Ways of staying: Status composition of international student stayers and its variations over cohorts and education trajectories

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1 Introduction

Studies of international student retention are limited by the short observation time-frame for which data are available. In the United States, research typically relies on visa transitions after graduation to understand retention up to five years after graduation (Finn 2014; Ruiz 2017; Ruiz and Budiman 2018). Long-term outcomes for international students, particularly their transitions into more permanent migration statuses, remain a black box.

In this paper, I examine the characteristics of stayers,[1] i.e., international students who stay and become part of the United States workforce, to shed some light on their long-term migration outcomes. I focus on the composition of stayers' with respect to migration status (hereafter, status composition), asking whether stayers are retained in the United States predominantly in temporary, legal permanent resident (LPR), or naturalized U.S. citizenship status. I also consider how status composition varies across two elements: broader changes in U.S. immigration policy context and the educational trajectories of student-stayers. In the process, I connect research on LPR transition and naturalization in the United States with a life-course perspective on migration (Conway 1980; Elder 1995, 1994; Paul 2011), to generate new concepts and hypotheses for understanding long-term migration outcomes. These results lay the groundwork for further examining the underlying selection processes (Chiswick and Miller 2009; Massey 2016; Massey and España 1987; Walsh 2011) that retain and sort student-stayers into different migration statuses.

Migration status is a crucial element for international student retention. Though authorized, students entering the United States hold a temporary migrant status, and they must switch into a different migrant status (e.g., workers) to stay after graduation. The primary channel for students to become workers in the United States is the H1-B visa, which—like a student visa—is temporary. Those who desire to migrate permanently must gain admission through the front door of LPR status, and subsequently, naturalized U.S. citizenship, which confers full social and political rights.

Importantly, the meaning of each migration status might be driven by broader changes in the national policy context. Naturalized citizenship is considered a commitment to become a permanent member of the society with full social and political rights and responsibilities; yet it can also become a "defensive" strategy in volatile times (Ong 2010). As immigration policy in the United States in the past two decades took a turn towards harsh enforcement, relying on

[1] In this paper, I will use the term "stayers" and "student-stayers" interchangeably.

criminalizing non-citizens and denying them due legal process, naturalization rates among vulnerable immigrant groups rose sharply (Massey and Pren 2012; Passel 2007).

I propose that one way to examine the changing meaning of migration status relative to the national policy context is to consider how status composition varies by the timing of first entry, or *variations by cohorts* (Elder 1975; Ryder 1965). The life-course perspective suggests that life events are connected, such that the timing and quality of one experience can shape later life transitions and outcomes (Ryder 1965). Stayers' experience of policy context at entry could thus impact their long-term migration status. For example, stayers experiencing more restrictive policy contexts at entry could be more likely to have LPR status and naturalized citizenship as a defensive move.

In addition to studying expression of policy changes through cohort variations, I also consider how students, as active agents (Bakewell, Haas, and Kubal 2012), negotiate their migration experiences. Drawing on the theory of stepwise migration (Conway 1980; Paul 2011), which suggests that immigrants develop unique trajectories—comprising of multiple steps—to get to their desired destinations, I understand expressions of agency through *variations in migration status by trajectories*. Perhaps the most common image of a student-stayer is one who moves through a lockstep of education-graduation-employment, but this is not the only possible trajectory. Some students deepen their connection to the United States by earning multiple degrees or by starting with a lower degree, such as a high school diploma. Others come as young people with their families, another way of anchoring a stronger attachment to the United States. Still others begin, but do not complete, a degree in the United States, and return later for employment. In examining the presence of trajectories, especially the less familiar ones, this paper expands current research on international student migration to a broader expression of staying.

Using a nationally-representative sample of U.S. scientists and engineers from the restricted-licensed Scientists and Engineers Statistical Data System (SESTAT) data, I examine the status composition of stayers who belong to four different entry cohorts. Entry cohorts are defined around three key policies that dramatically altered the United States' immigration enforcement landscape: the 1986 Immigration Reform and Control Act (IRCA), the 1996 Illegal Immigration Reform and Immigrant Responsibility Act (IIRIRA), and the 2002 Homeland Security Act (HSA) (De Genova and Peutz 2010; Hernandez 2005; Massey and Pren 2012). In essence, each subsequent entry cohort experienced a more enforcement-focused (or more restrictive) policy context.

Results from logistic regressions indicate that the probability of holding LPR status is much higher among stayers in the 1997-2002 and the post-2002 cohorts, compared to the pre-1986 cohort. The same relationship does not hold for naturalization, such that the probability of naturalization does not differ significantly across entry cohorts. Further, in considering the impact of historical policy change (which is known as a "period" effect in the life-course literature (Elder 1995; Ryder 1965)), I estimate an interaction effect between entry cohorts and number of years since entry, and find that stayers from the two most recent cohorts tend to

become LPR sooner (i.e., fewer years after entry). This suggests that LPR becomes a pre-requisite status for stayers in the latter two cohorts. In the sections that follow, I will further discuss the differences between the processes leading to LPR status and naturalization to help contextualize these findings.

With respects to elements of education trajectories, I identify a sizable proportion of stayers who divert from the common trajectory. Those with a "circular" trajectory, entering the United States as students but obtaining their degrees elsewhere, make up the largest proportion of stayers in the post-2002 entry cohorts. These circular stayers are also more likely to have LPR status. Another type of stayers, "adjusted" ones who enter with non-student temporary visas and then change to student's visas to pursue U.S. education, have the highest propensity to naturalize. These results help understand the underlying selection mechanisms that cumulate under the broader U.S. policy contexts. Contrary to the common wisdom that U.S.-educated foreign talents are the most desirable (e.g., see Obama 2014; Redden 2014), the current policy environment appears to favor "circular" stayers without a U.S. degree. The policy contexts also seem to attract more "Adjusted" stayers, who express the most agentic trajectories to pursue U.S. education, as they are the most likely to naturalize.

2 Backgrounds and Literature Review

2.1 Staying after graduation: Processes and challenges

The United States does not offer an official channel to streamline international students towards more permanent migration statuses after graduation (Riaño, Van Mol, and Raghuram 2018; Ruiz 2001). The pathway to staying after graduation is thus fraught with uncertainty. Broadly, stayers can have three types of migration statuses: a temporary worker (H1-B) visa, LPR status, or naturalized U.S. citizenship. These statuses are inter-dependent, such that one is required to transition to another. However, individuals can also remain in one status and not making the transition.

The temporary skilled worker visa (H1-B) is considered the logical next step for student-stayers (Lowell and Avato 2014; Martin, Lowell, and Martin 2001; Ruiz 2001), although the majority of H1-B visas are given to workers coming from outside the United States, i.e., those without U.S. qualifications (Ruiz 2013). To add to this complexity, there is an annual cap[2] for H1-B visas, which means that if the number of applications exceeds the cap, eligible students must enter a lottery (e.e., see Peri, Shih, and Sparber 2015). The H1-B visa confers a temporary migration status for up to 6 years,[3] with the condition that the migrant must not switch employer. An individual might apply for a new H1-B visa, which means they have to repeat the same steps above.

[2] The current cap is 65,000 visas plus 20,000 visas for those with advanced degrees. This cap has been adjusted over time, and it was the highest (at 195,000 visas) in 2001, 2002, and 2003. H-1B workers in the public and not-for-profit sector (such as in a not-for-profit university) are not limited by this cap.

[3] H1-B is valid for 3 years and renewable for 3 additional years. Renewals does not count towards the H1-B caps, thus there is less uncertainty in renewals.

Those on H1-B visas can obtain LPR status when their employers sponsor their LPR applications. This process is even more arduous than H1-B visas application, as it is regulated by an overall ceiling *and* a per-country ceiling designed to prevent the monopolization of immigrants from major sending countries in the LPR pool (Argueta 2016). The average wait-time for LPR applications is estimated at 4.3 years in 2010 (Jasso et al. 2010), and it can stretch up to 10 years for applicants originating from countries with high volume of LPR applications, such as China and India (Herbst 2009; Li and Lo 2012). Those with LPR status can stay up to 10 years, and the LPR status can be easily renewed once expired.

