**Settling for Academia?**

 **H-1B Visas and the Career Choices of Foreign-born U.S. Graduates**

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October 31, 2015

**Abstract**

H-1B visas allow U.S. employers to temporarily hire foreign-born workers in specialty, high-skill occupations. Prior to 2004, the H-1B visa cap was never binding. In 2004, as part of the H-1B Visa Reform Act, the cap was drastically lowered. While non-profit institutions of higher education and research were not subject to the ceiling, legal employment became much harder to secure in the private sector. This paper examines how immigrant career paths were affected by this change in policy by exploiting the fact that citizens from five countries (Canada, Mexico, Chile, Singapore and Australia) had alternate visas, created by free trade agreements, without binding caps. Differences-in-differences estimates suggest that international students from countries affected by the cap became more likely to work in academic institutions if they graduated after 2004 compared to immigrants from the five countries with H-1B substitute visas. The impact of the immigration policy change appears to be driven by immigrants who have PhDs, are in STEM fields, and originate from developing countries.

**1. Introduction**

Section 101(a)(15)(H) of the 1990 Immigration and Nationality Act regulates the H-1B visa, which allows U.S. employers to temporarily hire foreign-born workers in specialty, high-skill, occupations. The work authorization is limited to the sponsoring employer and lasts for three years, with the possibility of a three-year renewal. The number of H-1B visas, which had been initially capped at 65,000 per year, was temporarily increased to 115,000 in 1999 and 2000, and further to 195,000 in Fiscal Years 2001, 2002 and 2003. However, as part of the H-1B Visa Reform Act of 2004, the visa cap for bachelor’s degrees was reinstated to 65,000, with an added 20,000 visas for applicants with U.S. postgraduate degrees (see Figure 1). While the visa cap in preceding years had not been binding, it suddenly became significantly harder for most foreigners graduating from U.S. colleges and universities to secure legal employment in the for profit private sector. There were, nonetheless, some exceptions. In particular, free trade agreements had created close H-1B substitutes for citizens from five countries: Canada, Mexico, Chile, Singapore and Australia (Sparber and Kato 2010).[[1]](#footnote-1) Additionally, excluded from these ceilings were non-profit institutions of higher education, along with other non-profit and government research institutions[[2]](#footnote-2) –an exclusion intended to help retain the brightest minds in research.

A prolific literature has provided either direct or indirect evidence of significant reductions in the number of high skilled immigrants working in the U.S. when the visas became scarcer (*e.g.* Peri, Shih, Sparber 2015; Ghosh, Mayda, Ortega 2014). For the international students who remained in the U.S. after graduating, did the policy change impact their employment choices? Which types of students were most affected by the visa caps? What are the mechanisms through which visa caps alter the career paths of foreign nationals in the United States? In this paper, we take a first step towards answering these questions using a quasi-experimental framework, (exploiting the fact that nationals of certain countries had alternative work visas) that looks at changes in the likelihood of pursuing an academic career among foreign-born students who came to the United States to study on student visas.

Our analysis complements a growing literature on the impacts of high-skilled immigrants on innovation and productivity. Using state panel data, Hunt and Gauthier-Loiselle (2010) show that increases in immigrant college graduates’ population share lead to increases in patents per capita. Kerr and Lincoln (2010) find that H-1B admissions are associated with more patents by people with Indian and Chinese last names, but no meaningful decreases in the number of patents by natives. Exploiting variation in H-1B visa caps in conjunction with the distribution of STEM workers across U.S. cities before the start of the H-1B program, Peri, Shih, and Sparber (2015) find that H-1B driven increases in STEM workers are associated with higher wages for native workers, especially high-skilled natives. This suggests that high skilled foreign-born workers, at least those in STEM fields where innovation is central, are complements and not substitutes with high skilled natives in production.

It is most likely the case that, because of this relationship between high skilled migrants and productivity and innovation, institutions of higher education and non-profit research institutes are exempt from the H-1B visa cap. Ultimately, we aim to estimate the impact of this exclusion on the productivities of researchers in academia and private industry, but a first step towards that analysis involves testing empirically whether the visa cap changed the relative number of high skilled immigrants working in academia.

There are several mechanisms through which we might observe an increase in the relative number of immigrants working in the academic sector when visas become scarcer. First, immigrants whose visa applications are denied in the private sector may have to return to their home countries, unless they can find employment in academia. As such, there should be relatively more immigrants in academia when visa caps are binding. Another possibility is that, aware of the difficulty of securing a visa to work in the private sector, international students tailor their studies and job search strategies for a career in academia, possibly pursuing post-graduate studies.

As discussed above, our identification strategy exploits the fact that immigrants from five countries have alternative visas to the H-1B that allow them to work in the United States. Figure 2 shows how immigrants from these five countries became more likely to use the substitute visas when the cap on the H-1B became binding. Note, in particular, how quickly Australians started using the E3 visa after its introduction in 2005. We examine whether international students from countries without substitute visas and graduating from U.S. colleges and universities after the policy change became more likely to pursue careers in academia relative to those graduating before the policy change or after the policy change but from countries with alternative visas.

Using a similar identification strategy, Kato and Sparber (2013) show that the quality of students, as measured by SAT scores, pursuing an undergraduate degree in the United States decreased in response to binding H-1B caps.[[3]](#footnote-3) In a related analysis, Shih (2015) shows that the H-1B visa cap had a negative impact on the number of students pursuing degrees in the United States.

