Akerlof 1970). Autor (2001) provides a detailed account and model for how temporary firms create general skills training programs to select better workers as well. Indian companies in the IT services industry today run the largest general computer skills training programs in the world, and are highly selective (Schlosser 2006). Because the opportunity is paved for workers who join ILMI firms, workers in India can select into occupations and join firms with the intention and knowledge that doing so increases their chance of being sponsored for a visa or green card. This effect raises the returns to education in developing countries in general, and mitigates some concerns regarding brain drain (Agrawal, Kapur, McHale and Oettl 2011). As with various models of investments in general skills training, firms can pay the up front visa expenses and act as an employer while reaping rents from labor until workers obtain green cards or switch employers (Acemoglu and Pischke 1999).

The employment and selection practices of Indian IT services organizations include the administration of GRE-like General Mental Ability (GMA) exams to hundreds of thousands of applicants for entry-level employment (“freshers”) each year. This batch-processing of recruitment and selection processes is a relatively permanent feature of these firms. Exams are
regularly held in cities across the country of India, and the firms do hardly any interviewing of freshers. ILMIs have a hiring target in mind and take the best performers on the test. As the industry grew, training programs emerged to offer general software skills training to more than 10,000 people at a time, at least in part to weed out the poor performers, and to build up a “pipeline” that enables rapid “ramp-ups” (Kuruvilla and Ranganathan 2008, p. 51). In the early part of the decade, the companies dismissed around 2% of those that they hired, but as needs have grown and they are taking in more uncut diamonds, they are dismissing a higher percentage of those that they recruit and train. These selection tools are good predictors of performance, but not perfect. Recruits in the industry are frequently asked to sign “training bonds” as a condition of employment – agreements that they will pay the company back the pro-rated cost of training if they leave in less than one year.

Universities and Non-Commercial Research Organizations

The second largest group of organizational sponsors, non-commercial research institutions, are not primarily engaged in activities that result in patenting. Rather, they are involved in the production of pure or basic knowledge. The time horizon for the production as well as quality of research is highly variable. This is in large part due to the diffuse nature of university activities: with little central control over research activities, the strategy of universities is often less amenable to strong oversight and direction. Non-commercial research institutions such as universities often have an educational purpose as well as a knowledge production purpose. Many are research hospitals engaged in the delivery of patient services and medical education. National laboratories and research institutes may be less engaged in the “publish or perish” phenomena. Universities claim to sponsor the “best and the brightest” migrants for temporary workers visas, especially those who have previously obtained student visas. A greater percentage of these workers may ultimately be sponsored for permanent resident status because of the critical importance of physical proximity and being there to get work done.
2.2 Motivation and Development of Research Hypotheses

Hunter, Perry and Currall (2011) show that the organizational climate of a university impacts whether or not the university patents more. When it comes to universities and migration, Borjas and Doran (2012) find that increased migration of Soviet mathematicians decreased the number of U.S. mathematicians hired by universities in a field of particular Soviet strength, illustrating that these migrant STEM workers might crowd out natives. Foreign-born workers are often first identified and inducted through the university system as undergraduates at U.S. universities.

Universities recruit promising students into Ph.D. programs and post-doctoral research positions after observing quality. Initial low pay but greater freedom is intended to allow researchers to develop expertise in niche fields. Experts on the topic of performance management are skeptical of existing measurements of output in academic fields (Adler and Harzing 2009). They highlight numerous biases that influence results and the goal distortion of the measurement itself. Clear measures of research productivity do not exist. Various methods are relatively better or worse, but each measures different things, and so these experts do not recommend the use of these measures in promotion and tenure decisions. Furthermore, even increases in research funding are only loosely related to patents and article production, both of which are difficult to assess in terms of quality, but are linked to larger increases in faculty salaries (Abigail and Aloysius 2003). Given difficulty in measuring diffuse objectives and strategies, the effect of guest worker sponsorship is likely to be more mundane at the overall university level: universities often hire foreign-born guest workers as post-doctoral employees.

High-Tech Industry

The software, hardware, and semiconductor industries are thought to be at the forefront of innovation and are commonly referred to collectively as the high-technology industry. While semiconductor firms once relied less on patents, the increased competition between these firms
has led to a need to build extensive patent portfolios (Hall and Ziedonis 2001).

Innovation oriented high-tech companies all have high selection criteria: they recruit from the best universities and do intense interviews, tryouts and carefully examine past accomplishments and work samples of job candidates. Firms in this industry typically sponsor workers for migration only after inspection of their work product offshore. These firms compete intensely for human resources, and claim they are committed to recruiting the best and the brightest. Talent supply chains help individuals in developing countries know what high-technology organizations are looking for, and thus influence their opportunity set. Individuals born abroad who wish to work for these organizations might model their own behavior in ways to achieve the goal of guest worker sponsorship and employment in a chosen field. Because of their use of high-performance HR practices, any increase in STEM workers, including well-paid foreign born computer professionals engaged in innovation, would suggest their involvement in innovation, and spending more on R&D. Accordingly, more skilled guest worker sponsorship is expected to be associated with increased patenting and R&D spending in these industries.

2.3 DATA: MERGING VISA SPONSORSHIP WITH INSTITUTIONAL CHARACTERISTICS

Through a Freedom of Information Act request, I capture the number of H-1B and L-1 visas that were obtained for workers at specific organizations. This data from the United States Citizenship and Immigration Service represents the primary new information used in this study that has not been available to previous researchers. The raw file from the USCIS indicates that 3,825,465 guest workers were sponsored on H-1B and L-1 visas between 1993 and 2008 in over 3 million organization-years. While information was provided by the USCIS through before 1993 and after 2008, the outlying years are dropped due to concerns about the completeness and validity of the data in both the patent and USCIS database. Given the skewed distribution and the large number of observations and organizations, I focused on heavy users
of these worker visa programs with information available on their institutional characteristics. The scope of this study, therefore, can be defined as organizations that requested more than 150 guest worker visas over the entire period of time for which there was available data on institutional characteristics. This approach cannot account for the behavior of small firms, privately-held companies, or partnerships such as law firms or consulting organizations.

The first step to analyzing the relationship between immigration and innovation was to merge the guest worker dataset with patent data. Data for the organizations that were identified as obtaining more than 150 visas were merged with the patent assignee data in the Zucker-Darby database of patent grantee organizations (Zucker and Darby 2011). The application date of the patent was used in this analysis, as opposed to the date the patent was granted. Organizations were matched by a unique organizational ID to address the situation where the same company was in the database multiple times with slightly different versions of the same name. Furthermore, the Zucker and Darby (2011) database classifies organizations into the following types: firms, universities, national laboratories, hospitals, and research institutions, which enables many of the analyses performed below.

Table 2.1 shows the key summary statistics for 1993-2008 for both the raw datasets and sample datasets (those that have gone through the matching and cleaning process and are used for analysis). As a result of the cleaning process to find duplicate entries for the same organization and the matching process to concentrate on the largest guest worker sponsoring and patenting organizations, the number of guest workers in the database used in analyses was 1.2 million, indicating that 30% of the guest workers in the population are captured by nearly 700 organizations (less than .09 percent of the total number of organizations). In contrast to the complete data, the average number of guest workers sponsored per year by organizations in the sample

---

5This patent data comes from the United States Patent Office, but due to the Zucker-Darby database coverage ending in 2008 and a desire to seek replication through the use of another dataset, I also merged the guest worker dataset to the Berkeley Fung patent database (Lai, D’Amour, Yu, Sun and Fleming 2013). The cleaning and matching procedure for the Fung patent database yielded a dataset that contained approximately 25% of the total number of patents applied for from 1993-2008. 31
increased from 1.25 to 100 in the matched dataset.

Compiling and matching data on organizational characteristics was time-consuming, as it required iteratively searching for various spellings, misspellings, and general confusion surrounding the names of the entities involved as they underwent mergers and acquisitions. Because the entire dataset could not be cleaned in this labor intensive manner, this analysis of results is limited in the ways discussed in this section. After making a best effort to find all heavy-users of skilled guest worker visa programs that are publicly traded in stock markets worldwide, annual financial information was obtained from Wharton Research Data Services’ Compustat North America and Compustat Global.

The following annual financial information for each company was collected and merged: country of incorporation, country of headquarters, Global Industry Classification Standard (GSIC), annual worldwide employees, revenue, and research and development expenses. Information was gathered for 136 large universities for the years 1996-2008 from the Center for Measuring University Performance (CMUP 2011). Variables include the annual research funding, assets, and donations in current dollars, the number of doctorates granted, and the number of post-docs employed. The number and size of grant-awards is also taken from the Zucker-Darby database. Tables 2.2 and 2.3 show the number of observations, sum of visas, and mean summary statistics for the matched firm and university datasets that include only firms that are publicly traded with information available from Compustat and universities with information from CMUP.

---

Some adjustments were required before using the data. Adjusting financial data was a two-step process involving currency conversions of global Compustat figures into U.S. dollars, and then adjusting all dollar figures for inflation into 2010 dollars using the Consumer Price Index. Compustat’s currency database of annual average exchange rates was used for the first step, but because its publication ceased in July 2008, the annual average exchange rate for 2008 was found on oanda.com. Early crosstabs of the data revealed some mysterious results, such as firms spending a huge portion of their income on R&D. These results were checked against the annual reports of several of the corporations involved, and it was found that in certain cases, the financial information, and in particular, R&D spending, had been improperly transcribed into Compustat Global. This meant a number of observations of R&D were re-coded to zero. Further, while Compustat financial information was available only for certain years, region and sector categories for each organization were extended to every firm-year observation for several analyses.
Combining the university and Compustat data, the full matched dataset includes 416 organizations with 4,218 firm-year observations. Accordingly, this study’s findings relate to average within organization effects of visa sponsorship for large firms that are heavy users of the H-1B and L-1 programs.

**Empirical Model**

This paper seeks to establish whether guest worker migration has different consequences for different types of organizations in within-organization analyses. Accordingly, this paper uses a fixed-effects model. The dependent variables include patents, research & development spending, and labor productivity. The regression equation for the fixed effects model with sector and organizational country-of-origin heterogeneity is shown below:

\[
\ln(y_{i,j,s,t}) = \beta_0 + \beta_1 \ln(\text{visa}_{i,j,s,t-1}) + \beta_2 \ln(\text{visa}_{i,j,s,t-1}) \times X'_j + \beta_3 \ln(\text{visa}_{i,j,s,t-1}) \times X'_s + \gamma_{j,t} + \delta_{s,t} + \lambda_i + \epsilon_{i,j,s,t}
\]  

(1)

Independent and dependent variables are logged to enable a measurement of the visa sponsoring elasticity with respect to patenting, worldwide employment, research & development (R&D) spending, revenue and labor productivity. Each of these dependent variables is therefore represented on the left hand side of the equation by \(\ln(y_{i,j,s,t})\). The beta terms represent the average within organization effect of skilled guest worker sponsorship. The \(\ln(\text{visa}_{i,j,s,t-1})\) term represents the one year lag in logged visas obtained by an organization. The term \(\beta_2 \ln(\text{visa}_{i,j,s,t-1}) \times X'_j\) is the interaction of lagged visa sponsorship by industry sector. The \(\beta_3 \ln(\text{visa}_{i,j,s,t-1}) \times X'_s\) term is the interaction for country of origin. The \(\gamma_{j,t}\) term is a sector by year time trend, and \(\delta_{s,t}\) is country of origin by year time trend. The \(\lambda_i\) represents organization fixed effects. Finally, \(\epsilon_{i,j,s,t}\) is an unobserved (error) term.

\(^7\)While some analyses adjust for mergers and acquisitions by combining two entities for the entire study duration, I left each organization as it was, resulting in an unbalanced panel that includes firms that exit or are acquired before the close of the study period and those that enter after the start.

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Differences between organizations and years, such as is possible where organizations use different strategies or are subject to larger macroeconomic trends such as the boom-bust cycle, are absorbed by indicator variables for each year and organization. Additional controls include various measures of company or university size as measured by the log of sales, log of R&D expenditure, and log of assets for universities. This study includes a one-year time lag: guest workers are presumed to have a lagged effect because it takes several years for guest workers to begin making innovative contributions (Kerr and Lincoln 2010). Given that the approval process for visas, not to mention the recruitment and training procedures in foreign countries, are often years in the making, the one year lag of independent variables is used throughout.

2.4 Results

Several preliminary empirical results are provided in the descriptive statistics presented in the tables described below. These results allow for the first time a statistical characterization of the heavy users of the skilled guest worker visa programs. Regressions in this paper demonstrate that it is likely that organizations hire foreign-born workers who go on to innovate, but that increases in visa dependence are associated with decreased patenting and R&D and increased productivity. Semiconductor firms hire guest workers in conjunction with increased R&D spending, and universities utilize skilled guest workers as post-doctoral researchers. These results establish a number of boundary conditions for the effect of skilled guest workers, and make clear several contingencies under which guest workers are likely to have these effects.

These preliminary findings from this dataset contribute a new perspective to the literature on skilled guest workers by emphasizing how heterogeneity in organizational demand for skilled labor might produce the consequent effects of these workers. The results suggest that patenting increases in conjunction with guest worker sponsorship (Hypothesis 1). In terms of organizational strategy, increases in visa dependence are associated with lower patenting
and R&D but higher labor productivity (Hypothesis 2). Industry and region of origin effects explain a significant proportion of the variance in the effect of guest worker sponsorship on R&D and patenting (Hypothesis 3), such that semiconductor and IT firms experience greater R&D but semiconductor and hardware companies experience lesser patenting and universities increase postdoctoral student hiring.

**Who Sponsors Guest Workers?**

In the last two decades, more than four million temporary workers have been sponsored by their employers to work in the U.S. with H-1B and L-1 temporary worker visas, according to the data I gathered. The size distribution of organizations is highly skewed: Figure 2.1 shows that the largest users of the visa programs account for a significant portion of the total users of the program. Studying only large firms, however, leaves out a significant proportion of guest worker sponsorship. Next to nothing is known about these small organizational sponsors of guest workers, and it is a limitation of the present research that it could not go below organizations that sponsored 150 migrant workers.

Figures 2.2 and 2.3 show users of the visa program as broken out by industry sector. An illustrative list of the top five organizations in several of the large industries is included in Appendix 1. Table 2.2 shows that firms with large Indian workforces are the largest users of the program, followed by universities, software companies, financial firms, hardware companies, industrials, and semiconductors. There is a great deal of heterogeneity in the types of firms in the dataset, and it is likely that these firms have different uses for guest workers according to their industry and other institutional characteristics (as will be tested later). In terms of dependence on visas, Table 2.3 shows that 17% of Indian firms’ employees were sponsored for visas annually, followed by 5% of IT and software firms, and 2% of semiconductor firms. Notably, firms in the health sector, which includes biotechnology, are under-represented.

The decision to include firms headquartered outside of the U.S. was intentional in this
study, given that the role of foreign firms in the use of the guest worker programs has been highlighted as a critical issue (Hira 2010a), and most studies of migration that consider organizations exclude non-U.S. firms from their analysis (e.g. Kerr and Lincoln (2010) and Bound et al. (2013)). Approximately one-third of visas in the sample used for analysis were given to workers sponsored by entities headquartered outside of the U.S. It is also worth noting that while firms headquartered in India had a low number of patents, those based in Europe or Japan had a much higher number of patents on average than U.S. based firms. Likewise, Japanese and European firms are larger than the U.S. firms in both revenue and employment and have a smaller percentage of their workforce on visas than firms of other countries. This suggests that the most global, largest, and patenting European and Japanese firms sponsor a large number of migrant workers.

Innovation, R&D, and Heterogeneity

The first prediction is for a positive within-firm patent-visa elasticity. Table 2.4 supports the hypothesized relationships between guest worker sponsorship and patenting. Model 1 provides an estimate of the basic relationship between visa-sponsoring and patenting without additional covariates, while models 2-4 include region-year and sector-year time trends as well as region-visa and sector-visa interaction terms. Model 5 adds a control for firm size (revenue) and confirms the basic relationship.

The patent-visa elasticity is somewhere between .19 and .22 in models 1-3 in Table 2.4 and increases to .52 when accounting for organizational visa dependence, which is a proxy for the labor arbitrage strategy. This suggests that a ten percent increase in guest worker sponsorship is associated with between a 2.2% and a 3.1% increase in patenting; when accounting for organizational visa dependence, this increases to 5.1 percent. These estimates of the patenting-guest worker sponsorship elasticity are similar to others in the literature, if on the lower-end. In their firm panel Kerr and Lincoln (2010) found a ten percent increase in immigration was
associated with a 4-5% increase in invention at the firm level. In their city analysis, they found that a 10% increase in the H-1B population increased the Indian and Chinese invention (as identified by examining the ethnicity of the inventor on the patent) by 6-12% in the most H-1B dependent quintile of cities compared to the bottom two quintiles. Chellaraj, Maskus and Mattoo (2008) also provide evidence that a 10% increase in the number of immigrants results in a general rise in patent applications of 4.7%, while increasing universities’ patenting by 5.3% and non-university patent grants by 6.7 percent. Other research estimates include Hunt and Gauthier-Loiselle (2010), who use data from the National Survey of College Graduates and find that a one percent increase in the immigrant college graduates as a share of the population increases patents by 6% per capita. In addition, Hunt and Gauthier-Loiselle (2010) find that a 1% increase in immigrant college graduates results in an increase in patents per capita by 15 percent.

The second prediction suggests organizational strategy (either labor or proximity arbitrage) as measured by visa dependence provides additional information regarding the relationship between guest worker sponsorship and innovation. First, more visa-dependence is suggested to be negatively associated with patenting and R&D. This is shown in model 4 in Tables 2.4 and 2.5. At the same time, increases in guest worker sponsorship are more strongly associated with R&D and patenting when controlling for visa dependence, suggesting that all else equal, guest worker sponsorship does increase innovation. This changes, however, as firms become more dependent on the guest worker program, suggesting that when the number of guest workers changes the balance of the workforce, the effect on patenting and R&D is actually negative.

The positive relationship between labor productivity and visa dependence in model 4 in Table 2.6 suggests that more visa dependent firms increase labor productivity in conjunction with guest worker sponsorship. While model 2 shows that there is a positive association between guest worker sponsorship and labor productivity, this effect diminishes in model 3.
when R&D is controlled for, and it is negative when controlling for visa dependence. This sug-
gests that the effect of increased guest worker sponsorship on productivity is negative when
controlling for organizational visa dependence, but that the more dependent an organization
is, the higher the labor productivity.

Hypothesis 3 predicts that the effect of skilled guest workers on organizational outcomes
(patenting, R&D, and productivity) varies by organizational sector and region of origin. Re-
gion and sector interaction terms in Table 2.4 Table 2.5 and Table 2.6 increase the explanatory
power of the model. Models 2-4 in all three tables show that the effect of skilled guest workers
on organizational objectives varies by organizational sector. These results reject the null hy-
pothesis that there is no systematic difference in the relationship according to organizational
membership in an industry and country of origin.

Several of the specific industry effects are worth noting. The university, semiconductor, and
hardware industries actually experience a smaller association between guest worker spon-
sorship and patenting than other types of organizations in Table 2.4. The semiconductor and IT
industries experience a stronger association between R&D spending and guest worker spon-
sorship in Table 2.5. In Table 2.6, hiring more guest workers is associated with lower labor
productivity in the semiconductor industry and in universities (research funding is used for uni-
versities), which suggests these guest workers do not participate in revenue generating
activities in these industries.

2.5 DISCUSSION OF RESULTS

In conversations regarding skilled guest worker programs, discussants often wish to argue
the effect of having these workers in the U.S. on the economy. Rather than attempt to enter
that discussion, this paper suggests that there is a need to re-frame the discussion toward
understanding how strategic intent by organizational actors may be determining the causal
impact of these programs. In the research literature, studies have made the argument that these

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2.5 Discussion of Results

workers are either innovative or not based upon individual characteristics. Yet this implicitly assumes guest workers are self-selected and individual innovators or job-takers, rather than emphasizing how these workers are selected for by organizations that are in pursuit of their own goals.

