Boston College
Lynch School of Education and Human Development

Department of Educational Leadership and Higher Education

Center for International Higher Education

The Impact of Immigration Policy on STEM Degree Classification at US Universities: A Multiple Case Study in New England

Master's Thesis
By
Nicole Piechocki

Submitted in partial fulfillment
Of the requirements for the degree of
Master of Arts International Higher Education

May 2024

Abstract

Many academic departments at US higher education institutions have either recently begun to offer STEM-degree programs or have reclassified their traditionally non-STEM degree programs as STEM. It has been theorized that departments may do this to recruit F-1 student visa holders, who may be eligible to apply for two-year US work extensions after graduation after graduating from a STEM-designated degree program. However, this theory has not been studied at US higher education institutions. This quantitative study therefore explores the factors that have driven the creation or reclassification of STEM degree programs at six New England universities, focusing on the perceptions and observations of administrators. The findings show that currently-enrolled or recently-graduated F-1 students were most significant in influencing degree program reviews, although international student recruitment influenced and other institutional goals influenced this as well. Surveyed administrators reported that much of their time was spent ensuring compliance with US Department of Homeland Security regulations, which required significant time working with faculty and staff. The findings demonstrated that immigration policy may, by way of F-1 international students, influence academic decisions, suggesting a shift in the role academic faculty have in curriculum.

Table of Contents

List of Tables

List of Figures

Chapter 1: Introduction

In 2018, *Inside Higher Ed* reported that many economics departments at US universities had begun to make one of "the most bureaucratic of changes:" changing their formal degree classification from "45.0601: Economics, General" to "45.0603: Econometrics and Quantitative Economics" (Redden, para. 2). In many instances, these departments did not make any changes to their academic curriculum (Redden, 2018). Yet the new degree code (also known as the CIP code) made a crucial difference–increasing their international students' post-graduation work eligibility from one year to three.

Graduates of US higher education institutions (HEIs) with F-1 (Academic Student) nonimmigrant status are eligible to apply for up to twelve months of work authorization in their field after graduation through a benefit called Post-Completion Optional Practical Training or Post-OPT (ICE, n.d.-b; *Students in colleges, universities,* 2016;). When students graduate from a degree program listed on the US Department of Homeland Security's (DHS) Science, Technology, Engineering, and Mathematics (STEM) Designated Degree list, however, they become eligible to apply for an *additional* 24-month work authorization extension, known as the STEM OPT extension (US Department of Homeland Security, n.d.-c).

Multiple program directors reported to *Inside Higher Ed* that they had reclassified their previously non-STEM designated degree programs–Economics, for example–as DHS STEM Designated Degrees, such as Econometrics and Quantitative Economics, in order to improve the labor market outcomes for their F-1 students (Redden, 2018). In other instances, universities will petition for new degree programs to be added to the DHS STEM Designated degree list, leading Susan D'Agostino from *Inside Higher Ed* to ask, "Should Fine Arts and Communications

Qualify as STEM Degrees?" (2022). Many of these disciplines fall somewhere between science and the arts, but according to their program directors, they often require advanced mathematical knowledge (in the case of econometrics) or increasingly complex understanding of technological systems (as is the case with data visualization) (D'Agostino, 2022; Redden, 2018). Still, some commentators have accused these HEIs of using the promise of STEM OPT to increase international student enrollment. One scathing 2021 opinion piece from Bloomberg, for example, claims that US universities "have financial incentives to admit as many foreign students as possible" and therefore will work to ensure that "even majors like classics and art history and drama therapy qualify for the STEM extension" in order to satisfy their student consumers (Rosenthal).

Despite STEM OPT becoming something of a *cause célèbre* in recent years, there is scant academic literature on US F-1 student work authorization, and none examining how or why academic departments reclassify as STEM. Many scholars have demonstrated that HEIs may see international student recruitment as a tool to bolster declining enrollments (Aw, 2012; Stein & de Andreotti, 2015; Yang, 2019), but the potential role that F-1 students themselves may play in program creation or STEM reclassification has not been investigated before. As US HEIs increasingly create "applied," or "vocational" programs to address the changing labor market (Harada, 1994; Trow, 1973) and to compete with one another (DeWit, 2020; Dill, 2003) how sure can we be that F-1 students drive STEM reclassification? If international student influence is at the center of STEM degree classification, how does this influence current understandings of international student power within institutions (Bennett et al, 2023; Yang, 2019)? How does that fit into the larger conversations about academic quality assurance, marketization, and internationalization?

This study examines STEM degree reclassifications at six New England universities in order to better understand the factors influencing these curricular changes. In particular, this thesis is framed by the following research questions:

1. Who (or what) drives institutions or departments to reclassify their degree programs as STEM?
2. What role (if any) do F-1 students play in STEM reclassification?
3. What are the implications of STEM recategorization for HEIs?

The HEIs included in this study offer STEM-designated degree programs falling somewhere between traditional science and the humanities, including Business Analytics, Game Design, Architecture, Graphic Design, Finance, Mental Health Counseling, Digital Media, and Operations Management, among others. This study does not seek to determine whether or not these programs are STEM; rather, it examines what factors and mechanisms within these HEIs have led to these programs being classified as STEM. This is done with the goal of understanding what impact US Department of Homeland Security policy may have on academic curriculum and in organizational decision making on the departmental and institutional level.

Defining "International Student"

The term *international* is often "taken for granted and assumed to speak for itself," but as authors Rachel Brooks and Johanna Waters argue, it is a matter of debate what (and who) is considered to be "international" (2022). Mobile students, or those who cross international borders to study, similarly may be labeled as "international" as a differentiator from their domestic student peers (Brooks & Waters, 2022), often holding connotations of foreignness,

non-nativity, and otherness (Bennett et al., 2023). Because the term *international student* is so amorphous and can refer to any number of individuals (including J-1 exchange visitors, Third Culture Kids, students who are undocumented, DACA students, or dependents of nonimmigrant visa holders), I use the term *F-1 student* when referring to individuals with student visas and *international student* when referring more broadly to students who have crossed borders to enroll in higher education. This is done not to reduce the experience or identities of these students to their visa or immigration category or to imply the sameness of all individuals in this visa category (Bennett et al, 2023); rather, this is done to chart how immigration policies impact this specific student population, and how HEIs may make changes to address this specific population as a result.

Chapter 2: Literature Review

The first part of this chapter explores the history of international student visa categories in the United States, followed by an examination of the policy documents and gray literature on F-1 international students. This is followed by a discussion of recent initiatives to increase Science, Technology, Engineering, and Mathematics (STEM) education in the United States, as well as how the STEM Optional Practical Training (OPT) extension was created to address the perceived shortage of skilled laborers from overseas. Together, this demonstrates how international students have been viewed as both threats to national security and essential to protecting economic and geopolitical interests.

The second half of the chapter reviews the extant academic literature on massification and marketization, particularly as they interact with internationalization and international student recruitment. It then concludes with a discussion of the factors that influence curriculum within

the academy. This includes a brief overview of the theory of institutional convergence. This literature suggests that as higher education institutions (HEIs) compete for funds and rankings, international student enrollment becomes the currency of prestige. Academic curriculum, traditionally solely the domain of professors and academic departments, may shift as HEIs adapt to meet various industry, governmental, or societal demands. HEIs, as competitive organizations, may also adapt to mimic the practices of HEIs that are perceived as more successful.

Securitization of US International Education

To some extent, national security and US labor interests have always been at the heart of international student policy. In the 19th century, the US Secretary of State and, later, the US Secretary of the Treasury were responsible for administering the 1855 Passenger Act and the 1882 Chinese Exclusion Act, both of which were aimed at restricting immigration of "undesired alien groups" and foreign contract laborers (National Archives and Records Administration). However, both of these acts included special exemptions for students "or those proceeding to the United States from curiosity" who eventually intended to return to their home countries (Reeves, 2005, p. 16). In response to increased immigration to the United States in the early 20th century, Congress passed the 1906 Basic Naturalization Act to create the Bureau of Immigration and Naturalization (National Archives and Records Administration) which set uniform federal standards for naturalization (*Origins of the Federal Naturalization Service*, 2019). The Naturalization Act also upheld previously established standards of "racial eligibility" for citizenship, specifying that whiteness was a prerequisite for naturalization (Smith, 2002, para. 14). At the same time, Ellis Island immigration officials were instructed to note immigrants' national origin as it was believed this would determine where they would settle and the work

they would do in their new home country (Smith, 2002). Because of these implications for labor and industry, the Bureau would eventually become a division under the US Department of Labor (DOL) (National Archives and Records Administration). Again, even as US immigration policies restricted the admittance of "undesirable" immigrants, advocates sought to reduce the restrictions placed on students–often recognizing that they sought education to assist in the development of their home countries (Reeves, 2005). In 1921, the newly-created Institute of International Education, a nonprofit organization, successfully lobbied for students to be classified as *nonimmigrants* under the 1917 Immigration Act, thus reducing their risk of detainment or removal when entering the United States (Reeves, 2005). International students have therefore always been set somewhat apart from other new arrivals precisely because they have been expected to be *temporary visitors* rather than *immigrants*.

As US immigration policies became more restrictive in this era, both rates of unlawful entry and legal appeals of immigration policies increased (USCIS, 2019). In 1933, the increasingly complex aspects of immigration policy, oversight, and function were consolidated under the Immigration and Naturalization Service (INS) (Office of the Inspector General, 2002). For the next 70 years, this newly-formed agency would be solely responsible for all aspects of student admittance, immigrant record supervision, and removal (Office of the Inspector General, 2002; USCIS, 2023). During the same period, the perceived value of American higher education also changed. There had always been students from abroad who wished to study in the United States, but beginning in the 1950s, some foreign governments sought to accelerate their national development by paying for certain select citizens to study abroad in the United States (Reeves, 2005). Federal policymakers in turn realized that US higher education could be a significant form of *soft power*, or a way to instill American values in future leaders of foreign global

powers. Other initiatives such as the Fulbright Program sought to not only promote cultural and intellectual exchange, but also to cement relationships between the United States and allied nations in the Cold War era (Reeves, 2005).

Attitudes toward the INS began to shift in the 1980s and 1990s as political tensions grew between the United States and Iran, Iraq, Libya, Sudan, and Syria–US Department of State (DOS) categorized state sponsors of terror (Timms & Noble Suhler, 1998). The INS had long conceded that it did not know how many international students were in the US at any given time, raising concerns that student visas could be used for acts of terror (Office of the Inspector General, 2002). These concerns were seemingly confirmed following the 1993 World Trade Center bombing, when federal authorities discovered that participant Eyad Ismoil had been residing in the United States with an expired student visa since 1989 (Timms & Noble Suhler, 1998). At the same time, US intelligence officials increasingly feared that US-educated international students from sanctioned countries could use their education for weapons development. Deputy Assistant Director of the FBI National Security Division Dale Watson said in 1998, “We’re not concerned with Iranian students who come here to study French history from 1840 to 1850, but we are concerned about Iranians who come here to study chemical, biological, or nuclear engineering” (Timm & Noble Suhler, 1998).

US immigration policy was therefore already shifting toward a securitization rationale by September 11, 2001, when 19 individuals affiliated with the pan-Islamist militant organization al-Qaeda carried out four coordinated terrorist attacks in three US states. Subsequent investigations revealed that Hani Hanjour, the pilot responsible for flying American Airlines Flight 77 into the US Department of Defense headquarters at the Pentagon, had entered the

United States with an F-1 student visa in December, 2000 (Staff Statement No. 1, 2004). At the time, the INS had been in the process of implementing a "biometric student ID card" for electronic student tracking, but by 2001, the process had been put on hold indefinitely (Staff Statement No. 1, 2004). When Hanjour failed to report to his English language school, the National Commission on Terrorist Attacks upon the United States found, "a student tracking system was far from available to immigration inspectors or agents" (Staff Statement No. 1, 2004).

The INS had long been viewed as inefficient, but following the September 11 attacks, F-1 students themselves came to be viewed as "part of the policy failure" (Reeves, 2005, p. 92). The Homeland Security Act was passed in the immediate aftermath, leading to the creation of the Department of Homeland Security (DHS) (USCIS, 2023). It also divided the responsibilities of INS between the newly-formed US Citizenship and Immigration Services (USCIS), US Customs and Border Protection (CBP), and US Immigration and Customs Enforcement (ICE), a division of DHS (USCIS, 2023). The Student & Exchange Visitor Program (SEVP) was also created in 2003 under the DHS National Security Investigations Division for nonimmigrant F-1 student monitoring (Office of the Inspector General, 2002). Thus the 20th century ended, oddly, much like it began, with increased restrictions on immigrants and foreign visitors and separation of the immigration service's expanded administrative scope and powers. However, it also signaled a period of unprecedented scrutiny, with new initiatives such as the electronic monitoring system (SEVIS) and fingerprinting casting "blanket suspicion" on all F-1 students (Reeves, 2005, p. 93).