For international students graduating from a U.S. institution, we find that a post-2004 graduation was associated with an increased likelihood of working in academic institutions for students from countries impacted by the visa cap relative to students from countries with alternative visas. This result is robust to many alternative specifications of the model and samples, suggesting that outliers are not driving our findings. For students graduating before 2004, we do not find evidence supporting differential trends in employment outcomes by whether they originated from countries with H-1B substitutes. Employment outcomes cannot be explained by “placebo” visa cap changes prior to 2004 for students graduating before the actual policy change. Moreover, if we restrict our attention to students graduating before 2004, we fail to find any evidence of endogeneity owing to reverse causality between foreign-born graduates’ employment rates in academia and the likelihood that their respective countries of origin were among the non-exempt from the H-1B visa cap.

We continue our analysis by examining which immigrants are most likely to change career paths in response to the reduction in the H-1B visa cap. Not surprisingly, immigrants with Ph.D.’s were strongly affected by this policy. Interestingly, those with master’s degrees –typically a degree more likely to be oriented to the private sector– do not seem to have been significantly impacted by the policy change. We also find that it is immigrants in STEM fields that are driving our results, perhaps because their training prepares them for research careers in both the private sector and academia. Finally, possibly due to the more limited number of academically suitable employment options back home, immigrants from non-OECD countries are more impacted by the reduction in the visa cap than their counterparts from more developed OECD economies.

We end with an exploration of the mechanisms through which H1-B visa caps impact the careers of international students who complete degrees in the United States. Our preliminary evidence suggests that immigrants impacted by the visa cap are more likely to obtain professional degrees, but the data does not allow us to conclude anything about their likelihoods of pursuing master’s or doctoral degrees. It is therefore unclear whether they pursue higher levels of education specifically to prepare for an academic career or to increase the likelihood of obtaining one of the scarce H-1B visas in the private sector. We also show that immigrants impacted by the visa cap are not any more likely than those that are not impacted to work in a field which is different from the field of their degrees.

The remainder of the paper proceeds as follows. A description of our data is presented in Section 2. Section 3 follows with an explanation of our baseline model and identification strategy. Baseline results as well as robustness checks and evidence supporting our identifying assumptions are provided in Section 4. Tests for heterogeneous effects are given in Section 5, and Section 6 follows with a preliminary examination of the mechanisms through which visa caps impact career decisions. Section 7 concludes.

**2. Data and Descriptive Statistics**

Our aim is to estimate the impact of the more restrictive visa policy on foreign-born students graduating from U.S. colleges and universities. To that end, we rely on data from the 2003, 2010 and 2013 National Survey of College Graduates (NSCG). The 2003, 2010 and 2013 cycles of the NSCG provide coverage of the nation’s college-educated population as of the survey reference date, and they include information on demographics, educational attainment, degree field, and sector of employment, among other characteristics. Our sample consists of working-age immigrants who came to the United States on a student visa and graduated from a U.S. college or university after 1993. Given our focus on employment outcomes, we only include immigrants who provide an answer to the questions on the employment sector in the survey.

Table 1 provides some basic employment and demographic characteristics of foreign-born college graduates separated by whether they are from countries bound by the H-1B visa cap. Foreign-born college-graduates from countries bound by the H-1B visa cap are younger, more likely to be male, and black or Asian, than their counterparts from unbound countries. They are also more likely to be married, but less likely to have young children living in the household. A significantly higher share has completed a master’s or Ph.D., even though fewer had a mother with a college education than foreigners from nations unbound by the visa cap. Immigrants from countries with H-1B substitutes are slightly more likely to live in the East and West and less likely to live in the North Central and Southern parts of the United States. Most importantly, a somewhat higher share of foreign-born college graduates from countries bound by the H-1B visa cap are employed in the non-profit higher education and research oriented sector (23% as opposed to 20%).

To get a better sense of the potential impact that the change in the H-1B visa cap might have had on employment patterns in non-profit higher education and research institutions, Figure 3 displays the mean share of foreign-born college-graduates from countries bound and unbound by the H-1B visa, before and after the change in the cap. It is apparent how the share of foreign-born college-graduates going into non-profit higher education or research institutions practically doubled for those originating from countries bound by the H-1B visa cap, whereas it hardly rose for their counterparts from nations unbound by the H-1B visa cap.

To assess the statistical significance of any H-1B visa cap employment impacts, Table 2 displays the estimated change in the shares after the enactment of the visa cap among both foreign-born college-graduates from countries bound by the H-1B visa cap and from nations that are not. While the share of young college-graduates from countries bound by the H-1B visa cap rose by 15.4 percentage points following the enactment of the policy, the share of young college-graduates from other nations going into non-profit higher education or research jobs stood practically unchanged. As a result, the difference-in-difference estimate capturing the impact that the policy change might have had on the likelihood of being at work in academia is statistically significant at the 1 percent level. Specifically, with the new policy, the share of foreign-born college-graduates going into non-profit higher education or research jobs rose by 14.5 percentage points (about a 63 percent increase given the average share employed in that sector is 23 percent).