To state the assumption behind the present research strongly, I would predict that if guest workers were randomly assigned to organizations, the effects of these workers on the economy would be the same as at the present time. The possibility that organizations shape the traits, including skills and migrant worker status, that individuals acquire and that are measured in social science research is under-developed in this literature. Accordingly, further research, especially qualitative, is necessary to determine the causal direction of this organizational influence. Research to advance the organizational perspective might begin with identifying what major categories of organizational actors want as their central objective in hiring these workers, follow the path by which organizations create selection and recruitment strategies to find guest workers, determine whether and how on the job training overseas endows these guest workers with skills, and study how these organizations thus produce societal results that vary based upon the characteristics of the sponsoring institutions. While this paper makes a minor advance by finding the largest organizational sponsors and illustrating some contingent effects, a detailed account is still missing.

Policy Conclusions

With respect to guest worker programs, Hunt’s (2011) conclusion is affirmed by my analysis: I too conclude that firms and non-commercial research organizations do perform selection best. However, I would caution that giving organizations this extraordinary power with little regulatory oversight has led to some firms becoming heavily dependent on the visa programs with possibly harmful effects. Furthermore, while organizations offer some advantages over other forms of sponsorship, there are other risks to organizational sponsorship, including dis-
cramination abroad. The path-dependent nature of international talent conveyor belts based on national origin in the Indian ILMIs leaves many potential migrants born in other countries out of luck while increasing dependence upon a single talent source.

In line with earlier research, I conclude that the program functions essentially as intended by Congress, although there are some unintended consequences as well. That not all of the consequences of this program were intended is no surprise given the flexibility of these visa programs: they allow organizational actors to change the programs’ impact as their own needs arise and go out of favor. This does not mean, however, that legislation that attempted to pick and choose organizational winners and losers could be done without causing further unintended consequences. With respect to improving the program, past research has shown that when skilled guest workers finish a job in the U.S. or if the economy goes into a downturn, the lowest-paid leave first (Depew, Norlander and Sorensen 2013). That research, as well as Matloff’s (2013) and Hira’s (2010a), emphasizes that job mobility is a critical feature of guest worker programs: guest workers must have the ability freely separate from a bad job in order to reduce exploitation.

Policies that would encourage skill acquisition are suggested to be those that would build a permanent talent pipeline between workers and organizations. The insight that international organizations have built talent supply chains can be used to create domestic talent supply chains. While copying this model to create additional virtuous circles of skills development is easier said than done, the evidence in this paper shows one additional mechanism by which it is possible to encourage this: raise the wages for skills development. As migration to the U.S. involves a substantial increase in wages (Clemens 2013), additional incentives for domestic workers are unlikely to match the incentive structures facing foreign-born workers; the playing field between foreign-born workers and U.S. residents is not level. Still, something could be done through both grant aid and additional scholarships for post-graduate study to increase domestic workers’ and students’ incentives to gain a STEM education.
2.5 Discussion of Results

**Directions for Future Research**

Shadish, Cook and Campbell (2002) provides a useful guide for thinking through some of the challenges that face the literature on migration and organizations. The threats to internal validity in research on skilled immigration that this paper has identified include: *selection* (at the start of entry in to the country, immigrants differ based upon the organization they work for) [p.56]; *attrition* (organizations perform positive selections of migrant workers and return underperforming guest workers to their home countries); *testing* (in countries outside of the U.S., test-taking skills are emphasized) [p.60]; and *poor definition of research constructs* (the country of birth of these actors is given greater priority than their skills, and as a consequence conclusions are made about the effects of migrant status rather than skill status). In addition, threats to construct validity in this research include: *inadequate explications* (skilled immigrants cannot cause the effects claimed; rather organizational selection, goal-setting, and other OB processes are the likely causal force). Guest workers are interesting to study because they are an easy to track human resources input into organizations. Immigration records leave a handy paper trail with which it is possible to measure the effects of skilled workers on organizations. Therefore the construct “skilled migration” may be identified at too specific a level [p. 74].

Research on migration and organizations is still relatively new. As a broad area for research, the agenda for the future is open. Just as the Kerr and Lincoln (2010) study restricted its focus to organizations that patent heavily, the research conclusions presented here are also limited. This study looks only at large visa users. Although the Kerr and Lincoln results were upheld by this expanded analysis, the restricted range of the datasets could lead to mistaken conclusions. I cannot speak to the overall average effect of skilled immigration on organizational outcomes for smaller organizations or for privately held organizations. Future research that studies smaller users of the visa program through survey methods would greatly increase knowledge about the uses of these programs in small to medium sized firms.

With respect to the data assembled here, one possible route to take would be to attempt to
find instances where firm HR strategy does or does not switch, as is possible in the case of U.S. based IT services firms. When the offshoring phenomena began to grow rapidly, companies such as Accenture and IBM rapidly shifted their HR strategies toward India and the use of the visa programs, while other IT services giants such as EDS and CSC were slower to adapt. The different paths taken by these firms could make an interesting case of how HR strategy can dramatically influence organizational competitiveness. Further, this could have policy consequences. As seen in Figure 2.4, there appears to be a secular decline in the patent-visa elasticity over the period of this study while there are fluctuations based upon the business cycle. As a first use of this powerful new dataset, future quantitative research can delve into these subjects more deeply.

These limitations to the present understanding of skilled migration suggest a role for further qualitative research on organizations and migration. While prior researchers have gone to great lengths to show a causal effect of these guest worker programs, the actual causation is likely to be influenced in a feedback loop: organizations that patent hire and attract workers likely to patent leading to a self-reinforcing association in each subsequent period. Understanding these factors is critical to teasing out the causality in an area of study where concerns with endogeneity are endemic. Narrow case studies that focus on particular types of institutions could build a better understanding of how these forces work in specific circumstances. By breaking apart the study of homogeneous skilled guest workers and specifying the contingent organizational factors that might influence how these guest workers on the economy, this paper begins a path toward discovering the nature of these effects. Future research promises to shed more light.
### Table 2.1: Summary Statistics for Raw and Edited Data, 1993-2008

<table>
<thead>
<tr>
<th></th>
<th>Median</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Patents</td>
<td>1</td>
<td>7.73</td>
<td>442.49</td>
<td>360,959</td>
<td>2,788,907</td>
</tr>
<tr>
<td>Sample Patents</td>
<td>2</td>
<td>63.49</td>
<td>261.33</td>
<td>11,677</td>
<td>741,316</td>
</tr>
<tr>
<td>Total Immigration</td>
<td>1</td>
<td>1.25</td>
<td>1.56</td>
<td>3,058,981</td>
<td>3,825,465</td>
</tr>
<tr>
<td>Sample Immigration</td>
<td>35</td>
<td>99.84</td>
<td>323.63</td>
<td>11,677</td>
<td>1,165,850</td>
</tr>
</tbody>
</table>

### Table 2.2: Summary Statistics: Sum of Visas by Organization Sector and Region

<table>
<thead>
<tr>
<th>Sector</th>
<th>USA</th>
<th>Europe</th>
<th>Japan</th>
<th>India</th>
<th>Other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other</td>
<td>151,681</td>
<td>10,221</td>
<td>5,519</td>
<td>0</td>
<td>8,334</td>
<td>175,755</td>
</tr>
<tr>
<td>University</td>
<td>208,121</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>208,121</td>
</tr>
<tr>
<td>BFSI</td>
<td>79,468</td>
<td>21,039</td>
<td>0</td>
<td>0</td>
<td>254</td>
<td>100,761</td>
</tr>
<tr>
<td>Health</td>
<td>20,943</td>
<td>3,030</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>23,973</td>
</tr>
<tr>
<td>Consumer</td>
<td>53,131</td>
<td>2,083</td>
<td>8,746</td>
<td>0</td>
<td>1,613</td>
<td>65,573</td>
</tr>
<tr>
<td>Industrial</td>
<td>41,166</td>
<td>9,994</td>
<td>2,895</td>
<td>0</td>
<td>3,001</td>
<td>57,056</td>
</tr>
<tr>
<td>SC</td>
<td>41,607</td>
<td>1,802</td>
<td>640</td>
<td>0</td>
<td>897</td>
<td>44,946</td>
</tr>
<tr>
<td>HD</td>
<td>34,734</td>
<td>6,236</td>
<td>3,031</td>
<td>0</td>
<td>19,624</td>
<td>63,625</td>
</tr>
<tr>
<td>IT</td>
<td>149,506</td>
<td>22,790</td>
<td>4,695</td>
<td>244,570</td>
<td>4,479</td>
<td>426,040</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>780,357</td>
<td>77,195</td>
<td>25,526</td>
<td>244,570</td>
<td>38,202</td>
<td>1,165,850</td>
</tr>
</tbody>
</table>
### Table 2.3: Summary Statistics: Annual Means by Sector and Region of Organization

<table>
<thead>
<tr>
<th>Sector</th>
<th>Mean</th>
<th>Mean</th>
<th>Mean</th>
<th>Mean</th>
<th>Mean</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Visas</td>
<td>Patents</td>
<td>Rev</td>
<td>Emp</td>
<td>Research</td>
<td>H-1B Dep</td>
</tr>
<tr>
<td>Other (28%)</td>
<td>53</td>
<td>41</td>
<td>$45,535</td>
<td>56</td>
<td>$56</td>
<td>0.002</td>
</tr>
<tr>
<td>University (21%)</td>
<td>83</td>
<td>16</td>
<td>$263</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BFSI (6%)</td>
<td>136</td>
<td>9</td>
<td>$32,575</td>
<td>52</td>
<td>$3</td>
<td>0.006</td>
</tr>
<tr>
<td>Health (4%)</td>
<td>46</td>
<td>47</td>
<td>$14,349</td>
<td>30</td>
<td>$1,183</td>
<td>0.008</td>
</tr>
<tr>
<td>Consumer (10%)</td>
<td>54</td>
<td>80</td>
<td>$39,270</td>
<td>127</td>
<td>$611</td>
<td>0.002</td>
</tr>
<tr>
<td>Industrial (5%)</td>
<td>91</td>
<td>189</td>
<td>$22,114</td>
<td>95</td>
<td>$677</td>
<td>0.002</td>
</tr>
<tr>
<td>SC (4%)</td>
<td>87</td>
<td>133</td>
<td>$3,502</td>
<td>10</td>
<td>$508</td>
<td>0.018</td>
</tr>
<tr>
<td>HD (4%)</td>
<td>111</td>
<td>191</td>
<td>$16,126</td>
<td>41</td>
<td>$931</td>
<td>0.013</td>
</tr>
<tr>
<td>IT (14%)</td>
<td>256</td>
<td>84</td>
<td>$4,692</td>
<td>19</td>
<td>$272</td>
<td>0.048</td>
</tr>
<tr>
<td><strong>Total (100%)</strong></td>
<td>100</td>
<td>63</td>
<td>$20,550</td>
<td>54</td>
<td>$335</td>
<td>0.016</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Region</th>
<th>Mean</th>
<th>Mean</th>
<th>Mean</th>
<th>Mean</th>
<th>Mean</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Visas</td>
<td>Patents</td>
<td>Rev</td>
<td>Emp</td>
<td>Research</td>
<td>H-1B Dep</td>
</tr>
<tr>
<td>USA (85%)</td>
<td>78</td>
<td>45</td>
<td>$19,098</td>
<td>50</td>
<td>$278</td>
<td>0.011</td>
</tr>
<tr>
<td>Europe (5%)</td>
<td>130</td>
<td>139</td>
<td>$41,707</td>
<td>96</td>
<td>$894</td>
<td>0.007</td>
</tr>
<tr>
<td>Japan (2%)</td>
<td>79</td>
<td>549</td>
<td>$46,727</td>
<td>120</td>
<td>$1,574</td>
<td>0.002</td>
</tr>
<tr>
<td>India (4%)</td>
<td>479</td>
<td>18</td>
<td>$475</td>
<td>12</td>
<td>$6</td>
<td>0.168</td>
</tr>
<tr>
<td>Other (2%)</td>
<td>135</td>
<td>78</td>
<td>$17,555</td>
<td>47</td>
<td>$255</td>
<td>0.016</td>
</tr>
<tr>
<td><strong>Total (100%)</strong></td>
<td>100</td>
<td>63</td>
<td>$20,550</td>
<td>54</td>
<td>$335</td>
<td>0.016</td>
</tr>
</tbody>
</table>

*a* Note: Revenue and Research figures are in millions. Employees are in thousands. Source: Compustat.
## 2.5 Discussion of Results

Table 2.4: All Organizations: Regressions of Patent-Visa Elasticity

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>ln(Visas$_{t-1}$)</td>
<td>0.2169***</td>
<td>0.2390***</td>
<td>0.1911***</td>
<td>0.5341***</td>
<td>0.3706***</td>
</tr>
<tr>
<td></td>
<td>(0.0348)</td>
<td>(0.0537)</td>
<td>(0.0532)</td>
<td>(0.0928)</td>
<td>(0.1023)</td>
</tr>
<tr>
<td>University*ln(Visas$_{t-1}$)</td>
<td>-0.1727**</td>
<td>-0.1470**</td>
<td>-0.1376*</td>
<td>-0.1142</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0762)</td>
<td>(0.0744)</td>
<td>(0.0738)</td>
<td>(0.0733)</td>
<td></td>
</tr>
<tr>
<td>Semiconductor*ln(Visas$_{t-1}$)</td>
<td>-0.0132</td>
<td>-0.1273</td>
<td>-0.1582**</td>
<td>-0.1449*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0990)</td>
<td>(0.0807)</td>
<td>(0.0789)</td>
<td>(0.0802)</td>
<td></td>
</tr>
<tr>
<td>Hardware*ln(Visas$_{t-1}$)</td>
<td>-0.0370</td>
<td>-0.1315*</td>
<td>-0.1463**</td>
<td>-0.1500**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0995)</td>
<td>(0.0757)</td>
<td>(0.0744)</td>
<td>(0.0725)</td>
<td></td>
</tr>
<tr>
<td>IT*ln(Visas$_{t-1}$)</td>
<td>0.1119</td>
<td>-0.0756</td>
<td>-0.1243</td>
<td>-0.1394</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.1062)</td>
<td>(0.0890)</td>
<td>(0.0881)</td>
<td>(0.0899)</td>
<td></td>
</tr>
<tr>
<td>India*ln(Visas$_{t-1}$)</td>
<td>-0.1629</td>
<td>-0.2585</td>
<td>-0.3742</td>
<td>-0.3246</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.2354)</td>
<td>(0.6418)</td>
<td>(0.5403)</td>
<td>(0.4770)</td>
<td></td>
</tr>
<tr>
<td>ln(R&amp;D)$_{t-1}$</td>
<td>0.4329***</td>
<td>0.2249***</td>
<td>0.1522**</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0635)</td>
<td>(0.0742)</td>
<td>(0.0742)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ln(Visa Dependency)$_{t-1}$</td>
<td>-0.3551***</td>
<td>-0.2072**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0771)</td>
<td>(0.0845)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ln(Revenue)$_{t-1}$</td>
<td>0.2615***</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0832)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Organizations            | 387          | 387          | 387          | 387          | 387          |
| N                        | 3744         | 3744         | 3744         | 3744         | 3744         |
| R-Squared                | .3492        | .3902        | .4285        | .4381        | .4429        |

---
a All specifications include year and organization fixed effects. Specifications 2-4 include region-year, sector-year and visa sponsoring time-trends. Regressions are for years 1993-2008. A Hausman test indicated that the fixed effects model was preferred. Std. errors are clustered at the organization level.
Table 2.5: Regressions of R&D-Visa Elasticity

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>ln(Visas_{t-1})</td>
<td>0.2053***</td>
<td>0.1119***</td>
<td>0.0150</td>
<td>0.4708***</td>
</tr>
<tr>
<td></td>
<td>(0.0262)</td>
<td>(0.0348)</td>
<td>(0.0214)</td>
<td>(0.0544)</td>
</tr>
<tr>
<td>University*ln(Visas_{t-1})</td>
<td>-0.0457</td>
<td>0.0502*</td>
<td>0.0419*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0392)</td>
<td>(0.0280)</td>
<td>(0.0254)</td>
<td></td>
</tr>
<tr>
<td>Semiconductor*ln(Visas_{t-1})</td>
<td>0.2301***</td>
<td>0.1430***</td>
<td>0.0855**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0870)</td>
<td>(0.0434)</td>
<td>(0.0362)</td>
<td></td>
</tr>
<tr>
<td>Hardware*ln(Visas_{t-1})</td>
<td>0.1389*</td>
<td>0.0427</td>
<td>0.0227</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0828)</td>
<td>(0.0447)</td>
<td>(0.0409)</td>
<td></td>
</tr>
<tr>
<td>IT*ln(Visas_{t-1})</td>
<td>0.2299***</td>
<td>0.0727*</td>
<td>0.0233</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0802)</td>
<td>(0.0385)</td>
<td>(0.0324)</td>
<td></td>
</tr>
<tr>
<td>India*ln(Visas_{t-1})</td>
<td>-0.0570</td>
<td>-0.1601</td>
<td>-0.1431</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.5836)</td>
<td>(0.5180)</td>
<td>(0.4412)</td>
<td></td>
</tr>
<tr>
<td>Ln(Revenue)_{t-1}</td>
<td>-0.4599***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0498)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ln(Visa Dependency)_{t-1}</td>
<td>0.5558***</td>
<td>0.2560***</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0383)</td>
<td>(0.0477)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Organizations                  | 406        | 406        | 406        | 406        |
| N                              | 4205       | 4205       | 4205       | 4205       |
| R-Squared                      | .3301      | .3784      | .5985      | .6497      |

* All specifications include year and organization fixed effects. Specifications 2-4 include region-year, sector-year, and visa sponsoring time-trends. Regressions are for years 1993-2008. A Hausman test indicated that the fixed effects model was preferred. Std. errors are clustered at the organization level.
2.5 Discussion of Results

Table 2.6: Regressions of Productivity-Visa Elasticity

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>ln(Visas_{t-1})</td>
<td>0.0052</td>
<td>0.0272*</td>
<td>0.0258</td>
<td>-0.2563***</td>
</tr>
<tr>
<td>(0.0122)</td>
<td>(0.0163)</td>
<td>(0.0165)</td>
<td>(0.0383)</td>
<td></td>
</tr>
<tr>
<td>University*ln(Visas_{t-1})</td>
<td>-0.0405</td>
<td>-0.0397</td>
<td>-0.0536*</td>
<td></td>
</tr>
<tr>
<td>(0.0313)</td>
<td>(0.0314)</td>
<td>(0.0283)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Semiconductor*ln(Visas_{t-1})</td>
<td>-0.0676*</td>
<td>-0.0702*</td>
<td>-0.0439</td>
<td></td>
</tr>
<tr>
<td>(0.0361)</td>
<td>(0.0359)</td>
<td>(0.0376)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hardware*ln(Visas_{t-1})</td>
<td>-0.0090</td>
<td>-0.0110</td>
<td>0.0066</td>
<td></td>
</tr>
<tr>
<td>(0.0437)</td>
<td>(0.0419)</td>
<td>(0.0393)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IT*ln(Visas_{t-1})</td>
<td>-0.0072</td>
<td>-0.0105</td>
<td>0.0283</td>
<td></td>
</tr>
<tr>
<td>(0.0282)</td>
<td>(0.0278)</td>
<td>(0.0310)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>India*ln(Visas_{t-1})</td>
<td>-0.0266</td>
<td>-0.0238</td>
<td>0.0315</td>
<td></td>
</tr>
<tr>
<td>(0.1970)</td>
<td>(0.1962)</td>
<td>(0.1603)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ln(R&amp;D)_{t-1}</td>
<td></td>
<td>0.0108</td>
<td>0.1763***</td>
<td></td>
</tr>
<tr>
<td>(0.1970)</td>
<td>(0.0226)</td>
<td>(0.0290)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ln(Visa Dependency)_{t-1}</td>
<td></td>
<td></td>
<td>0.2954***</td>
<td></td>
</tr>
<tr>
<td>(0.0372)</td>
<td></td>
<td></td>
<td>(0.0372)</td>
<td></td>
</tr>
<tr>
<td>Organizations</td>
<td>412</td>
<td>412</td>
<td>412</td>
<td>412</td>
</tr>
<tr>
<td>N</td>
<td>4189</td>
<td>4189</td>
<td>4189</td>
<td>4189</td>
</tr>
<tr>
<td>R-Squared</td>
<td>.104</td>
<td>.1722</td>
<td>.1725</td>
<td>.2529</td>
</tr>
</tbody>
</table>