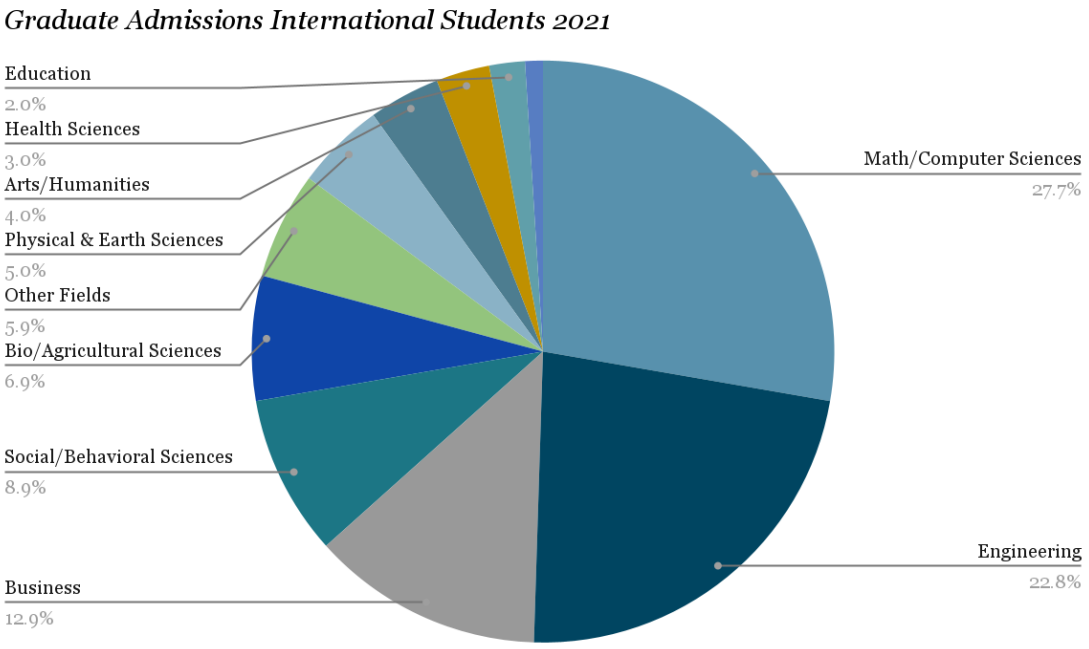
Profile of US F-1 students

The Homeland Security Act initially caused a decline in F-1 student enrollment, but by the mid-2000s, enrollment returned to and then exceeded pre-9/11 levels (Le & Gardner, 2010). Today, the United States enrolls more international students than any other country in the world, with 1.8 million F-1 students enrolled in January 2023 (*US foreign enrollment once again exceeds one million students*). Indeed, authors Tam Le and Susan K. Gardner report that international education was a $14 billion industry by 2007, making it one of the nation's biggest service sector exports (2010). That same year, F-1 students were awarded one third of all US doctoral degrees (Gonzalez & Kuenzi, 2012; Le & Gardner, 2010). Half of all postdoctorates in Economics, Computer Science, Engineering, and Physics were F-1 students (Gonzalez & Kuenzi, 2012), as were nearly 40 percent of all PhD candidates in all other STEM disciplines (Han & Appelbaum, 2016). Of these PhDs students, 69 percent were from China, India, Taiwan, or South Korea (Han & Appelbaum, 2016; Le & Gardner, 2010).

Nearly one third of all US F-1 graduate students as of 2024 are from China, (over 250,000 individuals), although those numbers are expected to soon be surpassed by Indian students, who applied for admission to US institutions (particularly Master's programs) in much larger numbers beginning in 2021 (Zhou, 2022). As Figure 1 demonstrates, nearly two thirds of all F-1 graduate students are enrolled in traditional STEM disciplines, particularly Mathematics & Computer Science and Engineering. However, Business programs and Social/Behavioral Sciences are growing in popularity, accounting for over 20 percent of all F-1 student enrollments.

F-1 students' choice of institutions and educational programs are primarily influenced by their friends and families (Peterson et al., 1999), although they also get much of their information on institutions and programs from university websites (Le & Gardner, 2010). These students almost universally report choosing to study in the United States because of its high-quality HEIs (Alberts & Hazen, 2005; Han & Appelbaum, 2016). Despite difficulties adapting to US cultural values (Alberts & Hazen, 2005), homesickness, and occasional financial hardship (Han &

Figure 1



Note. The data was collected from Zhou, E. (2022). (publication). *INTERNATIONAL GRADUATE APPLICATIONS AND ENROLLMENT: FALL 2021*. Council of Graduate Schools. Retrieved September 6, 2023, from https://cgsnet.org/wp-content/uploads/2022/09/CGS-International-Graduate-Applications-and-Enrollment-Fall-2021-2022.09.12.pdf.

Appelbaum, 2016), these students are often willing to overcome these challenges to finish their degrees in order to improve their professional opportunities.

While there is a persistent belief that F-1 students may use their status as a "springboard" to immigrate to the United States, numerous studies show that these students are often undecided about where they ultimately want to be (Alberts & Hazen, 2005; Han & Appelbaum, 2016; Le & Gardner, 2010). Xueying Han and Richard P. Appelbaum found in 2016 that half of all international STEM PhDs wanted to remain in the US after graduation, believing that compared to their home countries, they would earn a higher salary, have more career opportunities, and enjoy a better quality of life. Indeed, over three quarters of those surveyed either aspired to work for a specific American company or had ambitions to start their own. Likewise, F-1 students from various disciplines surveyed by Heike C. Alberts and Helen D. Hazen indicated their interest in working in the US for its perceived non-hierarchical professional environment and "state of the art" research facilities (2005, p. 141). Some reported that they would not be able to pursue their professional or educational interests in their home countries due to political censure or lack of sector development. Others were certain they would not remain in the United States permanently, but they did want to gain some US work experience to build a financial safety net and to expand their professional opportunities in their home countries (Alberts & Hazen, 2005). Perhaps as a result, international doctoral students nearly always report gravitating toward the advisors that they believe will help them find the best career opportunities (Le & Gardner, 2010).

Optional Practical Training and the H-1B Visa

There is no guaranteed path to work authorization or permanent residency for F-1 students under United States immigration law (Feeney et al., 2023; Yuan & Berliner, 2010).

Thus, while professional opportunities are at the forefront of most F-1 students' minds, whether they will be able to gain that experience in the United States after graduation is always unclear. The F-1 student status is a *nonimmigrant* category, and so a visa may only granted to a bonafide student maintaining a "residence in a foreign country which he has no intention of abandoning" and who seeks entry to the United States "solely" for the purpose of study (101(a)(15)(F)(i)). The nonimmigrant student category therefore does not allow for *dual intent*, or for students to apply for legal permanent residency (LPR) while also pursuing their studies. In their 2010 study on F-1 students from China, authors Kun Yan and David C. Berliner note that the lack of dual intent possibility may put some students in the position of "pretend[ing] to be…in the United States only temporarily to pursue their advanced degrees," even while they may "secretly want to remain in the United States after their graduation and find a way, though it is not guaranteed, to acquire permanent resident status or US citizenship" (2010, p. 182).

Work opportunities for F-1 students are extremely limited, but the INA has long recognized graduates' rights "to complement their classroom studies with a limited period of post-coursework Optional Practical Training (OPT)" (Washington Alliance of Technology Workers, 2022). OPT allows graduates from SEVP-certified universities, colleges, conservatories, or seminaries to request twelve months of temporary work experience from USCIS (ICE, n.d.-b; *Students in colleges, universities,* 2016). When students use this period of OPT after graduating from their program (as opposed to during their program, such as for summer internships) it is referred to as Post-Completion OPT or Post-OPT. Students are only eligible for twelve months of OPT *per degree level*; they cannot, therefore, continue to enroll in degree programs at the same level and apply for temporary work using the OPT period

indefinitely. OPT is therefore a short-term work experience opportunity connected to a degree program, rather than a path toward immigration.

Despite the limited nature of the Post-OPT period, students can use that period to build relationships with US employers who may be willing to sponsor them for longer-term work authorization. There are several temporary employment categories, but the one most commonly used to hire F-1 students graduates is the H-1B status: a three-year period of work authorization for individuals in certain specialty occupations (USCIS, n.d.-b). Specialty occupations, according to INA, are those requiring both a "theoretical and practical application of a body of highly specialized knowledge," typically requiring bachelor's degree or higher (USCIS, n.d.-b). The H-1B visa status also carries with it the possibility of an additional three-year extension.

Although H-1B visa holders are not required to work in STEM fields or for STEM employers, the category has historically been "closely associated" with STEM (Wasem, 2012, p. 8). Of individuals approved for the H-1B in 2010, for example, nearly half worked in computer related disciplines, particularly in the computer system design industry (Wasem, 2012). Unlike other nonimmigrant categories, the H-1B status allows for dual-intent, giving recipients the opportunity to apply for Legal Permanent Residency (LPR) (USCIS, n.d.-c, p. 11). It therefore creates a unique bridge between the immigrant and nonimmigrant visa categories, allowing US employers to hire workers for specialized, difficult-to-fill roles while also creating a path to permanent residency for individuals with unique and often technical skill sets (Wasem, 2012).

This is not to say that the process of sponsoring an F-1 student for the H-1B visa is a straightforward or simple process. Sponsoring US employers must first request DOL attestation that the individual has the requisite educational and laboral experience requirements for the

position (The H-1B Visa Program, 2023; Wasem, 2012). They must also file a Labor Condition Application to demonstrate that the employee will be paid " the greater of the actual wages paid to other employees in the same job or the prevailing wages for that occupation" (The H-1B Visa Program, 2023; Wasem, 2012, p. 9). In addition, employers must a) notify domestic employees of their intent to hire the nonimmigrant worker and b) demonstrate that there is no current employee strike or lockout (Wasem, 2012). If all conditions are met, then employers may enter their prospective employee in the annual H-1B Electronic Registration. Federal law mandates that only 65,000 H-1B visas may be granted each year (also known as the H-1B "cap"), although an additional 20,000 may be awarded to individuals who have earned a master's degree or higher from a US HEI. Because the number of registrants in the Electronic Registration Process far exceeds the number of visa statuses available each year, the system functions as a highly-selective lottery. HEIs and some nonprofit and governmental research organizations are not subject to this cap, and the number of individuals approved to work for these "cap exempt" employers has been growing since 1998 (Wasem, 2012). Still, the H-1B Electronic Registration Process has only become more selective over time. Of 780,884 total registrants in the H-1B lottery for the 2024 fiscal year, only 110,791 were selected–an approval rate of just 14.2 percent (USCIS, n.d.-b).

Failure to be selected in the H-1B lottery has consequences for both employers and potential employees. Each H-1B applicant who is not selected in the lottery represents a skilled position that ultimately will go unfilled–over 600,000 in the 2024 fiscal year alone. As such, the impact of the H-1B cap on US companies' productivity is enormous. Yet the failure to be selected in the H-1B lottery can also be devastating for would-be employees, who must work with an immigration attorney to find alternative options to lawful employment or begin making

plans to leave the United States. This can take an emotional toll on applicants, who often report feeling uncertain, depressed, or hopeless when not selected during the Electronic Registration Process (Wang, 2018). The H-1B visa category has therefore been criticized by both opponents of guest worker visas, who believe they displace domestic workers, as well as corporate technology leaders, who feel it does not do enough to address tech labor shortages (Chiappari & Paparelli, 2008).

Science, Technology, Engineering, and Mathematics

The Push for STEM

Concerns about a Science, Technology, Engineering, or Mathematics (STEM) labor shortage–and, by extension, the perceived inadequacy of US STEM education–have been growing for decades. US research universities were at the forefront of scientific and technological development during the Cold War era (Douglass, 2021), with the perceived superiority of US scientific education and research going largely unchallenged (Suter & Camili, 2018). That changed with the 1983 publication of *A Nation at Risk*, a policy report produced by the National Commission on Excellence in Education on the quality of US K-12 STEM education. On 19 international STEM proficiency tests administered in industrialized nations, the commission of experts wrote, US students never scored first and, on seven exams, actually ranked last. The clear implication was that US students were underprepared for the skilled labor that would allow the United States to maintain its dominance in the global knowledge economy. The Commission did not hesitate to frame this as a matter of national security, writing, “If an unfriendly foreign power had attempted to impose on America the mediocre educational performance that exists today, we might well have viewed it as an act of war.” While the

evaluation methods and conclusions drawn from *A Nation at Risk* have since been heavily criticized, the report marked a turning point in US education policy, most significantly increasing the funding available for the National Science Foundation (NSF) for both academic research and educational initiatives (Suter & Camili, 2018).

This topic was revisited by the National Academies of Science in *Rising Above the Gathering Storm* (2007) and *Rising Above the Gathering Storm, Revisited* (2010), which both concluded that US students' low rates of enrollment and retention in postsecondary STEM programs compared to other industrialized nations constituted a "Category 5 storm warning" (Suter & Camili, 2018, p. 54; Xue and Larson, 2015). These reports primarily focused on K-12 STEM education, but they also warned that poor STEM education in the early grades created a leaking pipeline of postsecondary students and workers equipped for the knowledge-based technology roles needed for the nation to maintain its global economic competitiveness. These claims were further bolstered when then-President Barack Obama's Council of Advisors on Science and Technology estimated that the US would need to increase its yearly production of undergraduate STEM degrees by 34 percent to meet labor market demand (Xue and Larson, 2012). Thus STEM initiatives, like international education, have often been interwoven with US national security rationales, reflecting policymakers' desires not to cede global political or economic power to other nations.

What is STEM?

The STEM acronym, first coined in the 1990s, is today often used as a catchall term for quantitative disciplines. Despite its ubiquity, educators and policy experts have long warned that "[t]here is no generally accepted definition of what specific academic disciplines 'STEM'

encompasses" (Wasem, 2012, p. 2). Some policy analysts argue that STEM should refer to a set of processes and practices used to generate knowledge, such as use of the scientific research methods, which "transcend disciplinary lines" (Gonzalez & Kuenzi, 2012, p. 2). Yet STEM is more often used as a framework to administer programs and funding, and so the major STEM education agencies–the Department of Education (DOE), the NSF, and the Department of Health and Human Services--each define STEM using their own unique, discipline-specific criteria. The NSF, for example, officially only recognizes the so-called core sciences (technology, physical science, engineering, and mathematics) but also routinely funds research in psychology, political science, and economics (Gonzalez & Kuenzi, 2012, p. 2). By contrast, the DOE has recently begun to promote "STEM/CS" or "Science, Technology, Engineering, and Math, including Computer Science," which it deems necessary for the nation's "future leaders, neighbors, and workers" to "solve problems, make sense of information, and know how to gather and evaluate evidence to make decisions" (n.d.). As a result, there is no clear consensus within the US government about what STEM is or what the educational and professional outcomes for students should be.