**3. Methodology**

While revealing, the descriptive statistics in Figure 3 and Table 2 fail to properly account for a wide range of factors potentially responsible for the found impact. As such, we proceed to more rigorously examine the impact of the policy by estimating the following benchmark model:

(1) $Y\_{i,c,gradyr, t}=α+β\_{1}H1B\_{c}\*H1B\_{gradyr}+β\_{2}H1B\_{gradyr}+ X\_{i,f,c,t}γ+δ\_{c} +θ\_{gradyr }+μ\_{t}+ε\_{i,c,gradyr,t}$

where $Y\_{i,c,gradyr, t}$ equals 1 if the foreign-born student *i* originating from country *c* and graduating from a U.S. college/university in year *gradyr* is employed in a non-profit higher education or research-oriented institution in survey year *t*, and 0 otherwise. Because we use several NSCG surveys, we are able to separately identify the impact of graduation year and survey year. While we would actually like to observe the sector of employment right after the student obtained her/his highest degree, such data are not available. It is possible that some students who were initially constrained by the visa cap, started working in academia only to switch to the private sector later on in their careers. In that case, our estimates provide an underestimate of the initial visa cap effect. We note, however, that even the first students affected by the policy were observed less than ten years after graduation in our sample.

The $H1B\_{c }$ variable equals 0 for foreigners originating from Australia, Canada, Mexico, Chile or Singapore and one for everyone else. The $H1B\_{gradyr }$ variable equals 0 for foreigners graduating prior to 2004, regardless of their origin –the exception is Australians, for whom it equals 0 for those graduating on or before 2005 since that is when an alternative visa became available to them. As such, the $H1B\_{c }\*H1B\_{gradyr }$ interaction term thus equals 0 for foreigners graduating prior to 2004, regardless of their origin, as well as for foreigners originating from Canada, Mexico, Chile or Singapore regardless of when they graduated, and for Australians graduating after 2005. For everybody else, it equals 1.[[4]](#footnote-4) The main coefficient of interest, β1, measures how the H-1B visa cap has impacted the likelihood of obtaining a job in the academic sector for foreign students impacted by the policy change.

The vector *X* accounts for a number of individual level characteristics likely impacting employment choices, such as age, gender, field of expertise, marital status, highest educational degree and parental educational attainment. The analysis also includes time-invariant fixed effects to capture idiosyncratic labor market characteristics by foreigners’ country of origin ($δ\_{c}$) and graduation year ($θ\_{gradyr }$). We also include year of the survey fixed effects to measure economy-wide changes in the labor market over time ($μ\_{t}$). In this manner, we address differences in labor market opportunities by country of origin (such as the presence of ethnic networks within the United States), bad labor markets faced by students graduating in certain downturn years (Böhm and Watzinger, 2015), or contemporaneous macroeconomic shocks, respectively. Standard errors are clustered at the country of origin level.

**4. Did the H-1B Visa Cap Alter the Employment Choices of International Students?**

**A) Main Findings**

Table 3 presents some preliminary results using a number of model specifications that progressively add controls. Adding region of residence controls does not have a substantial impact on our estimates of the effect of the policy. Adding field of degree fixed effects, however, does reduce our estimated coefficient by about 13 percent. Results from the most complete model specification suggest that the H-1B visa cap raised the employment likelihood of foreigners in academic and research oriented jobs by approximately 12 percentage points (roughly 52 percent). In addition, older graduates, as well as married ones, appear less likely to go into academia and research oriented employment. In contrast, graduates with a master’s, Ph.D. or professional degree are, respectively, 4 percentage points, 32 percentage points and 12 percentage points more likely to work in academia or in a research institution than their reference group with only a bachelor’s degree. The impact is, not surprisingly, large in the case of graduates with a doctoral degree, since they are more likely to be geared to research and academia. They are almost 1.4 times are likely as their counterparts with only a bachelor’s degree to be in that employment sector.

**B) Robustness Checks**

We perform a number of robustness checks to assess the reliability of our findings. These are all displayed in Table 4. First, we include information on the educational attainment of both parents, which could explain the employment choices made by the foreign-born. According to the estimates in the first column of Table 4, the estimated impact falls somewhat, from 12 to 10 percentage-points. Yet, it is still statistically significant at the 1 percent level and large, suggesting that the H-1B visa cap increased the likelihood that foreign-born from visa-cap bound nations chose to work in academia by roughly 50 percent.

Next, we experiment with including region-specific time trends addressing any unobserved time-varying regional characteristics that could potentially be driving employment choices made by the foreign-born, such as state-level support to universities or research projects. Column (2) in Table 4 displays the results from this exercise. Once more, while the size of the estimated impact drops by an additional half a percentage-point from its level in column (1), it is statistically significant at the 1 percent level and fairly large at 9.5 percentage points. As such, including a broader set of year, country of origin, graduation year, field of expertise and region of residence fixed-effects (in Table 3), along with region specific-time trends (in column (2) of Table 4), does not alter our findings in any meaningful way.

