Inter-Firm Mobility and Return Migration Patterns of Skilled Guest Workers

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Abstract

Critics of high-skilled visa programs argue that program regulations cause workers to be tied to their sponsoring firm, and that the programs lack a vehicle for adjusting the number of visas available during a recession. Using unique employee data from six major Indian IT firms, we find that these guest workers exhibit a significant amount of inter-firm mobility that varies over both the earnings distribution and the business cycle. Suggesting that despite regulatory frictions of the visa programs, competitive pressures are present in this labor market. Furthermore, we find that rates of return migration increase with the unemployment rate.

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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, in addition to providing "off-shoring" services to U.S. firms, 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 innovation (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 workers (Borjas 2009, Borjas and Doran 2012). In spite of the increased role of high skilled guest workers in the U.S. economy, their 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.[1]

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 negatively related with earnings, suggesting the existence of competitive market pressures. Third, the negative relationship between earnings and

[1]Further 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), and research by Matloff (2013) and Chakravartty (2006).

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.[2] 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 is characterized by high rates of mobility, and thus strong competitive market pressures that 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 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 of guest worker programs, as the nature 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 2014).

2 Background on Skilled Guest Worker Visa Programs

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

[2] See http://www.uscis.gov for details on the level of these fees.

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.[3] 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.[4]

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 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).[5] While regulations

[3]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).

[4]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.

[5]Unfortunately, our data does not span the necessary years to enable us to measure the

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.[6] 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 additional 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, Kerr and Lincoln 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

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.

[6] 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.

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.[7] 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 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 Data and Empirical Strategy

3.1 Data

Our dataset consists of employee records from six large Indian information technology companies. 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 out data, we observe 75,381 employee records for the years 2003-2011. In response to a Freedom of Information Act request, we obtained information on all firm visa sponsorship

[7] 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.

from the USCIS for the years 1993-2010.[8] 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.[9]

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 H-1B visas as L-1 visas were granted to Indian nationals.[10] In addition to guest workers, our data also 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 immigrants 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 (Norlander 2015), contains earnings and occupation information for the H-1B workers that a firm petitions to place at a particular worksite. Table 1 compares the distribution of earnings for computer programmer and developer occupations from the LCA data to our proprietary data. It shows that the earnings at the 99th percentile are higher in our data than in the LCA data, but earnings at the 1st percentile are quite similar.[11]

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 5,086 observations.[12] As an additional step to validate

[8]For more details on this data, see Norlander (2015).

[9]Excluding observations from 2011, our data still consists of over 60,000 observations.

[10]See USCIS website for more details, specifically Table 31: http://www.dhs.gov/yearbook-immigration-statistics-2012-nonimmigrant-admissions.

[11]If the earnings distributions of L-1 and H-1B workers in our data were substantially different, we would expect that the distribution of earnings in the LCA data and our own data would not match, as the LCA data includes only H-1B workers.

[12]In our data cleaning process, the trim above $117,234 threshold cuts seven observations for each observation below the threshold. Overall, this trim results in the loss of 10% of our

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 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 30.4 and earnings of $72,846. The similarities between our data and Lofstrom and Hayes (2011) further suggests that earnings distribution of L-1 workers must be similar to that of H-1B workers.

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.[13] 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 layoffs 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, we present the mean and standard deviations of our key variables. The mean salary in our dataset is $72,846 with a standard deviation of $13,415.[14]

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.

[13] A worker who did not obtain new employment would be "out of status." See http://www.uscis.gov/USCIS/Resources/C2en.pdf for further details.

[14] Note that the range of salaries in our sample is restricted to $44,138 - $117,234 for

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 7.82% 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.[15]

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 reports the quit and return rates of all 70,295 workers in our sample and shows that 21 percent of these workers quit and 30 percent of these workers return to India. However, these quit and return statistics alone likely 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 reports the quit and return rates for workers who began employment before September 1, 2005, allowing them to remain at risk of separation for atleast 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 9,673 workers, of which 39 percent quit and 47 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 and refute previous claims that guests workers within this this industry are "effectively tied to the firm."

To shed further light on the assumption of complete immobility, we display the the distribution of tenure for workers in our dataset. Figure 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

reasons discussed earlier in this section.

[15] 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.

of the period of study). Figure 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.

3.2 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 patters 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

$$\lambda_{i,j}(t|X_i(t)) = \lambda_{0,j}(t) \exp\left(\beta_j' X_i(t)\right) \tag{1}$$

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[16], log salary interacted 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 1 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 calcualted at various levels of unemployment.[17] Depew and Sorensen (2014) use employee records from two manufacturing firms from the interwar 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

[16]We use the monthly state level population unemployment rates as reported by the St. Louis Federal Reserve. We explored using the micro data of the monthly CPS to construct this measure for the industries or occupations more relevant to our study, but found evidence that this measure was measured with large amounts of error on account of small sample sizes. Specifically, the range of unemployment rates and variation from month to month suggested an imprecise measure.

[17]The elasticities are calculated using the estimated coefficients on log earnings and the interactions between log earnings and unemployement at the appropriate level of unemployment.

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 shows quit and return rates by year, and illustrates that the return rate increased 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 1 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.[18] 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 gra-

[18] 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.

dient between separations and earnings will become steeper during periods of lower unemployment rates, as evidenced by Depew and Sorensen (2014) and Hirsch et al. (2013). We similarly study the return elasticity by estimating equation 1 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.