STEM Labor Shortages and the STEM OPT Extension

Because there is no universally agreed-upon definition of STEM, it is impossible to say whether there is a STEM labor shortage. As Yi Xue and Richard C. Larson demonstrate in their 2015 study, employment rates vary constantly between industries and over time, with both demonstrable labor shortages and surpluses in various STEM industries at any given time. There is no proven correlation between students' STEM test scores and GDP growth, nor is there consensus on how a STEM labor shortage could impact the US economy (Gonzalez & Kuenzi,

2012). However, it is clear that the H-1B lottery system is "greatly oversubscribed," signifying that there has long been a demand for skilled workers exceeding the supply in at least some sectors (Extending Period, 2008). As US information technology companies such as Apple and IBM became multinational corporations in the 1990s and early 2000s, policy bodies such as the National Science Board (NSB) began to theorize that they would be increasingly reliant on "cross-national flows of highly trained specialists" (Suter & Camili, 2018, p. 59). Inability to hire these specialized workers in the US, the NSB argued, could result in these corporations moving high-wage divisions to other countries (Suter & Camili, 2018). During the same period, stakeholders in both the public and private sectors recognized that US Gross Domestic Product, while robust, would be unable to "match large, sustained increases [in Research & Development sectors] in China and other Asian economies" (Extending Period, 2008). The European Union, recognizing the growing need for highly skilled guest workers, introduced the Blue Card Network in 2007–a temporary work authorization program that, unlike the H-1B visa, guarantees work authorization for an unrestricted number of qualified workers within 90 days. This signaled to many US technology employers that the international talent pool–especially F-1 graduates of US universities–would be incentivized to seek alternative work opportunities in Asia and Europe (Extending Period, 2008).

Speaking before the House Committee on Science and Technology in March, 2008, then-Microsoft Chairman Bill Gates argued that if the H-1B visa process could not be reformed, then the period of Post-Completion OPT for F-1 students should be extended to "alleviate the crisis employers are facing" (Chiappari & Paparelli, 2008, p. 2). Similar reforms had been proposed to US Congress before, such as the Securing Knowledge, Innovation, and Leadership (SKIL) Act, which would have granted STEM graduates an OPT extension *and* allowed dual-intent.

However, Gates' testimony proved to be particularly salient. Seven months later, DHS introduced the STEM-OPT extension, or a 24-month OPT extension for F-1 students graduating from certain pre-selected degree programs (Chiappari & Paparelli, 2008). Officially, the extension was designed to serve the dual purpose of helping STEM graduates keep abreast of "fast-moving technological and scientific developments" (Washington Alliance of Technology Workers, 2022, p. 5) while also addressing the "competitive disadvantage faced by U.S. high-tech industries" (Extending Period, 2008).

Under the new rule, US employers would now be able to hire recent graduates for up to three years while also giving them the opportunity to register them in the H-1B Electronic Registration Process multiple years in a row, thus increasing their likelihood of approval (US Department of Homeland Security, n.d.-c). Graduates would be able to apply for the 24-month extension after completing their initial period of Post-OPT, and they could become eligible again after completing a degree program at a new educational level. This meant that students could theoretically earn multiple three-year periods of work authorization if they were to complete bachelor's, master's, and doctoral degrees, provided each was earned in a qualifying STEM discipline (US Department of Homeland Security, n.d.-c).

This represented a stunning expansion of work authorization for F-1 students, and it has proven to be a particularly popular benefit. Out of 1,095,299 total F-1 students and graduates in the United States in 2019 (*Number of F-1 students in the US hits all-time high*) 70,067 were working using the STEM OPT extension (USCIS, 2022). Yet the STEM Extension also came with a host of added restrictions. STEM graduates could only work for employers registered with DHS E-Verify, or those agreeing to track the employment authorization of *all* newly-hired

workers using the DHS online system (US Department of Homeland Security, n.d.-c). Workers on STEM OPT would still need to maintain their F-1 student status, and therefore would be viewed as trainees. This meant employers would need to complete training plans on the students' behalf and provide HEIs with annual evaluations on graduates' performance (US Department of Homeland Security, n.d.-b). The STEM OPT extension would not be a guaranteed benefit, but would require students to submit a new application requesting employment authorization to USCIS. Finally, only graduates with degrees in DHS-designated STEM disciplines would be eligible for the extension (US Department of Homeland Security, n.d-c).

The DHS STEM-Designated Degree List

DHS STEM Designated Degrees are differentiated based on their National Center for Educational Statistics (NCES) Classification of Instructional Program (CIP) codes (US Department of Homeland Security, n.d.-c). CIP codes were created in 1980 to define, categorize, standardize, and track degree programs at HEIs, primarily for consistent information reporting to other agencies such as the National Student Clearinghouse (IES, n.d.-d.). The NCES CIP taxonomy classifies degree programs using six-digit codes, with each containing a description of the educational program, its required coursework, and, occasionally, its intended graduate outcomes. For example, CIP code 40.0504 defines an *Organic Chemistry* degree as:

> A program that focuses on the scientific study of the properties and behavior of hydrocarbon compounds and their derivatives. Includes instruction in molecular conversion and synthesis, molecular synthesis and design, the molecular structure of living cells and systems, the mutual reactivity of organic and inorganic compounds in

> combination, the spectroscopic analysis of hydrocarbon compounds, and applications to specific problems in research, industry, and health. (IES, n.d.-a)

NCES explains CIP codes should be assigned based on a "set of structured learning experiences" leading to a certification, degree, or award (IES, 2020 p. 2). Instructional programs included on the CIP list must have "more than one isolated course" and "cannot be a haphazard collection of unrelated courses" (IES, 2020, p. 2). Otherwise, how CIP codes are assigned to degree programs is often left up to institutions themselves. Because CIP codes exist simply as descriptors of degree programs, there is no minimum threshold for a program to "qualify" for one beyond the NCES recommendation that it be for a degree-granting program consisting of related courses.

Degree programs that meet the criteria for the STEM OPT extension (also known as STEM-eligible programs) are published on the "DHS STEM Designated Degree Program List" (US Department of Homeland Security, n.d.-a). F-1 students graduating from programs in engineering, biological science, mathematics, and physical science are all eligible to apply for the STEM extension, as are many graduates in related fields such as research, technology, computer science, or other natural sciences. Stakeholders may also nominate new CIP codes for inclusion on the DHS STEM Designated Degree list (US Department of Homeland Security, n.d.-a). Importantly, however, not all traditional STEM programs are included in the degree list. Of the nearly 300 degree programs in the category "Health Professions and Related Programs," only 13 are included on the STEM degree list, including Pharmaceutical Sciences and Pharmacoeconomics (IES, n.d.; US Department of Homeland Security; n.d.-a). All areas of Dentistry, Medicine, Optometry, and Nursing are excluded–as are their affiliated residency programs (IES, n.d.; US Department of Homeland Security; n.d.-a).

DHS states that its definition of STEM draws on the NCES framework, which they claim defines STEM as an academic program in mathematics, chemistry, physics, computer science, information sciences, or engineering (Gonzalez & Kuenzi, 2012; US Department of Homeland Security, n.d.-a;). However, NCES clarifies on its own website:

> There is not a single unified definition of STEM used throughout the Federal government…STEM definitions vary from agency to agency and sometimes within an agency. Since there is such variation in how STEM is defined, NCES does not have a single definition…NCES does not have any authority or influence over what CIP Codes DHS defines as STEM for purposes of OPT. (IES, n.d.-c)

It is therefore unclear where the DHS STEM definition originated. In evaluating new degree programs for inclusion, SEVP writes that its adjudicators may solicit input from governmental, educational, and nonprofit entities to determine whether the program is "generally considered" to be STEM (Update to the Department, 2023). They may also review degree requirements at various HEIs to determine if the core aspects of the degrees are consistent across institutions (Update to the Department, 2023). This indicates that SEVP adjudicators do not make decisions in a vacuum, but will readily defer to the guidance of experts and external stakeholders. At the same time, the conflicting views of STEM itself may influence adjudicators' own perceptions of what is, and is not, STEM. Ultimately, DHS, despite not being an educational entity, exercises a significant level of discretion over what degree programs are ultimately included on its STEM Designated Degree List.

Massification, Marketization, and Internationalization

The following sections delve into the macro-level changes to the US higher education sector over the past five decades. In particular, I discuss how higher education's so-called "claimants to legitimacy" (Williams, 1995, p. 177) and financial austerity influence institutional practice.

Massification

The term *massification*–typically used to describe the practice of making luxury goods available to the mass market (Massification, n.d.)–was famously first applied to the higher education sector by sociologist Martin Trow in 1973 in reference to the growth in college and university enrollment in the post-war era. Trow noted that the number of students enrolled in HEIs in the United States and Western Europe doubled immediately after WWII, a trend that continued every decade through the 1970s (1973). This mass higher education, made possible by the post-war economic boom, was fueled by students' desires for upward mobility in the emerging post-industrial knowledge economy (Gumport et al., 1997; Trow, 1973). This in turn led institutions–and the sector itself–to expand to meet market demand (Trow, 1973). As higher education began to serve a more diverse student population, so too did student expectations for their institutions also change. By the 1970s, HEIs increasingly created new programs to prepare students for "specific technical elite roles" (Trow, 1973, p. 8). Within a few decades, the public perception of higher education changed tremendously. A university education, once available only for society's elite, became a rite of passage for the middle classes until, by the 1970s, it was a near-necessity in the post-industrial economy (Gumport et al., 1997).

These new, "professionalized" higher education systems were developed with the assumption of an ever-increasing resource base (Gumport et al., 1997, p. 8) A significant change occurred in the 1980s, when enrollment of 18-22 year old students began, for the first time, to decline (Gumport, 1997). As a labor-intensive, "productivity-immune" industry, costs in the higher education sector often outpace inflation, indicating that expenditures are often high and prone to increase rapidly (Johnstone, 2002, p. 19). As higher education enrollments decreased, costs to students, parents, and governments increased–reflecting a "paradoxical notion that a college education, while increasingly necessary, is also less economically rewarding" (Gumport et al., 1997, p. 27). Patricia Gumport et al. write that this caused HEIs to be seen as "wasteful in pursuit of their own, as opposed to the public's, agenda," contributing to declining political and financial support in the 1980s (1997, p. 23). As a result, HEIs were expected to be more accountable to student and public interests while funding for those very accountability measures was significantly reduced (Gumport et al, 1997).

Marketization and Internationalization

Just as public support for higher education dwindled, so too did higher education–traditionally viewed as a public good–increasingly come to be viewed as a *private* or *individual* good (Gumport et al., 1997). As students and parents were expected to shoulder a greater share of higher education's costs, they began to view the value of the degree in relation to the money spent versus the potential post-graduate wages (Dill, 2003; Gumport et al., 1997). Thus, the higher education sector's three so-called "claimants to legitimacy:" the public, students (or consumers), and the academic establishment–may increasingly impose conflicting values on their institutions or national systems (Williams, 1995, p. 177).

Public policy expert David D. Dill has called the US higher education system "the most market-oriented" in the world, noting that the competition for students, faculty, and funds has become "increasingly aggressive and global" (2003, p. 137). The rise of national and global ranking tables have cemented the association between *academic quality* and *reputation*, particularly in terms of global involvement (Hazelkorn, 2015; Scott, 2011). As public funding shrinks, HEIs may invest in their own reputation or prestige as a buffer against these market forces, often by mimicking other HEIs that excel in the global rankings (Dill, 2003). Such rankings focus primarily on "inputs," (Dill, 2003, p. 149), such as cross-border research collaborations, numbers of faculty members from other countries, and international student enrollment (Hazelkorn, 2015). This has caused the quality of HEIs to be inextricably tied to the extent of their international activity.

Internationalization has traditionally referred to "the process of integrating an international, intercultural, and global dimension into the purpose, functions…and delivery of higher education at the institutional and national levels" (Knight, 2008, p. xi), but it has since come to be characterized the HEIs' recruitment of a small, elite subset of students in order to advance in global rankings tables (De Wit, 2020). Indeed, education scholar Peter Scott argues that internationalization may be best conceptualized as "a market phenomenon, characterized by competition between nations and universities" (2011, p. 19). The most recent definition of internationalization proposed by Hans De Wit et al. (2015) now calls for the integration of international processes insofar as it improves the quality of education and research and makes meaningful contributions to society–reflecting their hopes for what internationalization *should* be, rather than what it often is.

Today, increasing international student enrollment is often one of the core features of many institutional and national internationalization strategies (Scott, 2011). International student enrollment is not just a proxy measure of prestige, though; international students are often full-pay students, and so their tuition dollars are often relied upon to supplement institutional overhead (Aw, 2012). Because 60 percent of international students enroll in just 170 institutions annually, global academic recruitment is highly competitive–especially as more European and Asian universities continue to rise in the global rankings (Aw, 2012).

HEIs may view international students as critical to their own survival, but this does not always translate into additional student care or support. Authors Sharon Stein and Vanessa Oliveira de Andreotti note that international students are often viewed as "cash…charity…[or] competitors;" that is, as sources of revenue for Western universities, as "objects" in need of Western knowledge to aid development in their own countries, or as potential competitors who will help their home countries advance in the global knowledge economy–potentially at the expense of the host country (2015, p. 230). One might expect international students, as fee-paying consumers, to have an additional degree of institutional power and influence, but in practice, their experience adjusting to the host culture context is often described as "uncertain, vulnerable, and de-powered" (Yang, 2019, p. 520). More recent international education scholarship has consequently employed a human rights or justice/equity lens to critically examine the political and ethical responsibilities that HEIs have to their international students (Yang, 2019). One example of this lens being applied to educational practice is the engagement of international Students as Partners (SaP)--that is, not merely *including* international student voices in decision making processes, but utilizing them "as genuine contributors to all aspects of university life" (Green, 2018, p. 4). While projects using SaP may not always be successful in

deconstructing "entrenched practice architectures," they can highlight student expertise and challenge traditional assumptions about the primacy of faculty or staff knowledge (Green, 2018, p. 24). Within the context of international education, the justice/equity lens is most commonly used to critically examine institutional practices such as high tuition fees or the use of English language proficiency tests in admissions. The lens has not yet been applied to research on the interaction between institutional practice and F-1 students' statuses as nonimmigrants and as potential workers in the global knowledge economy, presenting a promising new direction for research within the international higher education field.