 Are the results, however, driven by the foreign-born from specific countries? China and India are the two countries of origin receiving the most H-1B visas. They were also undergoing rapid economic changes during this time period. If international students who would have, otherwise, chosen to work in the private sector in the U.S. returned back to these countries after graduation in recent years, the observed impact might have little to do with the change in visa policy. Likewise, Bulgaria and Romania joined the European Union in 2007. As a result, many of their nationals might have sought private-sector employment in Europe, as opposed to the United States, independently of the new visa policy change. To assess if the observed impacts are, at all, driven by foreigners from those 4 nations, we experiment with dropping them from the sample. According to the estimates in column (3) of Table 4, our estimated coefficient of interest remains statistically significant and is not much different from the one in the most complete specification in Table 3, despite the substantially smaller sample size. We were also concerned that results may be driven by specific countries in our control group. In columns (4) and (5), we drop from the sample Canadians and Singaporeans, respectively, since they are the most highly represented in our control sample. Again, estimates only vary slightly when either of these very different countries are excluded from the analysis.

**C) Identification Checks**

While the findings in Table 3 appear robust to the inclusion of various regression controls and to sample composition changes, their validity is predicated on a number of assumptions. In what follows, we address these assumptions as well as other potential concerns and limitations with the analysis.

1. *Support for the Parallel Trends Assumption*

One of the main threats to our empirical approach is whether there existed differential trends in the propensity of opting for a job in academia among foreign-born non-citizens who graduated prior to or on 2003 from countries non-exempt from the H-1B visa cap and those from elsewhere. To investigate whether that was the case, we restrict our sample to those graduating during the pre-policy period –namely: 1993 through 2003. Then, we construct indicators for those graduating during the three years prior to the implementation of the H-1B visa cap (that is: in 2000, 2001 and 2002) which we interact with the dummy indicative of whether they originated from a non-exempt country. Finally, we include the interaction terms, along with the eligibility indicator, in a model similar to equation (1). If the impact captured in Table 3 was pre-existing, we would expect the placebo interaction terms to have a statistically significant coefficient in the same direction of the H-1B-visa cap impact in Table 3. The results of this test are documented in Panel A of Table 5. The estimated coefficients on the placebo interaction terms are not statistically different from zero, thus signaling that the visa cap impact in Table 3 was not due to pre-existing differential trends.

To offer reassurance that the results are not driven by a longer trend prior to the implementation of the visa cap, we further create a time trend for the period under consideration, and interact it with the so-called eligibility indicator (*i.e.* originating from a non-exempt country). The interaction term, along with the eligibility dummy, are then included in the model. Panel B in Table 5 displays the results from this exercise. Consistent with the parallel trends assumption, we find no evidence of a pre-existing trend driving our results as the estimated coefficient on the interaction term is not statistically different from zero.

1. *Endogeneity Concerns: Which Countries Are Bound by the H-1B Visa Cap?*

Another challenge to the proper identification of our policy impact stems from a potential non-random designation of countries with H-1B visa substitutes. It seems unlikely that countries have H-1B substitutes specifically because nationals from these countries are especially likely to work in the private sector after 2004. After all, some of the substitutes were created many years before 2004 and were small parts of large trade treaties. Moreover, all of our specifications include country of origin fixed effects. Nonetheless, to address the concern that these countries had H-1B substitute visas for reasons related to future changes in career trajectories of nationals, we follow La Ferrara *et al*. (2012) and aggregate the data for the period preceding the visa cap implementation –namely, prior to 2004. We estimate the following model:

(2) 

where $Eligibility\_{c}$ indicates whether the country is a non-exempt one; $Y\_{c}^{} $is the average employment rate in academia or research institutions of migrants from country *c* prior to 2004; and $Z\_{c}^{}$ is a vector of controls in our prior estimations (aggregated at the country-of-origin level over the pre-visa cap period) reflecting average country level characteristics prior to the implementation of the visa cap.

Table 6 displays the results from this exercise. If we do not account for any other characteristics of the foreign-born, we find a statistically significant *inverse* relationship between the share of citizens employed in academia and the likelihood of being from a country with a binding H-1B visa cap. This suggests that, if anything, immigrants from countries which would eventually be impacted by H-1B restrictions were less likely to work in academia, not more. In any event, as soon as we account for basic demographic and educational characteristics of the foreign-born from the various countries of origin prior to 2004, the statistical significance disappears. As such, there seems to be no significant link between the likelihood of originating from a non-exempt visa cap nation and the employment rates in academia of foreign-born graduates *prior* to the implementation of the visa cap. Therefore, while not arbitrary, the selection of which nations are bound vs. exempt from the H-1B visa cap does not appear to have been correlated with the employment rate of their nationals in the academia sectors prior to the implementation of the cap.

**5. Heterogeneous Impacts**

 Next we examine whether the H-1B visa cap has had heterogeneous impacts depending on the migrant’s education, field of experience, and national origin. These analyses address a number of policy questions of great interest, including the differential effect of the visa cap on B.A., M.A., Ph.D. or professional degree receivers or the specific pull of the policy in specific fields of specialization, such as Science Technology Engineering and Mathematics (STEM) fields. Likewise, it is interesting to understand how the visa cap might have impacted migrants from less developed economies and who, consequently, might have bleaker employment options back home. Are they more likely to have turned to academia than their counterparts from more developed economies?

To address all of these questions, Table 7 displays the estimated impacts of the H-1B visa cap on the likelihood of holding a job in academia or non-profit research institution in the above-mentioned scenarios. Not surprisingly, those with a Ph.D. were 16 percentage points more likely to go into academia or a non-profit research institution if they were from the so-called *treated* countries (any country other than the 5 countries with available cap exclusions) and had graduated after 2003, than other foreign-born students. The push of the visa cap on of doctoral or professional degrees is large in magnitude, resulting in a 70 percent increase of their likelihoods of going into academia. The large impact on this group is understandable given the focus of doctoral degrees on research. The H-1B visa cap only accentuated their inclination for this type of work further. If one of the policy goals was to redirect, perhaps even promote, the employment of foreign-born graduates in this type of job, it might have achieved that aim.