The steps from LPR to naturalization are much more straightforward for skilled immigrants. They only need to satisfy a minimum stay requirement and pass a naturalization test (North 1987).The minimum stay requirement is typically 5 years, and it can be shortened to 3 years for LPRs who are spouses of U.S. citizens, and to one year for those who serve in the United States' army. The naturalization process takes about 2 years, and as such, prior research typically use a typical length of 7 years to establish eligibility for naturalization (Chiswick and Miller 2009; Jones-Correa 2006).

As the transition from temporary status to LPR is more uncertain, students might have to leave because they cannot obtain sponsorship for a H1-B visa or LPR status. In contrast, the transition from LPR status to naturalization is not instrumentally required[4] for staying. As such, in this paper, I will examine the two transitions separately and attend to this difference when interpreting the results. The transition from LPR to naturalization can be understood largely as a choice, while the transition from temporary status to LPR reflects a combination of choice and constraints. Thus, the status composition of LPRs and temporary visas among student-stayers reflect the aggregate combination of leavers and stayers, among which stayers could be sorted into LPR status either because of their choices or because LPR becomes the only way to stay.

2.2 Immigration enforcement policy and its impact on permanent migration outcomes

Scholars generally agree that the Immigration and Naturalization Act of 1965 marked a radical break from prior U.S. immigration policies, by abolishing the national-origin quota and creating new preference systems such as employment for new immigrants (Hollifield, Hunt, and Tichenor 2008; Jasso and Rosenzweig 1990). The year 1965 also marked the sudden termination of the Bracero Program, which had been an important channel that streamlined temporary labor migration between Mexico and the United States, thus creating a large undocumented immigrant population (Massey and Pren 2012).

Against this backdrop, three important policies were adopted in the post-1965 era, and they cumulated into the enforcement-focus immigration policy regime that we witness today in the United States. First, the passage of IRCA in 1986 laid the foundation for immigration enforcement (Massey and Pren 2012; Meissner et al. 2013). IRCA was designed to solve the

[4] By "instrumentally required," I mean the law does not require naturalization. It does not refers to the instrumental value of citizenship, for example, some immigrants, given their circumstances, might think that naturalization is instrumental to their well-being as an immigrant in the United States (e.g., see Ong xxx).

problem of unlawful immigration following the sudden termination of the Bracero Program in 1965. IRCA had three interrelated provisions: it made the hiring of unauthorized workers a crime for the first time in U.S. history, called for strengthened border enforcement, and provided for naturalization for a large share of the unauthorized immigrant population. Under the broad category of border enforcement, IRCA contained a provision requiring the United States' Attorney General to deport noncitizens convicted of removable offenses as quickly as possible. This set in motion the practice of targeting immigrants who commit crimes and expanded the range of policing practices (Abrego et al. 2017).

In 1996, IIRIRA was enacted, and it ratcheted up the punitive aspects of U.S. immigration laws. Specifically, it expanded the list of crimes that make immigrants deportable, stripped rights to due process from immigrants with criminal records and from immigrants apprehended within 100 miles of the border, and, most importantly, authorized the 287(g) program, paving the way for state and local authorities to enforce immigration law (Abrego et al. 2017; Juarez, Gomez-Aguinaga, and Bettez 2018; Valdez, Coleman, and Amna 2016). With this move, immigrant enforcement practices expanded beyond the border and border-crossing to impact the daily life of immigrants in the United States (Wong 2012).

These policy developments came to the forefront after the terrorist attacks of September 11, 2001. Shortly after these attacks, the Homeland Security Act (HSA) was passed in 2002, which created the Department of Homeland Security (DHS) and increased funding for surveillance and deportation of foreigners. With the creation of DHS, funding for immigration enforcement increased dramatically, which translated into the creation of a complex apparatus for targeting, detaining, and deporting immigrants over the next decade (see Stumpf 2006). As policy quickly evolves into "hyper-enforcement" (Longazel 2013), immigrants and their families experience a constant state of fear stemming from the risk that they could be targeted for detention and deportation for an expansive list of crimes, many of which would be considered minor for native-born Americans (De Genova and Peutz 2010; Stumpf 2006).

In the post-1965 era, the adoption of each of these three policies represent key historical events that altered immigration policy contexts that student-stayers encountered when entering the United States. Drawing from the life course perspective (Elder 1975; Ryder 1965), the idea of a *cohort* suggests that individuals who experience shared temporal experience, such as entering the country in the same year, will have similar long-term migration outcomes. Considering stayers in four entry cohorts before and after each policy adoption, we might expect each cohort to have a distinct experience as immigrants in the United States. Prior to 1986, immigration enforcement has not yet been so strongly linked to criminal enforcement; thus, student-stayers do not experience fear associated with immigration enforcement and its consequences. With each subsequent cohort, immigrant enforcement became harsher and assumed a more regular presence in immigrants' daily lives (De Genova and Peutz 2010; Longazel 2013). As such, those in latter cohorts likely experience more fear and uncertainty while pursuing education in the United States.

With respect to long-term migration outcomes like naturalization, research on "defensive naturalization" suggests that hyper-enforcement policies make immigrants more likely to seek a permanent status that would give them social and political protection (Ong 2010). For some, such as Latin American immigrants, the risk of racialized enforcement compels them to naturalize, as citizenship provides important protections like due legal process. Not surprisingly, naturalization rates among Latin American immigrants have risen sharply since the 2000s (Massey and Pren 2012; Passel 2007). Applying a similar logic to student-stayers, entering the United States in more recent years might mean that permanent status, such as LPR, provides important assurance to alleviate the fear that stems from hyper-enforcement. If those who stay need LPR status,[5] the overall status composition will comprise of less temporary visas and more LPRs. In my analysis, I thus expect that *student-stayers in more recent cohorts are retained predominantly with LPR status rather than temporary status.* The same perspective would predict *that stayers from more recent entry cohorts are more likely to naturalize*, as well.

Beyond entry cohorts, life-course research also considers two related expressions of time: age and period (Elder 1975). With respects to migration, "age" is analogous to immigrant's length of stay, which is typically measured by the number of years since entry (Jones-Correa 2006; Van Hook, Brown, and Bean 2006). Prior research on immigrant incorporation suggests that immigrants who have been in the United States longer become more connected to the country, which can translate to a higher probability of obtaining LPR or citizenship (e.g., see Jones-Correa 2006). As such, s*tayers who accumulate more years since entry will be more likely to have LPR and naturalization status.*

At the same time, life-course research suggests that period effect, which denotes the impact of historical changes on individuals, can be estimated as an interaction effect between the other two elements, cohort and age (Keyes et al. 2010; Luo 2015; Ryder 1965). Accordingly, in this paper, I suggest that the impact of historical changes in U.S. immigration policies on migration outcomes can be understood as the variations in the degree to which entry cohorts and years since entry are moderated by each other (Luo 2015). Drawing from the discussion of "defensive naturalization" above, an expression of defensive status change is that student-stayers will obtain permanent migration status as soon as they become eligible for it. Thus, I expect that *length of stay will have a larger effect on LPR and naturalization among the more recent entry cohorts, compared to the pre-1986 cohorts.*

Beyond the instrumental explanations for LPR and naturalization as a protective status for stayers to remain in the United States without fear, as discussed above, prior research also suggests that naturalization is a different step that requires a sense of belonging and a strong commitment for long-term stay (Bloemraad 2006a, 2002; Van Hook et al. 2006). Naturalization is thus less desirable for those coming from countries that do not allow dual citizenship, which means the immigrants must formally give up their original citizenships (Jones-Correa 2006; Yang 1994). Considering the effect of the policy context, scholars find that the United States'

[5] This implies that those who cannot obtain LPR status will be more inclined to leave. The analysis cannot compare stayers and leavers, but it can assess the aggregated phenomenon based on the experience of stayers.

singular focus on enforcement sends an ambiguous message to immigrants about their desirability as new citizens, which explains low naturalization rate in the United States since the early 20th century (Bloemraad 2006). Contrary to "defensive naturalization" research (Ong 2010), this perspective implies that those who enter in hyper-enforcement policy contexts are even less likely to naturalize. As such, among those eligible for naturalization, *stayers from the more recent entry cohorts are less likely to acquire naturalized U.S. citizenships.*

2.3 Variations in education trajectories

Research on the international student post-graduation retention (Hawthorne 2010; Robertson 2013) often evoke an image of an individual who moves through a lockstep of education-graduation-employment in order to stay. I call this a "Common trajectory."