Curriculum and Institutional Behavior

Curriculum, according to Bastedo, serves as an indicator for society's expectations for higher education (2016). US higher education is significantly influenced by the German and British higher education models (Austin & Jones, 2016) which traditionally have emphasized a "strong professoriate" (Anderson, 2016, p. 3) and academic free inquiry (Anderson, 2016-a., p. 2). For that reason, curriculum changes have historically originated with academics, as:

> researchers themselves established new modes of inquiry…[Today, t]he curriculum itself signifies changes in the faculty's underlying assumptions about what counts as knowledge, what knowledge is most worthy of transmission, and what organizational forms are most appropriate. (Bastedo, 2016, p. 77)

Curriculum innovations have the power to expose students to new ideas and modes of learning that will best prepare them to advance knowledge or to be productive members of their society. This was evident in both the 19th century "subject parturition" movement, when disciplines such as chemistry or anthropology were differentiated and gained academic legitimacy (Bastedo,

2016, p. 68), and with the emergence of critical identity studies in the 1960's and 1970's (Trow, 1973, p. 17). Then, as today, university departments are directly responsible for curriculum creation, as well as other factors that affect its instruction, such as faculty workload distribution, hiring, mentoring, and consideration for tenure (Gardner et al, 2014).

At the same time, higher education curriculum has never been wholly separate from external interests (Geiger, 2016; Harada, 1994). The 1864 Morrill Land Grant Act created the first template for "multipurpose," professional research universities, with the expectation that these institutions would directly aid in state economic development (Geiger, 2016). Federal influence in higher education only grew after the launch of the Russian satellite Sputnik in 1957, spurring a demand for new research in the life sciences, physical sciences, and engineering (Gumport, 2016).

Still, the influence that external stakeholders have on the academic curriculum has grown in recent decades. Some of the most visible examples have been accreditors (Dill, 2010) and professional or regulatory organizations, which may act as gatekeepers to skilled professions such as social work or engineering (Harvey & Mason, 1995; Harris et al., 1994). Both set standards for curriculum design and delivery and for graduate outcomes, which in turn diminish some of the faculty's own historic power over the academic standards of their programs (Dill, 2010). Industry also plays a significant role in curriculum and research activity. This may happen directly, perhaps in the form of a corporate contract or research grant (Mendoza & Berger, 2008). More commonly, industry exerts its influence indirectly. Some scholars have connected higher education vocationalism to the increasing number of trustees from the private sector (Harada, 1994), who often take an active role in shaping the "educational vision" of their institutions

(Michael & Schwartz, 1999, p. 178). Other scholars note that student demand itself has caused curriculum to become increasingly "vocational" (Bastedo, 2016) or "applied" in focus (Harada, 1994) as students become more concerned with the "value add" of their educational experience (Trow, 1973, p. 13). This effect may become more noticeable as higher education shifts to serve older, working students seeking to "upskill" or remain competitive in a changing labor market (Bastedo, 2016).

The growing demands being placed on the curriculum may put additional pressures on academic departments. Faculty and department chairs are deeply affected by financial austerity, often feeling a personal responsibility to "stem the budgetary hemorrhage" at their HEIs (Gardner et al., 2014). This may include feeling pressure to "invest…considerable time and effort" in student recruitment and program creation, even while worrying that they do not have the resources to fully support them (Gardner et al, 2014). As a result, external market forces may find their way into the creation or delivery of the academic curriculum, despite the academic departments officially operating separately from the financial planning and admissions offices.

Theory of Convergence

Isomorphic change refers to increasing homogeneity or sameness between organizations (DiMaggio & Powell, 1983). At HEIs, this is typically mimetic (occurring when organizations mimic those that they perceive as being more successful, typically during periods of great uncertainty) or normative (resulting from professionalization in the sector) (DiMaggio & Powell, 1983). Both mimetic and normative isomorphism, as well as "organizational trial and error" and the frequent use of "best practice" have led to high degrees of convergence between higher education systems both within countries and globally (Regini, 2020, p. 103). This has been

characterized by a general "openness to the outside world," or increased interest in curriculum that reflects the changing knowledge economy and the embrace of corporate management models such as top-down decision making (Regini, 2020, p. 108). In analyzing HEIs, scholars should therefore expect to see high degrees of convergence, particularly in institutional management style and curricular innovation.

Summary

International students have frequently been at the center of the United States' own anxieties about its economic, political, and military position on the world stage. Yet F-1 students are relied upon to both support US HEIs and to perform skilled labor for some of the nation's most profitable industries. As a result, HEIs and immigration regulations have adapted to make the United States more attractive for internationally mobile students who might otherwise study or work in other countries. Academic literature suggests that HEIs may be increasingly susceptible to the pressures and influence of industry, students, and other institutions that they view as successful, which may change preconceived notions about curriculum and program offerings. Taken together, this demonstrates that many recent changes in the US higher education sector are both directly and indirectly influenced by securitization and global competition.

Chapter 3: Methodology

Research Questions

This study seeks to broaden scholarly understandings of the relationship that US Department of Homeland Security (DHS) policy and F-1 student recruitment have on the academic departments at higher education institutions (HEIs), particularly through Science, Technology, Engineering,

and Mathematics (STEM) coding and reclassification. As such, this inquiry was guided by the following questions:

1. Who (or what) drives institutions or departments to recategorize their degree programs to have STEM Classification of Instructional Programs (CIP) codes?
2. What role (if any) do F-1 students play in STEM recategorization?
3. What are the implications of STEM recategorization for HEIs?

The following section outlines the research methodology, including the research design, participant selection, interview protocol and data analysis, ethical considerations, trustworthiness, and positionality statement.

Research Design and Conceptual Framework

This study uses a qualitative approach to examine the perspectives and experiences of administrators at select US HEIs. Participants were chosen for inclusion in the study using "critical case" purposive sampling. In other words, selected individuals were those likely to have the greatest impact on knowledge development. This was done not to create a survey of how *all* HEIs operate, but rather, to delve deeper into a specific phenomenon that has been observed at certain select institutions (Creswell, 1998). Study participants were interviewed using a semi-structured interview protocol. Transcripts of completed interviews were analyzed and annotated to develop codes which were then grouped into themes.

Anselm Strauss and Juliet Corbin describe *grounded theory* as the allowance of theory to emerge from data, rather than beginning the research process with a theory in mind (1998, p. 12;

Bowen, 2006). As a result, "data is more likely to resemble the 'reality' than is theory derived by putting together a series of concepts based on experience or solely through speculation" (Strauss & Corbin, 1998, p. 12). However, social researchers also recognize that *sensitizing concepts* can provide points of reference and background guidance to use as starting points for analysis (Bowen, 2006; Charmaz, 2006). Therefore, this study draws on grounded theory in that participant interviews were analyzed and coded in order to identify themes without preconceived theories in mind. At the same time, the study was guided by the sensitizing concepts of *competition*, *securitization, internationalization*, and *convergence*.

Participant Selection

Target participants were registrars, STEM graduate program directors, institutional researchers, and/or Primary Designated School Officials (PDSOs)[1] at Student & Exchange Visitor Program (SEVP)-certified four-year colleges or universities, as these individuals were most likely to be involved in or to have direct knowledge of the CIP code reclassification process at their institutions or within select programs. For reasons of feasibility, only institutions in Massachusetts, New Hampshire, and Rhode Island were included for analysis. Only SEVP-certified institutions are authorized to enroll full-time F-1 students; hence, non-SEVP-certified institutions were excluded from the pool of eligible institutions.

HEIs within the three-state geographical area were identified based on the following criteria:

[1] Designated School Officials (DSOs) are F-1 student advisors responsible for information reporting in the DHS Student & Exchange Visitor Information System (SEVIS); PDSOs may nominate DSOs for their institution and typically serve as directors for their institution's F-1 student Office.

1. The institution had publicly-available articles or materials stating which of their programs were STEM-designated, and
2. The institution offered at least one STEM-designated program with a CIP code that fell outside the traditional STEM-fields (engineering, biological sciences, mathematics, and physical sciences) in the National Center for Education Statistics (NCES) CIP Code Taxonomy.

An initial Google search yielded 19 institutions in the target geographical area meeting this criterion. In an effort to gather information from institutions with varying program offerings and institutional missions, 16 individuals at ten HEIs were identified based on publicly-available information on institutional websites and emailed with an invitation to participate in the study. As will be discussed in the Findings section, no two institutions follow exactly the same process to review or reclassify CIP codes; therefore, it was not always possible to tell from the outside perspective which individuals would be able to discuss this process at their institutions. In some instances, eventual study participants had published blogs or articles about their institutions' STEM program initiatives on university websites. In other instances, a snowball sampling technique was used to identify potential study participants.

A total of seven participants from six private universities in Massachusetts and Rhode Island participated in the study (Table 1). They included three PDSOs, two registrars, one institutional researcher (speaking about their role at a previous institution), and one graduate programs director. These professionals' experience in their respective fields ranged from one to over 20 years. One participant, a high-level administrator who has lived in the United States for over thirty years, initially came to the US as an international undergraduate student.

The original intent of the study was not necessarily to examine private universities; however, only private universities in the target geographical area met the criteria established above. Possible explanations for this will be discussed in Chapter 6 of this study. Nevertheless, as Table 1 shows, the institutions were significantly varied in their institutional missions, numbers of enrolled F-1 students, and program offerings. Three HEIs were special-focus institutions, two were comprehensive R-1 research universities, and one was a liberal arts college with some graduate degrees. Academic programs that were discussed included Business Analytics, Interactive Media, Architecture, Cybersecurity and Criminal Justice, Mental Health Counseling, Digital Media, Graphic Design, Finance, and Operations Management. These were, for the most part, Master's programs (M.A., M.B.A., M.F.A., M.S.), although there was some limited discussion about bachelors programs.

Interview Protocol and Data Collection

Seven semi-structured interviews were conducted by phone and on Zoom between December 2023 and February 2024. Each 30- to 45-minute interview focused on participants' first-hand accounts of how CIP codes were assigned to certain academic programs, the factors that influenced those decisions, and their impacts. Each interview was transcribed using transcription software and then stored in a confidential secure server. Video and audio recordings of interviews were deleted immediately after transcription.

Data Analysis

In keeping with data analysis practices from grounded theory, transcripts of the interviews were analyzed and categories were identified and coded (Bowman, 2006; Chamaz, 2006; Strauss & Corbin, 1998). It was also noted whether target programs were newly created or

previously-existing programs that had undergone curriculum overhauls or reclassification. While particular note was made of sensitizing concepts when they appeared, certain anticipated themes such as *competition* and *convergence* did not appear nearly as much as expected. After the initial analysis, an axial coding technique was used to group codes into categories. These included *Pressure to Increase Enrollment*, *Alignment with Institutional Goals*, *Changing Industry Norms*, *Compliance*, *the Role of Faculty*, and *Student Satisfaction*.

Ethical Considerations

The research design for this master's thesis was approved by Boston College's Institutional Review Board (IRB). All participants read and signed a consent form and were made aware that they were able to stop participation at any point. Due to the sensitive nature of participants' interviews, both participant and institutional information was anonymized. Exact percentages of F-1 student enrollment have also been obscured to protect institutional and participant anonymity.

Trustworthiness and Limitations

Qualitative researchers ensure the trustworthiness of their findings by ensuring credibility, or establishing "how congruent…the findings [are] with reality" (Shenton, 2004, p. 64). Accordingly, the following practices were used to ensure credibility:

- Multiple individuals were interviewed as a way of triangulating data sources in order to compare and verify viewpoints and experiences, thus building a more detailed picture of the phenomenon;

Table 1
Participant Roles and Descriptions of Institutions

Institutional Descriptor	Number of Degree Seeking Students	Percentage of Student Population is F-1		Participant's Title
		Undergraduate	Graduate	
Profession-oriented teaching university	1,000-2,999	≥ 50%	≥ 50%	Primary Designated School Official (PDSO)
Fine arts university	1,000-2,999	25% - 49%	25% - 49%	Former VP Institutional Research
Special-focus doctoral university	3,000–9,999	10% -24%	≥ 50%	Primary Designated School Official (PDSO)
				Registrar
Comprehensive doctoral university	≥ 10,000	10% - 24%	10% - 24%	Associate Registrar
Comprehensive doctoral university	≥ 10,000	10% - 24%		Graduate Programs Director
Liberal arts college with graduate programs	3,000–9,999	≤ 9%	≤ 9%	Primary Designated School Official (PDSO)

Note. Institutional descriptors are drawn both from participants' own assessments as well as from institutional mission statements. Numbers of degree-seeking students from Carnegie Classification of Institutions of Higher Education. (n.d.-a). INSTITUTION SEARCH. https://carnegieclassifications.acenet.edu/institutions/

- Institution and participant information was anonymized in order to solicit honest, frank answers during the data collection process;
- A thick description of the research context is outlined in Chapter 4 of this study in order to convey the "real life" situations being investigated (Shenton, 2004).