 Was the exemption of academic and research institutions from the H-1B cap intentionally or unintentionally targeting the retention of the brightest minds in certain fields? A substantial amount of research has examined the competitiveness and promotion of STEM fields in the United States; therefore, we specifically gauge if the H-1B visa cap helped in that regard. According to the estimates in Table 7, the H-1B visa cap particularly increased the likelihood of holding academic or research jobs by close to 11 percentage points (48 percent) among graduates in STEM fields. For graduates in non-STEM fields, the policy had no statistically significant impact on the likelihood of pursuing a career in academia, the point estimate is very small and even negative. In that regard, we can conclude that the visa policy successfully contributed to the retention of foreign-born U.S. graduates specifically in STEM fields.

 Finally, it is worth exploring if the policy impacted foreign-born graduates differently depending on the degree of economic development of their home countries. In principle, we would expect foreign students to be more inclined to stay in the United States if their employment options back home, after having accumulated specific U.S. capital, might not seem very favorable. This is often the case for migrants from relatively less developed economies, many of which do not offer the employment prospects they might be able to enjoy in the United States. To assess if that is the case, the last two columns of Table 7 rerun the analysis focusing, first, on foreign graduates from OECD countries and, subsequently, on their counterparts from less developed non-OECD economies. While the share in academic jobs among immigrants originating from OECD visa-bounded countries did not significantly rise following the enactment of the policy, it did quite substantially among immigrants from non-OECD countries.

**6. Mechanisms**

There are several mechanisms through which H-1B visa caps may influence career trajectories of international students graduating from U.S. colleges and universities. As discussed in the introduction, the foreign-born interested in pursuing careers in the private sector may simply return to their home countries if they are unable to receive H-1B visas in the private sector. This would imply that the immigrants who remain in the United States are more likely to be employed in academia. Our finding that immigrants from developing countries are more sensitive to visa caps in terms of career trajectories is certainly consistent with this possibility but, because we only have data on the immigrants who remain in the United States, we cannot directly test for this.

Another potential mechanism is that immigrants tailor their educations to prepare themselves for careers in academia when it becomes more difficult to work in the private sector. To examine this possibility, we keep a sample of international students who completed a bachelor’s degree in the United States. We then examine whether those affected by the visa cap (because they are from countries without H-1B alternatives and they graduated after the cap became binding) are relatively more likely to pursue master’s, doctoral, or professional degrees. The two columns of Table 8 show that international students did not become significantly more likely to obtain Master’s or doctoral degrees as a result of the visa cap. However, column 3 shows that they did become more likely to obtain professional degrees. It is difficult to interpret these results because furthering their educations may have prepared the foreign-born for careers in academia, but it also may have increased the likelihood of obtaining H-1B visas in the private sector given that 20,000 H-1B visas are reserved for people with a Master’s degree or above.

As a final examination of potential mechanisms through H-1B visa caps may affect career trajectories, we examine whether the foreign-born who remain in the United States, despite a binding visa cap, are less likely to work in the field in which they received their highest degree. The last column of Table 8 presents results from a model run on our baseline sample of foreign nationals who obtain any degree in the United States. The estimated coefficient of interest suggests that the policy did not induce people to change their fields in order to work in the U.S. private sector. The point estimate is, in fact, negative, but very close to zero.

**7. Summary and Conclusions**

Overall, our analysis informs on various intended and unintended impacts of the more restrictive immigration policy pertaining to high-skill immigrants. Did the policy exclusions intended to retain talent in academic and research-related sectors achieve their aim? Did the impacts vary by highest degree, field, and country of origin? Our analysis suggests that the answer is yes to all of these questions.

We examine whether immigrants from countries without H-1B substitute visas are more likely to work in academic institutions after the H-1B quota cut in 2004, relative to the countries with H-B substitutes. We find that indeed they are. We also address common threats of difference-in-difference analyses. For example, we test for differential trends in employment patterns between our *control* group (Canadians, Mexicans, Chileans and Singaporeans graduating in/after 2004 or Australians graduating after 2005) and our *treated* group (all other foreign-born students) prior to the change in the H-1B visa cap in 2004. We find no evidence that such differential trends exist. Likewise, we address concerns regarding the potential endogeneity of the criteria regarding which countries are bound (vs. exempt) from the H-1B visa cap. Finally, we perform a number of robustness checks that assess the reliability of our findings to the inclusion of extended controls and regional time trends, as well as to the exclusion of specific countries experiencing other confounding policy or economic changes.

To conclude, a number of heterogeneity analyses suggest that our results are driven by immigrants with PhDs, in STEM fields, and from developing countries –hinting on the responsiveness of these groups to the immigration policy change and, in turn, the consequences that such responsiveness might have on academia. A better understanding of such impacts would not only shed light on the success of the policy exemptions in, hopefully, retaining the brightest minds in research but, in addition, on the changing demographics of higher education and non-profit research institutions.

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 **Source:** Kato, Takao and Chad Sparber (2013).