* a All specifications include year and organization fixed effects. Specifications 2-4 include region-year, sector-year, and visa sponsoring time-trends. Regressions are for years 1993-2008. A Hausman test indicated that the fixed effects model was preferred. Std. errors are clustered at the organization level.
Table 2.7: University Analysis: Visa Sponsorship, Visa-Patent & Visa-Grants

<table>
<thead>
<tr>
<th></th>
<th>DV: ln(Visas)</th>
<th>DV: ln(Post Docs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ln(Visas$_{t-1}$)</td>
<td>0.0537***</td>
<td>0.0424***</td>
</tr>
<tr>
<td></td>
<td>(0.0164)</td>
<td>(0.0147)</td>
</tr>
<tr>
<td>ln(Research)</td>
<td>0.5190***</td>
<td>0.3479***</td>
</tr>
<tr>
<td></td>
<td>(0.1821)</td>
<td>(0.1065)</td>
</tr>
<tr>
<td>ln(Doctorates)</td>
<td>0.0514</td>
<td>0.1774*</td>
</tr>
<tr>
<td></td>
<td>(0.0955)</td>
<td>(0.0975)</td>
</tr>
<tr>
<td>ln(Assets)</td>
<td>0.0124</td>
<td>0.0937**</td>
</tr>
<tr>
<td></td>
<td>(0.0957)</td>
<td>(0.0370)</td>
</tr>
<tr>
<td>ln(Grants)</td>
<td>0.0036</td>
<td>-0.0577</td>
</tr>
<tr>
<td></td>
<td>(0.0226)</td>
<td>(0.0355)</td>
</tr>
<tr>
<td>ln(PostDocs)</td>
<td>0.1007**</td>
<td>0.1271**</td>
</tr>
<tr>
<td></td>
<td>(0.0405)</td>
<td>(0.0515)</td>
</tr>
<tr>
<td>Organizations</td>
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<td>138</td>
</tr>
<tr>
<td>N</td>
<td>1293</td>
<td>1918</td>
</tr>
<tr>
<td>R-Squared</td>
<td>.5326</td>
<td>.1652</td>
</tr>
</tbody>
</table>

* All specifications include year fixed effects. Std. errors are clustered at the organization level.
Figure 2.1: Frequency Count and Distribution of Visas Sponsors By Organization Size
Figure 2.2: Time Series of Visa Use Organizational Type
Figure 2.3: Pie Chart of Visa Use by Organizational Type

- University: 23%
- Indian: 1%
- Industrials Discretionary: 25%
- Staples: 2%
- Finance: 6%
- Software: 3%
- Hardware Semiconductors: 2%
- Telecom: 10%
- Other: 14%
- Energy: 7%
- Health: 5%
- Security: 1%
Figure 2.4: Three Year Buckets of the Patent-Visa Elasticity
### Appendix Table 1 - Large Users of Guest Worker Programs

<table>
<thead>
<tr>
<th>Top 5 Firms</th>
<th>Distinguishing Features</th>
<th>Objective metrics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High Tech Firms</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Microsoft – 24140</td>
<td>High Patent Intensity</td>
<td>Patents &amp; R&amp;D</td>
</tr>
<tr>
<td>IBM – 23741</td>
<td>Moderate Visa Dependence</td>
<td></td>
</tr>
<tr>
<td>Oracle – 15441</td>
<td>High R&amp;D</td>
<td></td>
</tr>
<tr>
<td>Intel – 14515</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cisco – 14170</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>International Labor Market Intermediaries (ILMIs) With Large Indian Workforce</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tata – 51990</td>
<td>Low Patent Intensity</td>
<td>Revenue and Employment Growth</td>
</tr>
<tr>
<td>Infosys – 51373</td>
<td>High Visa Dependency</td>
<td></td>
</tr>
<tr>
<td>Wipro – 27026</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cognizant – 25845</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Satyam – 21903</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Universities</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U. of California – 6786</td>
<td>Low Patent Intensity</td>
<td>Post-Doctoral Employees</td>
</tr>
<tr>
<td>U. of Pennsylvania – 4908</td>
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<td></td>
</tr>
<tr>
<td>U. of Texas Anderson – 4825</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Harvard U. – 4660</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U. of Michigan – 3954</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3 Inter-Firm Mobility and Return Migration Patterns of Skilled Guest Workers

With Briggs Depew and Todd A. Sørensen

1. Abstract

Critics of U.S. high-skilled guest worker visa programs argue that 1) program regulations tie workers to their sponsoring firm, creating working conditions akin to indentured servitude and that 2) the programs lack a vehicle for adjusting downward the number of visas available during a recession. We address these two criticisms using unique payroll data from firms that rely upon these programs. Contrary to popular belief, we find that the guest workers in our sample exhibit a significant amount of inter-firm mobility that varies over both the earnings distribution and the business cycle. This suggests that, despite regulatory frictions of the visa programs, competitive pressures are a driving force in this labor market. Furthermore, we find evidence of increased return migration during periods of high unemployment. This is especially true for lower paid workers, suggesting positive selection.

3.1 INTRODUCTION

Since the information technology (IT) boom in the mid 1990s, the U.S. economy has relied more heavily on high skilled guest workers. In addition to traditional information technology
firms that employ migrant IT workers, there has been a surge in the number and size of India
based IT firms that provide “off-shoring” services to U.S. firms and also act as labor market
intermediaries. They do so by placing a large number of their IT professionals at U.S. firms
on skilled guest worker visas. The impact of high skilled guest workers on the U.S. economy
continues to be debated in the political arena. Proponents of an expanded visa program argue
that higher levels of skilled immigration will lead to higher growth rates through more inno-
vation (Kerr and Lincoln 2010, Hunt and Gauthier-Loiselle 2010), while opponents argue that
high-skilled immigration has negative effects on the labor market outcomes of native work-
ers (Borjas 2009, Borjas and Doran 2012). In spite of the increased role of high skilled guest
workers in the U.S. economy, there has been limited empirical evidence addressing many of
the issues at the heart of the debate. Our analysis addresses two important concerns about the
institutional features of guest worker programs, in particular, concerns raised by Hira (2010b)
and others that: 1) “guest workers [on the visa] can find themselves in working conditions akin
to indentured servitude” (Dorning and Fanning 2012), and 2) that the program has no labor
market test to ensure that immigrants do not crowd out citizens during periods of heightened
unemployment.8

In this paper, we exploit a unique dataset of employee records from six large Indian IT
firms operating in the U.S. in order to analyze the job mobility and return migration patterns
of Indian guest workers. Employee level payroll data allows us to study this topic for a sizable
and particularly important portion of the guest worker population. Our data consists of over
70,000 Indian workers on temporary visas from 2003-2011, which we show to represent over
one third of H-1B and L-1 visas granted to the ten largest firms in this industry. We present
three main findings regarding the inter-firm mobility of these workers. First, guest workers
at these firms exhibit significant inter-firm mobility. Second, this inter-firm mobility is nega-

8Further information suggesting that workers on these visas may be vulnerable to exploitation includes the
following Employment Policy Institute (EPI) report Hira (2010b), AFL-CIO report (Dorning and Fanning 2012),
3  Inter-Firm Mobility and Return Migration Patterns of Skilled Guest Workers

tively related with earnings, suggesting the existence of competitive market pressures. Third, the negative relationship between earnings and inter-firm mobility is more intense when unemployment is lower.

The degree of inter-firm mobility is important in labor markets because if firms take advantage of workers, then workers’ primary recourse is to freely quit their jobs and find better employers. However, guest worker programs impose frictions that impede mobility. H-1B guest workers are free to move between employers at anytime if they find an employer that is willing to transfer their visa. The explicit cost of transferring an H-1B visa between employers ranges between $2000 and $5225\[9\] L-1 guest workers face greater mobility constraints because their visa cannot be transferred. To switch employers, they must find a firm willing to sponsor an H-1B visa for them or they must obtain permanent residency. Job mobility in a market with this type of regulatory friction has yet to be empirically addressed in the literature, with the exception of the recent working paper by Naidu, Nyarko and Wang (2014). Intuition would strongly suggest that workers facing these frictions would be less mobile than native workers. However, the labor market for IT professionals in general is characterized by high rates of mobility, and thus strong competitive market pressures may mitigate the effect of these regulatory frictions. Hyde (1998) describes the labor market in the information technology industry in areas such as Silicon Valley to have “rapid mobility”, “short tenures”, and “weak loyalty to individual firms”. The actual degree of mobility of these guest workers is an empirical question that we directly assess in this paper.

In addition to our findings on inter-firm mobility, this paper makes valuable contributions to understanding the return migration patterns of these workers. Specifically, we find that return migration is negatively related to earnings and that this relationship generally becomes more intense when the unemployment rate is higher. This pattern of return migration should partially alleviate some concerns of opponents towards guest worker programs, as the nature

\[9\]See [http://www.uscis.gov](http://www.uscis.gov) for details on the level of these fees.
of return migration acts as an automatic counter-cyclical stabilizer of labor supply. This finding also contributes to the migration literature, by confirming previous findings of positive selection in migration (Abramitzky, Boustan and Eriksson 2012).

3.2 BACKGROUND ON SKILLED GUEST WORKER VISAS

The Immigration Act of 1990 created the H-1B and L-1 visa categories. The H-1B visa program is intended to enable organizations to bring workers into the U.S. in certain skilled occupations that are experiencing labor shortages. The L-1 visa is meant for multinational firms that need to transfer overseas workers to their U.S. operations, but has also been used by Indian IT firms to place their workers in temporary employment at U.S. firms. Both H-1B and L-1 visas require organizational sponsorship. These visas are referred to collectively as “skilled” guest worker visas because they require recipients to have a college education (Hunt 2010). Individuals who receive H-1B visas are required to possess skills in a “specialty occupation” while holders of L-1 visas are expected to possess “specialized knowledge”. Both the H-1B and L-1 visas are issued to individuals for initial periods of three years and may be renewed once for a total of six years, after which the temporary worker must either return home or apply for permanent residency. There is an annual limit on the number of H-1B visas available, but there is no annual limit on the number of L-1 visas available.

In its last major revision of the H-1B visa program, the American Competitiveness and Worker Investment Act for the 21st Century of 2000 (AC21), Congress addressed some concerns about the “portability” of the H-1B visa and enacted reforms aimed at preventing worker

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10 Legislation enacted in 2004 restricted the use of L-1 visas by “job-shops” that contract L-1 workers out to other firms, and starting in 2009, the Obama administration began a crackdown on L-1 usage, especially with regard to applications from India (National Foundation for American Policy 2012).

11 An annual cap of 65,000 was initially placed on the number of H-1B visas available. The American Competitiveness and Workforce Improvement Act of 1998 increased the H-1B visa cap to 115,000 for 1999 and 107,500 for 2000. The American Competitiveness and Worker Investment Act for the 21st Century of 2000 increased the cap to 195,000 through 2003, after which the number of visas reverted to 65,000. Additional changes allowed another 20,000 recipients of post graduate degrees obtained in the U.S. to receive this visa.
exploitation. Prior to AC21, H-1B workers had been able to switch employers only after the approval of a new petition, which could take in excess of six months to obtain. With the AC21 revision, workers who were already on an H-1B visa could now switch employers immediately upon the initiation of a sponsorship petition by their new employer. As the Congressional Record indicates, Congress felt that a competitive and properly functioning labor market was critical in order to insure that H-1B workers were not exploited. As the legislative committee report declared, “the market would not tolerate exploitation, especially given the fierce competition for skilled workers. An H-1B employee who is not being treated fairly can easily be petitioned by another employer and switch to work for that employer” (Hatch 2000).[12]

While regulations prohibit workers on an L-1 visa from switching jobs in the same manner as workers on an H-1B, L-1 workers are able to switch jobs if they find a new employer who will sponsor them for an H-1B visa, or if they are able to obtain permanent residency.

Despite the reforms of AC21, guest workers still face higher job mobility costs than do native workers or permanent residents. A skilled worker who meets the eligibility criteria for an H-1B visa cannot find employment in the U.S. without also finding an employer willing to undergo a time-consuming and expensive visa application and sponsorship process.[13] In order to hire H-1B workers, firms must also provide evidence regarding the non-displacement of native workers and the notification of current employees. These regulations act as an ad-

[12]Unfortunately, our data does not span the necessary years to enable us to measure the impact of this policy change. A recent working paper by Naidu et al. (2014) measures the impact of decreased regulatory frictions on low skilled guest workers in the United Arab Emirates, and finds significant increases in both earnings and mobility rates.

[13]A brief history of the fees includes a $1,000 fee on large employers that sunset on October 1, 2003; but after December 8, 2004, this fee was restored and increased to $1,500; after March 8, 2005, firms had to pay an additional $500 fraud prevention fee; from February 17, 2009 to February 17, 2011, the Employ American Workers Act imposed additional restrictions on banks receiving bailout funds hiring workers on H-1B visas, and after August 14, 2011, an additional $2,000 fee was imposed on each petition for an H-1B worker for certain employers. In addition to $2,000 of administrative costs, the fees currently listed on the USCIS website are $2,000 for all employers, an additional $2,000 for large employers of H-1B visas, and an additional $1,225 for expedited processing. These regulations also generate significant paperwork for the employer (the forms have an estimated paperwork burden of 3 hours and 45 minutes). This information was obtained from a series of press releases on the USCIS website: http://www.uscis.gov/news-releases
ditional friction and may limit the number of employers willing to hire skilled guest workers. Therefore, the number of outside options available to guest workers wanting to move may be limited.

In addition to popular perception and some scholarly acceptance of the view that guest skilled workers are tied to the firm (Kerr et al. 2013, Bound, Braga, Golden and Khanna 2014), several case studies have uncovered worker testimony regarding the implications of employer unwillingness to sponsor H-1B workers. Compared to having a green card (which allows workers to obtain another job without employer sponsorship), guest workers reported feeling “bound” and “tied down” to their employers (Banerjee 2006, Banerjee 2009). Banerjee reported that workers employed by Indian IT contractors found it difficult to obtain work directly from the American client firms from which they had been placed because these American firms preferred to maintain flexibility by outsourcing labor to Indian IT and other subcontractor firms.

Firm sponsorship of workers for permanent residency is thought to make employment particularly sticky. Matloff (2013) argues that workers sponsored by mainstream firms for permanent residency are “indentured servants” as they cannot switch jobs while in the lengthy process of applying for permanent residency, without losing their position in line. Indian IT firms such as those in our dataset apply for permanent residency for relatively few of their temporary migrant workers, and thus our workers may be more mobile than other workers. Thus, the actual degree of immobility of these workers is an important empirical question which our unique data will allow us to assess.

While we do not directly assess the impact of the guest worker programs on the earnings of these workers, our results are important in understanding the competitive pressures

\[\text{Hira (2010a) constructs an immigrant yield measure that compares the number of immigrants sponsored by firms for temporary worker visas to the number that the same firms sponsor for permanent residence. The largest ten offshore outsourcing firms, including the Indian IT firms, sponsored only 6% as many workers for permanent residence as for H-1B visas in 2008, compared to 64% yields for traditional technology firms such as Microsoft, Cisco, Oracle, Qualcomm, Google, and Intel.}\]
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in this labor market which may affect the wage setting process. Two studies have analyzed the earnings of guest workers after obtained permanent residency (Mukhopadhyay and Oxborrow 2012, Kandilov 2007). Using data from the New Immigrant Survey, they show that temporary workers receive a 20-25% earnings boost once they receive a green card. Another study that examines green card holders and temporary workers finds that IT workers with a green card earn only 6.1% more than IT workers without a green card (Mithas and Lucas 2010). Lofstrom and Hayes (2011) finds that the earnings gap between H-1B workers and naturalized citizens was 13.6% in 2009.

3.3 Data and Empirical Strategy

Data

Our dataset consists of employee records from six large Indian information technology firms. Companies in this industry are among the largest users of guest worker visas; these “offshore outsourcing” companies contract with major corporations in the U.S. and elsewhere to supply IT services (Hira 2010b). From the six Indian IT firms in our data, we observe 72,691 complete employee records for all employment spells starting in the years 2003-2011. In response to a Freedom of Information Act request, we obtained information on all firm visa sponsorship from the USCIS for the years 1993-2010. Our data shows that, between 2003 and 2010, the ten largest Indian IT firms sponsored a total of over 170,000 visas. Thus, our data captures well over one third of the workers in this industry.\(^\text{15}\) From 2003-2010, the USCIS approved 6,079,886 H-1B and L-1 visas.\(^\text{16}\) These data show that Indian IT firms account for a substantial portion of the H-1B and L1 visa programs.

Our data does not identify an individual’s visa status. However, it is worth noting that according to the non-immigrant visa statistics found on the USCIS website, three times as many

\(^{15}\)Excluding observations from 2011, our data still consists of over 60,000 observations.

H-1B visas as L-1 visas were granted to Indian nationals\footnote{See USCIS website for more details, specifically Table 31: \url{http://www.dhs.gov/yearbook-immigration-statistics-2012-nonimmigrant-admissions}}. In addition to guest workers, our data also likely contains a small number of permanent residents and citizens, who frequently work as high-paid executives or lower-paid support workers. Hira (2010b) provides evidence that the large majority of workers in this industry are guest workers and provides three reasons why Indian IT firms do not hire U.S. workers: to facilitate knowledge transfer to India, to have an inexpensive labor source in the U.S., and to train workers who will return to India and continue to support operations remotely. From correspondence with our data provider, we have been informed that nearly all workers in our data consist of guest workers from India.

To address the issue that our data contains a small number of permanent residents and citizens, we begin by comparing the earnings distribution in our own data with the earnings distribution of guest workers who are IT professionals in other data sources. The Labor Condition Applications (LCA) data\footnote{Available at \url{http://www.flcdatacenter.com/caseh1b.aspx}} contains earnings and occupation information for the H-1B workers that a firm petitions to place at a particular worksite. Table \ref{table:3.1} compares the distribution of earnings for computer programmer and developer occupations from the LCA data to our proprietary data.\footnote{We focus on all certified applications filed between 2003 and 2011, and display the distribution of the midpoint of the stated salary, weighting by the number of workers given in each LCA record.} It shows that earnings in our data are much larger than in the LCA data at the 99th percentile, but much closer at other points in the distribution.

These summary statistics, along with our general understanding of these firms, indicate that our data likely includes non-guest workers who are disproportionately highly-paid executives. Our data is then trimmed to reflect the middle 98% of the distribution of earnings in the LCA data, which results in us dropping 2595 observations\footnote{In our data cleaning process, the trim above $135,233 threshold cuts seven observations for each observation below the $36,566 threshold. Overall, this trim results in the loss of 3.6% of our data. Also, it is worth noting that our results are robust to estimation on our untrimmed data, although we believe that this trimmed sample removes many of the non-guest worker employees at these firms.} As an additional step to validate this approach of trimming the data, we compare our trimmed data with data from...
the American Community Survey (ACS) that is trimmed at the same earnings thresholds for computer professionals born in India and residing in the U.S. between one and eight years. Table 3.2 presents trimmed ACS data along with our trimmed firm data and shows that the workers in our trimmed dataset are similar with respect to age, gender, and earnings, although individuals in the ACS sample are more likely to be married. To further validate our trimmed sample, we note that the Lofstrom and Hayes (2011) sample of all H-1B visa holders from 2009 had a mean age of 30.6 in Information Technology, and annual earnings averaging $76,698. This is comparable to our sample’s average age of 30.57 and earnings of $73,601.