Every effort was made to interview multiple individuals within the same institution in order to corroborate the data. With the exception of one institution, however, only one staff member at each institution was willing and able to participate in the research study. It must also be noted that participants' opinions reflect their beliefs and perceptions of their faculty, institutional leadership, and F-1 students, yet the direct observations of these groups have not been included in this study. Nevertheless, the findings show that the participants have direct knowledge of how each of the interested stakeholders together contribute to curriculum and institutional changes as they relate to STEM OPT. Because the participants were able to present a holistic view of the CIP code review and adoption process, I argue that it is acceptable to include only those key administrators in the present study.

Positionality Statement

I am a white, US-born Designated School Official/International Student Advisor at an HEI in Boston, MA. This study is partially informed by my professional experience in international higher education, although I have never been an F-1 student in the United States. While this study is primarily concerned with STEM OPT's impacts on US institutions, I recognize that the study could have implications for F-1 students as well. My goal in conducting this research is to draw attention to the rarely studied intersection between US immigration

policy and international higher education. This study should not be taken as a comprehensive exploration of how F-1 students interact with their HEIs and with STEM OPT; rather, my hope is that this serves as a starting point from which other scholars (including F-1 international student-scholars) can add additional research from the F-1 student perspective.

Chapter 4: Research Context

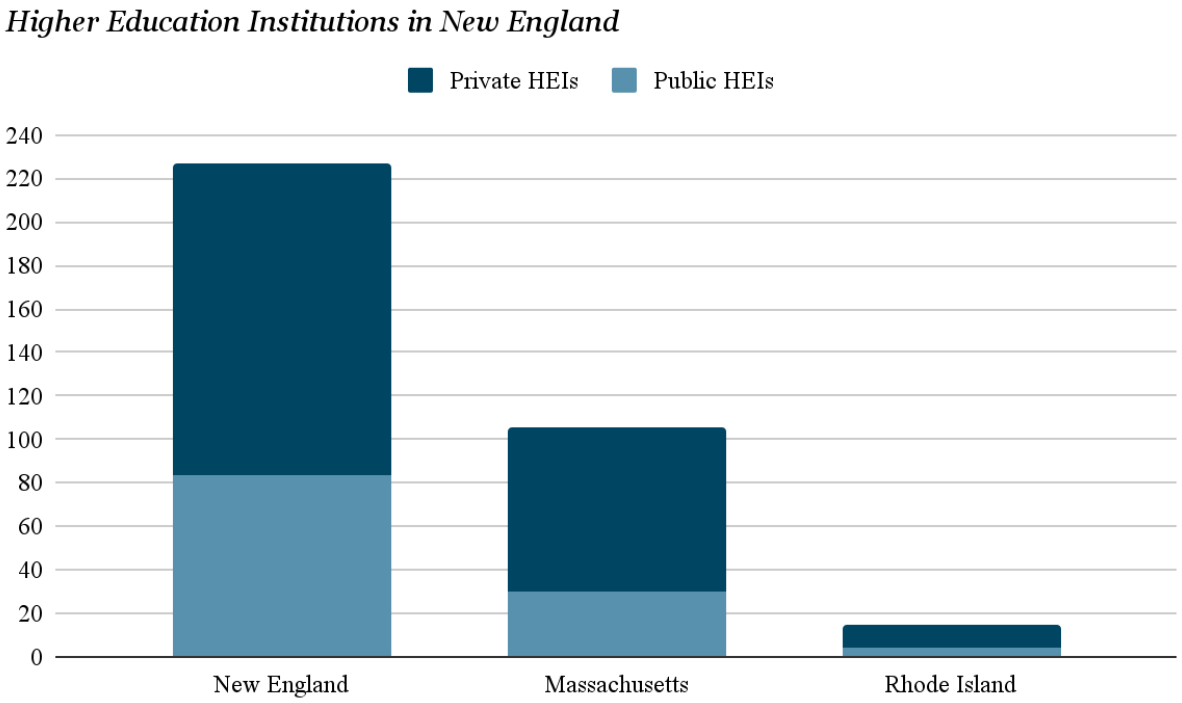
According to the Carnegie Classification of Institutions of Higher Education, 121 of New England's 227 HEIs are in Massachusetts and Rhode Island (Carnegie Classification, n.d.-a). Of these, 106 were in Massachusetts alone (Carnegie Classification, n.d.-a). Both Massachusetts and Rhode Island are home to a wide variety of higher education institutions (HEIs), including four Times Higher Education top 100 global universities (2023), 17 community colleges, 32 Research Doctoral Universities (nine R-1 Research Universities) (Carnegie Classification, n.d.-a), and several liberal arts colleges and special-focus art, business, and technology schools.[2] The vast majority of these HEIs are private institutions, as demonstrated in Figure 2 below, consistent with trends across the Eastern United States (Carnegie Classification, n.d.-a; Thelin, 2016).

According to historian John R. Thelin, colonial America's colleges and universities were founded with the goal of transplanting the "Oxford-Cambridge ideal" to New England, even if their operating practices and organization differed greatly from what existed in the Old World (2016, p. 37). The so-called "New England collegiate model" created the

[2] Due to discrepancies in use of the terms "liberal arts college" or "special-focus" institution, specific figures are not given here. Some respondents in this study applied these labels to their own institutions, while Carnegie Classification of Institutions of Higher Education or prominent global ranking tables do not classify them as such.

blueprint for other prestigious private colleges that were founded across the United States, such as Grinnell, Carleton, and Pomona. In the 19th century, the growing cost and selectivity of many private New England universities put them out of reach for most middle and working class families, reinforcing the notion that they served to educate the new American "aristocracy" (Thelin, 2016, p. 208). For those reasons, New England higher education has had a historic association with academic excellence, but also with prestige, wealth, and exclusivity.

Figure 2



Note. New England refers to the multi-state area of the Northeastern US comprising Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont. From Carnegie Classification of Institutions of Higher Education. (n.d.-a). INSTITUTION SEARCH. https://carnegieclassifications.acenet.edu/institutions/page/4/?inst&stabbr%5B0%5D=MA&stabbr%5B1%5D=RI

Massachusetts has an unusually high concentration of HEIs compared to other US states–all the more notable because more than half are private institutions operating independently from the state (Thelin, 2016). The majority of these HEIs are in the Boston metropolitan area, and over time, they have sought to establish niches for highly-specific constituencies in order to avoid direct competition with one another. This so-called Massachusetts Model has led to markedly high degrees of institutional differentiation, but according to Thelin, it has also meant that some of these HEIs must operate with great financial uncertainty (2016).

Both Massachusetts and Rhode Island HEIs also serve remarkably high numbers of non-local students. While this has long held true for the highly-selective "world class" universities and Ivy League (Brown University, 2024; Boston University, n.d.; Harvard University, n.d.; MIT, n.d.), this is also true for some inclusive public and private institutions (Gordon College, n.d.; University of Rhode Island, n.d.; Salve Regina University, 2021). For example, half of all students at the University of Rhode Island are from out of state, an intentional enrollment strategy employed to increase institutional revenue (Amaral, 2023; University of Rhode Island, n.d.).

About 15.5 percent of all students in Massachusetts in Rhode Island were F-1 student visa holders in the 2022-2023 school year, nearly 85,000 students altogether (US State Policies, 2023; *Student Population Comparison*, n.d.). Massachusetts is the fourth-largest receiving state for F-1 students, behind California, Texas, and New York (Martel et. al., 2023). However, the concentrations of F-1 students in Massachusetts and Rhode Island are higher than those found in California and Texas, as shown in Table 2. Indeed, a staggering 19.1 percent of all postsecondary students in Massachusetts are F-1 students, far outpacing the other top receiving states. Even in

Rhode Island, which has just under 60,000 postsecondary students, 8.1 percent of those are F-1 visa holders–nearly double the percentage in Texas (US State Policies, 2023). International student enrollment has also been growing in New England following the COVID-19 pandemic. During the 2022-2023 school year, F-1 student enrollment grew 16 percent in the area, driven almost entirely by HEIs in Massachusetts (Martel et al., 2023).

Table 2

Percentage of Post-Secondary F-1 Student Enrollment in Top Receiving States Plus Rhode Island

	Total Number of Students	Total Number of F-1 students	Percentage of Student population is F-1
California	2,737,000	138,393	**5.1%**
Massachusetts	418,000	79,751	**19.1%**
New York	1,192,000	126,782	**10.6%**
Rhode Island	59,000	4,786	**8.1%**
Texas	1,734,000	80,757	**4.7%**

Note. Data compiled from The Presidents' Alliance on Higher Education and Immigration. (2023, December 14). *U.S. state policies on DACA & Undocumented Students: Higher Ed Immigration Portal*. Higher Ed Immigration Portal. https://www.higheredimmigrationportal.org/states/

Summary

Higher education in Massachusetts and Rhode Island has traditionally been characterized by private, often highly exclusive HEIs, yet it would be more accurate to identify them as highly differentiated higher education systems with many institutions serving unique student populations. As these HEIs seek to avoid direct competition with their neighbors, they often expand their applicant pools to include students from other US states or countries. Compared to

destination states California, Texas, and New York, which host higher numbers of F-1 students each year, there are greater *concentrations* of F-1 students at Massachusetts and Rhode Island HEIs, suggesting that these students may have comparatively more visibility and, perhaps, influence on their campuses.

Chapter 5: Findings

This section includes a brief discussion of institutional Classification of Instructional Program (CIP) code review processes, as well as an analysis of whether degree programs were newly-created, reclassified without curricular changes, or reclassified with curricular changes. This is followed by an examination of the themes developed during the coding process, viz. *Pressure to Increase Enrollment, Alignment with Institutional Goals, Changing Industry Norms, Compliance, Role of Faculty,* and *Student Satisfaction.* While sensitizing concepts such as *competition* emerged over the course of the interviews, it was not nearly to the degree that was originally anticipated. This will also be discussed in greater detail later in the paper.

Program Creation v. Reclassification

Nearly all of the degree programs discussed during the interview process were previously-existing degree programs that underwent curriculum changes in order to receive Science, Technology, Engineering, and Mathematics (STEM)-designated CIP codes. One, a master's in Digital Media program, had recently become a standalone degree after previously being a concentration in a more traditional Journalism program. At two higher education institutions (HEIs), participants indicated that their academic departments were able to adopt STEM-designated CIP codes without making any curricular changes (Architecture, Graphic Design, Industrial Design, and Finance). At one HEI, as will be discussed later in this chapter,

programs were appropriately labeled as STEM without undergoing curricular changes, although its graduates are ineligible for the STEM Optional Practical Training (OPT) extension for other reasons. For the most part, however, the programs underwent some curricular change in order to be reclassified as STEM-eligible degree programs. This was particularly true of business programs, which often added new coursework in data analytics, statistics, finance, IT management, and/or coding and machine learning.

The CIP Code Reconfiguration Process

Over the course of the study, it became apparent that no two HEIs follow exactly the same process to review, amend, or reclassify their academic programs. Because the CIP code reclassification process often includes some element of curriculum change, the process at most HEIs was intertwined with curriculum review. These processes vary widely depending on the HEIs size, mission, and institutional culture. At one large comprehensive institution, the process of creating a new STEM degree program took two years and required review and approval from the academic department, curriculum review committee, university president, and board of trustees. By contrast, one participant at a small, specialized institution said that CIP code review and updates often took place through email exchanges between the registrar, international student office, and office of institutional research. At smaller institutions with embedded cultures of faculty governance, this process could entail convening a faculty committee for curriculum and CIP code review.

Two institutions did not have a curriculum review process. At one, a comprehensive research university, CIP code updates simply occur when a department chair or program director submits a request to the registrar's office. At another, a small, specialized institution, program

change was often a top-down process, although the international student office had been instrumental in ensuring STEM CIP code changes complied with US Department of Homeland Security (DHS) policy.

Comparison and Competition

There was surprisingly little discussion about how study participants felt their HEIs compared to others. This could be due to the high degrees of differentiation between HEIs in Massachusetts and Rhode Island. Notably, though, three participants directly mentioned Massachusetts Institute of Technology (MIT)–often in reference to their institutional leaders' desire to offer similar STEM-degree programs. This suggests that some New England HEIs do aspire to mimic the well-funded, highly-ranked Cambridge institution. However, these comments were often made in passing and were not central to conversations about STEM CIP code reclassification.

Benchmarking also did not figure into discussions about STEM reclassification as much as might be expected. Two participants indicated that benchmarking was a regular part of their curriculum review process, yet the process was wholly separate from CIP code review. Some participants commented on general trends in higher education course development (for example, noting that similar programs in other parts of the country had more tech or data focuses), but on the whole, institutional leaders seemed not to be comparing their HEIs to others during the CIP code reclassification process. When one institutional researcher's HEI began to discuss STEM reclassification for its Architecture program, for example, she explained that benchmarking simply wasn't possible:

> I said, "What are other people doing?" And it was so new, I think, and that's where we struggled with how there's no threshold for anything. So how do you make a case?..I think [the Director of the International Student Office] called a bunch of other places, art schools mostly, seeing what they were doing. But I think we were ahead of them in implementing this because we were responding to the student sort of needs.

The lack of threshold referred to here is the relative absence of guidance from DHS and NCES about the appropriate criteria institutions should use when assigning new CIP codes to degree programs. As scholarship from DiMaggio, Powell (1983), and Regini (2020) has shown, when HEIs innovate, it is often through professionalization and closer alignment with best practices within the sector. CIP code reclassification, by contrast, tends to be driven by factors external to the institutions' goals and strategic plan (as future sections will show). As a result, the HEIs discussed in this study appeared to review and reclassify their CIP codes with very little influence from other HEIs.

Changing Industry Norms

Changing industry norms, also surprisingly, were not significant drivers for STEM reclassification at the HEIs in this study. One notable exception was the Digital Media program at a comprehensive HEI, which had previously been a degree concentration. The program director explained that graduates with the Digital Media degree concentration had gone on to work for major media outlets, and the department had received substantial funding for continued research in media innovation. Both international and domestic students had long advocated for the creation of a STEM-designated M.S. program that would best represent their "distinctive set

of competencies," such as coding and data visualization. He believed that creating a standalone STEM degree was simply "the natural course of action" given the success of the concentration.