**Figure 2**

**Source:** Shih (2015).

**Figure 3: Share of Foreign-born in Academia and Non-profit Research Organizations**



 **Source:** Authors’ tabulations using the NSCG data.

**Table 1: Weighted Summary Statistics**

|  |  |  |
| --- | --- | --- |
| **Sample** | **Bound by H-1B Visa Cap** | **Not Bound by H-1B Visa Cap** |
| **Statistic** | **Mean** | **S.D.** | **Mean**  | **S.D.** |
| Employment in Academic and Research Jobs | 0.231 | 0.422 | 0.198 | 0.399 |
| Graduated After Visa Cap Changed | 0.422 | 0.494 | 0.387 | 0.487 |
| Age | 37.660 | 7.986 | 38.484 | 8.807 |
| Male | 0.646 | 0.478 | 0.437 | 0.496 |
| White | 0.232 | 0.422 | 0.535 | 0.499 |
| Black | 0.087 | 0.282 | 0.004 | 0.063 |
| Asian | 0.603 | 0.489 | 0.088 | 0.284 |
| Native American | 0.000 | 0.000 | 0.000 | 0.000 |
| Hispanic | 0.073 | 0.260 | 0.300 | 0.459 |
| Married | 0.725 | 0.447 | 0.699 | 0.459 |
| Naturalized Citizen | 0.334 | 0.472 | 0.352 | 0.478 |
| Bachelors’ Degree | 0.225 | 0.418 | 0.412 | 0.493 |
| Masters’ Degree | 0.504 | 0.500 | 0.368 | 0.483 |
| Ph.D. | 0.232 | 0.422 | 0.147 | 0.354 |
| Professional Degree | 0.040 | 0.195 | 0.073 | 0.261 |
| Year of Graduation (Highest Degree) | 2002 | 5.393 | 2002 | 6.098 |
| College-educated Mother | 0.158 | 0.365 | 0.246 | 0.431 |
| College-educated Father | 0.125 | 0.331 | 0.105 | 0.307 |
| East | 0.235 | 0.424 | 0.253 | 0.435 |
| North Central | 0.164 | 0.370 | 0.154 | 0.361 |
| West | 0.285 | 0.451 | 0.320 | 0.467 |
| South | 0.315 | 0.465 | 0.273 | 0.446 |
| Observations | 9,282 | 546 |

 **Notes:** Authors’ tabulations using data from foreign-born college graduates who came to the United States on a student visa and were interviewed in the 2003, 2010 and 2013 NSCG.

**Table 2: Differences-in-Differences in the Share Employed in Academic or Non-profit Research Jobs**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Immigrants Bound by H-1B Visa Cap**  | **Immigrants Not Bound by H-1B Visa Cap** | **DD** |  |  |
|  | **Pre-2004** | **Post-2004** | **DT** | **N** | **Pre-2004** | **Post-2004** | **DC** | **N** | **(DT-DC)** |  | **N** |
| Employment Share | 0.166 | 0.320 | 0.154\*\* |  9,282 | 0.195 | 0.204 | 0.009 | 546 | **0.145\*\*** |  | 9,828 |
|  | [0.372] | [0.467] | (0.026) | [0.397] | [0.404] | (0.033) | **(0.039)** |  |

**Notes:** Standard deviations are in brackets and standard errors, clustered at the country of origin level, are in parentheses. All regressions include a constant term. + *p*<0.1; \* *p*<0.05; \*\* *p*<0.01.

**Table 3: The Likelihood of Employment in Academic and Research Jobs**

|  |  |  |  |
| --- | --- | --- | --- |
| **Model Specification** | **(1)** | **(2)** | **(3)** |
| $$H1B\_{c }\*H1B\_{gradyr }$$ | **0.144\*\*** | **0.141\*\*** | **0.123\*\*** |
|  | **(0.038)** | **(0.030)** | **(0.027)** |
| $$H1B\_{gradyr }$$ | -0.282\*\* | -0.252\*\* | -0.196\*\* |
|  | (0.056) | (0.057) | (0.055) |
| Age | -0.064\*\* | -0.057\*\* | -0.055\*\* |
|  | (0.019) | (0.016) | (0.016) |
| Age-squared | 0.001\*\* | 0.001\*\* | 0.001\*\* |
|  | (0.000) | (0.000) | (0.000) |
| Male | -0.020 | -0.023 | -0.013 |
|  | (0.019) | (0.017) | (0.014) |
| Black | 0.072 | 0.052 | 0.056 |
|  | (0.069) | (0.069) | (0.071) |
| Asian | 0.020 | 0.015 | 0.008 |
|  | (0.067) | (0.066) | (0.063) |
| Hispanic | -0.055 | -0.056 | -0.068 |
|  | (0.087) | (0.089) | (0.083) |
| Married | -0.064\*\* | -0.062\*\* | -0.060\*\* |
|  | (0.015) | (0.013) | (0.013) |
| M.A. Degree | 0.029 | 0.027 | 0.040 |
|  | (0.037) | (0.036) | (0.032) |
| Ph.D. Degree | 0.371\*\* | 0.360\*\* | 0.318\*\* |
|  | (0.055) | (0.053) | (0.051) |
| Professional Degree | 0.149\*\* | 0.132\*\* | 0.123\*\* |
|  | (0.042) | (0.038) | (0.030) |
|  |  |  |  |
| Graduation Year FE | Y | Y | Y |
| Country of Origin FE | Y | Y | Y |
| Survey Year FE | Y | Y | Y |
| Region of Residence FE | N | Y | Y |
| Field of Expertise FE | N | N | Y |
| Observations | 9,828 | 9,828 | 9,828 |
| No. of Clusters | 170 | 170 | 170 |
| R-squared | 0.256 | 0.283 | 0.300 |
| **Notes:** All model specifications include a constant term. Standard errors are clustered at the country of origin level. They are displayed in parentheses. + *p*<0.1; \* *p*<0.05; \*\* *p*<0.01.  |