Given great uncertainty embedded in the process, which I described in Section 2.1, students develop strategies to enhance their chance at migration. The theory of stepwise migration (Conway 1980; Paul 2011) suggests that immigrants can forge their unique trajectories so as to reach their desire destinations. This includes taking additional steps, as each step helps an immigrant gain resources, or capital, in many forms: information, networks, financial resources, experience, etc. Extending this framework to student-stayers, it means there are possible alternatives beyond the Common trajectory.

Limited findings from existing research provide an idea of how an alternative trajectory may look like. Some studies find that students can take a "roundabout" route to education, for example, by trying out different destination countries before settling in one (Brooks and Waters 2009; Waters 2007). In the United States, non-degree programs, such as intensive English training, enable students to take this route and to experience the U.S. higher education context even before applying for admission into American universities and colleges. These programs have the most impressive growth in the past decade, as enrollments in non-degree programs moved up by over 8,000 percent between 2002 and 2012 (Ruiz 2014). Further, some studies note cases of "astronaut households," where parents migrate so that their children can obtain an education in the host country (Ley 2013; Tsong and Liu 2009; Waters 2002).[6] This strategy might work for dependent spouses as well, though its prevalence among spouses has not received attention from either researchers or the popular media.

From these findings, I suggest that there are at least two additional trajectories, which can be identified through a combination of visas and education history. I use the term "Circular trajectory" to refer to the "roundabout" routes. On this trajectory, stayers begin with a U.S. student's visa, but ultimately obtain higher education degrees elsewhere before returning to the United States for employment. The other trajectory is called "Adjusted," and it captures the experiences similar to those of children and spouse in "astronaut households." Individuals in this group enter with a temporary visa for dependents, and then switch to student visas to pursue

[6] Only those who attend schools while holding temporary visas are considered international students. In my identification strategy (Section 3.1), I explain how to distinguish this group in the data.

education. Note that it is possible to adjust from a temporary work visa to a student's visa as well; however, there is no prior research on this type of status adjustment.

My analysis will consider whether and how individuals with these two uncommon trajectories have different LPR and naturalization outcome. Due to the absent of prior research, my hypotheses in this Section are exploratory and lean towards instrumental explanations based on the characteristics of each trajectory. For Circular stayers who do not have U.S. qualification, I expect that they will have a harder time fitting in the narrative of a desirable skilled immigrants who have both the required qualification and cultural immersion in the United States (Redden 2014). As such, stayers with a *Circular trajectory would be less likely to be retained as LPR,* compared to those having a Common trajectory. At the same time, Circular stayers might have other options outside of the United States, and therefore *stayers with a Circular trajectory would be less likely to become naturalized citizens*. For Adjusted stayers who have more resources to facilitate the transition towards permanent migration, including the possibility that they would also become LPR if their parents or spouses get it, I expect that *stayers with an Adjusted trajectory are more likely to be retained with LPR status.* At the same time, Adjusted stayers likely have family members in the United States, which is an expression of strong commitment and connection. As such, I expect that *stayers on an Adjusted trajectory would be more likely to become U.S. citizens.*

On top of the three trajectories, qualitative findings in international student research, albeit limited, confirm that students also try to increase their chances for long-term migration by obtaining several U.S. degrees (Knight 2012; Pang and Appleton 2004) or by starting at a lower level, such as high school (Institute of International Education (IIE) 2017; Marklein 2014) to deepen their social connections in the United States. I expect that these elements impact permanent migration outcomes: *those who have more than one U.S. degree and those who start with a U.S. high school degree are more likely to be retained as LPRs*. Further, as these elements also increase stayers' social and cultural connection with the United States, I expect that among those eligible for naturalization, *stayers who have more than one U.S. degree, and stayers who start with a U.S. high school degree are more likely to become naturalized citizens*.

3 Data and Method

3.1 Data

To consider the expectations described above, I use data from the National Science Foundation's (NSF) SESTAT data. Pooling data from three waves of SESTAT, including the 2003, 2010, and 2013 surveys, I created a nationally representative sample of the science and engineering workforce in the United States in the 2003-2013 period. SESTAT participants have all received at least a bachelor's degree and have at least one degree in science and engineering, or are working in a science and engineering occupation (including those whose degree are not in science and engineering). From this, I identify a sub-sample of student-stayers (discussed further in Section 3.2) for the analysis. Consistent to prior research which indicate that international students are a rare population who are difficult to capture in national surveys (King and

Raghuram 2013), the sub-sample is small (N=9,778) relative to the overall pooled SESTAT sample (N=140,117).

I treat the data as repeated cross-sections, although some respondents appear in more than one wave of data. SESTAT uses a rotating panel design, which means that about two-thirds of all respondents in one wave are retained into the next wave, but about one-third of respondents are dropped and new replacement respondents are added (Fecso and Phelps 2007; Finamore et al. 2011). Given this sampling design, I only keep the first observation for individuals who appear more than once in the data. As my main predictors are based on retrospective information about visa and education history, which do not vary across survey waves, it does not matter which instance is kept.[7] I also deflate the weights to reflect the pooled data and adjusted the weight in each wave according to its sample size relative to the other waves.

Finally, as student-stayers are a small subset of the SESTAT sample, I use the sub-population estimate option in Stata to retain SESTAT's complex sampling design, which incorporates multiple sampling frames through the rotating panel method. Sub-population estimates increase the accuracy of variance estimations, thus creating more robust standard errors (Kreuter and Valliant 2007).

3.2 Method for identifying student-stayers

Following research on international student migration (Hawthorne 2010; King and Raghuram 2013; Robertson 2013; Ruiz 2014), I define international students as individuals who pursue U.S. education while on temporary visas. My identification strategy therefore ensures that those who are identified as student-stayers spend all or at least some of their study duration in temporary immigrant status. Using information on visa and education history, the identification strategy also distinguishes stayers based on three distinct education trajectories that I discussed earlier in Section 2.3.

To this end, I use retrospective information of education and visa histories available in the SESTAT data to identify student-stayers. Because SESTAT does not ask about the timing of naturalization, it is not possible to confirm that the respondents attend and complete schooling before obtaining citizenship. This missing variable will bias the identification strategy towards over-identification of student-stayers, for example, individuals who enter with a student's visa could naturalize via marriage before enrolling for their first U.S. degrees. For those on an adjusted trajectory, the risk of over-identification is even higher, as dependent children and spouses could naturalize as soon as their family members do. Further, as SESTAT only asks about the year in which a degree is granted, and not when the respondents start enrolling in school to pursue that degree. This exacerbates the uncertainty in mapping the time of transitioning to LPR status and the start of one's education.