4 Results

Tables 4 and 5 report the coefficient estimates from cause-specific Cox Proportional Hazard Models for quits and returns, respectively. As stated in the pervious 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 that 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 that 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 4, we see that 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.[19] In the bottom panel, we see that in our full sample the estimated

[19]Note that none of the individual parameters on the log earnings variables are significant, reflecting the high degree of co-linearity between these variables.

quit elasticity is equal to -0.9956, with a standard error of 0.0856. This implies that at the average unemployment rate in our sample, workers who are paid a 10% higher salary are approximately 10% less likely to quit. This result may be surprising for a labor market with such mobility costs, but they confirm that guest workers have some degree of mobility and that lower paid guest workers are able to relocate to other employment. Table 4 shows that men have a greater quit elasticity than women, consistent with Ransom and Sims (2010) and Hirsch, Shank and Schnabel (2006). Table 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 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 paid a 10% higher salary are 28.18% 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, layed 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 4 and 5 graphically display how the estimates of the quit elasticities vary over the business cycle. In Figure 4, we plot our estimate against the entire range unemployment rates observed in our data.[20] 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 between 11% and 12%. This implies that lower paid workers typically quit at higher rates than higher paid workers, and that this relationship intensifies at lower unemployment rates. Figure 5 explores heterogeneity in this relationship across our different demographic groups. It appears that the relatively inelastic estimates for females and

[20] To see a display of the frequencies of unemployment rates in our data, please see Figure 5 in the Appendix.

single workers are less sensitive to fluctuations in the business cycle.

Figures 6 and 7 repeat the exercise for return elasticities. Figure 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 cyclicality 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.

5 Discussion of the Results

One premise of many opponents of guest worker programs, and a common misconception among even experts, is that workers on these visas are unable to freely move between employers once they arrive in the U.S. The data that we have presented here contradicts this assertion. Our summary data shows that around 21% 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 39%. As these workers cannot separate to unemployment in the U.S. and still remain in compliance with immigration law, it is likely they have found work at another employer. 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 associated with a 10% increase in the quit rate, even at a relatively high unemployment rate of 7.8%. 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 estimates in Table 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 8, which shows where our own estimate of the quit elasticity (at our mean unemployment rate of 7.8%) falls in the distribution of previous estimates, as reported by Manning (2011).[21] This finding comes in spite of the fact

[21] We use 25 estimated quit elasticities reported by Manning (2011) in Tables 6 and

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 that we estimate suggest that 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 information regarding job opportunities may offset the impacts of increased mobility costs. Additionally, 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 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

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.

30% of all of our observations and nearly 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 comparable 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).

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 39% of the workers who started employment at least six years before the end of our study.

Our findings, which suggest that 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 estimates found in work by (Buchinsky, Fougre, 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 than higher paid workers to receive outside job offers that dominant their current job. 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. (2014), 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.

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Table 1: Comparison of LCA and Firm Data

	LCA Data	Firm Data
Wage Distribution		
1st Percentile	44,138	44,925
5th Percentile	54,254	55,200
25th Percentile	72,210	63,137
50th Percentile	72,210	70,202
75th Percentile	72,210	83,100
95th Percentile	87,580	123,000
99th Percentile	117,234	177,000

Table 2: Comparison of Trimmed Firm and ACS Data

	Firm Trimmed	ACS Trimmed
Wage Distribution		
1st Percentile	50,429	47,182
5th Percentile	56,000	53,585
25th Percentile	63,201	65,000
50th Percentile	69,322	75,956
75th Percentile	80,132	90,000
95th Percentile	100,000	108,509
99th Percentile	112,350	115,176
Demographics		
Female	0.18	0.18
Married	0.62	0.80
Age	30.38	31.36

[a] 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: Summary Statistics

	Mean	Std Dev	N
Salary	72846.37	13415.03	70,295
Avg. Age	30.38	4.95	70,295
Female	0.18	0.39	70,295
Married	0.62	0.49	70,295
Quit	0.21	0.41	70,295
Return	0.30	0.46	70,295
Unemployment Rate	7.82	2.50	1,601,493
Quit (Started Before Sep 2005)	0.39	0.49	9,673
Return (Started Before Sep 2005)	0.47	0.50	9,673

Table 4: Results: Quit to another Firm

	All	**Male**	**Female**	**Married**	**Single**
$ln(Salary)$	-0.2801	-0.5291	-1.2810	-1.6319	0.7407
	(1.9211)	(1.9154)	(3.8143)	(2.5053)	(3.2189)
$ln(Salary) \times UR$	-0.7335	-0.7722	0.0516	-0.5461	-0.6047
	(0.9044)	(0.8993)	(1.7519)	(1.1025)	(1.6882)
$ln(Salary) \times UR^2$	0.1182	0.1279	0.0009	0.0994	0.0900
	(0.1332)	(0.1334)	(0.2412)	(0.1512)	(0.2622)
$ln(Salary) \times UR^3$	-0.0046	-0.0050	0.0004	-0.0038	-0.0032
	(0.0060)	(0.0061)	(0.0103)	(0.0065)	(0.0120)
UR	7.8800	8.3316	-0.9157	5.8624	6.4842
	(10.3263)	(10.2577)	(19.7322)	(12.5547)	(18.9999)
UR^2	-1.3135	-1.4247	0.0011	-1.1130	-1.0038
	(1.5202)	(1.5219)	(2.7141)	(1.7251)	(2.9438)
UR^3	0.0515	0.0563	-0.0041	0.0427	0.0360
	(0.0689)	(0.0693)	(0.1160)	(0.0744)	(0.1350)
Female	0.0461			0.2416***	-0.2054***
	(0.0287)			(0.0442)	(0.0377)
Married	-0.3724***	-0.4846***	0.0293		
	(0.0180)	(0.0190)	(0.0607)		
Individuals	70295	57304	12991	43297	26998
Quits	14607	12019	2588	8830	5777
Observations	1601493	1329718	271775	1075425	526068
Chi-Sq.†	37.79	41.09	15.81	33.42	32.61
	[0.0000]	[0.0000]	[0.0012]	[0.0000]	[0.0000]
Chi-Sq.‡	136.23	178.62	36.21	158.26	37.90
	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]
Quit Elasticity:					
Unemp. Rate=7.8	-0.9956	-1.1535	-0.6532	-1.6437	-0.0115
	(0.0856)	(0.0808)	(0.1925)	(0.0858)	(0.1586)

[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: $ln(Salary) \times UR$, $ln(Salary) \times UR^2$ and $ln(Salary) \times UR^3$).