In our data on employment spells in the U.S., we observe both a start date and an exit date. The exit date takes two forms: it notes either the date on which a worker returned to India or the date on which a worker otherwise separated from employment and stayed in the U.S. Legally, both L-1 and H-1B workers would have to obtain employment at another firm in the U.S. to remain in the country. Because workers essentially have to find a new employer that transfers their visa in order for them to be allowed to stay in the U.S., we believe that the vast majority of separations observed (other than returns to India) are voluntary separations to employment at other U.S. firms (inter-firm mobility). We therefore refer to these separations as “quits”. The other form of separations are workers who return to India, referred to as “returns”. Specifically, returns likely stem from involuntary separations: expiration of one’s visa, work is completed on a software development project, or the firm lays off the visa worker. Return’ may also include workers who voluntarily exit employment in the U.S. to return to India for a number of employment or personal reasons. Throughout, we use the term “separations” to refer to the set of all quits and returns.

We now turn to the summary statistics of our data. In Table 3.3 we present the mean and standard deviations of our key variables. The mean salary in our dataset is $73,601 with

\[A \text{ worker who did not obtain new employment would be “out of status.” See http://www.uscis.gov/USCIS/Resources/C2en.pdf for further details.}\]
a standard deviation of $15,491. Married individuals are a majority of our observations, and our sample is largely composed of young male workers. In our data we also observe the state in which the employee works. Using state level unemployment rates, we find an average unemployment rate of 7.89% faced by workers over the entire time period in our sample. Besides the start and end date in our data, our variables are not time-varying and are observed on the last date available for each employee.

A common assumption about this labor market is that the job mobility of guest workers is severely restricted or forbidden outright. For example, see Kerr et al. (2013) which states “once the work has started, the immigrant is effectively tied to the firm until obtaining permanent residency or obtaining another temporary visa,” and Bound et al. (2014) which states that “an important feature of the H-1B visa is that the visa is for work at the specific firm. As a result, workers are effectively tied to their sponsoring firm.” Our data allows us to speak directly to this assumption and demonstrates that this is not the case. Table 3.3 reports the quit and return rates of all 70,096 workers in our sample and shows that 20 percent of these workers quit and 29 percent of these workers return to India. However, these quit and return statistics alone understate mobility as they contain a large number of workers who are still working at their firm (i.e. right-censored observations). The bottom panel of Table 3.3 reports the quit and return rates for workers who began employment before September 1, 2005, allowing them to remain at risk of separation for at least a full six years (the length of an H-1B visa), up through the last date in our study (September 1, 2011). This subset of our data consists of 7,779 workers, of which 36 percent quit and 50 percent return to India. Therefore, approximately 14 percent remained at the firm. This remaining percent would either be in the process of gaining, or have already gained, permanent residency. These summary statistics provide our first major finding.

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Note that the range of salaries in our sample is restricted to $36,566 - $135,233 for reasons discussed earlier in this section.

We do not observe hours worked, however, given the structure of our data and industry practices and regulations for guest workers, which require minimum annual pay, we believe that all workers earn a fixed salary.
and refute previous claims that guest workers within this industry are “effectively tied to the firm.”

To shed further light on the assumption of complete immobility, we display the distribution of tenure for workers in our dataset. Figure 3.1 shows the density of quits and returns to India by days of tenure for our full sample. Both separation and returns peak within the first year of arrival, and appear to fall monotonically after that. However, this figure includes a large number of workers who are right-censored (still employed at the end of the period of study). Figure 3.2 repeats this analysis for the subsample of only workers who started employment before September 1, 2005. We see that quits spike in the first two years after arrival in the U.S., fall in the third year, and rise again in the fourth, indicating strategic behavior by workers who separate only after the renewal of their visa. The observation that workers’ inter-firm mobility varies with the visa cycle further illustrates that these workers possess a degree of non-random mobility. Returns, on the other hand, spike in the first year, and then fall before rising to a peak at the six-year point, after which visas expire.

Straightforward analysis of the summary statistics has shown that the workers in our data are actually quite mobile, with nearly two in five workers quitting within a time horizon of six years or greater. In the next section we continue to evaluate their mobility by turning our attention to which workers tended to separate and how this changed with fluctuations in the macro economy. According to standard search theory, such as Burdett and Mortensen (1998), a lower paid worker, all else equal, is more likely to voluntarily separate than a higher paid worker as the worker are more likely to receive an outside job offer that dominates their current low earnings. We expect this willingness to climb the job ladder to be particularly salient among guest workers, who have revealed themselves to be willing to relocate to a different culture thousands of miles from home to improve their earnings. In the next section we present our empirical strategy for testing for the gradient of separations with respect to earnings and how this gradient changes over the business cycle.
Econometric Model

In this section we describe our empirical strategy for further analyzing the mobility patterns of Indian IT workers who are in the U.S. on temporary visas. We study the gradient of separations with respect to earnings by estimating “quit elasticities” and “return elasticities”. We estimate these elasticities using duration analysis. The use of a duration model is a natural fit for modeling the length of an employment spell, as it allows us to exploit the time dependence of our duration data. Duration models have often been used to study different aspects of job mobility: Webber (2011) estimates the elasticity of separation with respect to earnings for all private sector workers in the US, Farber (1994) studies the role of state dependence and heterogeneity in the mobility patterns of young workers and Loury (2006) studies the association between informal networks and the tenure of workers.

There are two ways in which an individual can exit our data: by quitting (inter-firm mobility) or by returning to India. To separately model these two events, we estimate cause-specific hazard models using the semi-parametric Cox proportional model. A key advantage of the Cox model is that the partial likelihood function does not contain the baseline hazard function. Therefore, when estimating the model for quits (returns) we are able to allow for the presence of observations censored by an exit from the data due to a return (quit) without having to impose restrictive forms on the baseline hazard function. Essentially, we are separately estimating marginal hazards for quits and returns. Therefore, the hazard for cause \( j \) (quitting or returning to India) is given by

\[
\lambda_{i,j}(t|X_i(t)) = \lambda_{0,j}(t) \exp (\beta_j' X_i(t)) 
\]

(2)

where \( \lambda() \) is the hazard function, \( \lambda_{0,j} \) is the baseline hazard for cause \( j \), \( t \) is the length of tenure, and \( X_i(t) \) are the includes covariates for individual \( i \). The vector of covariates include controls for: log salary, a third degree polynomial in the unemployment rate\(^24\) log salary interacted

\(^24\)We use the monthly state level population unemployment rates as reported by the St. Louis Federal Reserve.
with each component of the cubic of the unemployment rate, sex, marital status, a third degree polynomial in start age, firm specific indicators, year indicators, month indicators, and state indicators. Although the notation in equation 2 suggests that we have time-varying covariates, only the state unemployment rate is time-varying.

We include the interactions of log salary and the unemployment rate in order to study how the gradient in separations with respect to earnings changes over the business cycle. Specifically, we allow for state level unemployment rates to proxy for the tightness of labor markets. To summarize the relationship between earnings and separations, we report separation elasticities calculated at various levels of unemployment.\(^{25}\) Depew and Sørensen (2012) use employee records from two manufacturing firms from the inter-war period to show that the elasticity of quits is likely to be greater during economic expansions than recessions. However, they do so using only variation over time between expansions and recession, while here we are able to exploit both across time and across state variation in the unemployment rate, as is done in a recent working paper by Hirsch, Jahn and Schnabel (2013).

Understanding how the elasticity of quits varies over the business cycle is of particular interest because it will demonstrate whether or not the labor market for H-1B Indian IT workers is similar to other labor markets in which workers exhibit more inter-firm mobility during expansions than during recessions. Additionally, understanding the cyclicality of the elasticity of returns informs us as to how the nature of return migration may change over the business cycle. Understanding this process is of importance to opponents of the program who fear that the presence of these workers during economic downturns may harm natives.

Figure 3.3 shows quit and return rates by year, and illustrates that the return rate increased.

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\(^{25}\) The elasticities are calculated using the estimated coefficients on log earnings and the interactions between log earnings and unemployment at the appropriate level of unemployment.'
during the “Great Recession” while the quit rate fell, in line with what one might assume about inter-firm mobility and return-migration during an economic downturn. The increased return migration suggests that fears that guest workers adversely impact citizens, especially during economic downturns, are at least partially mitigated by the increased propensity of these workers to return migrate during bad labor markets. In contrast, the quit rate decreases during hard economic times, suggesting that inter-firm job mobility may be hampered during recessions. Our work is not unique in studying earnings and mobility over the business cycle; this question has been examined in previous studies such as Solon, Whately and Stevens (1997) and Devereux and Hart (2006). However, neither of these previous works estimates elasticities of separation nor do they study the mobility behavior of immigrants.

To obtain the quit elasticity, we estimate equation 2 specifying the risk of failure as employment ending by the worker exiting the firm to employment at another firm in the U.S., and treating employment spells that have not yet ended, or those that ended in a return to India, as right censored. Since we are interacting log earnings with a third degree polynomial of the unemployment rate, the quit elasticity is calculated as a function of the unemployment rate. A quit elasticity of zero suggests that current salary has no relationship with the inter-firm mobility for these workers. A negative elasticity implies that workers who are being paid a lower salary are the workers who are more likely to quit. Furthermore, we expect that this gradient between separations and earnings will become steeper during periods of lower unemployment rates, as evidenced by Depew and Sørensen (2012) and Hirsch et al. (2013). We similarly study the return elasticity by estimating equation 2 with the event being an employment spell ending through a return to India. A negative estimate of a return elasticity implies that lower earning workers are more likely to return to India than higher paid workers, suggesting that the return migration process increases positive selection in migration.

\[26\] Recall that all observations will be at risk of a quit to another firm in the U.S., as H-1B workers may obtain another sponsor, and L-1 workers may find a firm that is willing to sponsor them on an H-1B visa.
3 Inter-Firm Mobility and Return Migration Patterns of Skilled Guest Workers

3.4 RESULTS

Tables 3.4 and 3.5 report the coefficient estimates from cause-specific Cox Proportional Hazard Models for quits and returns, respectively. As stated in the previous section, we include fixed effects for the intermediary Indian IT firm, month, year and state. In addition, we also control for the worker’s gender, marital status, and a cubic in start age. Our main variables of interest are the log earnings of the worker, a cubic in the unemployment rate, and interactions between these variables. Each table presents coefficient estimates for five different groups of workers: all, male, female, married and single workers. The top two panels of each table report coefficient estimates on our main independent variables and the number of relevant observations for each group of workers. The third panel presents the results of two Chi-squared tests measuring the mobility of workers. The first tests a null hypothesis that the interactions between log earnings and the cubic in the unemployment rate is zero, while the second tests a null that the coefficients on all four variables that involve log earnings are zero. A significant result in the first test would indicate the relationship between earnings and separations is influenced by macroeconomic conditions. A significant result in the second Chi-square test would provide evidence towards a more conservative hypothesis: that workers’ earnings are associated with quit rates in this sample, suggesting guest workers’ separations are sensitive to earnings. Finally, the bottom of each panel reports the relevant separation elasticity at the mean unemployment rate faced by workers in our sample.

In Table 3.4, we see our results reject the null for both Chi-squared tests, confirming our conjecture that skilled guest workers’ propensities to quit are related to earnings and that this relationship varies over the business cycle. In the bottom panel, we see that in our full sample the estimated quit elasticity is equal to -0.8761, with a standard error of 0.0627. This implies that at the average unemployment rate in our sample, workers who are paid a 10%

27 Nine tests are rejected at the .1% level and one at the 10% level
28 Note that none of the individual parameters on the log earnings variables are significant, reflecting the high degree of co-linearity between these variables.
higher salary are approximately 9% less likely to quit. This result may be surprising for a labor market with such mobility costs, but they confirm guest workers have some degree of mobility and that lower paid guest workers are able to relocate to other employment. Table 3.4 shows that men have a greater quit elasticity than women, consistent with Ransom and Sims (2010) and Hirsch, Shank and Schnabel (2006). Table 3.4 also shows that married workers have a greater quit elasticity than single workers, for whom we observe the only evidence of immobility (as a function of earnings) at the mean unemployment rate. Below, we will explore how this elasticity varies over the business cycle.

Table 3.5 repeats the above analysis, but now modeling the propensity to return migrate. The chi-squared tests again indicate that there is a relationship between return decisions and earnings. At our average rate of unemployment, the estimates on the full sample show that workers who were paid a 10% higher salary are 29.06% less likely to return to India. This point estimate of the return elasticity is remarkably similar across the four subgroups, with the exception being a greater sensitivity to earnings for females. This confirms that lower paid workers (and therefore potentially less productive workers) are more likely to be recalled to India when projects end, laid off, or voluntarily return to India. Furthermore, this relationship between earnings and return migration varies over local economic conditions. As we discuss below, this evidence holds important consequences regarding concerns that lower-paid migrant workers substitute for domestic workers during economic downturns and that visa quotas need to be adjusted during weak labor markets.

Figures 3.4 and 3.5 graphically display how the estimates of the quit elasticities vary over the business cycle. In Figure 3.4, we plot our estimate against the entire range unemployment rates observed in our data. The figure shows that the quit elasticity is increasing in the unemployment rate, and becomes indistinguishable from zero (though never significantly above zero) at an unemployment rate around 12%. This implies that lower paid workers typically

30To see a display of the frequencies of unemployment rates in our data, please see Figure 3.5 in the Appendix.
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quit at higher rates than higher paid workers, and that this relationship intensifies at lower unemployment rates. Figure 3.5 explores heterogeneity in this relationship across our different demographic groups. It appears that the relatively inelastic estimates for females and single workers are less sensitive to fluctuations in the business cycle.

Figures 3.6 and 3.7 repeat the exercise for return elasticities. Figure 3.6 shows a negative relationship between the return elasticity and the unemployment rate for low to moderate levels of unemployment, while there is an increase in the elasticity over high levels of unemployment. Nevertheless, the elasticity appears to be more negative at levels of unemployment consistent with a typical recession than at full employment. This is suggestive of negative selection in return migration that intensifies during an economic downturn.

In summary, our duration analysis has revealed important facts about levels and cyclicity of both the return and quit elasticities. The return elasticity is elastic and generally pro-cyclical. The quit elasticity is counter-cyclical and significantly different from zero when unemployment is below historically high levels. In the Appendix, Table 1 and Figures 1-4 display the robustness of our findings to using quadratics in the unemployment rate or using an untrimmed sample.

3.5 DISCUSSION OF THE RESULTS

One premise of many opponents of guest worker programs, and a common misconception even among experts, is that workers on these visas are unable to freely move between employers once they arrive in the U.S. The data we have presented here contradicts this assertion. Our summary data shows around 20% quit their jobs to other employment while in the U.S. When we focus on only workers who entered our data at least six years prior to the end of our study, this number jumps to 36%. As these workers cannot separate to unemployment in the U.S. and still remain in compliance with immigration law, it is likely that when not returning to India, these workers only exit employment at an Indian IT firm if they have already established
employment at another firm. Further, we find that the lowest paid among these workers are
the most likely to quit their job, consistent with workers moving in the labor market to escape
bad or low paying employers. Specifically, we find that a 10% decrease in earnings is associ-
ated with a 9% increase in the quit rate, even at a relatively high unemployment rate of 7.89%.
This strongly suggests that guest workers employed by large Indian IT firms are in fact quite
mobile.

In addition to showing that the workers in our study are mobile, the quit elasticity esti-
mates in Table 3.4 suggest the workers in our data are actually more sensitive to earnings than
workers in previous studies of other labor markets. We make an explicit comparison to prior
estimates in Figure 3.8, which shows where our own estimate of the quit elasticity (at our
mean unemployment rate of 7.89%) falls in the distribution of previous estimates, as reported
by Manning (2011). This finding comes in spite of the fact the fact that our study covered a
period with an above average rate of unemployment and a market with higher than typical
frictions to mobility, as we have argued throughout.

These results may shed some light on the general determinants of worker mobility. The
relatively large quit elasticities we estimate suggest competitive pressures in the labor market
for IT professionals may trump the regulatory frictions of the guest worker programs within
this market. For example, the general thickness of this market and the prevalence of inform-
ation regarding job opportunities may offset the impacts of increased mobility costs. Addition-
ally, the workers included in our study may be inherently more mobile than workers in other
studies. When compared to Hirsch and Jahn (2012), Hotchkiss and Quispe-Agnoli (2009) and
Naidu et al. (2014), the workers in our data have migrated longer distances. Their propensity

\[ \text{We use 25 estimated quit elasticities reported by Manning (2011) in Tables 6 and 7 of his book chapter. When}
\]
estimates for multiple groups were reported, we took the raw average of the reported estimates. When ranges were
given, we took the midpoint. For a paper reporting one sided bounds, we used the bound itself as the estimate.
All reported elasticities in these tables were obtained by estimating the effect of earnings on quits. Rather than
report the implied supply elasticities, as Manning did, we instead report minus one half of his numbers, i.e. the
raw separation elasticity results that were used to generate the implied supply elasticity numbers, and are thus
most comparable to the numbers presented in our study.
to initially undertake a long distance migration suggests that the workers may be relatively more sensitive to earnings differences in their labor supply decisions. Their work in a thick labor market with free-flowing information about outside options may also inoculate against the immobilizing effects of guest worker program imposed frictions. Indeed, Hotchkiss and Quispe-Agnoli (2009) finds that two subgroups of workers in their data are more earnings responsive than natives: undocumented workers in the food service or hospitality industries. They argue that the undocumented workers in their study are employed in markets where their social networks are larger than those of natives, providing them with superior information about outside employment opportunities. The guest workers in our study may also be particularly mobile in terms of willingness to search and move within the U.S., have more industry than firm specific human capital, or have particularly thick networks because of the large number of Indian nationals in this labor market (Yueh 2008).

Another concern of opponents of the H-1B program is that it does not adjust the number of visas available over the business cycle and thus leaves native workers competing with immigrant workers during weak labor markets. Our data show that the rate of return migration is relatively high at 29% of all of our observations and 50% of workers who have been in the data for at least six years. It also shows that return migration increases during the years of the Great Recession, suggesting that return migration during recessions should at least partially mitigate concerns that the program does not adjust to labor market conditions. In addition, we find robustly negative estimates of return migration elasticities, which implies that the lowest paid, and thus presumably less productive workers, are the ones most likely to return migrate. This suggests that these guest worker programs may also increase the selectively of migration to the U.S. through a filtering process by which only the most productive workers are permitted to remain in the U.S. by their organizational sponsors.

We note that we make no explicit comparison to the quit elasticities for natives in this industry. Previous research has found evidence that migrants may be less mobile than compa-
rable natives (Hirsch and Jahn 2012, Hotchkiss and Quispe-Agnoli 2009), and that removing frictions faced by guest workers may increase their mobility and increase their earnings (Naidu et al. 2014).

3.6 CONCLUSIONS

Inter-firm mobility is the key competitive pressure tempering an employer’s power to set earnings, provide benefits, or adjust working conditions. The absence of inter-firm mobility suggests that workers are tied to the firm, which may cause serious negative effects on workers’ labor market outcomes. One major criticism of guest worker visa programs is that they limit mobility, potentially placing workers in a situation of indentured servitude. In the case of H-1B visa holders, frictions are imposed from outside the labor market by government regulations: explicit costs to changing the employer sponsor of a visa may dissuade some firms from hiring these workers, thus thinning the labor market. It is not surprising that the popular consensus is that this labor market is plagued by immobility and thus the exploitation of these workers.