To overcome these limitations, I generated a "typical duration" for each degree type. This

[7] As an aside, other studies focusing on time-sensitive information such as wages used a random selection mechanism to select one observation out of the multiple responses, e.g., see Sassler et al. 2017.

typical duration is estimated as 5 years for Bachelor's degrees, 3 years for Master's degrees, 8 years for Doctorate and Professional degree, and 4 years for High school and Other degrees. These numbers are estimated based on the average time to completion for each degree type in the United States (National Center of Education Statistics 2014; Sykes 2011). If a naturalized citizen entered with a student's visa and completed their first U.S. degree within this typical duration, they are flagged as student-stayers. Otherwise, they are not flagged as stayers.[8] For LPR respondents, the typical duration is used to calculate a start-year for their first U.S. degree. LPR respondents who obtain LPR status before the calculated start-year will also be dropped from the sample. Importantly, using typical duration as a condition for identification errs on the conservative side, as I will likely underestimate the number of student-stayers by dropping those who take a longer time to complete their first U.S. degree. In the reverse direction, those who complete their degree sooner (e.g., one or two years) could not complete the lengthy LPR and naturalization process within that timeframe. As such, overestimation is unlikely.

Specifically, I identify stayers as those who enter with a student's visa and those who enter with other temporary visa but acquiring U.S. degree(s) while on temporary status. I use five variables to identify student-stayers in the SESTAT sample. First, to capture individuals who enter the United States with a temporary visa status, I use a variable indicating type of the first visa, which distinguishes between student's visa, temporary work visa, and temporary dependent visa (e.g., F-2 visas are for dependent spouse or children of a F-1 student's visa-holder). Second, using a set of variables capturing the location (us or non-us location) of the schools granting the respondent's various degrees, I determine if the respondent ever obtained a U.S. degree (including high school). Third, with respects to the missing time of naturalization and missing degree start time, which I discussed in the earlier paragraph, I use three additional variables to filter out stayers who do not fit the typical duration condition: (1) current immigration status; (2) timing of LPR transition and (3) the duration between first entry and completion of first U.S. degree. Naturalized respondents who took more years than the typical degree to obtain their first U.S. degrees are dropped from the sample. For LPR respondents, those who become LPR before finishing their first U.S. degrees are also dropped from the sample.

I identified student-stayers according to the three education trajectories, which I described in Section 2.3. "Common" stayers are those who enter with a student's visa and obtain at least one U.S. degree in the process. The typical duration condition, which I described earlier, is used to drop LPR and naturalized respondents who likely transition before starting school. For example, if a naturalized respondent reports taking 6 years between entry and completion of their first Bachelor's degree, they are dropped from the sample. If one is currently holding a

[8] I verified the accuracy of this identification strategy by checking with a different dataset, which is the restricted-use NSCG 2015 linked with the original ACS (only available in the Census Research Data Center). By linking the two surveys, I can link the ACS question on timing of naturalization to each respondent. I find that this strategy is mostly consistent, such that very few respondents are misidentified (such that they naturalize way before completing the first U.S. degree). The misidentification rate is lower than 0.05%. As the NSCG 2003-2013 and 2015 have the same set of questions and administration procedures; it provides some assurance that the use of typical duration is appropriate.

temporary visa, the typical duration condition is not necessary, because they must have completed school while on temporary status.

Respondents in the second group, "Circular" stayers also enter with a student's visa, but do not have any U.S. degree in their education history. Because they do not have U.S. qualification, the typical duration condition is not applied to this group. Finally, "Adjusted" stayers consist of respondents who enter with other temporary visas, including temporary work visa and dependent's visa. They have at least one U.S. degree, and the condition of typical degree duration is applied to drop certain naturalized and LPR respondents in this group, similar to the previous discussion of "Common" stayers.

3.3 Statistical analyses

With student-stayers in each of the three education trajectories identified, I perform two sets of analyses to examine whether and how entry cohorts and trajectories are related to permanent migration outcomes. I use logistic regressions to predict two outcomes: LPR status (relative to temporary status), and naturalization (relative to LPR status). As I have discussed earlier, the transitions across three statuses are inter-dependent, such that it is impossible for one to go from temporary visa to naturalized citizenship without spending some time as LPR. Therefore, it is only appropriate to contrast the relative outcomes in two separate analyses.

Following prior research on naturalization (e.g., see Yang 1984) I use logistic regression with the following form:

$$\ln\left(\frac{p_i}{1-p_i}\right) = \alpha + \beta_1 Cohort + \beta_2 Years\ since\ entry + \beta_x Trajectories + \beta_z Controls$$

where $\ln\left(\frac{p_i}{1-p_i}\right)$ represents the logged odds of becoming LPR or naturalized citizens, α is the intercept, $\beta_1$is the coefficient representing variations over entry cohorts, $\beta_2$is the coefficient representing variations over years since entry, $\beta_x$refers to the set of coefficients capturing the impact of different elements of education trajectories, including trajectory type, type of first U.S. degree, number of U.S. degree, β_z refers to the set of coefficients for the control variables.

Additionally, applying insights from research on age-period-cohort effect, I estimate an additional model that taps into variations over periods as an interaction term between entry cohort and years since entry (I have discussed this in details in Section 2.2). The interaction model takes the following form:

$$\ln\left(\frac{p_i}{1-p_i}\right) = \alpha + \beta_1 Cohort + \beta_2 Years\ since\ entry + \beta_3 Interaction + \beta_x Trajectories + \beta_z Controls$$

where there is one additional element, β_3, which reflects how the coefficient for years since entry further varies across different entry cohorts.

The analyses are performed on different samples. Models predicting LPR status are only performed on those eligible for LPR (i.e., excluding naturalized citizens, N=5,499). Similarly, in models predicting naturalization, I restricted my sample to people who are eligible for naturalization, i.e., those who hold a green card for at least 7 years (N=5,085). Models that

include characteristics of U.S. education, such as number of degrees and type of first U.S. degrees, only include stayers on the Common and Adjusted trajectories, thus resulting in smaller samples.

All models also include control variables that account for other key individual characteristics that might influence LPR and naturalization outcomes: gender, age at entry, educational achievement, and place of birth. All four control variables come from SESTAT data.

First, existing research on naturalization suggest that *age at entry* have a positive relationship with the propensity to naturalize, as those entering at a younger age might develop strong sense of belonging with the United States (Chiswick and Miller 2009; Van Hook et al. 2006; Yang 1994). Research has not examined how age of entry influences LPR status, but we might expect a similar relationship because LPR is a pre-condition for naturalization.

Second, prior research also indicates that patterns of Permanent migration are *gendered*, such that female immigrants are more likely to transition towards LPR and naturalization (e.g., see Yang 1994). In my models, I use a dummy variable for female respondents.

Third, *educational achievement* is an important factor that could influence LPR and naturalization outcomes. Education is an indicator of specialized skills, and as such, those with specialized degrees, such as Doctorate or Professional, are more desirable to the United States, and as such, they could access permanent migration more easily (Chiswick and Miller 2009; Jasso et al. 2010). I use a categorical variable indicating the respondent's highest degree to address this relationship.

Finally, *place of birth* is an important factor driving both LPR and naturalization outcomes. Previous studies have documented how the LPR backlogs are particularly long for certain origins countries, such as India and China (Jasso et al. 2010; Luthra 2009; Ruhs 2006). Naturalization outcomes also vary strongly by origins, such that immigrants from developed countries in Europe and Oceania are much less likely to naturalize (Bloemraad 2006b; Chiswick and Miller 2009). To control for this factor, I use a categorical variable for birthplace, which includes some countries which send large volume of immigrants (e.g., China, India, Mexico) and broad world regions (e.g., Europe).

4 Results

4.1 Types of student-stayers

Using the identification strategy described in Section 3.2 above, I identified 9,778 student-stayers in the SESTAT 2003-2013 database. Figure 3.1 displays the share of student-stayers among the United States foreign-born workforce in science, health, and engineering (SHE) fields. Overall, I estimated that slightly more than 23% are student-stayers. Among naturalized SHE workers, about 17% are stayers; and among LPR workers, stayers made up of 24%. The presence of student-stayers is largest among temporary SHE workers, accounting for nearly half of this group.