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

Table 5: Results: Return to India

	All	**Male**	**Female**	**Married**	**Single**
$ln(Salary)$	3.4761*	3.1664	5.5834	5.2270**	1.3515
	(1.9637)	(2.0895)	(4.0321)	(2.3040)	(3.3928)
$ln(Salary) \times UR$	-1.8904**	-1.8060**	-2.5304	-2.5573***	-0.6021
	(0.7811)	(0.7895)	(1.7534)	(0.8680)	(1.4611)
$ln(Salary) \times UR^2$	0.1798*	0.1689*	0.2257	0.2579**	-0.0133
	(0.0973)	(0.0937)	(0.2381)	(0.1037)	(0.1883)
$ln(Salary) \times UR^3$	-0.0052	-0.0048	-0.0064	-0.0081**	0.0028
	(0.0038)	(0.0035)	(0.0100)	(0.0039)	(0.0075)
UR	21.3747**	20.3527**	28.7497	28.9914***	6.9223
	(8.8067)	(8.8877)	(19.5922)	(9.7492)	(16.3201)
UR^2	-2.0455*	-1.9162*	-2.5829	-2.9361**	0.1140
	(1.0985)	(1.0562)	(2.6581)	(1.1643)	(2.1033)
UR^3	0.0599	0.0551	0.0743	0.0926**	-0.0301
	(0.0431)	(0.0401)	(0.1112)	(0.0442)	(0.0839)
Female	0.2454***			0.1703***	0.2889***
	(0.0494)			(0.0633)	(0.0462)
Married	-0.7224***	-0.8278***	-0.5718***		
	(0.0214)	(0.0244)	(0.0379)		
Individuals	70295	57304	12991	43297	26998
Returns	21017	16431	4586	11348	9669
Observations	1601493	1329718	271775	1075425	526068
Chi-Sq.†	18.43	15.81	27.47	16.82	29.78
	[0.0004]	[0.0012]	[0.0000]	[0.0008]	[0.0000]
Chi-Sq.‡	382.77	614.58	284.93	548.57	129.91
	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]
Return Elasticity:					
Unemp. Rate=7.8	-2.8183	-2.9339	-3.4823	-2.8750	-2.8175
	(0.0419)	(0.0253)	(0.2521)	(0.0374)	(0.0944)

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

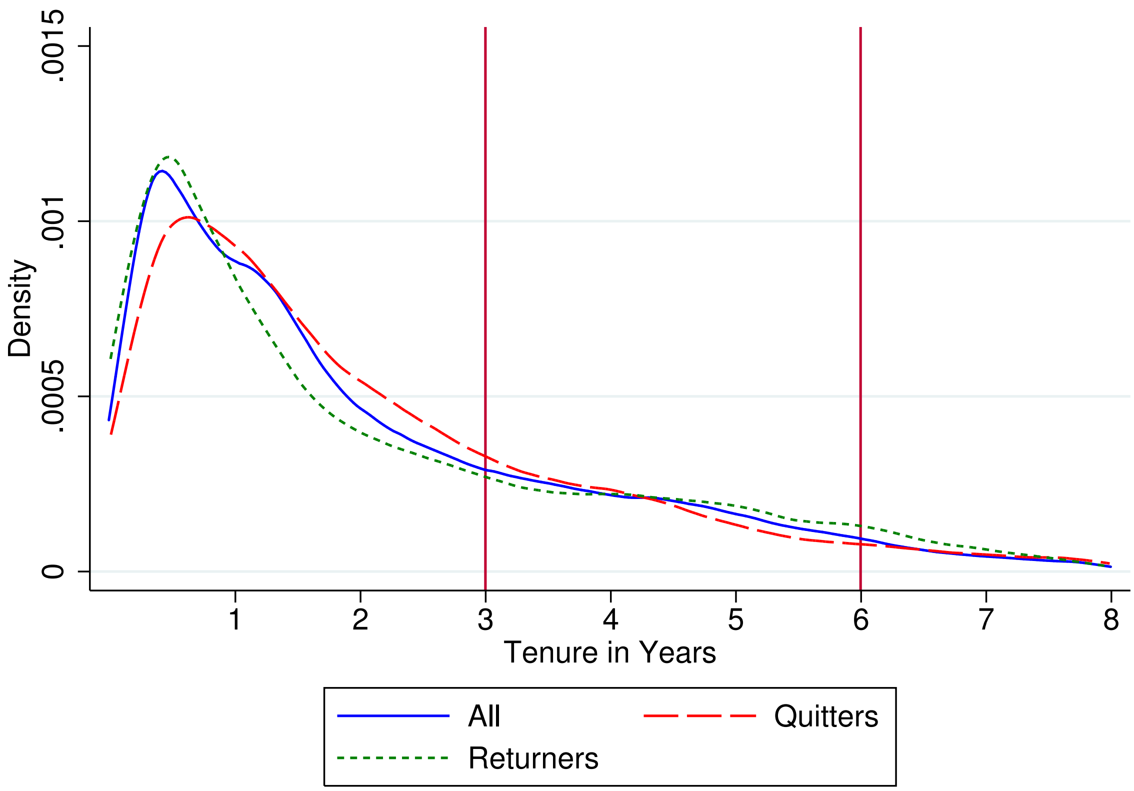
[b] Standard errors clustered on the state are presented in parentheses. P-values are in brackets.

[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: $ln(Salary) \times UR$, $ln(Salary) \times UR^2$ and $ln(Salary) \times UR^3$).