By using a unique proprietary dataset containing H-1B and L-1 guest workers, we are able to analyze their mobility. Our analysis has uncovered a number of important findings that provide new insight into this important, yet understudied, labor market. First, despite the regulatory conditions in this market, we find evidence of significant inter-firm mobility. Specifically, we find evidence of inter-firm employment moves for 36% of the workers who started employment at least six years before the end of our study. Our findings, which suggest these workers are indeed mobile between firms, run contrary to the common assumption that these workers are effectively tied to the firm. This degree of mobility is similar to estimates found in work by Buchinsky, Fougère, Kramarz and Tchernis (2010), who, using the Panel Study of Income Dynamics, find that “in each of [their] sample years, between 6.5% and 14.1% of the individuals change jobs.” These rates correspond to a 6 year quit rate between 33.2 percent and 60.0 percent. Second, we find a negative relationship between earnings and the
propensity to switch firms. This is consistent with standard search theory models, in which lower paid workers are more likely to receive outside job offers that dominate their current job, than are higher paid workers. Third, we find that this relationship between earnings and movement between firms intensifies during periods of low unemployment, consistent with previous studies of mobility over the business cycle.

We also uncover important and policy relevant results with respect to return migration. First, we find that lower paid workers are more likely to return to India than are higher paid workers. Second, we find that the relationship between earnings and return rates generally becomes greater during economic downturns. This pattern of return migration should partially alleviate some concerns of opponents of guest worker programs, as the nature of return migration acts as an automatic counter-cyclical stabilizer of guest worker labor supply. These findings are consistent with the general finding of positive selection from return migration shown in Abramitzky et al. (2012), but our findings add to the literature by providing, to our knowledge, the first estimates of the cyclicality of selectivity in return migration for high skilled guest workers.
Table 3.1: Comparison of LCA and Firm Data

<table>
<thead>
<tr>
<th></th>
<th>LCA Data</th>
<th>Firm Data</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wage Distribution</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st Percentile</td>
<td>36,566</td>
<td>44,972</td>
</tr>
<tr>
<td>5th Percentile</td>
<td>45,818</td>
<td>55,200</td>
</tr>
<tr>
<td>25th Percentile</td>
<td>57,510</td>
<td>63,208</td>
</tr>
<tr>
<td>50th Percentile</td>
<td>67,105</td>
<td>69,900</td>
</tr>
<tr>
<td>75th Percentile</td>
<td>81,659</td>
<td>82,200</td>
</tr>
<tr>
<td>95th Percentile</td>
<td>112,811</td>
<td>120,000</td>
</tr>
<tr>
<td>99th Percentile</td>
<td>135,233</td>
<td>174,000</td>
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</table>

Table 3.2: Comparison of Trimmed Firm and ACS Data

<table>
<thead>
<tr>
<th></th>
<th>Firm Trimmed</th>
<th>ACS Trimmed</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wage Distribution</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st Percentile</td>
<td>47,862</td>
<td>40,312</td>
</tr>
<tr>
<td>5th Percentile</td>
<td>55,506</td>
<td>51,376</td>
</tr>
<tr>
<td>25th Percentile</td>
<td>63,162</td>
<td>65,000</td>
</tr>
<tr>
<td>50th Percentile</td>
<td>69,300</td>
<td>77,312</td>
</tr>
<tr>
<td>75th Percentile</td>
<td>80,626</td>
<td>92,267</td>
</tr>
<tr>
<td>95th Percentile</td>
<td>105,000</td>
<td>118,630</td>
</tr>
<tr>
<td>99th Percentile</td>
<td>126,540</td>
<td>130,000</td>
</tr>
<tr>
<td><strong>Demographics</strong></td>
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<td></td>
</tr>
<tr>
<td>Female</td>
<td>0.18</td>
<td>0.18</td>
</tr>
<tr>
<td>Married</td>
<td>0.62</td>
<td>0.80</td>
</tr>
<tr>
<td>Age</td>
<td>30.57</td>
<td>31.46</td>
</tr>
</tbody>
</table>

*ACS data is drawn from Indian born individuals who have been living in the U.S. from 1 to 8 years, and work in the Computer Systems Design Industry and who are coded to the Software Programmer and Developer Occupations.*
Table 3.3: Summary Statistics

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Std Dev</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salary</td>
<td>73601.00</td>
<td>15490.86</td>
<td>70,096</td>
</tr>
<tr>
<td>Avg. Age</td>
<td>30.57</td>
<td>5.21</td>
<td>70,096</td>
</tr>
<tr>
<td>Female</td>
<td>0.18</td>
<td>0.39</td>
<td>70,096</td>
</tr>
<tr>
<td>Married</td>
<td>0.62</td>
<td>0.49</td>
<td>70,096</td>
</tr>
<tr>
<td>Quit</td>
<td>0.20</td>
<td>0.40</td>
<td>70,096</td>
</tr>
<tr>
<td>Return</td>
<td>0.29</td>
<td>0.46</td>
<td>70,096</td>
</tr>
<tr>
<td>Unemployment Rate</td>
<td>7.89</td>
<td>2.50</td>
<td>1,572,065</td>
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<tr>
<td>Quit (Started Before Sep 2005)</td>
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<td>0.48</td>
<td>7,779</td>
</tr>
<tr>
<td>Return (Started Before Sep 2005)</td>
<td>0.50</td>
<td>0.50</td>
<td>7,779</td>
</tr>
</tbody>
</table>
### 3.6 Conclusions

Table 3.4: Results: Quit to another Firm

<table>
<thead>
<tr>
<th></th>
<th>All</th>
<th>Male</th>
<th>Female</th>
<th>Married</th>
<th>Single</th>
</tr>
</thead>
<tbody>
<tr>
<td>ln(Salary)</td>
<td>-1.7195</td>
<td>-1.7902</td>
<td>-1.1988</td>
<td>-2.1153</td>
<td>-1.7129</td>
</tr>
<tr>
<td></td>
<td>(1.7161)</td>
<td>(1.6744)</td>
<td>(3.5148)</td>
<td>(2.2095)</td>
<td>(2.4195)</td>
</tr>
<tr>
<td>ln(Salary) × UR</td>
<td>0.1021</td>
<td>0.0422</td>
<td>0.2772</td>
<td>-0.0394</td>
<td>0.6331</td>
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<tr>
<td></td>
<td>(0.7909)</td>
<td>(0.7784)</td>
<td>(1.5151)</td>
<td>(0.9939)</td>
<td>(1.2171)</td>
</tr>
<tr>
<td>ln(Salary) × UR²</td>
<td>-0.0041</td>
<td>0.0085</td>
<td>-0.0500</td>
<td>0.0232</td>
<td>-0.0942</td>
</tr>
<tr>
<td></td>
<td>(0.1144)</td>
<td>(0.1136)</td>
<td>(0.2037)</td>
<td>(0.1381)</td>
<td>(0.1882)</td>
</tr>
<tr>
<td>ln(Salary) × UR³</td>
<td>0.0006</td>
<td>0.0000</td>
<td>0.0029</td>
<td>-0.0007</td>
<td>0.0049</td>
</tr>
<tr>
<td></td>
<td>(0.0051)</td>
<td>(0.0051)</td>
<td>(0.0086)</td>
<td>(0.0060)</td>
<td>(0.0087)</td>
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<tr>
<td>UR</td>
<td>-1.3205</td>
<td>-0.6251</td>
<td>-3.4000</td>
<td>0.3611</td>
<td>-7.2844</td>
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<tr>
<td>UR²</td>
<td>0.0395</td>
<td>-0.1035</td>
<td>0.5627</td>
<td>-0.2796</td>
<td>1.0504</td>
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<tr>
<td></td>
<td>(1.3022)</td>
<td>(1.2950)</td>
<td>(2.2900)</td>
<td>(1.5751)</td>
<td>(2.1109)</td>
</tr>
<tr>
<td>UR³</td>
<td>-0.0061</td>
<td>0.0004</td>
<td>-0.0319</td>
<td>0.0085</td>
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<tr>
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<td>(0.0584)</td>
<td>(0.0583)</td>
<td>(0.0967)</td>
<td>(0.0681)</td>
<td>(0.0978)</td>
</tr>
<tr>
<td>Female</td>
<td>0.0788***</td>
<td>0.2630***</td>
<td>-0.1690***</td>
<td>0.2630***</td>
<td>-0.1690***</td>
</tr>
<tr>
<td></td>
<td>(0.0247)</td>
<td>(0.0392)</td>
<td>(0.0361)</td>
<td>(0.0392)</td>
<td>(0.0361)</td>
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<tr>
<td>Married</td>
<td>-0.4187***</td>
<td>-0.5170***</td>
<td>-0.0510</td>
<td>0.2630***</td>
<td>-0.1690***</td>
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<tr>
<td></td>
<td>(0.0153)</td>
<td>(0.0242)</td>
<td>(0.0514)</td>
<td>(0.0392)</td>
<td>(0.0361)</td>
</tr>
<tr>
<td>Individuals</td>
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<td>57153</td>
<td>12943</td>
<td>43161</td>
<td>26935</td>
</tr>
<tr>
<td>Quits</td>
<td>14234</td>
<td>11716</td>
<td>2518</td>
<td>8593</td>
<td>5641</td>
</tr>
<tr>
<td>Observations</td>
<td>1572065</td>
<td>1305588</td>
<td>266477</td>
<td>1054958</td>
<td>517107</td>
</tr>
<tr>
<td>Chi-Sq.†</td>
<td>33.04</td>
<td>36.88</td>
<td>7.68</td>
<td>21.76</td>
<td>46.72</td>
</tr>
<tr>
<td></td>
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<td>[0.0000]</td>
<td>[0.0530]</td>
<td>[0.0001]</td>
<td>[0.0000]</td>
</tr>
<tr>
<td>Chi-Sq.‡</td>
<td>118.19</td>
<td>138.81</td>
<td>18.49</td>
<td>125.65</td>
<td>48.18</td>
</tr>
<tr>
<td></td>
<td>[0.0000]</td>
<td>[0.0000]</td>
<td>[0.0010]</td>
<td>[0.0000]</td>
<td>[0.0000]</td>
</tr>
<tr>
<td><strong>Quit Elasticity:</strong></td>
<td><strong>Unemp. Rate=7.89</strong></td>
<td><strong>-0.8761</strong></td>
<td><strong>-0.9192</strong></td>
<td><strong>-0.7103</strong></td>
<td><strong>-1.3047</strong></td>
</tr>
<tr>
<td></td>
<td>(0.0627)</td>
<td>(0.0580)</td>
<td>(0.1379)</td>
<td>(0.0594)</td>
<td>(0.1481)</td>
</tr>
</tbody>
</table>

---

*a* Included fixed effects: Firm, Month and Year. Controls also include a cubic in start age.

*b* Standard errors clustered on the state are presented in parentheses. **P-values** are in brackets.

*c* *0.10, **0.05 and ***0.01 denote significance levels.

† Chi squared statistic for the joint test of cyclicalty (three interactions terms equal zero: ln(Salary) × UR, ln(Salary) × UR² and ln(Salary) × UR³).

‡ Chi squared statistic for the joint test of non-zero elasticities (four log salary terms equal zero: ln(Salary), ln(Salary) × UR, ln(Salary) × UR² and ln(Salary) × UR³).
### Table 3.5: Results: Return to India

<table>
<thead>
<tr>
<th></th>
<th>All</th>
<th>Male</th>
<th>Female</th>
<th>Married</th>
<th>Single</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\ln(\text{Salary})$</td>
<td>3.8088*</td>
<td>3.4199</td>
<td>6.0695</td>
<td>5.3080**</td>
<td>0.8728</td>
</tr>
<tr>
<td></td>
<td>(2.1322)</td>
<td>(2.1748)</td>
<td>(3.8802)</td>
<td>(2.2435)</td>
<td>(3.5289)</td>
</tr>
<tr>
<td>$\ln(\text{Salary}) \times UR$</td>
<td>-1.6614**</td>
<td>-1.5490*</td>
<td>-2.2963</td>
<td>-2.3110***</td>
<td>-0.0883</td>
</tr>
<tr>
<td></td>
<td>(0.8371)</td>
<td>(0.8185)</td>
<td>(1.6552)</td>
<td>(0.8363)</td>
<td>(1.4457)</td>
</tr>
<tr>
<td>$\ln(\text{Salary}) \times UR^2$</td>
<td>0.1198</td>
<td>0.1037</td>
<td>0.1673</td>
<td>0.2031**</td>
<td>-0.1129</td>
</tr>
<tr>
<td></td>
<td>(0.1057)</td>
<td>(0.0989)</td>
<td>(0.2248)</td>
<td>(0.1010)</td>
<td>(0.1852)</td>
</tr>
<tr>
<td>$\ln(\text{Salary}) \times UR^3$</td>
<td>-0.0022</td>
<td>-0.0015</td>
<td>-0.0034</td>
<td>-0.0054</td>
<td>0.0078</td>
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<td>(0.0042)</td>
<td>(0.0038)</td>
<td>(0.0095)</td>
<td>(0.0039)</td>
<td>(0.0074)</td>
</tr>
<tr>
<td>$UR$</td>
<td>18.8818**</td>
<td>17.5765*</td>
<td>26.1234</td>
<td>26.2974***</td>
<td>1.2398</td>
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<tr>
<td>$UR^2$</td>
<td>-1.3830</td>
<td>-1.1977</td>
<td>-1.9327</td>
<td>-2.3291**</td>
<td>1.2153</td>
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<tr>
<td></td>
<td>(1.1932)</td>
<td>(1.1188)</td>
<td>(2.5073)</td>
<td>(1.1392)</td>
<td>(2.0671)</td>
</tr>
<tr>
<td>$UR^3$</td>
<td>0.0259</td>
<td>0.0182</td>
<td>0.0402</td>
<td>0.0631</td>
<td>-0.0852</td>
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<td></td>
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<td>(0.0432)</td>
<td>(0.1055)</td>
<td>(0.0438)</td>
<td>(0.0829)</td>
</tr>
<tr>
<td>Female</td>
<td>0.2615***</td>
<td>0.1995***</td>
<td>0.2955***</td>
<td>0.1995***</td>
<td>0.2955***</td>
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<tr>
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<td>(0.0463)</td>
<td>(0.0463)</td>
<td>(0.0463)</td>
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<td>Individuals</td>
<td>70096</td>
<td>57153</td>
<td>12943</td>
<td>43161</td>
<td>26935</td>
</tr>
<tr>
<td>Returns</td>
<td>20553</td>
<td>16012</td>
<td>4541</td>
<td>10958</td>
<td>9595</td>
</tr>
<tr>
<td>Observations</td>
<td>1572065</td>
<td>1305588</td>
<td>266477</td>
<td>1054958</td>
<td>517107</td>
</tr>
<tr>
<td>Chi-Sq.(^{†})</td>
<td>35.68</td>
<td>37.09</td>
<td>28.74</td>
<td>31.54</td>
<td>37.39</td>
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<td>[0.0000]</td>
<td>[0.0000]</td>
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</tr>
<tr>
<td>Chi-Sq.(^{‡})</td>
<td>627.89</td>
<td>773.71</td>
<td>285.57</td>
<td>778.84</td>
<td>336.06</td>
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<td>[0.0000]</td>
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</tr>
<tr>
<td><strong>Return Elasticity:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>(0.0255)</td>
<td>(0.0192)</td>
<td>(0.1243)</td>
<td>(0.0205)</td>
<td>(0.0643)</td>
</tr>
</tbody>
</table>

\(^{a}\) Included fixed effects: Firm, Month and Year. Controls also include a cubic in start age.

\(^{b}\) Standard errors clustered on the state are presented in parentheses. P-values are in brackets.

\(^{c}\) * 0.10, ** 0.05 and ***0.01 denote significance levels.

\(^{†}\) Chi squared statistic for the joint test of cyclicality (three interactions terms equal zero: $\ln(\text{Salary}) \times UR$, $\ln(\text{Salary}) \times UR^2$ and $\ln(\text{Salary}) \times UR^3$).

\(^{‡}\) Chi squared statistic for the joint test of non-zero elasticities (four log salary terms equal zero: $\ln(\text{Salary})$, $\ln(\text{Salary}) \times UR$, $\ln(\text{Salary}) \times UR^2$ and $\ln(\text{Salary}) \times UR^3$).
Figure 3.1: Distribution of Tenure

Vertical lines represent the 3 and 6 year renewal/expiration dates for H-1B visas.
Figure 3.2: Distribution of Tenure for Non-Censored Workers

Vertical lines represent the 3 and 6 year renewal/expiration dates for H-1B visas.
Figure 3.3: Quit and Return Rates

Year
Quit Rate Return Rate
2003 2004 2005 2006 2007 2008 2009 2010 2011
0 .02 .04 .06 .08 .1

Rate

Year
Quit Rate Return Rate
2003 2004 2005 2006 2007 2008 2009 2010 2011
Figure 3.4: Quit Elasticities Over the Business Cycle
Figure 3.5: Heterogeneity in Quit Elasticities Over the Business Cycle
Figure 3.6: Return Elasticities Over the Business Cycle
Figure 3.7: Heterogeneity in Return Elasticities over the Business Cycle

Male

Female

Married

Single

Point Est. 95% Conf.
Figure 3.8: Previous Estimates of Elasticities: Kdensity Probability Density Function

Note: The green line shows the quit elasticities at our mean unemployment rate of 7.89%. The red lines display the median estimate in the literature.
Table 3.1: Elasticity Estimates: Income Trim Check

<table>
<thead>
<tr>
<th>Spec</th>
<th>Quit Elasticity</th>
<th>Return Elasticity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Trim</td>
<td>Full</td>
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<tr>
<td>Spec 1</td>
<td>0.0176</td>
<td>0.1732***</td>
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<tr>
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<td>Spec 2</td>
<td>-0.7988***</td>
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<tr>
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<td>(0.0229)</td>
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<tr>
<td>Spec 3</td>
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<td>-0.5658***</td>
</tr>
<tr>
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<td>(0.0516)</td>
<td>(0.0102)</td>
</tr>
<tr>
<td>Spec 4</td>
<td>-0.8098***</td>
<td>-0.5428***</td>
</tr>
<tr>
<td></td>
<td>(0.0664)</td>
<td>(0.0150)</td>
</tr>
<tr>
<td>Spec 5</td>
<td>-0.8761***</td>
<td>-0.5775***</td>
</tr>
<tr>
<td></td>
<td>(0.0627)</td>
<td>(0.0132)</td>
</tr>
</tbody>
</table>

a These results are displayed at an unemployment rate of 7.89 percent. Specification 1 includes a cubic of unemployment, log salary, and the interaction between log salary and the cubic in unemployment, specification 2 adds controls for gender, marital status, start age, start age squared and start age squared, specification 3 adds firm indicators and specification 4 adds month and year indicators. Standard errors clustered on the state are presented in parentheses.

b * 0.10, ** 0.05 and *** 0.01 denote significance levels.
Figure 3.1: Quit Elasticities Over the Business Cycle (No Trimming)
Figure 3.2: Return Elasticities Over the Business Cycle (No Trimming)
Figure 3.3: Quit Elasticities Over the Business Cycle (Quadratic in UR)
Figure 3.4: Return Elasticities Over the Business Cycle (Quadratic in UR)
Figure 3.5: Unemployment Rates Faced
4 India’s Outsourcing Industry and the Offshoring of Skilled Services Work: A Review Essay

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1. Abstract

The offshoring of knowledge services has grown in importance for researchers of employ-ment and work as the scale and scope of such offshoring has increased in recent years. We crit-ically review the existing literature and attempt to reframe the debate by analyzing the central questions, provide a framework for understanding the process of offshoring, and present evidence from field interviews. We find that much of the existing literature treats wages and skills as synonymous, and propose that a framework that treats these as separate dimensions could prove useful for understanding the phenomenon, as does acknowledging the accompanying disaggregation of tasks and changes in work process.