—FIGURE 3.1 HERE—

In Table 3.1 below, I show how this group is distributed across key characteristics. In 2003-2013, about 31% of the stayers have temporary visas, 27% have LPR status, and 42% are naturalized U.S. citizens. With respects to entry cohorts, a key independent variable in my analysis, it shows that stayers are quite evenly distributed across the four entry cohorts, with 30% in the pre-1986 cohort, 27% in the 1987-1996 cohort, 18% in the 1997-2002 cohort, and 25% in the post-2002 cohort. On average, stayers have been in the United States for about 16 years, and their average age at entry is 25 years old.

—TABLE 3.1 HERE—

Across education trajectories, 50% of student-stayers in SESTAT are on the "Common" trajectory, about 16% are "Adjusted" stayers, and 33% are "Circular" stayers. The majority of those who have U.S. qualification start with a Master's degree or a Bachelor's degree, which constitute 42% and 35% of the group, respectively. Close to one-third of U.S. educated stayers have multiple U.S. degrees.

Distributions of the control variables are consistent with research on the SHE workforce (Lan, Hale, and Rivers 2015; Sassler, Michelmore, and Smith 2017), for example, the majority of stayers are male (64%) and most have advanced degrees (66% have graduate degrees). India and China are countries that send the largest share of student-stayers, at 21% and 12%, respectively.

4.2 Models predicting LPR status

Do LPR outcomes vary by entry cohorts and education trajectories? I used logistic regressions to examine how entry cohorts, years since entry, and different elements of one's education trajectory are linked to different logged odds of obtaining LPR status, relative to temporary status. Results from these models are displayed in Table 3.2 below.

—TABLE 3.2 HERE —

As expected, Model 1 shows that entry cohorts have a large and significant effect, indicating that stayers in latter cohorts are much more likely to be retained with LPR status, compared to the pre-1986 cohort. Note that the coefficient sizes are quite dramatic: those in the 1987-1996 cohorts have about 1021% higher odds[9] of becoming LPR, those in the 1996-2002 cohort have about 765% higher odds,[10] and those in the post-2002 cohort have about 400% higher odds.[11] This result is not driven by small cells, as cross-tabulating entry cohorts by LPR outcome reveals that the smallest cell (those in the pre-1986 cohort who do not have LPR status) contains 70 individuals.

In Model 2, I add interaction effect between entry cohorts and years since entry as a way to understand "period effect," or the impact of historical policy changes are expressed differentially as the stayers spend more years in the United States (Keyes et al. 2010; Luo 2015; Ryder 1965). This alters the previous set of coefficients. In Model 2, entry cohorts assume a negative relationship with LPR outcomes, while the interaction effects between entry cohorts and

[9] 1021%=(11.21 – 1)*100
[10] 765%=(8.65 -1)*100
[11] 349%=(3.49-1)*100

years since entry are positive and significant. I show predicted margins in Figure 3 to help understand this interaction effect.

—FIGURE 3.2 HERE—

Figure 3.2 shows that the two cohorts entering the United States in 1997-2002 and post-2002 have much lower probability of being retained as LPRs, compared to the pre-1986 and the 1987-1996 cohorts, in the first 10 years since entry. However, the probability of LPR grows more sharply with each additional year in the United States for the 1997-2002 and post-2002 cohorts, compared to the pre-1986 cohort. The probability of becoming LPR approaches 1 at about 20 years since entry for the two most recent cohorts, while the same predicted probability is less than 0.8 for the pre-1986 cohort. This interactive relationship is consistent when Circular stayers, who do not have U.S. qualification, are excluded in Model 3. These results indicate some tendency to obtain LPR status quickly, possibly as a defensive measure, among stayers in more recent cohorts.

Turning our attention to variations over trajectories, results from Model 1 and 2 in Table 3.2 indicate that Circular stayers, compared to Common stayers, have 63% higher odds[12] of obtaining LPR status, net of other factors. This result is not stable, as it is only significant in the interactive model (Model 2) and not the additive model (Model 1). This relationship is contrary to my expectations in Section 2.2 which predict that Circular students would have the lowest odds of obtaining LPR status.

In Model 3, I restrict the sample to only U.S.-degree-holders, which means that Circular stayers are excluded. Model 3, like Model 2, also contain an interactive effect between entry cohorts and years since entry. Results in Model 3 indicate that U.S. education history explains some of the variation in LPR status. Stayers who start in Doctorate or Professional degree are much more likely to be retained as LPR (or=2.863, $p<0.05$). Having multiple U.S. degrees increases the odds of LPR status by about 63%. This partially supports my expectations in Section 2.3, such that those with more U.S. degrees are indeed having higher odds of obtaining LPR status. Contrary to my expectations, an early education trajectory which starts in high school does not make a difference to one's odds of obtaining LPR status.

4.3 Models predicting naturalization

To further examine whether and how naturalization outcomes vary across entry cohorts and education trajectories, I perform logistic regressions on a different sample of stayers who are eligible for naturalization. The results are displayed in Table 3.3. Note that for this analysis, I need to combine the most recent two cohorts into one (Post-1997), as the sample is restricted to respondents who have LPR status for at least 7 years, which means that very few in the post-2002 cohort can satisfy this condition.

—TABLE 3.3 HERE—

The results in Model 1, 2, and 3 indicate that differences in the odds of naturalization are not statistically significant across four entry cohorts. Years since entry have a significant

[12] 63%=(1.63-1)*100

relationship with naturalization outcome, as evidenced by the positive and statistically significant coefficient, where one additional year increases the odds of naturalization by about 8.4%.[13] The interaction effect between entry cohorts and years since entry, as shown in Model 2, is also not significant in Model 1 and 2. In Model 3, where the sample further excluded Circular stayers, the interaction effect between the post-1997 cohorts and years since entry is marginally significant at $p<0.1$. The effect can be interpreted as a negative relationship where every additional year since entry decreases the odds of naturalization for those in the post-1997 cohort by about 15.8%.[14] This thus provides some support for the expectations that an enforcement-focus policy regime makes new immigrants feel ambivalent about their values to the country (Bloemraad 2006), which then dampens their desire to naturalize.

With respects to education trajectories, Adjusted stayers are about 60% more likely to naturalize, compared to Common stayers. This result is robust across all model specifications, and it supports the expectation that Adjusted stayers are more likely to naturalize because of their existing connections (e.g., family members) with the United States.

In Model 3, the education history variables are included, and they do not matter much. Stayers who start with Doctorate or Professional degrees are less likely to naturalize, and stayers starting with high school or other degree are more likely to naturalize, although these relationships are marginally significant at $p<0.1$. These opposite relationships imply that those who start early (in U.S. high schools) cultivates a stronger sense of membership with the country than those who start at the most advanced degree. This interpretation lends support to the idea that education trajectories that cultivate more social connections with the United States will increase the probability of naturalization. However, having multiple U.S. degrees is not statistically significant for naturalization outcomes, and thus the expectation is only partially supported.

5 Discussions

In this paper, I consider long-term retention outcomes of international students in the United States and analyze how the status composition of stayers varies over entry cohorts and education trajectories. This effort provides important insights to how the broader policy structures implicitly sort stayers into different migration status (Chiswick and Miller 2009; Massey 2016; Massey and España 1987; Walsh 2011). At the same time, my exploration of education trajectories helps capturing some expressions of student's agency (Bakewell et al. 2012) in forging their own path to migration in the United States. Taken together, this effort lays the groundwork for future research as well as policy-makers to further dissect the patterns and consequences of long-term international student retention.

As I analyze the variations in LPR status across four entry cohorts, I find that the odds of obtaining LPR status are dependent on entry cohorts, such that student-stayers in latter cohorts are much more likely to become LPR. The interaction effect between entry cohorts and years

[13] 8.4%=(1.084-1)*100

[14] -15.8%=(0.842-1)*100

since entry, which is analogous to a "period effect" (Keyes et al. 2010; Luo 2015; Ryder 1965), further clarifies that length of stay matters differently for stayers in different entry cohorts. Among stayers in the post-2002 cohort, the probability of having LPR status approaches one (meaning that everyone has LPR status) at about 15 years since entry. In contrast, the predicted probability of having LPR is smaller than 0.8 at 15 years since entry for the pre-1986 cohort. This implies that having LPR status is possibly a prerequisite for staying among more recent cohorts of student-stayers. In contrast, perhaps as a function of entering in a less restrictive policy context, those in the pre-1986 cohort could develop social connections that allow them to be more open-ended about their migration statuses.