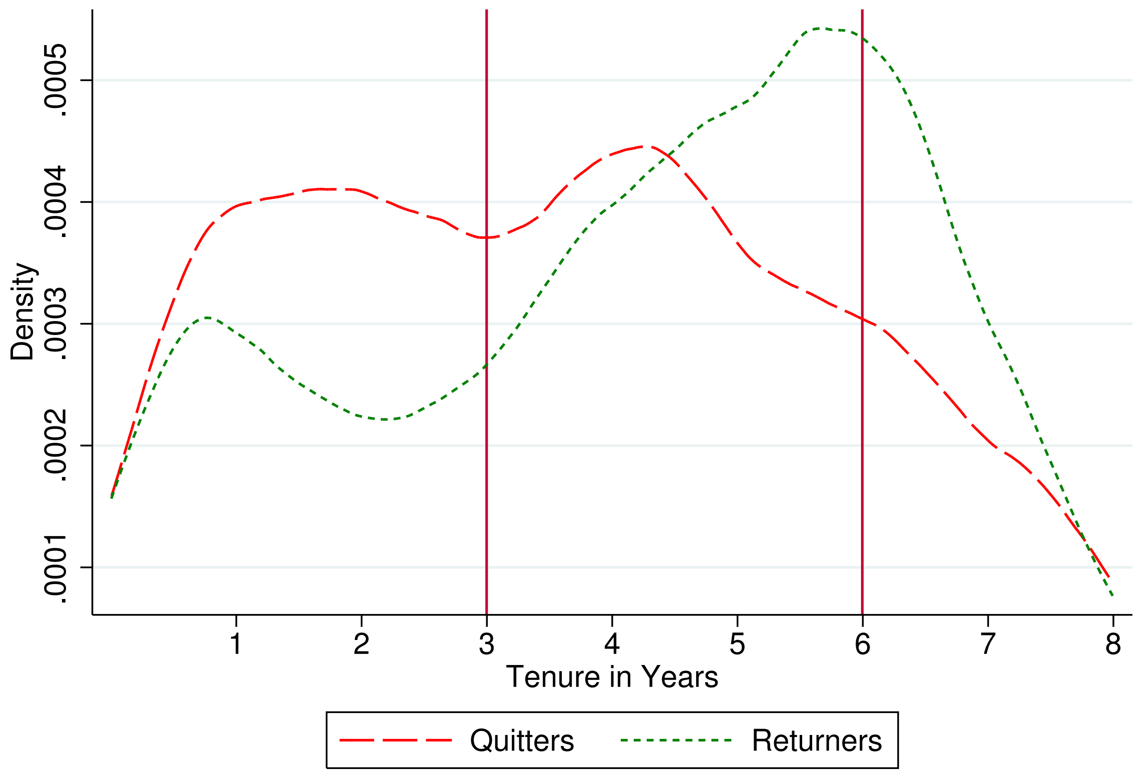
‡ Chi squared statistic for the joint test of non-zero elasticities (four log salary terms equal zero: $ln(Salary)$, $ln(Salary) \times UR$, $ln(Salary) \times UR^2$ and $ln(Salary) \times UR^3$).

Figure 1: Distribution of Tenure



Vertical lines represent the 3 and 6 year renewal/expiration dates for H−1B visas.

Figure 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: Quit and Return Rates