4.1 INTRODUCTION

In both the popular and scholarly discourses regarding the nature and impact of offshoring of knowledge work from the advanced to developing nations and regions, there are two main diverging views on the employment impacts of globalization. These perspectives are perhaps
best expressed by Blinder (2006) and Leamer (2007) on the question of whether the world is becoming “flat.” On the one hand we have Blinder’s accounting of occupations based on the trade-ability of the work itself, suggesting that a significant portion of work done in the developed world could in principle be offshored, creating a new industrial revolution as the developed economies change toward one where in-person services dominate. Blinder finds that many occupations and resulting employment are susceptible across the spectrum of skill content, pay, and occupational status; Thomas Friedman’s (2007) book *The World is Flat* provides the most popular expressions of Blinder’s viewpoint that offshoring presents a fundamental challenge to employability in developed nations, raising the possibility that only services which must be performed in-person are ultimately safe. Leamer, on the other hand, argues that education, innovation, and agglomeration economies will ultimately result in creative, complex, relationship based jobs being retained in the developed world while simple codifiable tasks go offshore. Analogizing from the original industrial revolution, he expresses the view that the work that can and will be offshored is likely to be mundane and will be performed by overseas helpers for the information age equivalent of craft workers in the developed world, and that such work constitutes a small and shrinking portion of jobs.

Thus, on the one side are those who view offshoring as a significant threat to the developed world, while on the other side are those who expect that the creative destruction of trade will create significant non-offshorable employment opportunities across the range of skill levels. In this review essay, we examine the premises of these divergent perspectives on offshoring, frame a series of fundamental questions on the phenomenon of intellectual services offshoring, and provide a preliminary framework for analyzing this type of offshoring. We consider the offshoring of computer services, an industry which involves a wide spectrum of work - from complex tasks that are difficult to offshore to simpler tasks - that allows for a nuanced examination of our questions of interest. This essay is also informed by 13 open-ended interviews with technology officers of US companies as well as the project managers of an Indian out-
4.1 Introduction

sourcing company to which jobs have been offshored from these US firms; we use these to help develop the key questions going forward.

In reviewing the literature that has been published in the last decade, we see the debate as centered on the following questions: "what is the scale of offshoring, "what can be offshored" (e.g. Blinder 2006, Blinder (2009)), Piore (2004), "what will be offshored," and "what are the limits of offshoring" (e.g. Jensen (2009))? We therefore organize this essay around these questions. To address the scale of offshoring, we look closely at the extent of offshoring in the IT services industry. In addressing the question of what can be offshored, we examine the debate among researchers on what work can be done abroad, as well as raise new questions about the feasibility of offshoring. We examine the literature on work practices in the IT industry and contrast what is known in high skill offshoring of computer services to what is known about call centers and other areas of offshore work. We focus on disaggregation, or the breaking down of tasks into smaller components as a critical theme for this question.

In terms of what will be offshored, we propose a framework for understanding the type of work and processes involved in offshoring that treats skills and wages as separate dimensions, and seeks to understand the transformation of work through offshoring. In contrast to many researchers who see offshoring as a static substitution process, we emphasize changes in work processes, which help us advance an understanding of offshoring as a dynamic process that does not merely reflect a change in the location of work. These results push us to think about offshoring as a potential change in occupational and industrial organization, and the nature of the work being done itself.

To address the question of the limits of outsourcing, we use our interview data to consider the nature of knowledge transfer and functional collaboration across distances and cultures, as well as the strategic, practical, and regulatory constraints. We see fundamental questions here regarding the existence and maintenance of a non-offshorable corporate strategic “core” and whether the movement of offshoring up the value chain ultimately gravely threatens that
“core.” This essay is organized as follows: after defining our terms within a discourse which is famously confused, we address each question in sequence, incorporating relevant literature and interviews. We conclude with a discussion of our findings, and raise some fundamental questions for future research.

Definitions

We follow others in viewing the debate as suffering from definitional problems related to “muddled” constructions and different uses of key terms (Bhagwati, Panagariya and Srinivasan 2004). Thus, we focus on trade in services that is arm’s-length, with buyer and seller remaining in separate physical locations not requiring geographical proximity, and call this offshoring where the separate locations are two different countries. We further restrict our focus to impersonally delivered and therefore tradable services, which Blinder (2009) contrasts to those that are personally delivered. We do not use the terms “outsourcing” and “offshoring” interchangeably. We use the term “offshoring” to refer to all arms-length cross-border trade in services, including when a firm offshores production to its own “captive” offshore arm, and reserve the term “outsourcing” to the special case where a firm hires a secondary firm (an outsourcer) to perform the work. Our examples of the Indian IT industry are therefore examples of “offshore outsourcing,” which as used in this paper refers to the case where work has been outsourced to a secondary firm, which then performs the work overseas.

Interview Methodology

We met with executives from companies that were engaged in outsourcing and offshoring work to India. In Appendix A, we present the background of thirteen individuals at both U.S. firms engaged in outsourcing and Indian offshore outsourcing firms across all levels of the organizational hierarchy that we interviewed. The titles of our interviewees include Chief

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31 We also discuss trade that involves the seller moving to the physical location of the buyer, as when workers engage in temporary migration, as this is often a pre-requisite and enabler of arms-length trade in the examples we use from the IT industry. This is commonly referred to as body-shopping.
Administrative Officer, Chief Information Officer, and Chief Operating Officer, and are listed in Appendix A. We also spoke at length to others in top management who were directly involved in outsourcing activities such as Executive Vice-President and Associate Vice-President and others across organizational hierarchy levels such as Senior Director, Senior Manager Principal Diversity Officer, Team Lead and Module Lead. Our interviews lasted between sixty and ninety minutes. We used semi-structured interviews addressing the question of what can and cannot be outsourced in their organization’s specific context. We recorded and transcribed these interviews when we were given permission. For interviews in which the participants did not want to be recorded, we took extensive notes. We summarized these interviews after they were completed.

4.2 What is the scale of offshoring?

More than a decade into the 21st Century, from less than 4% in 2002, more than a third of the employees at the three largest U.S. IT services companies (IBM, EDS-HP, and Accenture) are now based in India, suggesting a significant shift toward the offshore provision of IT services. Meanwhile, with about 30% of the services for any given project being performed “onsite” at a customer’s work location, the Indian IT services companies (TCS, Infosys, Wipro, HCL) that most embrace an offshoring model are now the largest employers of H-1B workers in the United States. One question is regarding the scale of offshoring: how much is being offshored now? This section shows how the discussion of offshoring has largely has not kept pace with empirical developments, and combines several data sources to give the reader an overview of the extent of offshoring of software services work.

The Rise of Offshoring

India’s software industry began in 1968 with the founding of Tata Consultancy Services (TCS), although TCS did not begin exporting software until 1974. One important factor for the de-
The development of the Indian industry was the departure of IBM in 1978, which let go of its 1,200 employees in India after the government instituted new rules limiting foreign owned companies to a maximum 40% ownership of their Indian subsidiaries (Khanna and Palepu 2004b). TCS is today the largest of the Indian IT services companies, while the second largest, Infosys, was founded in 1981. Early on, these companies took work at the customers’ locations in the United States, a practice known as “body-shopping” and were small and undifferentiated from other service providers, except by cost. For example, in 1995, a “Fortune-10 corporation” (probably General Electric) corralled all of their Indian software vendors into different rooms at a Bangalore hotel to prevent communication between them. GE’s “aggressive” negotiation style involved their team going from room to room soliciting the best terms from each vendor and then pitting one against the other (Murthy 2009, p. 6). As late as 1989, 90% of Infosys’s revenue was from work performed at customers’ sites, and it was not until the early 1990s that the offshore methodology described in Section 4.3 really rose (Khanna and Palepu 2004a).

There were many catalysts behind the rise of offshoring of computer programming work, including the need for programmers with the Y2K phenomena, the large pool of English-speaking engineering graduates available at a low cost, the “body shopping” phenomena involving the export of engineers to the United States in the 1980s and 1990s, and the Indian diaspora in Silicon Valley (Kuruvilla and Ranganathan 2008).

Prior research seems to agree that the scale of offshoring remains small, even if it has grown rapidly. Most trade in services involves trade between developed countries, and not the trade between developed and developing nations that is at the center of the debate. To shed light on scale, we consider the case of trade in the computer and information services industry (a subset of Business and Professional Services, commonly referred to as the IT services industry). The U.S. department of Commerce’s Bureau of Economic analysis (BEA) reports imports of $6.9 billion in 2010, up from $2.8 billion in 2006 while higher estimates of IT services trade come from the Reserve Board of India’s (RBI) survey of Indian software and IT services com-
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Companies, which estimated $24 billion in exports to the United States and Canada in 2009-2010. Whether one believes a larger or smaller estimate, many have raised concerns about inadequacies with the U.S. data, and regardless of the true figure, the conclusion that the dollar figures are small in the context of the U.S. economy and global trade is certainly correct, even within the narrower context of U.S. services trade (in 2010, $587 billion in exports and $393 billion in imports).

One difficulty with the approach that uses dollar figures and aggregated data, however, is that the level of aggregation matters greatly when it comes to examining effects of offshoring (Amiti and Wei 2009). The choice of figures also matters; dollar estimates mask the employment effects of offshoring because of the much lower cost of workers in offshore locations, and the labor market implications of offshoring can be missed as a result. There is good evidence that IT workers in India would earn high wages if they were in the U.S.: a randomized quasi-experiment found that computer programmers in India often earns less than a quarter of what the same worker would earn if they were outside India (Clemens 2013).

The following discussion presents occupation and industry employment data in computer occupations in the IT services industry. Table 4.1 contrasts modest growth in employment in computer occupations in the IT services industry in the U.S. with robust growth in employment in the computer occupations in the export-oriented segment of the IT services industry in India. Table 4.2 presents the number of workers in India and worldwide employed by the 5 largest Indian and non-Indian IT services companies. In a situation that has changed rapidly in the last decade, there are now more workers in computer occupations employed by India’s software export industry than by the entire U.S. IT services industry.

Changes in the employment patterns of the largest IT services companies in the world, and the Indian IT services companies, also demonstrate a substantial shift in the global location of IT services. Table 4.2 includes data from IBM, HP, Accenture, CSC, and Cap Gemini – five of the six largest IT services companies in the world (Hitachi is excluded because public data is not readily available). These data come from corporate annual reports, published news sources, executives’ statements at investor meetings, and other publicly available sources of information. Based on the pattern observed in Table 4.2, offshoring of services has led to

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There were 5 missing company-year observations among the Indian IT companies, and 21 for the non-Indian IT companies. Wherever one year’s data was missing for a particular company, an extrapolation was done based upon the growth rate observed in the available data.
Table 4.1: Computer Employment, U.S. IT Services & IT Exports, India

<table>
<thead>
<tr>
<th>Year</th>
<th>India-Software Exports</th>
<th>U.S. - Software Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>110,000</td>
<td>556,372</td>
</tr>
<tr>
<td>2001</td>
<td>162,000</td>
<td>643,618</td>
</tr>
<tr>
<td>2002</td>
<td>170,000</td>
<td>643,923</td>
</tr>
<tr>
<td>2003</td>
<td>205,000</td>
<td>624,132</td>
</tr>
<tr>
<td>2004</td>
<td>296,000</td>
<td>644,229</td>
</tr>
<tr>
<td>2005</td>
<td>390,000</td>
<td>639,434</td>
</tr>
<tr>
<td>2006</td>
<td>513,000</td>
<td>684,760</td>
</tr>
<tr>
<td>2007</td>
<td>690,000</td>
<td>697,843</td>
</tr>
<tr>
<td>2008</td>
<td>860,000</td>
<td>728,979</td>
</tr>
<tr>
<td>2009</td>
<td>948,809</td>
<td>739,636</td>
</tr>
</tbody>
</table>

Source: Author estimated U.S. figures from American Community Survey (1990 Census Industry Code=732), India estimates are from NASSCOM (via Dossani and Kenney (2008) and NASSCOM. NASSCOM data does not include employees working in India for multinational corporations engaged in software exports.

substantial changes in the employment patterns of the global IT workforce. An effect on the industry has been felt as well. Companies that failed to adapt quickly enough – EDS (now part of HP), for example – experienced a dramatic decline in share price and market share, and laid off tens of thousands of workers in the U.S.

Data Difficulties

Both the India and U.S. numbers exclude computer professionals working in corporations outside of the software services industry (where the software development work is “insourced” or performed by an in-house IT department). Additionally, the India numbers exclude employment of Indian nationals working in India for foreign multinational corporations. The U.S. data come from the American Community Survey, which shows 23 percent, or approximately 800,000, of the 3.4 million people employed in computer occupations in 2010 worked in the IT services industry. The IT services industry is the largest employer of workers in computer occupations. In contrast, only 153,000 workers or 4.5% of those in computer occupations were
4.2 What is the scale of offshoring?

Table 4.2: Estimated Headcount of 5 Largest Non-Indian and Indian IT Cos.

<table>
<thead>
<tr>
<th>Year</th>
<th>World’s Largest IT Cos.</th>
<th>Largest Indian IT Cos.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>India</td>
<td>Worldwide</td>
</tr>
<tr>
<td>2002</td>
<td>28,030</td>
<td>670,572</td>
</tr>
<tr>
<td>2003</td>
<td>35,154</td>
<td>679,849</td>
</tr>
<tr>
<td>2004</td>
<td>57,662</td>
<td>684,325</td>
</tr>
<tr>
<td>2005</td>
<td>81,808</td>
<td>709,409</td>
</tr>
<tr>
<td>2006</td>
<td>110,131</td>
<td>773,655</td>
</tr>
<tr>
<td>2007</td>
<td>157,054</td>
<td>868,566</td>
</tr>
<tr>
<td>2008</td>
<td>197,147</td>
<td>907,997</td>
</tr>
<tr>
<td>2009</td>
<td>228,646</td>
<td>901,268</td>
</tr>
<tr>
<td>2010</td>
<td>267,284</td>
<td>971,216</td>
</tr>
<tr>
<td>2011</td>
<td>349,689</td>
<td>1,022,361</td>
</tr>
</tbody>
</table>

Source: Author compilation based on annual reports, media reports, including some estimates based on reports regarding percent of effort offsite.

The large differences between BEA’s numbers and the RB[33] and NASSCOM’s numbers are partly attributed to the BEA’s method of defining professional, and technical services (according to the BEA) although a variety of experts such as Hira (2009) and Dossani and Kenney (2008) are more critical of the BEA’s data including whether it is identifying the universe of services importers from the U.S. And the GAO, the IPC at MIT, the House committee on science and technology, all of whom have examined the discrepancy in numbers between U.S. and Indian data, concluded that the data collection structures maintained by the BEA, the Census and the BLS “prevent any meaningful understanding of the scope of offshoring, the scale of U.S. job losses, the businesses and occupations being affected and the economy’s potential responses to unabated offshoring” (DLR 2008). In another report, Sturgeon (2006) argues that it is impossible to measure the economic effects of services offshoring because there are too

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[33] See http://rbi.org.in and search for reports on “invisibles.”
many data gaps. Their report highlights the critical need for the U.S. to collect more detailed data for international trade in services, as well as more detailed information on time series data on employment by occupation in order to answer that question more positively.

One concern with the India data is that both NASSCOM (the Indian IT industry body) and the RBI survey consider employees who work for an Indian IT services firm “onsite” (outside of India) to be part of the services export employment and revenue figures, as they meet the definition of Mode 4 services trade. In an early study of India’s IT industry, Arora, Arunachalam, Asundi and Fernandes (2001) discuss three types of projects: “onsite” projects where all of the work is done at a client’s work location in the U.S. or other developed market (also known as “staff augmentation” or “body-shopping”). The second category is a blend of onsite and “offshore” development, with multi-national firms providing onsite technological and managerial expertise over Indian IT firm employees in the U.S. or other developed nation while the Indian IT firm delivers certain components from India or “offshore.” The third category is pure offshore development. Baily and Lawrence (2004) argue for scaling the India figures back by 40% as this includes workers who are located “onsite.” Using NASSCOM data, Parthasarathy (2004) shows that offshore development or pure Mode 1 trade was only 5% of industry revenue in 1990, 32% in 1995, and 39% in 2000. RBI data shows that the “offshore” or Mode 1 Indian export segment has increased rapidly since the RBI began collecting data – from 38.8% of software export revenue in 2003 to 64% in 2010. Thus, we can see that even though some of the workers included in the India IT figures may not physically be located in India and are instead engaged in Mode 4 trade, the proportion of work performed offshore and in India has grown significantly in the last two decades. This point – that offshore work requires onsite participation – has important implications and has been frequently overlooked in studies on the offshoring phenomenon.

Unlike offshoring in manufacturing, where high profile plant closings attract both media attention and systematic data collection through mass layoff statistics, layoff statistics and di-
direct measures of those affected by offshoring are not readily available. The EDS 2007 Annual Report disclosed that 2,400 employees accepted an early retirement offer made to 12,000 employees the prior year. The 2005 EDS report disclosed expenses 1,500 employees accepting early retirement. HP’s 2008 Annual report discussed $246 million due to severance and facility costs related to EDS, a 2009 media report discussed wage cuts at EDS of between 10 and 47 percent (McIlwain 2009), and HP disclosed in 2012 that it planned to lay off 25,000 workers (Bloomberg reported that up to 15,000 cuts could be at the former EDS). In the larger picture, while numbers are scarce, Mankiw and Swagel (2006) note only 1.6% of job separations in mass layoffs were due to offshoring; Rishi and Saxena (2004) put this figure at 2.5%; Kirkegaard (2007) at 4%. The companies that adapted quickly – IBM and Accenture, most prominently – reconfigured their workplace practices and market offerings to incorporate “global delivery.” This included a significant shift in employment patterns, layoffs in smaller numbers in the U.S., and an increase in the flexibility of their labor practices.

For example, IBM had 5000 employees and Accenture 4000 employees in India in 2002 and 2003, respectively – in 2010, IBM had 131,001 in India, and Accenture 50,000. Similar figures for changes in IBM’s U.S. employment are difficult to locate. Ex-IBM employees maintain a U.S. headcount for IBM, which reportedly declined from 133,789 in 2005 to 98,000 in 2010 (IBM 2012). As IBM is not purely a services company, however, the IBM numbers may also reflect restructuring and reorganization due to changes in its very large software or product businesses.

The Future Scale of Offshoring

To adjust to competition in labor management practices pioneered by the Indian offshoring industry, U.S.-based companies in the IT services industry have had to adapt their workforce practices to focus on slack resources. Along its path to becoming a “globally integrated enterprise,” a problem described at IBM was “‘frictional’ unemployment” caused by workers
who were “on the bench” waiting for assignments. The finance department developed and tracked utilization metrics, and felt that they were below the industry level, leading to lost revenue, profitability and opportunities. The purpose of the “Workforce Management Initiative” (WMI) was to fix this problem and implement supply chain methods in the management of human resources. As one of the leaders of the initiative described it: “We rationalized the idea of the WMI as insights into talent supply and demand. The idea was originally to convert revenue to talent demand and to remove the slack from the system. There was a supply chain logic here. But realize that talent is not perfectly fungible. At some point, it’s still people” (Boudreau 2010).

Accordingly, IBM created 490 defined roles with over 4,000 skill sets, allowing Vice President of Human Resources J. Randall MacDonald to estimate that 22 percent of the workforce would have obsolete skills in three years, of which 85% could remain with the company while 15% would be let go or self-select out (Grossman 2007). There is a shift toward an “employability contract” rather than the typical employment contract. Again, MacDonald said that IBM would predict the skill sets that will become obsolete and in demand, notify employees, and be prepared to let go of those who did not keep up. As a result of the WMI at IBM, billable utilization rates between 2003 and 2008 increased by 9% (Boudreau 2010). This effort to make sure human resources are continuously productive indicates one direction of the industry in addition to its continued sourcing of “fresh” talent offshore.