This program was something of an outlier, however. While three other participants acknowledged that there was labor market demand for graduates with certain STEM skill sets, none said that industry changes were the impetus for STEM reclassification. Ironically, some believed that the STEM-designated degree list still did not fully reflect how certain degree programs had become more technology-focused to reflect changing industry standards. One participant, for example, explained that her HEI offered two separate tracks for Interactive Media–one focused on software development, the other focused on art and storytelling. Yet the art track is a "technical artistic degree" with coursework in coding, computational media, and prototype development. She explained:

> The code that was selected, which best speaks to the program, is not STEM-eligible, but even within the description of the code, it connects to a tech element. It's just not been on the list. So that is important for students to know, especially when they're thinking… "[A]ll this stuff I'm doing is coding. Why don't I get this?"

In this case, the HEI submitted a petition to the Student Exchange Visitor Program (SEVP) to request that the CIP code for Game and Interactive Media be added to the DHS STEM Designated Degree list, noting that the core degree component is "programming of interactive media entertainment" (IES, n.d.-c.). This suggests that the DHS STEM Designated Degree list may be out of step with the rapid changes occurring both in university Research & Development (R&D) and in the tech sector.

Pressure to Increase Enrollment

Respondents from the four smallest HEIs reported that institutional leadership prioritized F-1 student recruitment. Two of these presidents had once been F-1 students themselves and seemed to take a genuine personal and professional interest in internationalizing their campuses. However, these participants also indicated that student recruitment and enrollment was a particular concern at their institutions. Three mentioned the *demographic cliff*, or the anticipated decline in traditional college-aged US students due to declining birth rates during and after the Great Recession (Matthews et al., 2023). Said one:

> We're all looking for ways to diversify our applicant pools at different levels. And I think a lot of us are also going to tap the same things where we're looking for transfer students, we're looking for international students, we're looking for graduate students to try to get off of that reliance on undergraduate tuition income. And so I think that now the moment is hot to make it more attractive for international students to be coming here.

Two PDSOs had discussed the potential appeal of STEM OPT for F-1 students with their deans and enrollment managers. Another said that their admissions officers working abroad had noticed that prospective F-1 students often asked if programs were STEM-eligible. In academic fields with declining enrollments, such as journalism or accounting, STEM-eligibility could therefore be seen as a way to increase enrollments and ensure the continuation of degree programs.

The participants from HEIs with relatively small endowments (or no endowment, in the case of one small, specialized HEI) emphasized that their institutions were uniquely tuition dependent and therefore might spend more time looking for ways to attract fee-paying F-1

students. These small, non-comprehensive HEIs, expressed more concerns about their immediate overhead costs, rather than prestige or global rankings. At the same time, nearly all study participants indicated that their HEIs were interested in the recruitment potential of STEM designated degree programs, regardless of their institution's endowment (NACUBO, 2022).

The study participants were unsure whether STEM-degree offerings actually made substantial differences in enrollment or revenue. One noted that additional institutional support is needed to ensure that F-1 students successfully complete their programs–not only English-language tutoring, but also help with "study habits, IT, everything. Like finding an apartment…getting a bank account, *all* of these things." In other words, ethical F-1 student enrollment practices must also include setting aside substantial resources for student care and assistance. Another participant said that while enrollments were increasing for his STEM Digital Media program, enrollments in the traditional journalism program continued to decline, leading him to wonder if the department was simply "robbing Peter to pay Paul."

Many institutions do seem to view STEM-designated degrees as possible tools for recruitment, but most participants denied that recruitment was the *impetus* for CIP code review. Indeed, as the above examples show, it isn't necessarily clear if STEM degree reclassification results in higher overall revenues, even if it increases enrollments.

Alignment with Institutional Goals

Only one participant said that their leadership had made increasing STEM designated programs an institution-wide priority. Even so, reclassification was often closely aligned with broader institutional goals in other ways, such as offering more "relevant" or "innovative" programming (Harada, 1994) or creating opportunities for cross-disciplinary work.

Some departments saw STEM reclassification as an opportunity to better align their department with the broader institutional mission or to establish a specialized niche within their HEI. For example, the business school at one technology-focused HEI now offers multiple STEM-designated programs, in one participants' estimation, in order to rebrand as "the tech side of business." This department historically has had low enrollments (roughly 10% of the institution's graduating class in 2019), and so the STEM-designation has allowed the department to align itself more closely with other institutional goals, thereby justifying its continued financial support from the university (Gardner et al., 2019). A participant at a comprehensive institution echoed this sentiment, explaining that the STEM-designation "helps to communicate, I think, with the higher ups and the Provost and President's offices that we're quite relevant to their STEM agenda."

Student Satisfaction and Outcomes

In almost all instances, the impetus for CIP code reclassification was the F-1 students themselves. Rather than prospective students, these were currently enrolled or recently graduated students who often organized letter-writing campaigns, signed petitions, or contacted department leaders to request CIP code review. Surprisingly, multiple participants noted that their enrollment offices took an interest in STEM OPT as a recruitment tool only after current and recently graduated F-1 students brought it to the attention of their departments. F-1 students frequently share information through their social and virtual networks, and as one institutional researcher recalled from a letter-writing campaign at her institution, they said, "This is happening in other schools. Why aren't we doing this here?"

These students' employment prospects and long term immigration goals were the most significant factors influencing their interest in STEM OPT. One Primary Designated School Official (PDSO) said:

> ...there is an expectation, like, "Hey, if I'm gonna spend…every single penny of my parents' savings, there's gotta be something in it for me, which is why I'm gonna find a way to stay in the US. And the only way to stay in the US is to be able to do a STEM degree."

Not every F-1 student necessarily intends to immigrate, as the academic literature demonstrates (Alberts & Hazen, 2005; Han & Appelbaum, 2016; Le & Gardner, 2010). Yet two participants agreed that the additional work authorization afforded by STEM OPT gives graduates more opportunities to learn about US work culture, gain experience in their fields, and build relationships with employers. Most importantly, it affords students time to decide if "this is where they want to be," an opportunity that they felt would otherwise not be available to students navigating what they called a "flawed" or "broken" immigration system.

Participants' feelings on international students as fee-paying consumers were nuanced and complex. Some participants agreed that they were in some ways obligated to satisfy their student customers. In some degree programs, over 90 percent of enrolled students were F-1 student visa holders–making them a population that was, in effect, too significant to ignore. Yet many participants also framed this within the context of their duty of care toward their F-1 students. When summarizing how STEM CIP code reclassification had impacted their institutions, nearly all participants believed the expanded work opportunities for their graduates was the most significant positive outcome. One institutional researcher, who had implemented a

STEM CIP code review policy at a previous institution, reflected on the tension between the student-as-consumer and the duty of care rationales:

> [A]rt schools…are super tuition dependent in a way that [my new institution] is not, and that was revenue, that was full pay revenue. Imagine 35% of your revenues coming from full pay students…Here, they're not so visible. They're not so visible…So it just feels very different. How–if the students here had written a petition or a letter to advocate for STEM OPT for their department–how would [this institution] have handled that when the international student population here is just a much smaller percentage? Would it have? I don't know.

Importantly, conversations about CIP code reclassification often turned to institutions' overall ethical responsibility to their F-1 students–which did not begin or end with STEM OPT. As mentioned above, a few felt that disproportionate attention was being paid to F-1 student *recruitment*, rather than support services. Reactions to CIP code reclassification were therefore mixed.

Despite one PDSO's earlier belief that STEM is a significant driver for F-1 student enrollment, another doubted that STEM-designation was a primary concern for all students. At his liberal arts college, the participant noted that the majority of his F-1 student STEM majors had chosen their programs "just because they're interested in the topic and the OPT is tangential…Some of them don't know what OPT is." It was perhaps more meaningful, he believed, when the HEI listened to the students and created supports tailored to their specific needs. For example, the participant's HEI set up a van rental program to allow students to travel to and from the rural campus more easily. He said, "International students have told me, 'You

should put this online on the website. I want my friends to know about this!'" This suggests that *institutional responsiveness* may be at the core of F-1 students' concerns.

Compliance

Nearly all participants spoke at great length about their efforts to keep their HEIs in compliance with DHS regulations. This was true not only of PDSOs, whose essential job functions include F-1 student reporting standards and compliance, but also registrars, institutional researchers, and program directors, who are primarily responsible for academic changes and degree program reporting. Many noted that with the introduction of the DHS STEM Designated Degree List, all HEIs began to take a greater interest in the CIP codes being assigned to their degree programs. This, in effect, has meant that administrators outside the International Student Offices must now work with other stakeholders in the institution to ensure continued compliance with immigration regulations.

As the HEIs in this study began to expand their STEM designated degree program offerings, participants noted that more of their time was spent working with students, faculty, and staff to ensure compliance. For example, two discussed that in the Summer of 2023, increasing numbers of F-1 students with non-traditional STEM designated degrees began to receive Request for Evidence letters (RFEs) when applying for the STEM OPT extension. While DHS creates and maintains the STEM Designated Degree list, it is US Citizenship and Immigration Services (USCIS) that evaluates and approves student applications for STEM OPT. When the USCIS adjudicating officer believes that the student's "evidence…does not establish eligibility for the benefit sought," they may issue an RFE soliciting "all the evidence the officer anticipates needing to determine eligibility" (USCIS, n.d.-a). One PDSO recalled:

> In the business schools, it's a little bit trickier because we're adapting CIP codes that don't necessarily reflect the title of our degree program…[T]his summer…we had probably 40 to 50 RFEs on our STEM every week…And I've never seen this in my 10,000 years of doing this kind of work. What they were flagging was the fact that we have our Master's in Finance, which uses CIP code 52.1399 which is [Management Sciences and Quantitative Methods]. The other they were flagging–they were flagging the fact that we did allow some of our Master's in Business Administration or a Master's in International Business to basically do a double major with either Analytics or Finance. That was being flagged. I begged and pleaded with our registrar team to change our transcript so that at least we had Major One, Major Two and CIP code.

It is fairly common for an institution's advertised degree program to differ from its official CIP code–for example, a student's degree program on their transcript may be *English* while the CIP code for the degree program may be 23.1401, *General Literature* (CIP User Site). However, this participant believed that these RFEs signified that USCIS was more closely scrutinizing the "52 family," or degree programs with CIP codes beginning with 52 for "Business, Management, Marketing, and Related Support Services" (IES, n.d.). All students at this participant's institution were eventually approved for STEM OPT, but only after sufficient effort from the International Student Office, where staff worked with each individual student to prepare a response.

Some participants believed that incidents like this one could indicate discrepancies between USCIS and DHS interpretations of immigration laws as they affect F-1 students. A few–who had previously counseled F-1 students through the COVID-19 pandemic, various presidential elections, and the passage of the Homeland Security Act–expressed great concern

that further immigration restrictions could be on the horizon. Accordingly, many participants spent much of their time educating others within the institution about DHS regulations. This tended to fall into two separate categories: education for F-1 students and education for faculty and staff.

Educating Students about STEM Compliance

At HEIs where STEM designated degree programs have only recently been introduced, participants reported that significant time was spent retraining International Student Office staff and holding information sessions to educate students on the DHS STEM OPT requirements. Even so, all PDSOs had difficulties managing F-1 student expectations. When programs received new STEM CIP codes, for example, F-1 graduates were often disappointed to discover that the new CIP codes could not be applied to their degrees retroactively; in other words, they were still ineligible for the STEM OPT extension. In other instances, PDSOs were concerned that their admissions offices seemed to promise prospective students three years of "guaranteed work authorization," rather than a "*potential* two-year extension after one year if they even pass the…program." One PDSO discussed counseling F-1 students through nervous breakdowns when they realized that they would not be able to apply for the STEM OPT extension due to an extended leave of absence, inability to graduate on time, or failure to be hired by an E-Verify participating employer. Some felt that the students were promised a vision of how a STEM-designated degree would provide a pathway to immigration, only for them to encounter a different reality upon arriving in the United States. One PDSO said:

> They come here and immediately it's like, "Okay, so like, I'm gonna do my OPT and my STEM OPT, and then…I'm gonna do sponsorship, so can you tell me how that all

> works?" I'm like, "How about we go to class first? How about you get through your first semester? How about you graduate and let this thing take its time?" But that's the expectation. They're like…"We were sold X." And very much so–they were *sold* because this is what enrollment does.

In other instances, participants explained that students might unwittingly receive incorrect information from their admissions offices, program directors, or professors, who may not fully understand the DHS STEM regulations. This at times had serious consequences for the students. One participant related an instance in which an older adult student relocated his family to the United States in order to enroll in a STEM-designated Architectural and Building Sciences program (04.0902). At the time, the participant's HEI had been investigating whether it would be possible to reclassify other degree programs in CIP Code 04 (Architecture and Related Services). He recounted:

> He was thinking about those three years after graduation. "Two years [in the program] plus three, that's five years in the US and then I can apply for a work visa"...The director of grad admissions at the time…he was saying the same thing to this student, "Oh, the real estate program is going to be STEM-designated. And by the way, it's a shorter program and it's a more interesting topic for you." And it was based on the student's interest… So he spent a semester in the real estate program…I followed up with him this semester…and I realized, "Wait a minute, this is not STEM-designated." And I contact the registrar and they're like, "No, no. Yeah, we were told that it couldn't be that [STEM-designated CIP] code." So now the student is stuck in a program that's not STEM-designated, which is pretty awful. So I think [the institution] is trying to push STEM for

> international students to increase enrollment, but they're not doing it very successfully or ethically.