Figure 4: Quit Elasticities Over the Business Cycle

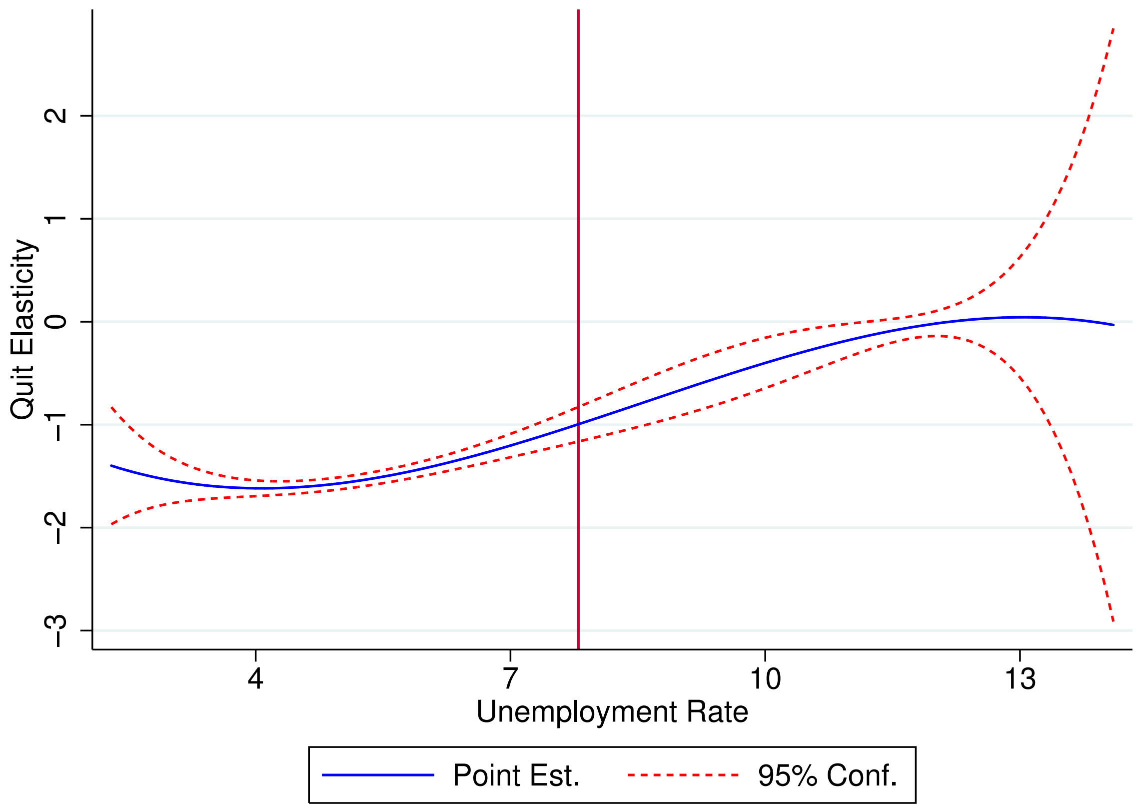


Figure 5: Heterogeneity in Quit Elasticities Over the Business Cycle

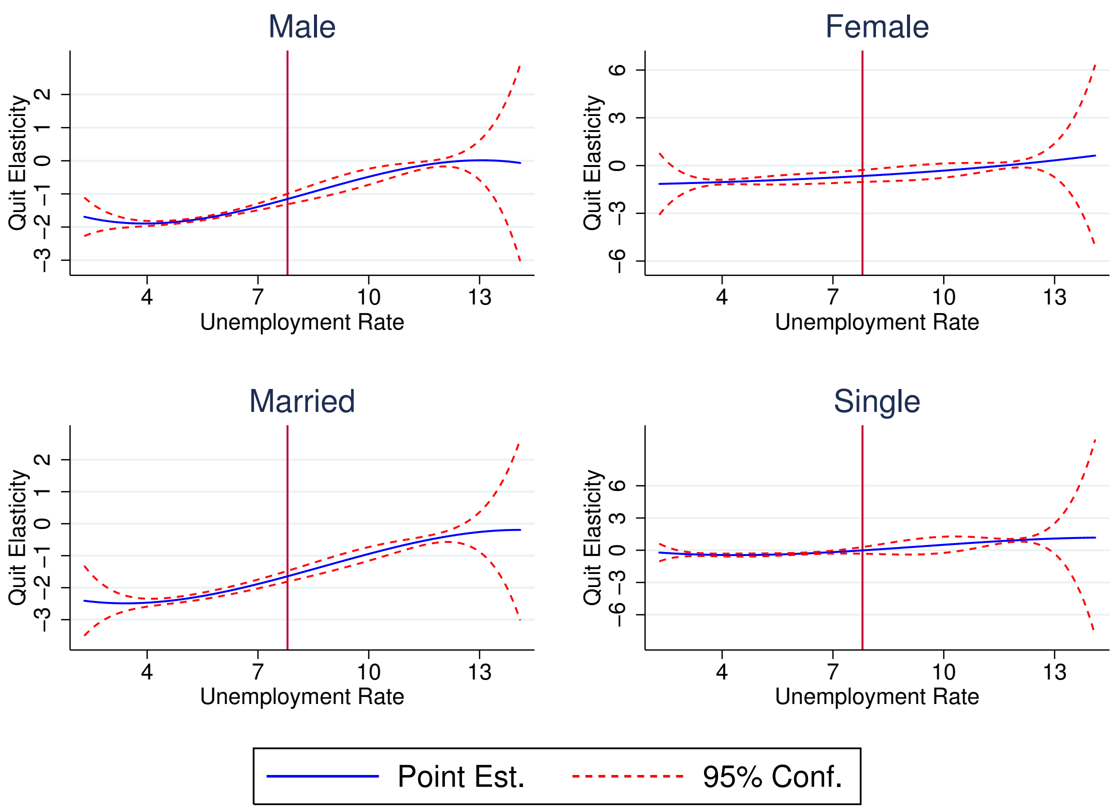


Figure 6: Return Elasticities Over the Business Cycle

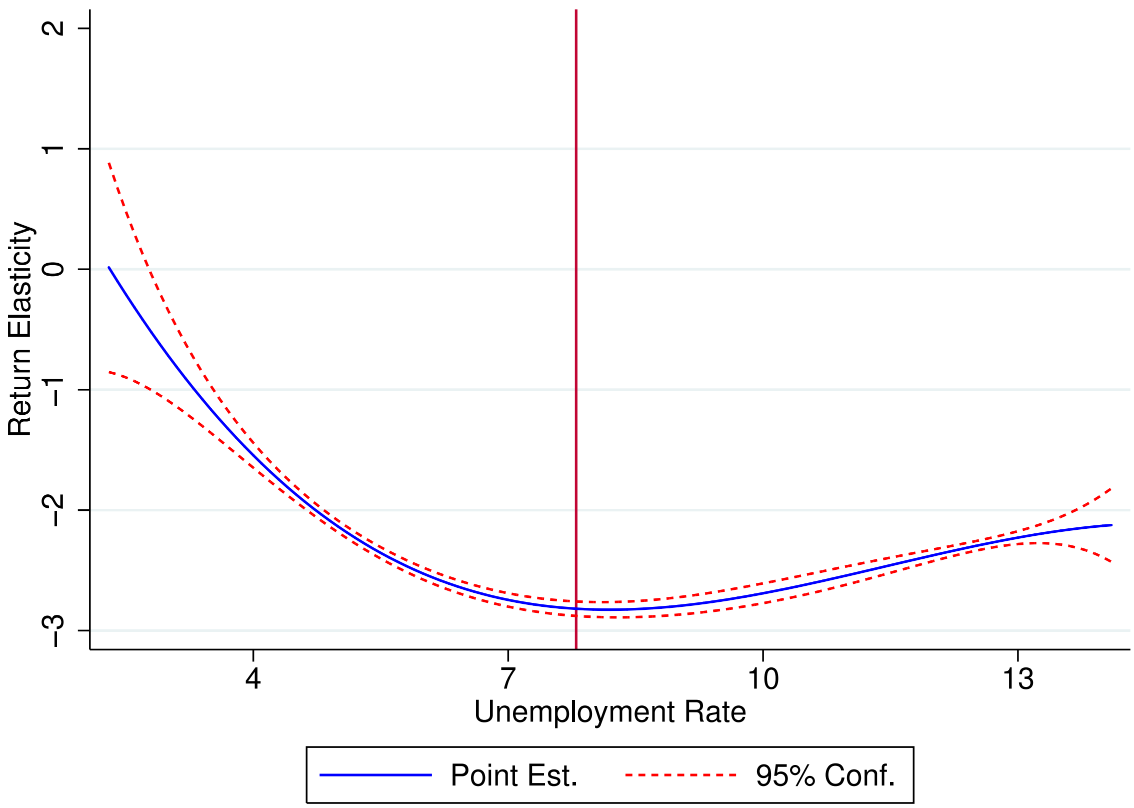


Figure 7: Heterogeneity in Return Elasticities over the Business Cycle

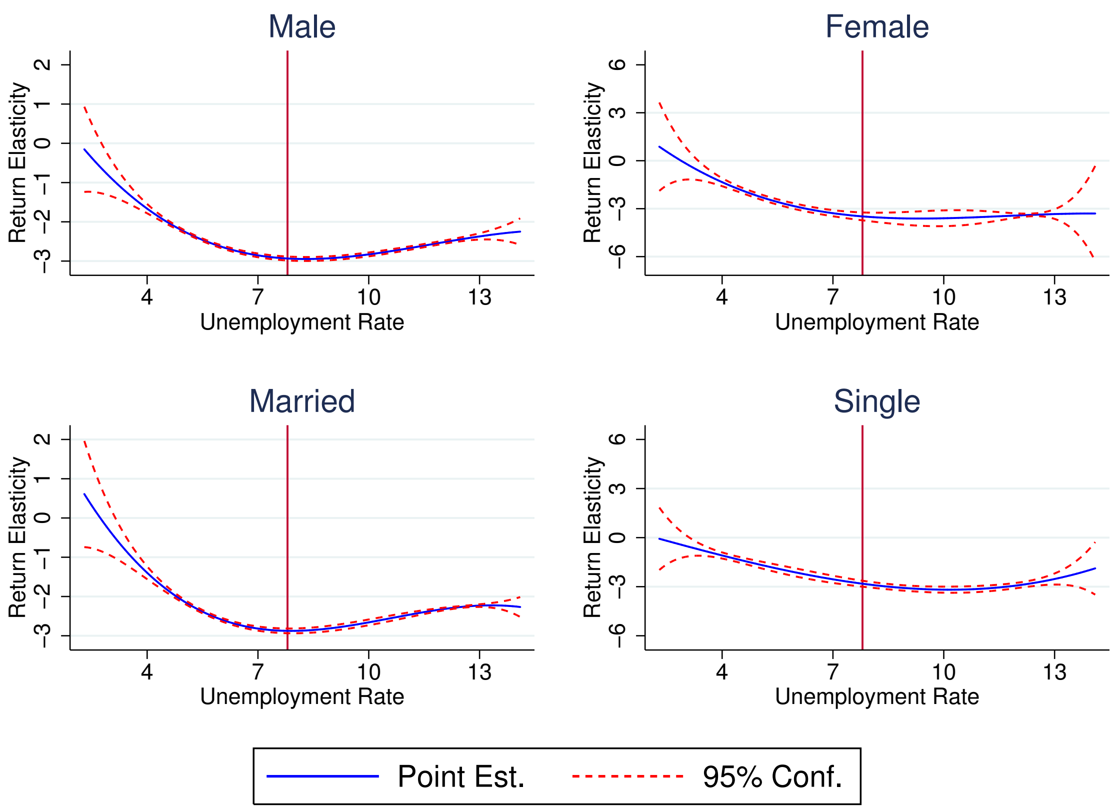
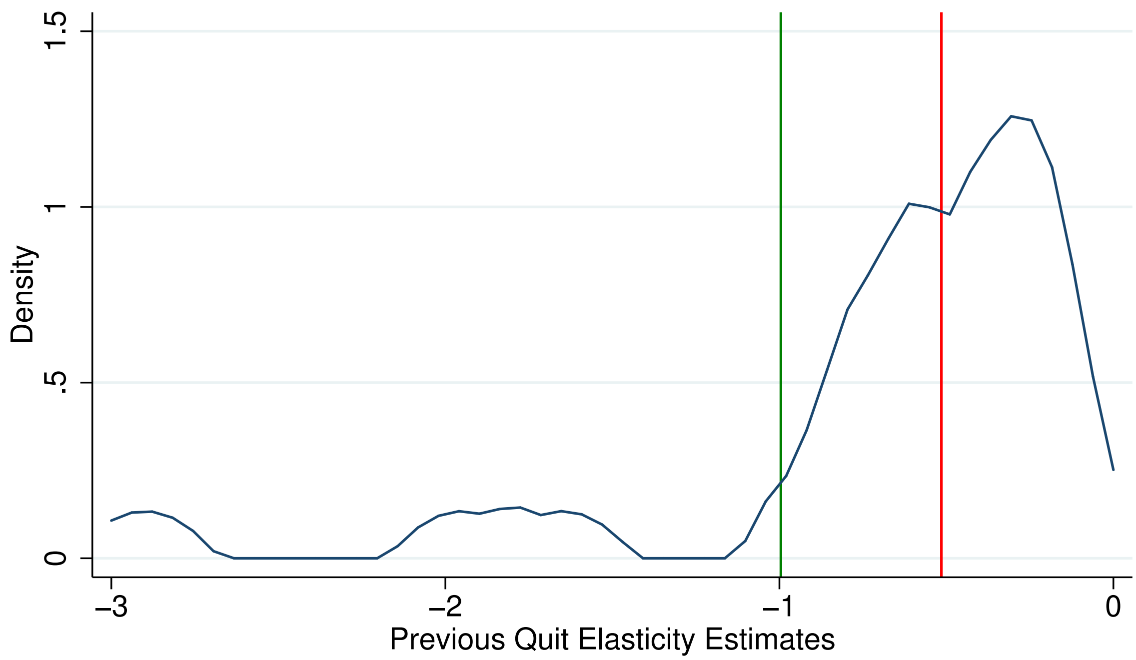


Figure 8: Previous Estimates of Elasticities: Kdensity Probability Density Function



Note: The green line shows the quit elasticities at our mean unemployment rate of 7.8%. The red lines displays the median estimate in the literature.

Appendix Table and Figures

Table 1: Elasticity Estimates: Income Trim Check

	Quit Elasticity		**Return Elasticity**	
	Trim	**Full**	**Trim**	**Full**
Spec 1	-0.2975**	-0.0320	-2.2198***	-1.6233***
	(0.1259)	(0.0342)	(0.0134)***	(0.0096)
Spec 2	-1.0071***	-0.6456***	-2.3767***	-1.5987***
	(0.1082)	(0.0188)	(0.0188)	(0.0140)
Spec 3	-1.1082***	-0.6810***	-2.6932***	-1.6268***
	(0.0688)	(0.0094)	(0.0332)	(0.0157)
Spec 4	-0.9112***	-0.5633***	-2.7042***	-1.7236***
	(0.0877)	(0.0148)	(0.0332)	(0.0144)
Spec 5	-0.9956***	-0.5986***	-2.8183***	-1.7374***
	(0.0856)	(0.0136)	(0.0306)	(0.0164)

[a] These results are displayed at an unemployment rate of 6 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 1: Quit Elasticities Over the Business Cycle (No Trimming)