With respects to naturalization outcomes, the relationship described above does not materialize. There is no variation across cohorts of student-stayers in naturalization outcomes. The results indicate that only longer duration of stay, as expressed by more years since entry, significantly increases the odds of naturalization. Further, the interaction between entry cohorts and years since entry only has one marginally significant coefficient, such that stayers who came after 1997 are less likely to naturalize as they accumulate more years in the United States. Taken together, these findings refute the "defensive naturalization" expectation (Ong 2010). However, it is noteworthy that naturalization rate is quite high among this group, as about 80% of the sample have naturalized U.S. citizenships. Perhaps naturalization is more common among the population of scientists and engineers, who have established careers in the United States, and thus, policy changes do not make them much more likely to become U.S. citizens.

In addition to taping the effect of policy contexts with different measures of entry cohorts, years since entry, and an interactive "period" effect, I also explore the extent to which stayers have different education trajectories and consider if these variations in trajectories matter for LPR and naturalization outcomes. Among student-stayers identified in SESTAT, I identify three education trajectories, which I call Common, Circular, and Adjusted. Despite limited research about the uncommon trajectories, I estimate that Circular and Adjusted stayers contribute to close to half of all student-stayers in the United States' SHE workforce in 2003-2013. With respects to LPR and naturalization outcomes, I find that Circular stayers are more likely to have LPR status, relative to temporary status. This generates two related interpretations. First, the presence of Circular stayers and their higher odds of obtaining LPR, net of other factors, indicate that the United States policy environment favors Circular stayers, despite the fact that they do not have U.S. qualifications. Second, it also indicates that Circular stayers, due to their precarious link with the United States, need to anchor their stays with the LPR status. The broader implication of this finding is that it refutes the general wisdom that international students with U.S. degrees should be retained more (Hawthorne 2010; Obama 2014; Redden 2014; Robertson 2013). It means that the absent of a specific retention policies as well as the country's reliance on the market forces (i.e., through H1-B visas which are completely driven by employer's sponsorship) (Ruhs and Martin 2008) have produced an outcome opposite to the desire of policy-makers.

Additionally, I find that students' efforts to create more connections with the United States society, such as by undertaking an Adjusted trajectory, make them more likely to become naturalized U.S. citizens. The evidence at this point is mixed, for example, having multiple U.S. degrees increases one's odds of obtaining LPR status, but it does not influence the odds of naturalization. Keeping in mind that these two outcomes are estimated on two separate samples, this result still indicates that LPR status and naturalization are two different processes, wherein LPR status guarantees one's permanent stay and citizenship requires a strong commitment to become a fully-pledged member of the United States society. For this reasons, Adjusted students, who likely move with their family members, are more inclined to pledge allegiance via citizenship.

The work in this paper is limited in three areas. First, as it was only possible to study stayers and not those who have left, I have been careful to talk about "staying" as both a choice and a constraint, such that not all who desire to stay can do so. Second, data on visa history in this paper only provide limited view of the first and the last migration status of stayers. As such, it was not possible to consider other trajectories that diverge from education and employment, such as a trajectory that cross paths with marriage, which is documented among new immigrants in the United States (Jasso et al 2010). The uncommon education trajectories, particularly the Adjusted one, shed some light on the complex interaction of education, employment, and family, such that starting in dependent status (e.g., children or spouse) does not preclude their future values as immigrants: these stayers end up contributing to the United States science and engineering workforce. As such, this work fosters the understanding of long-term international student retention as a process that connects different spheres of one's life, not just education and work. Third, my effort to understand alternative education trajectories is limited by the lack of research in this area, such that it is not possible to generate much expectation in the statistical analysis. However, by showing that these trajectories do exists and estimating their sizable shares among student-stayers, my hope is that this would invite further research to flesh out the nuanced experiences of these students on uncommon paths.

In closing, I show one additional figure on the relationship between entry cohorts and education trajectories of student-stayers in the SESTAT 2003-2013 data. Figure 3.3 indicates that the relative share of Circular stayers has grown steadily in each subsequent cohort, and that Circular stayers are in fact the majority of stayers in the final cohort, post-2002.

—FIGURE 3.3 HERE—

I want to situate these estimates in the context of explosive growth in international student's enrollment in the past two decades in American universities and colleges (Ruiz 2014), which has been interpreted as the continued global prominence of U.S. higher education (Raghuram 2013) and the creation of a "future" immigrant workforce which are ready to be incorporated at any time (e.g., see Obama 2014; Redden 2014). Given Figure 3.3, there are possible gaps in these assumptions. The first is that explosive enrollments might not mean that students are more committed to U.S. education (e.g., they might not complete a degree and choose to go elsewhere). The second is that implicit selection through the market-driven H1-B visas coupled

with increasingly restrictive policy context could have conditioned new international students to expect a more circular and flexible path, rather than committing to making the United States their permanent homes. The implications of these two gaps is that if the policy context continues to move in its current (more restrictive) direction, the loss for U.S. higher education and skilled workforce would be even more pronounced as these uncommon trajectories remain under-studied.

Figure 3.1. Presence of student-stayers in the United States foreign-born SHE workforce, 2003-2013

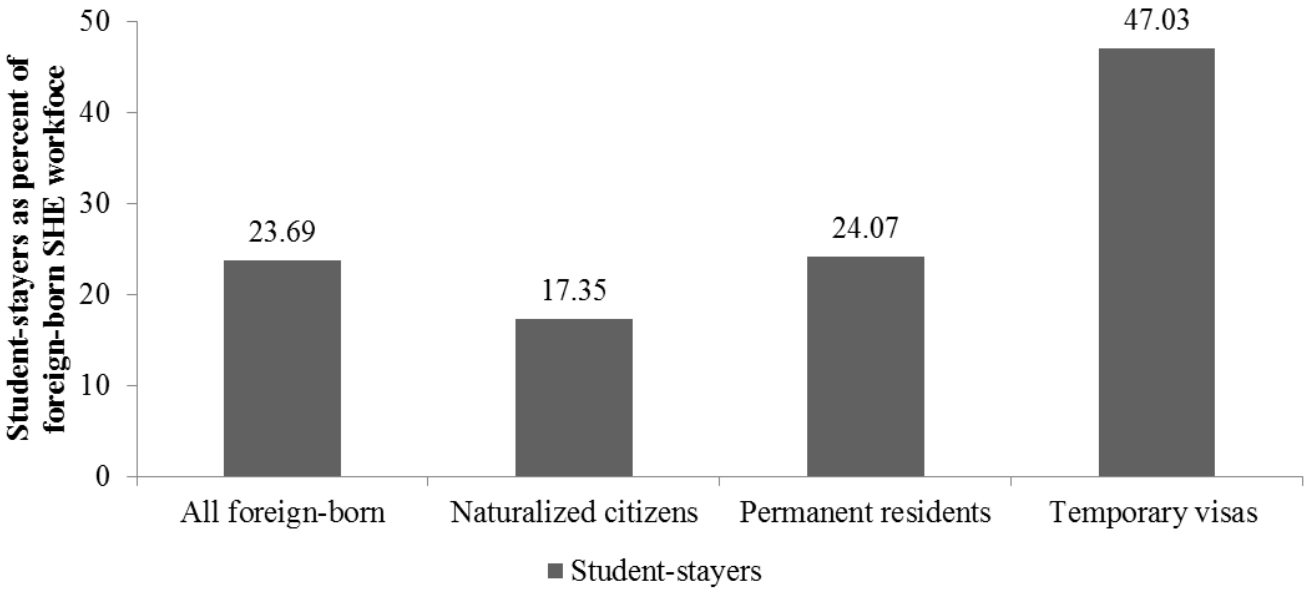

Figure 3.2. Predictive margins showing interaction effect of entry cohort and years since entry on LPR status