These miscommunications can also occur when faculty and staff make quick assumptions about a program's STEM-designation without verifying with other offices. Another participant described a similar situation with a global development professor who was also involved with international recruitment. She explained:

> The professor had no idea what we were talking about when we were talking about CIP codes…[I]t came up in part because he does a lot of work in Ghana, and all of the students that were talking to him that he was trying to recruit were like, "Is this STEM-eligible?" And he was like, "Well, we [have a technology focus], I guess so." And then they were coming to us…and he was like, "What do you mean it's not?"

International Student Offices are responsible for educating their F-1 students about the limitations and benefits of their immigration status, but in the above examples, they were expected to do so after the students had already invested significant time and money in the enrollment process or had already relocated to the United States. As discussed in the previous section, F-1 students frequently share information with each other, and so some of this misinformation can originate with students or within chat groups or web forums. However, it may also be perpetuated by faculty and staff within the HEIs themselves. Institutions may therefore inadvertently create more work for themselves–and more disappointment for their students–if they don't ensure that accurate information about STEM OPT is made available from an early stage.

Educating Faculty and Staff about STEM Compliance

Almost all participants spoke at length about their efforts to educate internal stakeholders about the limits of STEM OPT. Prior to the introduction of the DHS STEM Designated Degree list, most faculty and staff outside the Registrar's and International Student Offices had "no idea what a CIP code was." Some felt that their academic departments were now eager to assign STEM CIP codes to their degree programs, yet they still didn't fully understand the nuances of F-1 student regulations. Underscoring this point, one participant was contacted by the author in January 2024 to participate in this study based, in part, on the number of criminal justice programs listed as "STEM-eligible" on his institution's website. The individual indicated that until he received my message, he had not been aware that these programs were being advertised as "STEM-eligible." He regularly participated in graduate enrollment management meetings at his HEI and had advised the deans that it was important to clearly demarcate which degree programs are STEM-designated for prospective students. The criminal justice programs, he explained, did have appropriate STEM CIP codes assigned, but because they were online degree programs, F-1 students are not eligible to enroll in them. The participant was left with the impression that the departmental leadership had "listened to the STEM OPT side of things [but] they didn't listen to the program structuring side of things."

Similar sentiments were echoed by other participants, who felt that they often had to manage faculty and staff, as well as student, expectations. This frequently caused tension between the academic departments and other administrative offices. One registrar described a particularly contentious process when her institution's business school sought to reclassify some of its degree programs:

> [T]his was an argument that we had multiple times over the years. And so myself, Institutional Research, the Vice President of Enrollment Management, [the International Student Office], the International Affairs Director, we're in there trying to help them understand that we can't just give this a STEM code because you feel like doing it. It has to be about the curriculum. And so our Director of International Affairs would be there to say, '...[I]f we were to be audited and the Department of Homeland Security found that we were just sticking codes on programs that didn't really deserve them so that students could stay in the country, we could lose our ability to grant [immigration documents], period'…And after many years of having this conversation, about once a year at least, I finally helped them understand that these are the reasons: substantive changes in courses, course descriptions, course focuses, disciplines, degree requirements. That's what gets you a new code.

The introduction of the DHS STEM Designated Degree list has therefore necessitated the creation of CIP code review processes at many HEIs. For some institutions, this was a major undertaking–one institutional researcher, for example, reported that when she began to build the framework for CIP code review, her HEI had not created or changed a degree program in over a decade. Ultimately, most spoke positively about the changes their institutions had made, even though they were often still in the process of building or standardizing their CIP code review processes. A PDSO felt that the relevant offices at her HEI now communicated with each other more proactively about CIP code reclassification. Two others believed that their faculty and staff were more aware of the impact that CIP codes had on their F-1 students, which caused them to approach CIP code assignment more thoughtfully and intentionally. Building a *set process* for

CIP code review therefore seemed to be positive for many HEIs, although it was not without its challenges.

The Role of Faculty

The role that faculty play in CIP code reclassification–and the impact that reclassifications have on them–were varied and complex. In alignment with the scholarship of Bastedo (2016), faculty and departments at the target HEIs are often central to curriculum decisions. In many instances, registrar's offices rely on the departments to propose the most appropriate CIP code for their programs. Many participants believed that, on the whole, the academic departments did this appropriately. However, all interviewed participants agreed that there was now an incentive to reclassify degree programs with STEM-designated CIP codes. This at times made some participants–particularly registrars–responsible for ensuring that academic standards were upheld in the CIP code review process. None of the participants were opposed to program reclassification if it was appropriate, but some worried whether the changes had sufficient academic rationale. For example, one registrar explained that where her office had once taken CIP code or curriculum change requests at face value, they now spent much more time requesting supplementary information and clarification. She said:

> ...we did have a situation pop up with the [School of Social Work]. They were going to try to reclassify. And so at the time…the previous registrar, she said, 'Mmmm, let me stop here.' And she consulted the Provost's Office and it came back that, 'No, what you're going to try to do is just *not* going to make those programs STEM-eligible'… And then the [School of Education], I think we asked them to refine a piece of their curriculum…there were definitely some back and forth conversations.

Registrar's offices play a significant role in coding degree programs and reporting them to relevant agencies such as the National Student Clearinghouse. As more academic departments work to reclassify some degree programs as STEM, they may find that their traditional authority to determine academic curriculum (and, in some instances, to propose what they feel are appropriate CIP codes) may be challenged. The registrar above noted that her institution's business school was able to introduce a new STEM MBA track fairly easily, but she believed it was because they had worked very closely with her office from the beginning. Therefore, various members of university support staff may have expanded roles in curriculum and CIP code changes.

Indeed, participants observed varying faculty responses to these curricular changes. One graduate programs director at a comprehensive university worried that the top-down creation of his STEM digital media degree program affected the faculty's view of the department and their place within it:

> Within academia, especially with tenured faculty, it's mostly volitional. People can kind of do what they want…and that might mean over time that there's a group that just doesn't really participate much and it's not that helpful. So that could unfold…I haven't seen a lot of evidence [but]...I have seen as a manager and as a director, a bit of like, "Oh, well, that's *your* thing." It becomes a kind of specialized area, almost like in the way that research subfields become specialized, where it's like, "Okay, well, that's what *you* study. I don't really know anything about it, but good luck." And that's okay in research because we all specialize…But curricula should be owned by the whole faculty, and it really

> should be a team effort. And so the potential siloing of these kinds of programs is an issue that I would just be on guard for.

This participant suspected that some faculty may have felt the new program devolved from the original mission of the journalism and media studies department. He and two other administrators had been working to sustain the program, but he had misgivings about what would happen if even one left the department. Without experienced faculty sharing the department's vision of the program, it was unclear if anyone would be able or willing to assume leadership at a later time.

Responses were significantly different at institutions with faculty unions or strong cultures of faculty governance. One institutional planner at a unionized institution recounted:

> There's very strong faculty governance…The curriculum was theirs…The review of curriculum [and] new programs had to originate from the ground up. Nobody would ever say, "You need to develop a program about this." I mean, you could say, "Hey, let's think about data science," and maybe something w[ould] happen, but…I couldn't make them.

In this particular instance, some degree programs were eventually updated to have STEM CIP codes, but only after the participant presented information on CIP codes and F-1 student outcomes to the faculty senate. At another institution (non-union, but with a robust faculty governance structure), faculty committees actively oversaw curriculum review, program creation, benchmarking, and program classification for transferability. A participant noted that the faculty there was eager to approve new, innovative programs, but that the added duties were "definitely taking a toll on people." Importantly, STEM reclassification does not immediately translate into increased capacity. Just as the participants in Gardner et al.'s 2016 study reported

feeling the pressure to invest more time and resources into expanding their program offerings, so too were the faculty at this HEI consumed with course and program reviews–to the point that other important work, such as general university policy updates, were put on hold. As a result, CIP code reclassification at these institutions may be limited by both the faculty governing structure–which protects academics from unwanted curricular interference–as well as the faculty's own capacity to review and update degree programs.

On the whole, many participants felt that their faculty seemed invigorated by the opportunity to add STEM dimensions to their programs, even if they did not think of themselves as scientists or technologists in the traditional sense. Participants said that STEM reclassification helped reframe their paradigms around their academic programs, research, and–perhaps most significantly–the impact that their programs had on student outcomes post-graduation. Yet the pursuit of the STEM CIP code may challenge the traditional authority that departments and faculty have had to determine their academic curriculums–requiring them to collaborate with other institutional stakeholders in ways that they haven't before. When top-down decisions are made, they may alienate tenured faculty. At the same time, ground-up, faculty-led initiatives can be potentially draining, especially as many faculty members report ever-expanding teaching responsibilities in addition to their duties as researchers. Academic faculty are therefore a crucial but perhaps overlooked part of the STEM CIP code conversation.

Chapter 6: Discussion

This chapter analyzes the findings in the previous section within the context of the research questions. Implications for higher education institutions (HEIs) and overall immigration implications are considered. The final section contains recommendations for HEIs regarding

Science, Technology, Engineering, and Mathematics (STEM) reclassification based on the findings.

The Role of F-1 Students in STEM Reclassification

Academic research on marketization would suggest that "prestige-seeking institutions" would create or reclassify STEM programs in an effort to mimic institutions with significant F-1 student enrollment and high global rankings (Aw, 2012; Dill, 2003; Scott, 2011). Instead, the HEIs in the present study only sought Classification of Instructional Program (CIP) code reclassification after F-1 students themselves petitioned their academic departments. Even when changing industry standards drove program redesign (as with one newly-created Master's of Digital Media program), CIP code reclassification always occurred with F-1 students' post-graduate outcomes in mind. At the selected HEIs, it was only after the academic departments reclassified their degree programs that enrollment managers began to view STEM Optional Practical Training (OPT) as a recruitment tool. Indeed, participants indicated that their enrollment offices were primarily interested in forestalling enrollment decline, rather than rising in the global university rankings.

The role that F-1 students play in CIP code reclassification is therefore a crucial one. In one sense, this may provide a powerful counterexample to the common conceptualization of the F-1 student experience as a disempowered one (Stein & de Andreotti, 2015; Yang, 2019), suggesting that F-1 students may exercise greater influence over institutional decision-making than originally thought. At the same time, many participants tied these students' influence directly to their status as tuition-paying consumers. Ultimately, F-1 students at these HEIs seemed to fall somewhere between empowered and disempowered: able to successfully self-

advocate and make genuine contributions to university life while also having their futures in the country being tied directly to their status as fee-paying students.

As noted in the methodology section, only private HEIs were included in the present study due to their seeming wealth of newly reclassified, non-traditional STEM programs. This could be explained in part by the high concentration of private HEIs in Massachusetts and Rhode Island (Carnegie Classification, n.d.). The leading three institutions for F-1 student enrollment are all private HEIs (NYU, Northeastern University, and Columbia University), yet public research universities tend to enroll more international students overall (Institute of International Education, 2023). These public research institutions receive *both* state-level funding and, in many cases, significant public and private research funding (NSF, 2023). Therefore, it is possible that STEM reclassification is primarily a *private HEI phenomenon*, perhaps because they do not receive state funding and may be more tuition-dependent, because they have more flexibility and ability to change curriculum compared to public HEIs, or both. Still, future research is warranted to investigate whether this is the case.

What are the implications of STEM recategorization for HEIs?

The introduction of the STEM Designated Degree list has, oddly, put US Department of Homeland Security (DHS) regulations at the center of academic discussions about program creation and curricular review. DHS administers the Student & Exchange Visitor Program (SEVP), but it is a law enforcement agency, not an academic one. Interviewed participants spoke often about DHS regulations and their efforts to educate students, faculty, and staff about them. While it is valuable for all members of the academy to be aware of the limitations affecting F-1 student visa holders, this means that DHS exerts an indirect influence over the development and

redesign of academic curriculum. In effect, many academic programs are now updated specifically with DHS in mind–perhaps signaling a greater weakening of the professoriate's influence and freedom of inquiry (Anderson, 2016; Anderson, 2016-a.). Overall, the findings raise important implications regarding HEI finances and faculty efficacy, while also presenting a challenging view of institutional convergence. In addition, they raise difficult questions about the future of both STEM fields and the humanities and the arts.

Financial Implications

Despite the common belief that F-1 students' tuition dollars may help supplement institutional overhead (Aw, 2012), some participants were unsure whether CIP code reclassification had a significant impact on institutional revenues. Two participants noted that ethical F-1 student enrollment must also include investment in support services to ensure student success. Another two noted anecdotally that at their institutions, newly reclassified STEM programs either did not seem to have substantially higher enrollments or they seemed to "poach" students from other academic programs. This unexpectedly problematizes the notion of F-1 international students as "cash cows" (Stein & de Andreotti, 2015, p. 230), suggesting international student enrollment may not always be as profitable as previously supposed.

Faculty

Academic departments face tremendous pressure to increase program offerings, deliver quality educational content, and retain and engage their faculty (Gardner et al., 2014). On the surface, STEM CIP code reclassification may seem an ideal solution, attracting F-1 students with the promise of extended work authorization in the United States while also updating academic programs to align with the evolving global knowledge economy, thus justifying continued

financial support from the institution. Yet the findings suggest that faculty may be resistant to these changes, particularly if they feel it deviates from the program or department's original mission. This could mean that faculty therefore do not invest their time and energy to sustain these fledgeling programs–raising the question of whether these new, interdisciplinary STEM programs can be sustained without significant top-down support. The risk of program disintegration may be lower at HEIs with strong faculty governance, as curriculum design and reclassification must originate with the faculty. At the same time, these faculty committees may not always be aware of how academic decisions influence their F-1 students, and so they must now work with other institutional stakeholders in order to fully understand the full impact of curricular changes.

Student-Led Institutional Convergence?

While the participants in this study generally did not report that their HEIs used benchmarking or direct comparison during CIP code reclassification, it is clear that F-1 students compare their academic programs to those of their friends and peers–both within their institution and at other US institutions. The participants' F-1 students often approached their academic departments requesting a CIP code review by citing the existence of a similar STEM-designated program elsewhere. This could potentially drive institutional convergence in a roundabout manner, as HEIs reclassify their degree programs to satisfy F-1 students who are comparing their institution to those of their friends. Just as academic programs in the late 20th century became more "applied" or "vocational" in response to student demand (Bastedo, 2016; Harada, 1994), it is possible that academic disciplines that are dependent on F-1 student enrollment may generally become more quantitative, or "STEM-focused" overall.