One conclusion from the employment data is that the scale of offshoring in its most mature area so far is already quite large, larger than scholars had thought. These facts are not new to industry observers and participants – certainly not the HR and senior executives who have overseen an industry shift toward globalized trade in services – yet to the extent that the experience here has been reflected upon, it has been through anecdotal evidence, and we have not seen the employment data previously compiled and presented in this fashion even by those who track the industry. The considered pace of academic discussion and scholarly reliance on
highly-aggregated estimates from government trade statistics has meant that the substantial nature of this shift has been under-estimated in previously published literature – even among those who do consider offshoring a potentially serious matter.

4.3 **WHAT CAN BE OFFSHORED?**

There is a strong division among those who have studied the potential impact of offshoring relatively high skill service-sector jobs from the U.S. to developing countries. On the one side are those who view it as a fundamental challenge to employability in developed nations, akin to the effects of globalization on manufacturing, where ultimately only services performed “in person” are safe from the offshoring threat (most notably, Blinder (2006) and Blinder (2009)). On the other side are those who see it as a more limited phenomenon, insignificant in terms of the volume of trade in the global economy, and easily understood in terms of traditional comparative advantage a la Smith and Ricardo (Mankiw and Swagel (2006), Leamer (2007), and Bhagwati et al. (2004)). Most researchers tend to think of jobs that are being offshored as those that are routine and can be broken down into simple tasks (See for example Acemoglu and Autor (2011); Autor, Levy and Murnane (2003); Leamer (2007)). Piore (2004) further suggests that there are limitations in the divisibility of complex services work such as software. But in contrast to the notion that only simple jobs can be offshored, Autor (2013) suggests that even high level executive jobs, and creative jobs can be offshored i.e., that overseas workers can perform these functions as much as anyone else, although that is not what is taking place. Consistent with this view, Blinder (2009) finds no correlation between skill levels and the offshorability of jobs in his highly cited study.

Blinder’s decision rule about whether a job is offshorable or not is whether the service requires to be personally done at a U.S. work location (e.g., barber, nurse) or whether the service can be delivered electronically, and if so whether its quality is degraded when delivered electronically. Based on this definition, Blinder (2006) finds that between 28 and 42 million
jobs (30-40% of all jobs in the U.S.) are in principle offshorable. In a study using different methods, Blinder and Krueger (2013) also find the concept of offshorability detached from skill and wage, estimate that 25% of U.S. jobs are offshorable, and find that 19% of workers say their jobs can be done from a remote work location. This research suggests that there is no connection between a job’s “offshorability” and the skill level needed to perform it.

International trade researchers and organizational economists have emphasized additional factors that shape the decisions of firms to either vertically integrate or outsource functions. One focus has been on the transaction costs involved, including the number of vendors offering services, the difficulty of customizing relationships and contracts, the legal environment surrounding the enforceability of international service contracts, the size of firms and the ability to scale efforts (Grossman and Helpman 2005, Merino and Rodríguez 2007). Another indication of the importance of transaction costs is that a significant reduction in information and communications technology (ICT) costs increased the willingness of firms to offshore, leading especially to increased offshoring by more ICT intensive firms (Abramovsky and Griffith 2006). In knowledge intensive industries, there is an additional concern about the ability to retain control over knowledge assets. While physical capital is often excludable in that control of its use can be maintained by a firm, even if located overseas, knowledge capital can more readily be captured by others (is non-excludable). Firms that rely more on non-excludable knowledge capital are more likely to concentrate overseas investments through foreign direct investment rather than outsourcing arrangements (Chen, Horstmann and Markusen 2012).

Another perspective to understand the connection between skills and offshoring can be found in Learner’s (2007) master-helper metaphor. Here, offshoring is akin to a master craft worker making all the decisions, and then parceling out simple and well-specified tasks to a variety of low skilled helpers. This view suggests workers who possess the greatest skill

34 Leamer also discusses wide-ranging limitations on offshoring such as agglomeration economies, transporta-
will maintain their jobs and emerge well compensated from globalized trade in services due to their comparative advantage, not that jobs with any skill level are offshorable.

In evaluating these perspectives, it might be useful to hearken back to the first industrial revolution. We venture that if we had looked at the dictionary of occupational titles in the mid-19th century (if it had existed), we might have seen a lot of master craft workers, whose jobs we likely would have concluded could be replaced by craft workers in another location, consistent with Blinder’s view of offshorability. But if one adopted Leamer’s perspective, these workers would be less threatened than workers whose jobs were lower skill, routine, and most threatened by market forces. This latter view would certainly have held up under early industrialization conditions, as craft workers hired apprentices and lower-skilled helpers.

We found that the perception of those in the companies in the U.S firms engaging in offshoring we interviewed is that the jobs they send away are routine and low skilled. The Chief Administrative Officer of a Bank that had offshored tasks to India observed “Either you do it because it is cheaper or do it fundamentally because you don’t want to do it or you don’t want think about it. It is so non-core to your business that it is a management distraction.” (Interview 1, Appendix A).

Similarly, the routine-creative distinction was also embraced by the Chief Information officer of a US based online network company, who suggested: “Business leaders will decide what to outsource autonomously. IT people will step in to decide what is better to do onshore and what is better to outsource offshore. It is a very ad-hoc decision and no rigid decision rules exist. One of the factors we look at is the extent to which routine or creative.” (Interview 2, Appendix A)  

The Executive Vice President and Chief Operations Officer of a health care organization based on the U.S. offered support for Leamer’s view: “The jobs that we are looking to outsource for us fall into 2 categories may be 3 categories. One is just purely transactional, adjudicating and processing claims from the provider. They don’t touch they don’t talk on the phone; they are doing their work at the back or ensuring that the claim is processed correctly or enrolling the members... The second
is application development... If you are really good about defining the requirements, defining it and giving it someone else who has actually established really good quality standards as some of the really good offshoring companies, they will program what you tell them to program with a very high level of accuracy. It puts the onus back on the companies to be really good about their requirements... you have to be much more clearer about your requirements.” (Interview 3, Appendix A)

To be sure, a lot of work that is offshored is consistent with this picture. For example, the offshoring of call center work, billing services, accounting, coding of legal documents and so forth are examples of simple routine tasks that have gone to India (see Kuruvilla and Ranganathan (2008) for a more detailed list of such jobs). Offshoring of call center work is often on the lower end of customer service support, with little employee discretion and tight monitoring overhead (Batt et al. 2007). Following call centers, the computer programmer occupation and the IT industry have seen a large amount of offshoring as well. Research on the Indian IT industry found that Indian IT companies in the late 1990s were “providing relatively simple software programming and coding services, exploiting its superior access to a supply of cheap software programmers, and with only limited degree of technical and managerial contribution (Arora et al. 2001).” Arora et al. concluded that Indian firms needed to move into higher value services and products, and improve their software development methodologies to realize their potential. Managers at U.S. firms reported, “the type of work outsourced was neither technologically very sophisticated nor critical to their business.” Parthasarathy (2004) writes that Indian firms continue to do lower value-added work, with few signs of innovation exemplified by Silicon Valley.

To return to the industrial revolution metaphor, there is some evidence that supports the view that work inside India’s software factories increasingly resembles factories during the industrialization and proto-industrialization periods. Detailed case studies of the current labor processes in place in India’s IT industry suggest that Indian IT firms utilize neo-Tayloristic management techniques that place a focus on measured productivity, implement quality pro-
cesses that place an emphasis on documentation and process adherence, and “excel” at dividing work into small pieces (Upadhya 2009). Thus, even though the work is more circumscribed, the possibility exists that a new “industrial revolution” in services is also taking place. This kind of industrial revolution, one brought about by changes in production and the nature of work, could lead to rapid increases in productivity as did the previous one, as the tools people used shifted away from craft and toward Fordist mass production.

The Offshore Methodology

While services offshoring captured popular attention in the early 2000s, a quieter transformation was underway in the organization of work in software services. Over the course of the last two decades, there has been an attempt to transform IT occupations with craft or artisanal features into jobs that emphasize factory-like processes predicated on predictability, scale, and less flexible work practices (Upadhya 2009). While the idea of a “software factory” achieved attention in the Japanese context in the 1980s (Cusumano 1989), the story of Indian IT offshoring companies is still evolving. As late as 1989, 90% of the largest Indian IT companies’ revenue was from work performed with traditional methods at customers’ sites, and it would take nearly two decades for offshore software development methodologies to rise, even despite dramatic decreases in the cost of information and communication technologies.

Within the management literature, the term “software factory” first emerged to describe the adoption of a collection of software engineering practices within a facility. In the mid-1970s IBM created a dedicated software development facility in Santa Teresa that brought together over 2,000 programmers in one place, and in 1975-1976, SDC created “The Software Factory” and took out a trademark on the name. SDC’s software factory embraced three techniques:

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35 Our discussion here of a potential services industrial revolution brought about by changes in management practices and technology related to information (e.g. Karmarkar (2010)) is distinct from Blinder’s discussion of industrial revolution brought about by offshoring of services work. Blinder (2006) more broadly refers to a “third industrial revolution” whereby the scope of tradable services expands due to advances in information transmission per se. Our definition has more to do with the changes in management practices of services workers enabled by technology.
the use of tools, standardized procedures and management policies for design and implementation, and “a matrix organization separating high-level system design (at customer sites) for program development (at the software factory)” (Cusumano 1989). However, the software factory concept did not work in the U.S., for two reasons that Cusumano cites. First, managers did not like giving up local control of development at the customers’ site, and refused to send work to the centralized facility; project managers preferred to build teams “onsite” at the customer locations. Second, in their attempt to use standardized tools and reusable components, they were ahead of their time in terms of technology, as the range of projects using different computers and applications was too wide to make components easily transferrable.

The Software Engineering Institute (SEI) launched the “Capability Maturity Model” (CMM) in 1987 to enable the Department of Defense to evaluate the “process maturity” of defense contractors. CMM takes a continuous process improvement approach and recognizes five levels of process maturity at the organizational level: 1) initial / ad hoc, 2) repeatable, 3) defined, 4) managed, 5) optimized. SEI performs CMM audits to assess the level of process maturity in a company, and it has become an industry practice to go through the audit even if not bidding for defense contractor business. In 1992, no firms were at CMM level 4 or 5 (the highest, “optimized” level) and the majority of firms were at the initial “ad hoc” level of maturity. Indian companies were early adopters of the CMM. While 26 percent of all CMM appraisals were at level 1, and only 6.6% were at level 5, there were twice as many Indian companies in 2004 with a CMM 5 ranking as US based companies (Davenport 2005).

The growing ability to separate sections and perform a division of labor is evident in monitoring and control process at Indian companies’ “offshore development centers” – the software campuses in India where tens of thousands of computer programmers report to work every day. These offshore development centers accomplish what could not be done previously in the domestic American software development context: they bring together computer programmers in one location removed from the client’s site to develop software. As such, they en-
able the implementation of factory-like processes. Upadhya (2009) provides a detailed ethnographic study of work in the offshore development centers, and describes how processes are increasingly hegemonic. Time management systems are synchronized with metrics systems that are closely monitored by clients and managers, according to Upadhya, who use these numbers to calculate the effort required to complete projects. Employees frequently underreport hours to improve their productivity ratings. Commitment is created and held through strong values systems focused on identifying with the organization. In essence, a top-down, hierarchical form of control is exercised with intense monitoring of workers’ output through requiring extensive documentation, code reviews and bug checks, and input through hours worked.

The situation offshore is different but also places an emphasis on supply chain principles in management. With global delivery as a key offering, Indian IT companies constantly maintain a surplus of labor in India ready to travel at any minute to a customer site when a project should arise (Waldinger and Erickson 2002). The staff are trained and ready to deploy – and prepared to return to India when the project is finished. Indian IT services companies also require workers to clock in and clock out, just like at a factory, at least at in India: at Infosys, it is 9 hours and 15 minutes, at Accenture, 9 hours, at Wipro 9.5 hours, and at TCS, 9.5 hours. The workers’ labor is billed to clients, so if workers do not show up, then the client cannot be billed. The elimination of slack is very focused on inputs as measured by hours and days worked. So when a holiday occurs in India that does not also occur in the U.S., or when there are an excess of holidays in a particular quarter in India, workers are expected to come in on Saturdays to increase the number of billing hours. Other software practices can also be enforced in the factory environment: employees can be better monitored on a day-to-day basis, improving the use of tools such as a knowledge repository, and documentation techniques.

Yet, there is some nuance here. Perhaps not surprisingly, rather than taking the view that they are providers of low skill services merely performing cost arbitrage, the perception of
the outsourcing companies in India was very different. Not only are they cheaper, Indian IT firms and the offshore industry tend to believe that they provide a superior product through higher quality and greater predictability, as well as developing the ability to break down complex tasks into simpler components. Thus, in addition to taking on already well-specified methodologies, the Indian IT companies also see themselves as playing a role akin to industrial engineers, breaking down the complex functions of the client companies into ever simpler tasks that can be reasonably offshored. Their workers perform both the tasks of the master and the craft worker, the industrial designer and the factory producer. A senior manager at an Indian Offshoring company told us “"IT is] the first of the so-called services which is very similar to manufacturing. You send out a spec, somebody makes it as per spec, you compare with spec, quality is cleared, you inspect it, you ship it. Same process is followed in IT, just that it’s not physical. Therefore it’s much faster, much more iterative, and much more real time.” (Interview 4, Appendix A).

The idea that routinization is replacing the craft worker can also be found in this observation by the Director of a large Indian Offshoring company “"[We have an] automated, factory approach, the same thing as an assembly line. And that is increasing quality and delivery. ... I mean why is it that they [software development projects] go wrong so many times? It is because they are not focused on engineering, they are focused on individuals who are brilliant in doing coding. But here it has become a science of engineering. Engineering makes it much more predictable, maybe removes the fun, but it becomes much more predictable.” (Interview 5, Appendix A). Finally, the idea that these type of jobs can be broken down into its smallest component parts and shipped overseas can be seen in the response of an Associate Vice President of Transportation & Services in a large IT offshoring firm. “I believe that you have to break down the project into pieces. Today we are good at breaking down, okay this has to happen onsite and this can go offshore. If you follow this breakdown of the work into smaller pieces what requires client interaction, client approval, client review do that on-site. Once the sign off is done then take it to offshore. I always relate this to civil engineering. If the client wants a house, discuss the house with him. Once the design is discussed you don’t need the
4.3 What can be offshored?

client. We can do everything without the client.” (Interview 6, Appendix A).

To return to the historical metaphor, the movement to the factory in later periods of industrialization led to increased production and efficiencies through fully breaking down the tasks of the master craft worker, who was highly skilled and knew how to perform every stage of the production process, into much simpler, deskilled tasks which could be doled out to the less skilled workers. The ultimate outcome was the fully developed Fordist factory in the U.S., with many unskilled jobs, and a few industrial engineers who designed the work and broke down the tasks - but few skilled craft workers. The historical factory also increased the scale of production to allow a single plant to serve customers in national and international markets, separating the craft worker from the local community. In the context of offshoring, then, we might ask whether the breaking down of tasks and development of software factories similarly undermines the role of the craft worker / artisanal software programmer?

But if one looks at the offshoring landscape today, there is enough evidence to suggest that a range of jobs are being offshored (it is worth noting that there is very little reliable data regarding the number of jobs offshored). Not only are more complex jobs offshored, but the range of occupations and professions involved is multiplying rapidly. As Sako (2013) points out “Tasks requiring high levels of skill that were formerly considered the sole province of the advanced economies are being performed offshore on behalf of corporate and individual consumers in advanced economies. These tasks involve reading X-rays, carrying out lab experiments for new drug discovery, developing engineering design, administering payroll for companies and preparing documents for filing patents.” Thus, it is common to see offshoring in many industries and occupations: video special effects and gaming, financial analysis, accounting and compliance, engineering services, and pharmaceutical research and development jobs. Other fields such as radiology are in very early stages or have been blocked by professional and quality concerns (Yu and Levy 2010).

There is also evidence that the nature of the work gets transformed in the offshoring pro-
cess. In their case study of pharmaceutical R&D offshoring, Finegold, Erhardt and Sako (2009) find that the nature of the task is alterable in the course of offshoring. These studies suggest that offshoring is a dynamic activity. Thus although the dominant portrait is one of lower-skilled activities being offshored, there has been an acceleration in the offshoring of more highly-skilled activities including R&D, design, and data analysis to the Indian IT companies, which have grown their services to include much more than programming (Dossani and Kenney 2007, Dossani and Kenney 2009). Jensen (2009) found in his case studies that offshoring of advanced tasks was initially founded on the exchange of technical knowledge, but very soon moved to an exchange at strategic and systemic levels that stimulated changes in the client firm’s strategy: the client firm went to India initially to access cheaper engineering and software talent but stayed for using offshoring as a tool for strategic transformation. Once technical knowledge is shared between client and subcontractor, the next step is the externalization of the tacit knowledge (judgments and other higher level tasks) that truly distinguishes advanced work from routine work.

What conclusions can we draw from the two perspectives discussed here about what can be offshored? The key missing element in the current debate, and an arena for future research is the disaggregation of jobs that occurs through the process of offshoring. If one had gone to a master craftsman (let’s take Smith’s pin maker) on the eve of the first industrial revolution and asked him about the advantages of lower-skilled helpers and the division of labor, he might well have said something like “sharpening the end of the needle is easy but somewhat dangerous, so not cost effective for me to do; I’ll instruct my new unskilled helpers to do that.” But the accumulation of such decisions eventually broke down the work of the skilled craftsman to the collection of unskilled jobs in the Fordist factory. So, might the ongoing division of tasks in intellectual services eventually threaten the role of far more knowledge workers in the developed countries? When viewed in this way, it is clear that the question of what jobs can be offshored is still largely unanswered, that the view that only routine jobs
are offshorable does not fully take into account the implications of stripping away the routine aspects of existing jobs.

4.4 What will be offshored?

Clearly, any answer to the question of what will be offshored must take into account the transformation in the work itself during the process, which we see as the dynamic process of separating skills and wages through the re-engineering of work. The interviews and the findings above suggest that what is being offshored includes both high wage and low wage work, both high skill and low skill work. We have become used to equating skill with wage: “High Wage-High Skill” and “Low Wage-Low Skill” have become standard in our lexicon. Offshore work in advanced IT services is an example of this. The work being done in IT is high wage by U.S. standards, and the skill level, as best as it can be ascertained, seems to be high, even by U.S. standards. Similarly, anecdotal evidence of jobs in the life sciences that have been offshored suggests that many of these are also high wage and high skill. A person with a Masters degree in chemistry working at a pharmaceutical company involved in the discovery of new drugs, for example, commands a salary of over $100K annually. In U.S. terms, this is a high skill high wage job. Yet how does the analysis change if we allow the possibility that not all high wage jobs require high skill levels?

Table 4.3 presents an attempt to consider skill and wages as separate dimensions, and to recognize how dynamic forces at the intersection of skill and cost affect the ability and willingness to offshore any particular piece of work. We believe that this framework provides a way of understanding what jobs - or the component tasks currently within any job - are most likely to actually be offshored in the future. High wage work is often difficult to offshore, because of skill requirements and agglomerations such as cultural geography, and this is recognized in the upper-right hand quadrant of Table 4.3. While there can be geographic shifts in the location of these jobs, the amount and the speed at which these shifts can take place is lim-
ated because moving work with this level of tacit knowledge often also requires the physical
movement of the human resources in possession of that knowledge. So work in this quadrant
has a lower likelihood of being offshored. A classic example of such an activity is the work
tailed in preparing a motion to dismiss a case before U.S. courts. For example, there is an
instance where the comedian Sacha Baron Cohen engaged an India-based Legal process off-
shoring company to prepare a motion to dismiss (he was sued for defamation in California
courts for an episode in Da Ali G show). The India based LPO firm prepared the motion for
a U.S. based lawyer to present in court. However, the lawyers in the LPO were trained by
lawyers from the U.S. hired by the LPO for training purposes. Thus, high-skill high-wage
work, like most jobs, can be offshored and is being offshored.