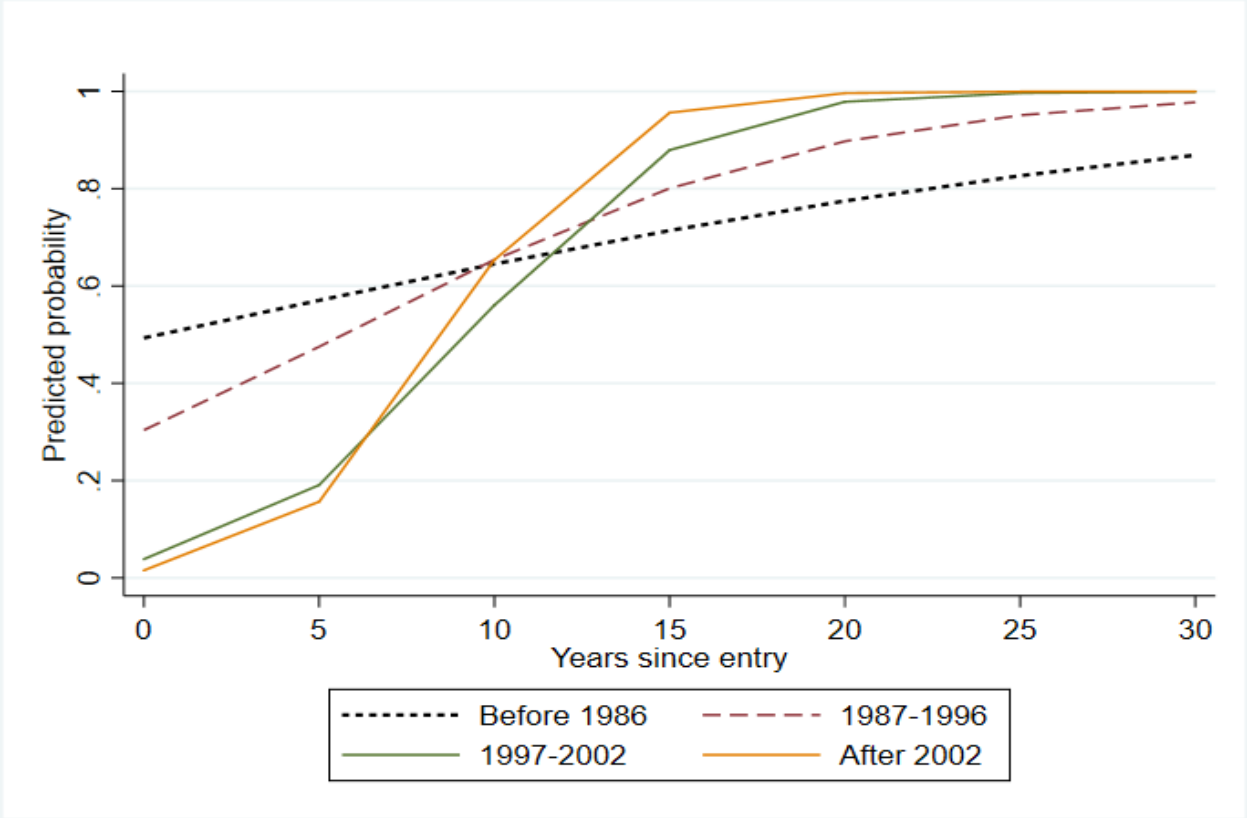

Figure 3.3 Types of student-stayers by entry cohorts

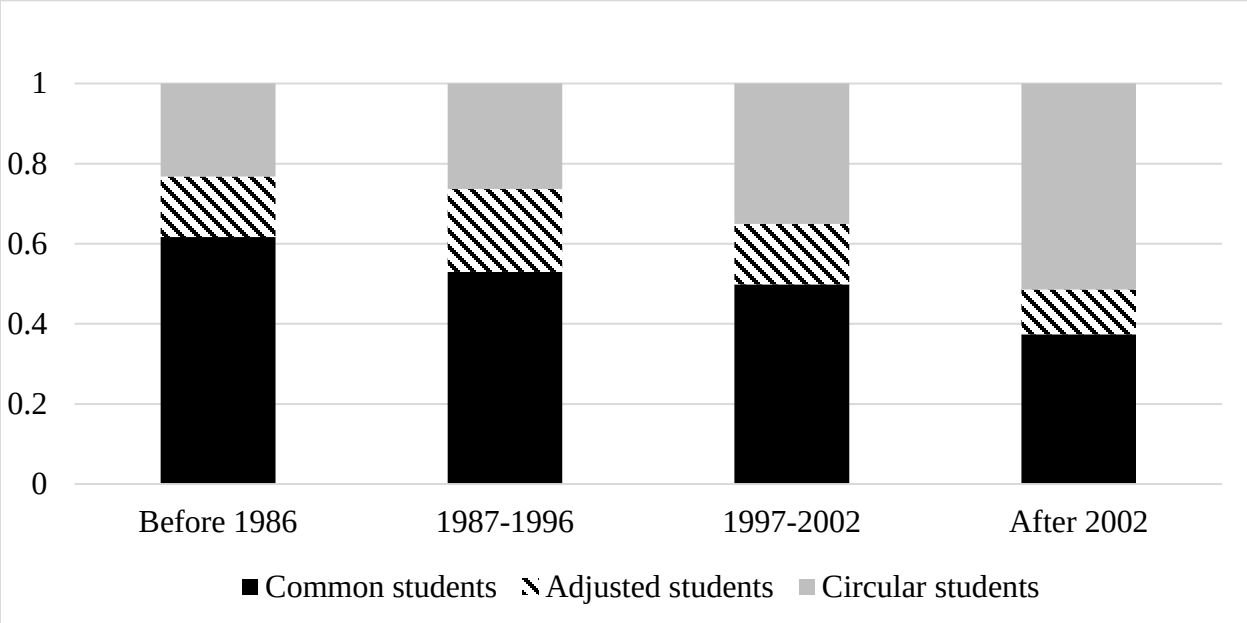

Table 3.1. Descriptive statistics of variables used in analysis

	All student-stayers			**Sample 1:** Temporary and LPR status			**Sample 2:** Naturalized citizens and stayers eligible for naturalization+		
	Mean/Prop	**S.D.**	**Note**	**Mean/Prop**	**S.D.**	**Note**	**Mean/Prop**	**S.D.**	**Note**
Migration status:									
Temporary visas	0.31			-			-		
LPR status	0.27			0.47			-		
Naturalized U.S. citizen	0.42			-			0.79		
Independent variables:									
Entry Cohort									
Pre-1986	0.30			0.09			0.54		
1987-1996	0.27			0.25			0.34		
1997-2002	0.18			0.25			0.11		
Post-2002	0.25			0.42			0.01		
Years since Entry	16.67	12.79		10.06	8.05		24.85	11.03	
Trajectory type									
Common	0.51			0.48			0.55		
Adjusted	0.16			0.13			0.19		
Circular	0.33			0.40			0.26		
First U.S. degree*			N=6,892			N=3,627			N=3,780
High School or Other	0.18			0.10			0.26		
Bachelor's	0.35			0.34			0.38		
Master's	0.42			0.50			0.33		
Doctorate or Professional	0.05			0.07			0.04		
Have more than one U.S. degree*	0.27		N=6,892	0.16		N=3,627	0.39		N=3,780
Control variables:									
Female	0.36			0.36			0.36		
Place of birth									
India	0.21			0.25			0.15		
China	0.12			0.13			0.10		
Mexico	0.02			0.02			0.02		
Philippines	0.03			0.02			0.04		
Europe	0.14			0.16			0.14		
Other Asia	0.27			0.23			0.30		
North America	0.04			0.04			0.05		
Other Latin America	0.11			0.09			0.12		

Africa	0.06		0.05		0.06
Oceania	0.01		0.01		0.01
Highest degree					
Bachelor's	0.34		0.33		0.36
Master's	0.45		0.46		0.43
Doctorate or Professional	0.21		0.20		0.21
Age at Entry	24.89	0.14	25.16	6.40	
Survey year					
2003	0.32		0.26		0.37
2010	0.34		0.37		0.31
2013	0.35		0.37		0.32
Number of observations	9,778		5,499		5,085

Notes: *denotes different sample sizes; + eligible individuals are those who have been in LPR status for at least 7 years; this similar to prior research on naturalization (e.g., see Jones-Correa 2001).