**Table 4: Robustness Checks of the Likelihood of Employment in Academic and Research Jobs**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Model Specification** | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** |
| $$H1B\_{c }\*H1B\_{gradyr }$$ | **0.100\*\*** | **0.095\*\*** | **0.106\*\*** | **0.085\*** | **0.116\*\*** |
|  | **(0.035)** | **(0.032)** | **(0.027)** | **(0.041)** | **(0.027)** |
| $$H1B\_{gradyr }$$ | -0.137+ | -0.205\* | -0.162\*\* | -0.159\* | -0.190\*\* |
|  | (0.079) | (0.082) | (0.044) | (0.072) | (0.055) |
|  |  |  |  |  |  |
| Parental Education Controls | Y | Y | N | N | N |
| Region Time Trends | N | Y | N | N | N |
| Country Exclusions | N | N | China, Bulgaria, India | Canada | Singapore |
| Observations | 9,626 | 9,626 | 5,471 | 9,557 | 9,795 |
| No. of Clusters | 169 | 169 | 166 | 169 | 169 |
| R-squared | 0.300 | 0.309 | 0.349 | 0.305 | 0.301 |
| **Notes:** All model specifications include a constant term, as well as the regressors and fixed-effects in the most complete specification of Table 3. Parental education controls include dummies for whether the parents (mother and father) were college educated. Standard errors are clustered at the country of origin level. They are displayed in parentheses. + *p*<0.1; \* *p*<0.05; \*\* *p*<0.01.  |

**Table 5: Falsification Tests Checking for Pre-existing Effects of the Policy**

**(Dependent Variable: Likelihood of Employment in Academic and Research Jobs)**

|  |  |
| --- | --- |
| **Sample:** | **Highest Degree Earned During Pre-Policy Period** |
| **Panel A:** | **Using Placebo Dummies to Indicate Policies Starting in Earlier Years** |
| $H1B\_{Placebo gradyr=2003 }$**\***$H1B\_{c }$ | **-0.171** |
| **(0.126)** |
| $H1B\_{Placebo gradyr=2002 }$**\***$H1B\_{c }$ | **-0.087** |
| **(0.067)** |
| $H1B\_{Placebo gradyr=2001}$**\***$H1B\_{c }$ | **-0.075** |
| **(0.106)** |
| $H1B\_{Placebo gradyr=2000 }$**\***$H1B\_{c }$ | **0.052** |
| **(0.057)** |
| $$H1B\_{Placebo gradyr=2003 }$$ | 0.201 |
|  | (0.126) |
| $$H1B\_{Placebo gradyr=2002 }$$ | 0.131+ |
|  | (0.068) |
| $$H1B\_{Placebo gradyr=2001 }$$ | 0.134 |
|  | (0.107) |
| $$H1B\_{Placebo gradyr=2000 }$$ | 0.002 |
|  | (0.059) |
| Observations | 5,855 |
| R-squared | 0.277 |
| **Panel B:** | **Using a Time Trend for the Pre-Policy Period Interacted with Eligibility** |
| **Time Trend\***$H1B\_{c }$ | **-0.001** |
| **(0.010)** |
| Time Trend | -0.020 |
|  | (0.031) |
| Observations | 5,395 |
| R-squared | 0.271 |

**Notes:** + *p*<0.1; \* *p*<0.05; \*\* *p*<0.01. The regression includes a constant term, as well as all the other regressors and fixed effects in the most complete specification in Table 3. Standard errors are clustered at the country of origin level.

**Sample:** Foreign-born who came with student visas and obtained their highest degree prior to 2004.

**Table 6: Assessing the Endogeneity of Country Eligibility**

**(Dependent Variable: Likelihood of Being from a Treated Country)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Model Specification** | **(1)** | **(2)** | **(3)** |
| **Key Regressors** | **Baseline** | **Extended Controls** | **Plus FE** |
| **Employment Rate in Academia/Research** | **-0.348\*** | **-0.278** | **-0.159** |
|  | **(0.159)** | **(0.238)** | **(0.258)** |
| Average Age |  | -0.013 | 0.008 |
|  |  | (0.110) | (0.114) |
| Average Age Squared |  | 0.000 | 0.000 |
|  |  | (0.001) | (0.001) |
| Share Male |  | -0.006 | -0.188 |
|  |  | (0.165) | (0.201) |
| Share Black |  | 0.127 | 0.120 |
|  |  | (0.130) | (0.136) |
| Share Asian |  | 0.056 | -0.007 |
|  |  | (0.061) | (0.068) |
| Share Hispanic |  | -0.114 | -0.083 |
|  |  | (0.089) | (0.095) |
| Share Married |  | -0.017 | -0.034 |
|  |  | (0.222) | (0.243) |
| Share with Masters |  | 0.265 | 0.283 |
|  |  | (0.191) | (0.215) |
| Share with Doctorates |  | 0.309 | 0.213 |
|  |  | (0.204) | (0.252) |
| Share with Professional Degree |  | -0.315 | -0.358 |
|  |  | (0.435) | (0.495) |
|  |  |  |  |
| Share Graduating in a Particular Year | N | N | Y |
| Share in Each Field of Expertise | N | N | Y |
|  |  |  |  |
| Observations | 156 | 156 | 156 |
| R-squared | 0.030 | 0.152 | 0.275 |