However, we posit that there also exists high wage work that does not carry the trait of
being high skill, and it is precisely these jobs where offshoring is most likely to be growing
fastest, as indicated in the top left quadrant of Table 4.3. Often, high wage work carries a mix of
tasks of various skill levels, and there is potential that skilled work can be disaggregated into
smaller unskilled tasks if forethought is given to the production process. The quadrant in
the top left corner of Table 4.3 illustrates high wage, low skill tasks that are undergoing rapid
offshoring in the present. Several highly paid jobs have large elements of low skill work in
them, and as firms move aggressively to cut costs, these elements are increasingly offshorable.

36 For example, lawyers (especially first and second year associates) who do mostly routine tasks. There may be
good reasons for not disaggregating such high skill work e.g. institutionalized norms, impact of training systems,
belief in combining more and less complex work to provide high quality outcomes (avoid burnout), the nature
of the interdependence, etc. One central question is the extent to which globalization will break down these
constraints, whether structural or psychological.

37 Table 4.3 is based on an analysis of the O*NET 17.0 skills database, which contains detailed information on
the tasks, abilities, and skills required of 974 occupations included in the Standard Occupational Classification’s
2010 taxonomy. We build skill constructs for each occupational category and merge SOC 2010 codes to Census 2000
following Autor and Dorn (2013). The skill construct we use reflects a general factor for skill level, and combines
many sub-items from the O-NET skills database into a single construct that is mean centered at zero. Occupations
are “low skill” if they are below the mean, and vice versa. The residuals of a regression of wage on skill are used to
assign occupations into wage categories, such that low/high wage refers to wages given the level of skill required.
### 4.4 What will be offshored?

Table 4.3: The Offshorability of Services Work

<table>
<thead>
<tr>
<th></th>
<th>Low Skill</th>
<th>High Skill</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High Wage</strong></td>
<td>Fastest growth areas for offshoring: these jobs are often seen as high skill because of high wages, but this will change as a learning process necessary to understand and break work down into less-skilled components begins. The process is complete when the maximum amount possible is done offshore and the job is likely to no longer be high wage - even in the destination country. Examples: Financial managers and analysts, budget analysts, insurance underwriters, credit authorizers, checkers, and clerks, technical writers, auditors and accountants.</td>
<td>Unlikely to be offshored: these jobs require de-mystifying and transforming the work process before they can be shifted to the upper left quadrant. It is possible, however, that the offshoring cycle begins with this work being done “onsite” by nationals or temporary migrants, and that the work can then shift “offshore” through expatriate assignments or reverse migration. Examples: Chief executives, Biomedical, aerospace, chemical, sales, and civil Engineers. public relations managers, marketing and sales managers, lawyers.</td>
</tr>
<tr>
<td><strong>Low Wage</strong></td>
<td>Mature areas for offshoring: these jobs are easy to offshore and commonly are, but there are lower returns to offshoring and firms decide purely based on cost-benefit where to source. Examples: Telemarketers, customer service representatives, library assistants and technicians, bill and account collectors, secretaries and administrative assistants, travel agents, computer operators.</td>
<td>Least likely to be offshored: these jobs require de-mystification as well as a rigorous cost-benefit evaluation. They are least threatened. Examples: Writers and authors, editors, librarians, wholesale and retail buyers, logisticians, advertising sales, insurance sales, architects.</td>
</tr>
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</table>
Therefore jobs that today are in the top left quadrant, we predict, are likely to be split up and parts of those jobs will belong in the bottom left category in the future: low skill, and low wage. In theory, any job or work process can undergo a transformation from the top right quadrant to the bottom left. To refer again to an example from the IT industry, a possible re-interpretation of the master-helper analogy is that the corporate IT department’s production function is progressively broken down into component parts, to be done more efficiently separately and elsewhere. Starting in the top right quadrant, jobs in the computer occupations - or significant portions of the work of the IT department - have moved from their high wage and high skill position into the top left quadrant over the last decade, effectively becoming less skilled in the process. In the future, we would predict these jobs are going to move firmly into the lower left quadrant. This is not to say all computer programmers will be low wage, but only that programmers in developed nations will continue to face direct competition, and will need to move up the value chain to retain high wages as previously rare knowledge and skills become widespread and routine. Finally, the low wage and high skill quadrant at the bottom right of Table 4.3 include complex call centers such as travel reservations agents, statistical clerks and financial specialists. These jobs are less likely to be offshored except where cost considerations move them back toward high wage.

The framework presented above provides a logical rubric, taking into account the transformative powers of the offshoring process, to analyze the likelihood of work going offshore. Because it relies so heavily on understanding the nature of work, which requires a qualitative grasp of the work itself, one limitation is that it does not allow us to say specifically which occupations are most at risk. Every occupation in the dictionary of occupational titles includes both high and low skill work - for now. For example, most academics must both perform the research and triple-check the citations. Moreover, every individual within an occupation will face unique bundles of work with pieces that fall in different quadrants within the framework. Nevertheless, we believe this is a valuable guide for anyone who wants to begin to get a sense
of whether it is likely that work will move offshore in the future. That said, as with all forecasting tools, this framework will work best if everything continues as at present and is simply a linear projection based on the trends we see today. There are a number of potential roadblocks to this process, and below we cover what we see as possible limits to the future of offshoring.

4.5 What are the limits of offshoring?

There are several possible limits to offshoring discussed below, all arising from the variety of substantial frictions in the movement of work from the high wage and high skill quadrant of the framework to the low wage low skill quadrant: i.e., knowledge transfer. How, then, is knowledge, both explicit and tacit, transferred in offshore intellectual services? The knowledge transfer process has always been a weak point in the movement of programming work, even when done domestically and long before outsourcing to India became a phenomenon.\(^{38}\)

As in the industrial factory, one of the key potential limits involves the question of whether workers are willing to collaborate in the process of eliminating their own jobs through efficiency improvements. Along these lines, the outsourcing companies tend to express concern about the effect on cooperation and morale of the potential elimination of jobs through the outsourcing process. We found in our fieldwork that offshoring companies clearly think about - and push the clients to specify up-front - whether and how the employees whose jobs are eliminated will be redeployed. As an Associate Vice President of an Indian Software company told us: "I need to understand first how the application works, the technology and the architecture of the application, understand the working so that I can maintain, that is - make changes, make enhancements etc. This is possible only if the existing team tells me how they coded the existing program, what is design of the application all that. Sometimes these 10 people they are worried about their future. They

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\(^{38}\) One of the challenges to the original concept of the “software factory,” notably at a California IBM facility in 1975, was getting cooperation in knowledge transfer. That particular effort failed because managers at customer locations were reluctant to relinquish control over projects or give resources to the offsite location, while workers at the customer sites also felt threatened or dismissed the benefits of working with the offsite (not even offshore) location (Cusumano 1989).
want to know what happens to me once I give away all my knowledge to these folks what will happen to me. Will I lose my job? Will I move to something else within this company or will they ask me to leave? So that is - we tell the client that before we engage any outsourcing vendor make your plans very clear to your employees. This is so that they are aware. The uncertainty within employee community will create lot of problems for us.” (Interview 7, Appendix A).

But lack of cooperation can derive from the client companies as well. As the COO of the Health Care Company in the U.S. indicated “Someone, a person making that decision, might say that it is the one thing that tips them on the negative side because they may say that I don’t believe in companies that take jobs out of the country... A lot of companies we cover insurance have union and non-union populations and we are providing health insurance to the company not to the union or non-union workers but to the extent that the unions find out about that, it will be a bad thing for us. They would make sense why they would not want to do it with us.” (Interview 8, Appendix A)

In some cases, local firms were able to articulate with a greater degree of specificity regarding what work will be done here. The CIO of an IT company told us “Creative/Prototyping more will be done here [in the U.S.]. The reason it will be done here is because user groups will test things, product managers will back to engineering and it will be an iterative design process that requires lots of interactions and answers to questions. It is difficult to send this offshore wait for 12 hours before getting a response due to time zone difference... it therefore boils down to the amount of communication required for a project. The vaguer that is - that is, higher the communication required and harder (more complex) the project - more is the interaction required.” (Interview 10, Appendix A). Thus, practical limits on the effectiveness of communication across time zones also come into play.

And, while the divisibility of software projects is controversial in the literature on software engineering (Brooks 1987, Greenbaum 1979, Kraft 1977), there are clearly limitations on the ability to divide and then offshore the work, some of which were discussed above. Piore (2004), for example, focuses on the technological limits of offshoring in terms of the division of labor in software design, and what cannot be done at a distance. He finds that the division of...
4.5 What are the limits of offshoring?

labor is very different in design as compared to manufacturing, insofar as software integration requires close, in-person contact, what Piore calls “organic growth.” Another possibility is the interdependence between the tasks and the inherent complexity of the design: the higher the interdependence and complexity, the less likely is the possibility that these tasks can be successfully offshored. These considerations suggest the possibility of inherent technological limits on the extent of offshoring.

Some of these problems of cooperation, divisibility, and communication have been addressed in offshoring through considerable interaction between client and subcontractor, an interaction that results in the development of trust, often through a language community based on conversation. Jensen (2009), for example, highlights in his study the need for interaction and coordination in knowledge work, noting that the employees of the Indian subcontractor had to work at the client company in Denmark for a considerable period in order to make later coordination easier. In the context of U.S. customers and Indian IT firms, both client and vendor interviews reveal that long term relations between vendors and clients lead to the vendor becoming “embedded” in the client organization and can thereby lead to sophisticated knowledge transfer that can be more subtle and indirect than directly asking workers to break down their own jobs. Kumar, van Fenema and von Glinow (2008), for example, found that the traditional typology (Van De Ven, Delbecq and Koenig 1976) was not enough to explain the nature of such work because it could not describe intense and repeated interaction between actors and work sites in both transactional (sequential and reciprocal) and parallel work found

39 He notes that designing software invariably has some division of labor (separate pieces of code can be written in different places), but also has an integration and coordination dimension, (the codes have to be combined together to create a program that works, and this process of integration often reveals bugs). He suggests, then, substantial technological limits to what can be outsourced, based on the technology of design.

40 For example an Associate Vice President (Transportation & Services) at an Indian Software company said: “What we try to do is to rotate people from both the sides. A guy from here goes onsite stays for some months and comes back. An onsite spends some time here works with the team and goes back. Even today even clients are wiling to come here and stay with us for 3 months, in one of our clients in Hyderabad three people came to India stayed with us for 3 months, answered the questions, trained the team and a lot of clients are willing to come here. We try to send people to client sites and have people from client sites come here...we rotate people. Lot[s] of people go and come.”
Thus, institutional practices such as “embeddedness” have developed in the IT offshoring industry so as to facilitate the transfer of knowledge from workers to other workers both within their own firms and across contractors. This transfer of knowledge engages not only the workers in a one-to-one literal transfer of information, but they are gaining an understanding too of the nature of the problem as seen by the customer, in order to later be able to take autonomous action to resolve issues.

In sum, a key question as regards cooperation, divisibility, and communication is the extent to which these limitations might be overcome given the intensity of offshore firms’ presence onsite, and the development of more practical tools for distance meeting. The extent to which this process can minimize cultural geographic distance is clearly also a crucial unanswered question; to what extent can the gap between the human tasks that can be performed by a computer program and those that require constant literal in-person contact be bridged?

When we asked our interview subjects directly about the limits of offshoring, we received a wide range of responses beyond cooperation, trust and communication or practical limits such as language, culture, politics or the need to be close to the same time zone; these responses essentially boiled down to (1) the existence of a meaningful “core” within a corporation that cannot or will not be outsourced, and is therefore unlikely to be offshored (at least by contractor firms) and (2) formal regulations such as those related to government security.

The concept of a corporate “core” seems central to the conceptions of outsourcing among those in the US based companies we interviewed. The Chief Administrative Officer of a U.S. based Bank suggests: “As you look to what to outsource you don’t outsource your core competencies. You outsource those things which you can do but you don’t do as well as somebody else and if you find a vendor that has those competencies better than you, you know you are going to get lower costs” (Interview 9, Appendix A).

It seems that “core” typically relates to corporate mission and the basic essence of how
firms derive value, and that what gets outsourced is a strategic decision on which information to disclose and on who contributes to decision making. One key question is whether this strategic core can in fact be maintained as the offshoring process moves up the value chain. At what point then is the line drawn to stop this process from moving up into the core, if it in fact can?

Another significant limit to offshoring, is of course regulation. Several U.S. states have passed legislating limiting offshoring. Ohio passed in 2010 a “made in America Bill” to ensure that all products and services for the legislative branch be made in the U.S. or supplied from within the U.S. And federal regulations also clearly play an important role in many industries; as the CIO of a health care company indicated: “The DOD will not allow us to offshore any jobs. So in that book of business we are just not allowed to. They will not allow anyone with access to computer but not a U.S. citizen... you need to have security checks and ... that business is also sort of off limits” (Interview 11, Appendix A).

In sum, there seem to be a variety of apparent limits to the ultimate reach of offshoring, ranging from comparative advantage, to the inherent limitations on the divisibility of tasks in software development, to the politics and incentives of knowledge transfer, to other practical limits such as language and culture, to the existence and maintenance of a strategic “core,” to formal regulations. Any serious examination of the question of the extent of the growth of offshoring going forward would have to take into account these limits, as against the view of some of the offshoring companies that “we can offshore anything.” As the scope of work being outsourced extends to ever more complex and high-level tasks, the larger question is whether the most essential knowledge ultimately will be transferred to India or other destinations, similar to manufacturing to China and engineering knowledge to Singapore, making technological/skills advantages of client companies irrelevant?

Questions have been raised regarding whether restrictions on offshoring are legal in the context of non-discrimination and “lowest-bidder” requirements on government contracting (Zuckerman 2008).
4.6 DISCUSSION AND QUESTIONS FOR RESEARCH

of global value chains away from manufacturing to the services sector has not attracted as much research attention as it should. Additionally, those researchers who have analyzed the offshoring of services work have taken divergent approaches to the subject of offshoring that revolve around the questions we have considered here: “what can be offshored,” “what will be offshored,” and “what are the limits of offshoring?” This essay provides a review of major work in this area, reports from industry participants, and a preliminary framework for analyzing the future of this emerging phenomenon, and suggests some provocative questions for researchers to consider going forward.

The future extent of offshoring of services and the consequences for the advanced economies clearly remain open questions; our consideration of the phenomenon leads us to the following central questions. Can limits to offshoring related to the issue of knowledge transfer - what people are willing and able to transfer based on corporate and government views toward knowledge transfer and the effect of factors such as cultural geography on the process - be overcome? Will work seen as safely high skill / high wage today be susceptible to offshoring in the future, as jobs are broken into simpler component pieces? And, ultimately will the process of creative destruction associated with offshoring produce enough skilled yet non-offshorable jobs to sustain a significant middle class in the developed world rather than exacerbate the ongoing growth in income and wealth inequality?

Having full faith in the offshore methodology and the ability to perform work wherever cost is lowest, IT services companies are ambitious to replicate their success in further domains and to increase their profit margins and speed their growth through the movement of more work offshore. For example, IT companies have moved into other “business process outsourcing” (BPO) and “knowledge process outsourcing” (KPO) services, offering back office support such as call center, accounting, document review, research, and other knowledge-based ser-
vices work. We see organizations that are already vendors to the largest corporations playing a disproportionately large role in the services offshoring phenomenon. Functions and processes that corporations are already accustomed to outsourcing, it seems, are more likely to go offshore, but where and how does this process stop? Some of the interviews suggest that this is all akin to peeling away an onion, where we can either define and defend an arbitrary core, or else peel it away to nothing. Does the “core” of the corporation ultimately exist, or will it peel away?

In looking toward what functions will be offshored, other frequently outsourced business processes already include finance and accounting, legal, marketing, public relations, payroll and so on. Many organizations have already decided that these processes are “non-core” or have found outside organizations that better manage the process. Consultancies and other partnerships such as law firms are historically known for an “up or out” model of HR management with fundamentally pyramidal vacancy chains, fewer opportunities at the top and many low-level “helpers” below. This raises the question of how people in the developed world will rise when the lower rungs of the career ladders that are necessary for skill acquisition, talent recognition and advancement move offshore. With a shrinking number of lower-level helper jobs from the developed nations, where many people who have historically risen in to higher management get their start, how will workers in developed nations acquire the experience and knowledge and how will firms discover the potential human resources if workers are no longer “embedded” in firms.

Another set of key questions involves the affects of technology and social development on the limiting influences of cultural geography. To what extent do existing and emerging jobs require literal and constant in-person contact among culturally similar people for reasons such as efficiency of knowledge transfer and development of trust? One would think that any functional educational system in developing countries in particular will aim to flatten cultural geography in a globalizing world to complement what is happening more organically; does,
for example, some combination of teleconferencing technology, comfort with the concept of trust-based communities online, homogenization of culture and the development of common shorthand electronic communication of acronyms and idioms through the use of Facebook and other “flattening” technologies ultimately loosen the limits on functional collaboration among people far apart geographically and (for now) culturally?

If routine jobs in fact exist at all levels of the labor market and if many of the more complex jobs contain routine aspects, what will come of the middle managers and professionals whose main skill/attribute is either a credential or unique knowledge of how things hold together (knowledge of the component parts of a complicated process, those whose self-definition is based on their knowledge of a particular process)? Are there enough jobs for craft workers to sustain the developed world side of the equation? Might the disaggregation of work, the stripping away of jobs that are entirely routine as well as the routine aspects of more complex jobs, both eliminate a large portion of the master craftsmen, as well as worsen prospects and shorten the employment relationship for everyone else? Will the impact on wealth and craft/creative job creation of intellectual and cultural globalization of developed world products outweigh the loss of more routine work? And ultimately, will the interaction of globalization and technological advance concentrate wealth and employment among the creative few, or allow for broader growth in the post-industrial future?

We began this essay by offering two divergent views on what types of work can be offshored. Our analysis reveals that there are many layers to understanding the nature of work that can be offshored, given the limits of what can be offshored, and what organizations are willing to offshore. We hope that these insights will help to stimulate and re-frame the debate on these fundamental questions.

4.7 Appendix A

List of Interviewees
<table>
<thead>
<tr>
<th>Interview Number</th>
<th>Description of the Interviewee</th>
<th>Description of the Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 9</td>
<td>Chief Administrative Officer</td>
<td>Savings and Loan Bank</td>
</tr>
<tr>
<td>2, 10</td>
<td>Chief Information Officer</td>
<td>Online network of websites for real estate, finance, moving and for home related information</td>
</tr>
<tr>
<td>3, 8, 11</td>
<td>Executive Vice President &amp; Chief Operating Officer</td>
<td>Managed Health Care Company</td>
</tr>
<tr>
<td>4</td>
<td>Senior Manager</td>
<td>Indian Software Company</td>
</tr>
<tr>
<td>5</td>
<td>Director</td>
<td>Indian Software Company</td>
</tr>
<tr>
<td>6, 7</td>
<td>Associate Vice President (Transportation &amp; Services)</td>
<td>Indian Software Company</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Additional Interviews</th>
<th>Description of the Interviewee</th>
<th>Description of the Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Senior Director, Project Management</td>
<td>Specialty biopharmaceutical company</td>
</tr>
<tr>
<td>B</td>
<td>Senior Manager- Human Resources</td>
<td>Indian Software Company</td>
</tr>
<tr>
<td>C</td>
<td>Vice President</td>
<td>Indian Software Company</td>
</tr>
<tr>
<td>D</td>
<td>Module Lead (Telecommunication Sector)</td>
<td>Indian Software Company</td>
</tr>
<tr>
<td>E</td>
<td>Team Lead (Transportation &amp; Services)</td>
<td>Indian Software Company</td>
</tr>
<tr>
<td>F</td>
<td>Associate VP (Human Resources)</td>
<td>Indian Software Company</td>
</tr>
<tr>
<td>G</td>
<td>Principal Diversity Officer</td>
<td>Indian Software Company</td>
</tr>
</tbody>
</table>

- Note: Interviews A- G do not feature in the text but informed our understanding of our phenomenon. Some interviewees are quoted multiple times.
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