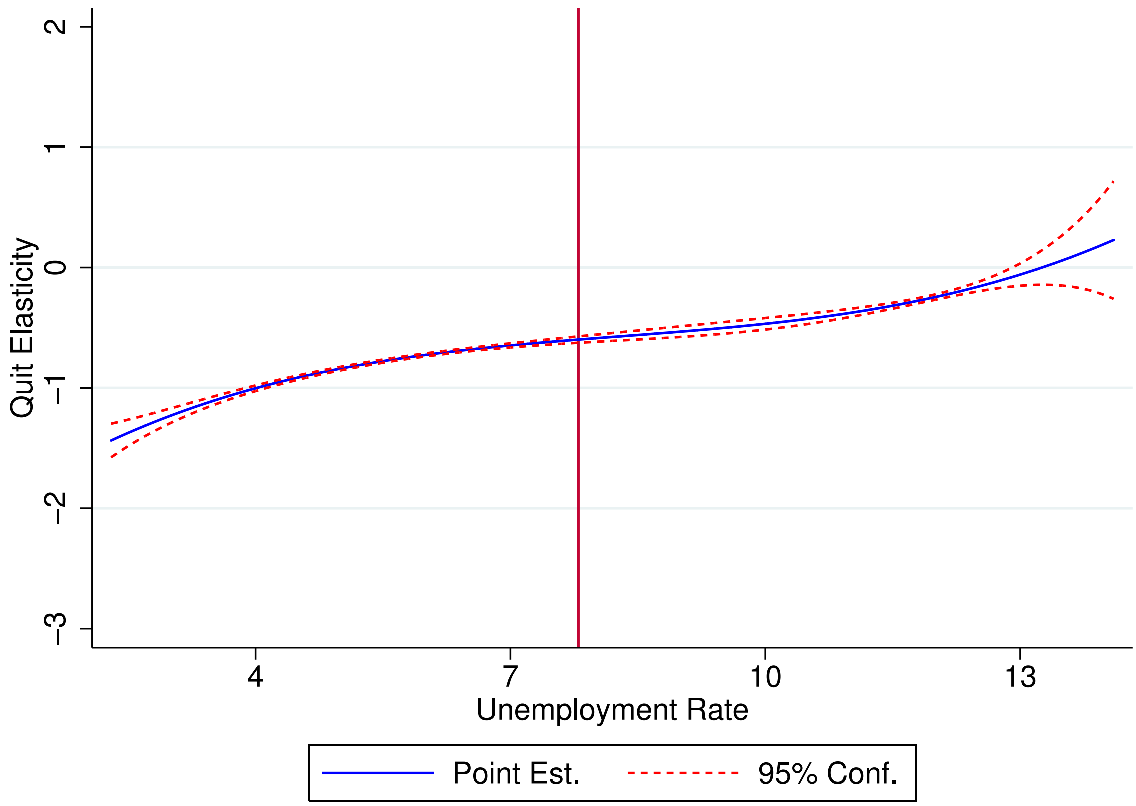


Figure 2: Return Elasticities Over the Business Cycle (No Trimming)

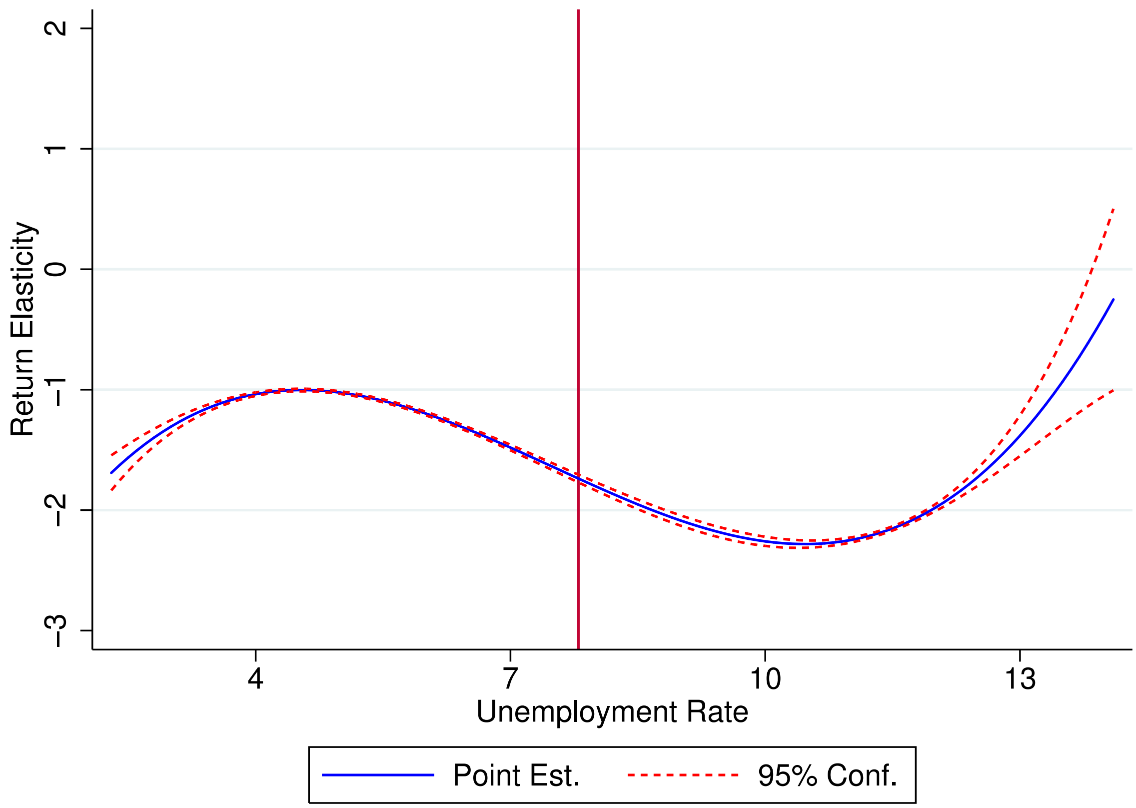


Figure 3: Quit Elasticities Over the Business Cycle (Quadratic in UR)