**Notes:** + *p*<0.1; \* *p*<0.05; \*\* *p*<0.01. Data are collapsed at the country-of-origin level. The regression includes a constant term.

**Table 7: Heterogeneity Analyses**

|  |  |  |  |
| --- | --- | --- | --- |
| **By:** | **Educational Attainment**  | **Field of Expertise** | **Development Level of Home Country** |
| **Group:** | **B.A.** | **M.A.** | **Ph.D.** | **Professional Degree** | **STEM** | **Non-STEM** | **OECD** | **Non-OECD** |
| $$H1B\_{c }\*H1B\_{gradyr }$$ | 0.142 | -0.021 | **0.157\*** | 0.212 | **0.105\*** | -0.035 | 0.029 | **0.458\*\*** |
|  | (0.094) | (0.056) | **(0.064)** | (0.285) | **(0.050)** | (0.045) | (0.035) | **(0.020)** |
| $$H1B\_{gradyr }$$ | -0.013 | -0.314\*\* | -0.380\*\* | -1.076\*\* | -0.196\*\* | 0.258\*\* | -0.091+ | -0.215 |
|  | (0.138) | (0.093) | (0.065) | (0.377) | (0.070) | (0.056) | (0.052) | (0.148) |
|  |  |  |  |  |  |  |  |  |
| Observations | 1,444 | 4,843 | 3,281 | 260 | 8,035 | 1,793 | 2,236 | 7,592 |
| No. of Clusters | 129 | 142 | 130 | 62 | 158 | 136 | 34 | 136 |
| R-squared | 0.506 | 0.355 | 0.260 | 0.687 | 0.288 | 0.510 | 0.323 | 0.312 |
| **Notes:** All model specifications include a constant term, as well as the regressors and fixed-effects in the most complete specification of Table 3. Standard errors are clustered at the country of origin level. They are displayed in parentheses. + *p*<0.1; \* *p*<0.05; \*\* *p*<0.01.  |

**Table 8: Channels through Which Visa Caps May Impact Career Paths**

|  |  |  |
| --- | --- | --- |
| **Channels** | **Decision to Achieve a Higher Education** | **Working Outside of Field of Highest Degree** |
| **M.A.**  | **Ph.D.** | **Professional Degree** |
| $$H1B\_{c }\*H1B\_{gradyr }$$ | 0.080 | -0.007 | 0.151\* | -0.005 |
|  | (0.110) | (0.027) | (0.071) | (0.048) |
| $$H1B\_{gradyr }$$ | -0.291 | 0.351\*\* | -0.208\* | -0.408\*\* |
|  | (0.234) | (0.073) | (0.103) | (0.058) |
|  |  |  |  |  |
| Observations | 1,632 | 1,632 | 1,632 | 9,828 |
| No. of Clusters | 140 | 140 | 140 | 170 |
| R-squared | 0.387 | 0.283 | 0.384 | 0.223 |
| **Notes:** All model specifications include a constant term, as well as the regressors and fixed-effects in the most complete specification of Table 3. Standard errors are clustered at the country of origin level. They are displayed in parentheses. + *p*<0.1; \* *p*<0.05; \*\* *p*<0.01.  |

1. First, the North American Free Trade Agreement created the TN (Trade NAFTA) visa for professionals from Canada and Mexico. Although the approved list of occupations is more restrictive than that of the H-1B, each occupation is associated with college degree holders. There is no limit to the number of TN visas that can be issued. Second, two free trade agreements signed by President Bush on September 3, 2003, created the H-1B1 program by setting aside up to 5,400 of the annual H-1B visas for citizens of Singapore and up to 1,400 for Chileans. Finally, a bill signed on May 11, 2005, established 10,500 annual E-3 visas for Australian professionals. The caps on E-3 and H-1B1 visas have never been reached (H-1B1 visas set aside for citizens of Singapore and Chile are subtracted from the overall H-1B visa quota, however, unused H-1B1 visas are made available as H-1B visas to citizens of other countries). [↑](#footnote-ref-1)
2. For the remainder of the paper, we will use the term “academia” to refer to both non-profit institutions of higher education and non-profit or government research institutions. [↑](#footnote-ref-2)
3. If workers in the academic sector tend to be more high-skilled than those in the private sector, this would dampen any impacts of the policy change on the likelihood of pursuing a career in academia that we may find among the students who do decide to study in the United States. [↑](#footnote-ref-3)
4. Note that we do not include a non-interacted $H1B\_{c}$ term because we include a full set of country of origin fixed effects. The year of graduation fixed effects, however, are not perfectly collinear with $H1B\_{gradyr }$because Australia’s H-1B visa substitute only became available in 2005. [↑](#footnote-ref-4)