Table 3.2. Logistic regressions predicting LPR status (relative to temporary visas)

	All stayers		Only U.S.-degree holders
	Model 1	**Model 2**	**Model 3**
Entry cohort (Ref=Pre-1986)			
1987-1996	11.212***	0.403	0.58
	[4.971,25.289]	[0.065,2.491]	[0.077,4.381]
1996-2002	8.651***	0.030***	0.086*
	[2.970,25.201]	[0.005,0.186]	[0.011,0.693]
Post-2002	4.489*	0.011***	0.034**
	[1.018,19.789]	[0.002,0.081]	[0.003,0.339]
Years since entry	1.302***	1.073*	1.087*
	[1.223,1.387]	[1.007,1.143]	[1.012,1.167]
Entry cohort x Years since entry			
1987-1996 x Years since entry		1.100*	1.096+
		[1.014,1.194]	[1.000,1.202]
1997-2002 x Years since entry		1.364***	1.260***
		[1.238,1.503]	[1.130,1.406]
Post-2002 x Years since entry		1.570***	1.428***
		[1.402,1.758]	[1.236,1.650]
Trajectory type (Ref= Common)			
Adjusted	0.815	0.918	0.908
	[0.552,1.204]	[0.620,1.358]	[0.627,1.315]
Circular	1.256	1.631**	
	[0.929,1.698]	[1.185,2.245]	
First U.S. degree (Ref=Bachelor's)			
High school and Other			1.32
			[0.766,2.273]
Master's			1.342
			[0.814,2.213]
Doctorate and Professional			2.863*
			[1.175,6.980]
More than one U.S. degrees			1.631*
<u>Control variables:</u>			
Female	1.271+	1.23	1.327+
	[0.995,1.623]	[0.954,1.587]	[0.985,1.787]
Place of birth (Ref=India)			
China	1.062	1.131	0.944
	[0.781,1.444]	[0.812,1.576]	[0.649,1.372]
Mexico	1.936	2.351+	1.743

	[0.862,4.350]	[0.995,5.557]	[0.571,5.321]
Philippines	0.587	0.477	0.54
	[0.238,1.452]	[0.193,1.179]	[0.161,1.814]
Europe	2.246***	2.281***	1.353
	[1.499,3.364]	[1.490,3.492]	[0.820,2.233]
Other Asia	1.116	1.243	1.138
	[0.811,1.536]	[0.893,1.730]	[0.774,1.674]
North America	1.582+	1.899*	1.898+
	[0.938,2.666]	[1.098,3.285]	[0.978,3.682]
Other Latin America	1.563+	1.587+	1.303
	[0.997,2.451]	[0.995,2.531]	[0.720,2.358]
Africa	2.668**	3.024***	2.413*
	[1.430,4.978]	[1.621,5.640]	[1.170,4.976]
Oceania	0.986	0.75	0.28
	[0.194,5.009]	[0.149,3.786]	[0.032,2.406]
Highest degree (Ref= Bachelor's)			
Master's	0.847	0.854	0.734
	[0.620,1.157]	[0.623,1.172]	[0.442,1.221]
Doctorate or Professional	0.767	0.688*	0.314**
	[0.541,1.088]	[0.479,0.989]	[0.146,0.679]
Age at entry	1.079***	1.079***	1.063***
	[1.052,1.108]	[1.051,1.108]	[1.035,1.091]
Survey year (Ref=2003)			
Survey 2010	1.002	1.229	1.025
	[0.611,1.641]	[0.735,2.056]	[0.565,1.860]
Survey 2013	0.71	0.622	0.587
	[0.376,1.338]	[0.335,1.156]	[0.287,1.202]
Observations	5,499	5,499	3,627

Exponentiated coefficients; 95% confidence intervals in brackets

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3.3. Logistic regressions predicting naturalized citizenship (relative to LPR status)

	All former students		**Only U.S.-degree holders**
	Model 1	**Model 2**	**Model 3**
Entry cohort (Ref=Pre-1986)			

1987-1996	0.997	1.038	0.801
	[0.617,1.610]	[0.617,1.747]	[0.446,1.441]
Post-1997	1.353	0.872	0.281
	[0.636,2.880]	[0.185,4.112]	[0.054,1.468]
Years since entry	1.084***	1.085***	1.066***
	[1.055,1.114]	[1.055,1.115]	[1.036,1.096]
Entry cohort x Years since entry			
1987-1996 x Years since entry		1.011	1.012
		[0.949,1.077]	[0.938,1.091]
Post-1997 x Years since entry		0.939	0.842+
		[0.780,1.131]	[0.689,1.029]
Trajectory type (Ref= Common)			
	1.781*	1.776*	1.557+
Adjusted	[1.093,2.902]	[1.089,2.897]	[0.934,2.596]
	1.005	0.991	
Circular	[0.676,1.494]	[0.668,1.470]	
First U.S. degree (Ref=Bachelor's)			
High school and Other			1.716+
			[0.944,3.121]
Master's			1.203
			[0.705,2.052]
Doctorate and Professional			0.297+
			[0.079,1.118]
More than one U.S. degrees			1.422
			[0.862,2.346]
<u>Control variables:</u>			
Female	1.124	1.143	1.249

	[0.814,1.553]	[0.830,1.574]	[0.867,1.799]
Place of birth (Ref=India)			
China	1.973*	1.964*	1.697
	[1.091,3.568]	[1.086,3.552]	[0.852,3.378]
Mexico	0.838	0.829	0.625
	[0.353,1.990]	[0.349,1.971]	[0.224,1.748]
Philippines	1.678	1.642	0.589
	[0.575,4.895]	[0.558,4.831]	[0.199,1.743]
Europe	0.617+	0.615+	0.501*
	[0.356,1.070]	[0.354,1.068]	[0.260,0.963]
Other Asia	1.297	1.277	1.403
	[0.760,2.214]	[0.747,2.181]	[0.778,2.530]
North America	0.297**	0.291**	0.238**
	[0.119,0.743]	[0.117,0.727]	[0.096,0.587]
Other Latin America	1.206	1.192	1.129
	[0.655,2.218]	[0.647,2.198]	[0.552,2.312]
Africa	1.206	1.159	0.917
	[0.552,2.636]	[0.536,2.508]	[0.402,2.090]
Oceania	0.135**	0.132**	0.324+
	[0.039,0.467]	[0.038,0.460]	[0.088,1.188]
Highest degree (Ref= Bachelor's)			
Master's	1.234	1.23	1.085
	[0.868,1.754]	[0.868,1.743]	[0.629,1.870]
Doctorate or Professional	1.197	1.207	1.476
	[0.738,1.942]	[0.743,1.960]	[0.640,3.406]
Age at entry	0.985	0.985	1.021
	[0.961,1.010]	[0.961,1.010]	[0.990,1.053]
Survey year (Ref=2003)			
Survey 2010	0.594**	0.568**	0.556*
	[0.401,0.882]	[0.376,0.858]	[0.354,0.873]
Survey 2013	0.742	0.719	0.791

	[0.465,1.184]	[0.412,1.255]	[0.431,1.455]
Observations	5,085	5,085	3,780

Exponentiated coefficients; 95% confidence intervals in brackets

$^{+}$ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

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