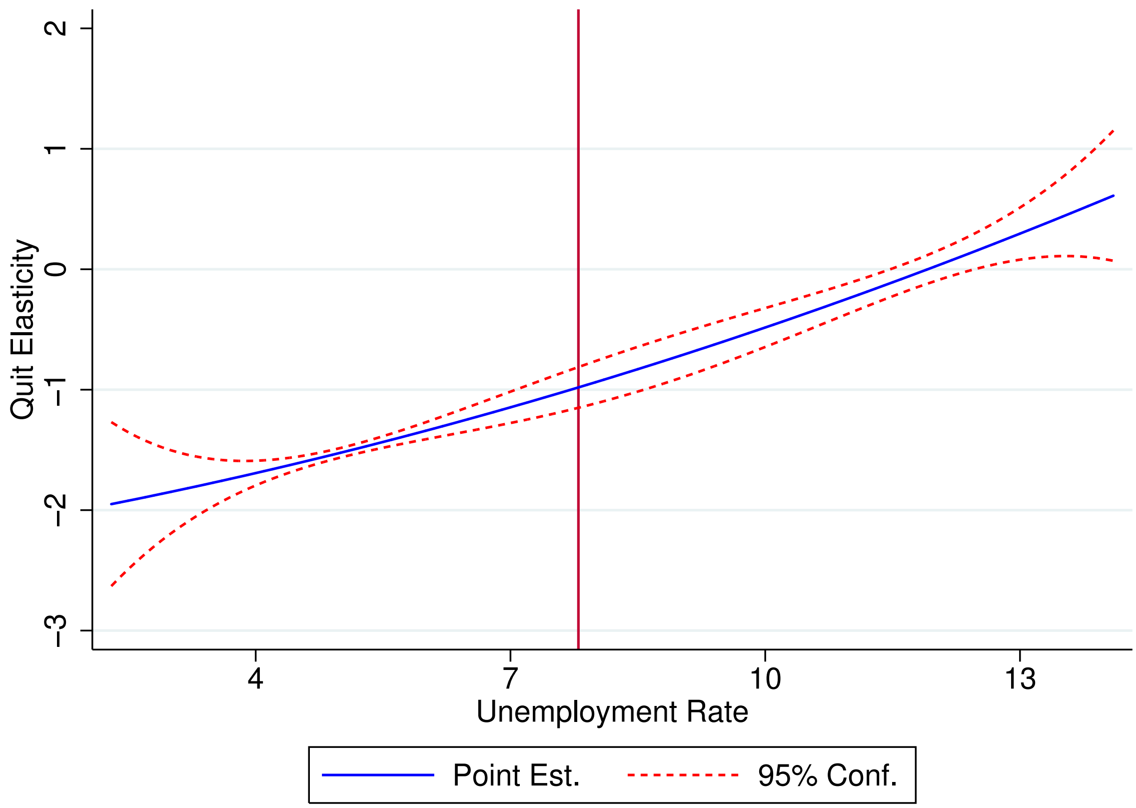


Figure 4: Return Elasticities Over the Business Cycle (Quadratic in UR)

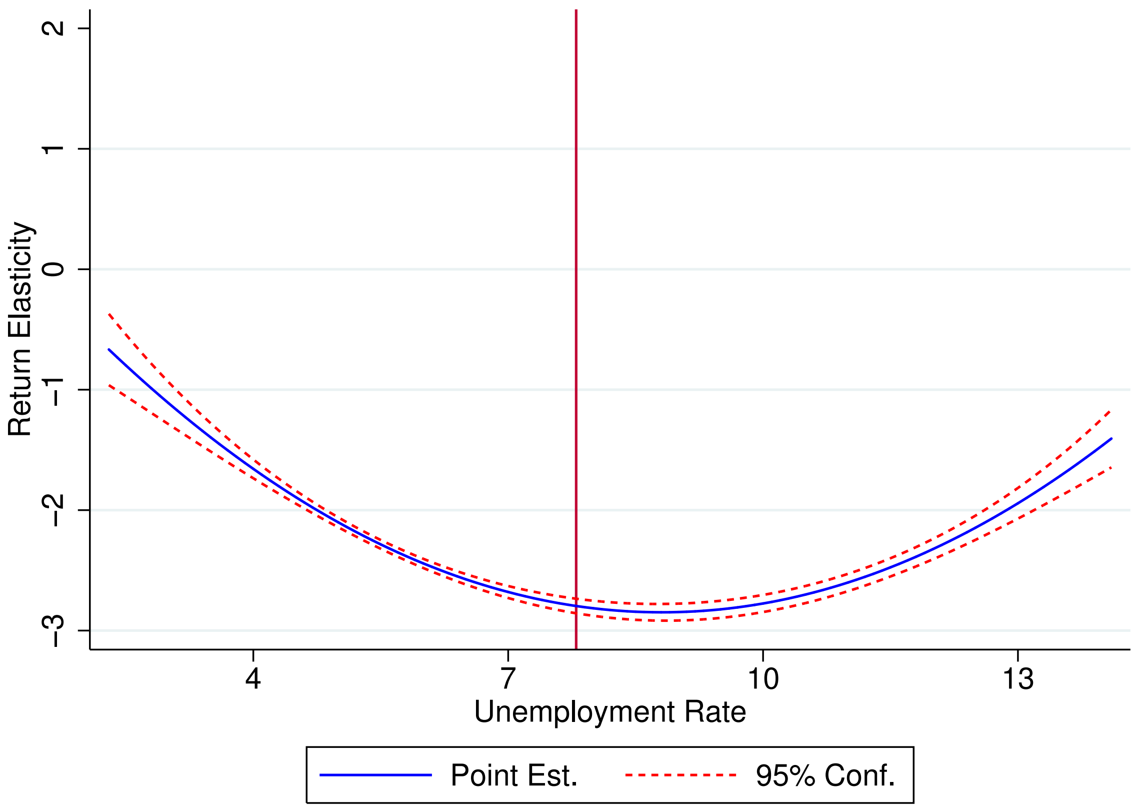


Figure 5: Unemployment Rates Faced