F-1 Students in Humanities and the Arts

While a 24-month STEM OPT extension is a tremendous benefit for graduates in technical fields, it also functions as a disincentive to study the arts, humanities, or other "non-STEM," high-need professions such as Social Work, Nursing, and Education. The arts and humanities did not come up often over the course of these interviews, but when they did, it was often in reference to declining enrollments. As discussed earlier in this section, it is not entirely clear if STEM-classified programs *increase* enrollments, but the interviews do suggest that they may hasten the decline of traditional arts and humanities programs. The broader discussion of how these academic disciplines are affected by the absence of F-1 students notwithstanding, academic departments and institutional leaders would do well to consider what impact STEM reclassification may have on enrollments in arts and humanities programs more generally.

The STEM Fields

Former Dean of the Georgia Institute of Technology College of Engineering Gary S. May has argued that, crucial as the creative disciplines are, broadening the definition of STEM risks "distracting" policymakers from building a national science and technology innovation strategy (D'Agostino, 2022). Indeed, STEM departments also qualify for STEM funding in the form of increased institutional resources and federal and foundational grants. As more academic programs nudge their way into the STEM space, this raises the question of whether resources for the so-called core sciences will be diluted.

The participants in this study acknowledged that their academic programs were somewhat ambiguously positioned between the arts and the sciences. One participant at a fine arts university, for example, said that her faculty were "artists and designers first;" they were

willing to embrace the technical aspects of their disciplines in order to support their F-1 students, but they did not see themselves as scientists or technicians. In other words, the faculty and staff at the selected HEIs seemed disinterested in being part of a larger national STEM strategy. The programs were typically professional–rather than research–graduate degrees, and so HEIs were more likely to seek funding through tuition dollars rather than grants. When they did receive research funding, as with the Digital Media program mentioned above, it came from discipline-specific foundations, rather than the National Science Foundation (NSF) or through corporate partnerships. Thus the programs did not seem to compete with the traditional STEM disciplines for funding or recognition–nor did the participants indicate that that was their intention.

At the same time, it is increasingly clear that workers in the global knowledge economy will need increasingly complex technical knowledge. When does that Technological knowledge appropriately befit the T in STEM? Perhaps it is time, as many education and policy experts have suggested, to abandon the STEM acronym altogether (Gonzalez & Kuenzi, 2012). This is not to suggest that there cannot be specialized funding and educational initiatives for these disciplines. Rather, they should be focused on specific processes, modes of analysis, and intended outcomes (Gonzalez & Kuenzi, 2012) in order to recognize the rapidly changing nature of some academic disciplines while also ensuring that funding is still allocated to research, education, and global public development initiatives.

Immigration Implications

At the time of interviewing (late 2023 and early 2024), several participants expressed great concern for how the coming US Presidential election could impact their F-1 students. The Trump administration was characterized by heightened restrictions for international students

(particularly Chinese students) and US HEIs (Douglass, 2021-a), some of which have carried over into the Biden administration as well. Though not as widely reported, both OPT and STEM OPT were targeted for restriction or elimination by the Trump administration (Anderson, 2020) and were at the center of a 2022 federal lawsuit (Washington Alliance of Technology Workers). While OPT and STEM OPT have both survived, the legacy of Trump-era restrictions have "generated a sense that the United States is no longer a welcoming nation for foreign students" (Douglass, 2021-a, p. 61). Some participants in this study were therefore fearful about the future possibilities for their students in the United States after graduation.

DHS has declined to comment on the practice of STEM CIP code reclassification, saying only that graduates with qualifying degrees are eligible to apply for the STEM OPT extension (Redden, 2018). Indeed, participants in the present study demonstrated that CIP codes are not assigned to programs arbitrarily, but often through extensive review and often after some curriculum change. One participant, however, expressed her belief that the number of Request for Evidence (RFE) letters sent to STEM OPT applicants in the summer of 2023 could indicate a growing distrust of students and HEIs, perhaps signifying that changes to the STEM OPT extension could be on the horizon.

In light of these concerns, it is worth again considering the origins of the STEM OPT extension. As discussed in earlier sections of this paper, the STEM OPT extension was first proposed in 2008 as a way to allow employers in the US IT sectors to hire recent graduates for some difficult-to-fill positions–particularly those that would otherwise be left unfilled by the H-1B visa cap. It was not, crucially, even intended as a way to expand work opportunities for all STEM graduates or to advance US scientific and technological development more broadly. The

STEM OPT extension did create an opportunity for US employers to hire recent graduates for certain technical roles, but it also puts graduates in the awkward position of being *trainees* (per the terms of their F-1 student status) while also performing labor that theoretically should be performed by *skilled workers*. How, then, can a recent graduate expect to be both?

In 2021, 61,543 F-1 student graduates were authorized for STEM OPT (ICE, n.d.-a). Many F-1 students view the STEM OPT as a significant benefit, even a reward for doing difficult coursework. It is not clear how many of these graduates will eventually apply for the H-1B visa, but both academic scholarship (Alberts & Hazen, 2005; Han & Appelbaum, 2016; Le & Gardner, 2010) and interviews with study participants indicate that this is the plan for many F-1 students. Still, the H-1B Electronic Registration System is a lottery, and every year there are graduates who are not selected after their third year of STEM OPT despite being entered into the lottery system multiple years in a row. It is therefore worth critically examining whether the STEM OPT extension is the correct solution, or if further immigration reforms should be explored to better address the needs of the labor market, employers, and the US-educated F-1 graduates seeking to use their knowledge and skills within the US.

The faculty and staff who work most closely with F-1 students may have relatively little political power, yet the HEIs they work for do exercise significant legal influence. As the Harvard/MIT joint lawsuit against DHS regarding F-1 student enrollment regulations during the COVID-19 pandemic demonstrates, HEIs may have significant influence (ICE, 2020; Reif, 2020) even in political environments that are relatively unfriendly to the higher education sector (Douglass, 2021). As F-1 students navigate an uncertain future, it may increasingly fall upon the would-be global institutions to exercise their policy influence on their students' behalf.

Considerations for Institutions

Based on interviews with study participants, I put forth the following recommendations for SEVP-certified colleges, universities, conservatories, or seminaries regarding STEM CIP code review and reclassification.

Consider your CIP Code evaluation process.

Many HEIs included in this study only created STEM CIP code review processes after their F-1 students began to petition for new CIP codes for their degree programs. These institutions were more likely to have a lack of cohesion among departments in changing or reviewing CIP codes, which could result in incorrect information being relayed to students. It is therefore worthwhile for HEIs to think proactively about how they will review requests for CIP code reclassification. At some HEIs, this is related to the curriculum review process, although this does not necessarily need to be handled by a curriculum review board. One HEI in the study, for example, has successfully managed CIP code changes simply by ensuring the PDSO, registrar, academic department, and Institutional Research office are all in the same email chain. Most importantly, a CIP code review process should a) align with the extant institutional culture and governing structures and b) include the international student offices and registrars from an early stage.

How does your institution define STEM?

While the STEM label itself is imprecise, stakeholders within an institution can develop their own internal definition of STEM and criteria to determine a program's eligibility for a STEM CIP Code. For example, academic departments at Johns Hopkins University must work

with their Dean to establish that a program's academic curriculum is at least 50 percent STEM when requesting a STEM-designated CIP code (n.d.). One study participant created a similar template at her institution, requiring that departments seeking STEM reclassification provide a) detailed information on the number of required and elective courses that are considered STEM and b) the educational background and training of program faculty. This created an institutional standard that could be referred back to when reclassifying new programs.

Is there faculty buy-in?

Traditionally, faculty inclusion in significant decision making is considered an important way to both "protect faculty interest and ensure that institutions maintain fidelity to the academic mission" (Eckel & Kezar, 2016, p. 164). In practice, HEIs derive their authority both from the administration and academic faculty, whose roles may occasionally overlap, particularly in areas concerning curriculum and strategic planning (Eckel & Kezar, 2016). When developing new degree programs or reclassifying previously existing ones, it's important to remember that faculty are not only responsible for curriculum delivery and review, but may also eventually assume positions of leadership within academic departments as program directors, deans, and department chairs. As such, degree programs can only be sustained over the long-term with faculty support.

At some HEIs, such as unionized institutions or those with high degrees of faculty governance, curriculum may be closely guarded by governing senates or committees (Eckel & Kezar, 2016). At these HEIs, as one participant discussed, proposing CIP code reclassification may be possible if administrators educate faculty boards about how curriculum and degree programs impact F-1 students. Still, these efforts will likely receive the most support from

faculty if they feel that proposed curricular changes align with the overall program or departmental mission, developments within the academic field, and their own expertise.

Recognize the importance of immigration regulations.

As the previous sections have shown, failure to follow F-1 student regulations can have significant consequences for students and HEIs. While some program participants outside the International Student Offices had built significant knowledge about federal regulations, the best way to ensure compliance is to regularly include Primary Designated School Officials (PDSOs) and Designated School Officials (DSOs) in the early conversations about CIP code changes and curriculum review.

Students as Partners, rather than Students as Consumers.

The Student as Consumer rationale assumes that a student is a customer or consumer and higher education is much like any other good or service. The traditional neoliberal belief about consumers is that they maintain power because they "embody a simple modern logic–the right to choose" (Gabriel & Lang, 2015, p. 1). In the Student as Consumer approach to STEM CIP code reclassification, HEIs would be expected to recognize that their F-1 students want STEM OPT and would therefore provide more STEM-designated degree programs as part of their "service offerings" in order to increase their share of the education market. Students, in turn, may be expected to demand STEM CIP code reclassification regardless of their degree programs, and may be easily persuaded to seek out new degree programs should their original institution not provide an adequate level of service. Practices such as inviting students to participate in high-level decision-making could be seen to "indicate HEIs' intentions to demonstrate where sovereignty resides" (Nixon et al, 2016, p. 932). Certainly, some HEIs described in the present

study employed a similar student-as-consumer framework, although academics and other commentators have long criticized this neoliberal approach to higher education. Catering to the "satisfaction" of the student, they argue, "extinguishes more enduring intellectual development engendered through challenge, struggle and problem-solving" (Nixon et al, p. 930).

Engaging Students as Partners (SaP), by contrast, creates a "deterritorialized" space by challenging students to engage with faculty and staff as "genuine contributors to all aspects of university life" (Green, 2018, p. 14). While it may seem odd to engage students–who, by definition, have imperfect or incomplete knowledge–with curricular changes, SaP recognizes that students are crucial members of the academic ecosystem, each bringing unique experiences and knowledge to bear. Indeed, graduate students are often actively engaged in advancing their academic fields at the same time that they are learning from them, already holding dual educator/researcher and student roles. When employed within a critical framework, such as through "engagement with complex, interdependent global systems and legacies," SaP allows students to become co-creators seeking to solve issues collaboratively and equitably with attention to how their actions affect both local and global communities (2018, p. 12). As opposed to catering to the student as a consumer, the SaP model therefore puts power in the hands of the students while maintaining fidelity to HEIs' core academic mission.

In the context of STEM CIP code reclassification, SaP would entail faculty and department leadership facilitating or working directly with students from varying backgrounds within a program to review curriculum changes and innovations, focusing on both the varying learning and the professional outcomes for all students. This would not take the place of registrar or faculty curricular review; rather, it would allow students and departments to be co-creators of

new programs based on new visions of what their programs should be. Certainly, not every instance will result in a new STEM program, but engaging students in the innovation process may allow departments to change in other, unexpected ways that may also benefit both F-1 students and the wider community.

Student care does not begin or end with work authorization.

Work authorization is a matter of great importance for F-1 international students, but it is far from their only concern. As many participants discussed in the above section, HEIs have a duty of care to their F-1 students. Ensuring their successful program completion means providing students with the resources they need to be successful, such as specialized tutoring, support adjusting to US educational culture, and assistance navigating the daily realities of living in a new country such as applying for bank accounts or finding a doctor. At the same time, a growing body of literature has shown that current attitudes of international students often take a "deficit view," or stance that these students are "inherently lacking, incompetent, and therefore needing to adapt to the host" (Yang, 2019, p. 520). Less attention is often paid to the ways that F-1 students may be disadvantaged by the structure of HEIs themselves. This can include, but is not limited to: the sudden introduction of all-online instruction, which is incompatible with the F-1 student status; dorm closures, which may compel students to pay significant fees to return to their home countries for short-term school breaks; or lack of flexibility in vaccine requirements for students coming from countries with limited medical infrastructure. HEIs should therefore take a broader view when assessing how best to serve their international students, recognizing that there are other ways in which F-1 students can be supported as members of the community beyond their eligibility for STEM-OPT.

Conclusion

This study was intended to explore the role that F-1 international students may have in changing US educational programs. The findings demonstrate that within higher education institutions (HEIs), F-1 students are at the forefront of discussions among administrators and faculty about whether or not to reclassify academic programs as Science, Technology, Engineering and Mathematics (STEM). While STEM Optional Practical Training (OPT) may be used as a carrot to entice F-1 students to enroll in certain higher education programs, it tends to be currently enrolled or recently graduated students who initiate the reclassification process. F-1 international students themselves should therefore be regarded as important institutional stakeholders whose actions may have consequential impacts on the academy. At the same time, the rise of reclassifications raises new questions about what should be considered STEM, who should make determinations about what should be on the academic curriculum, and how the traditional roles of faculty and administrators may be shifting. Most importantly, it demonstrates that US Department of Homeland Security (DHS) regulations have substantial impacts on HEIs–making it an often invisible but highly significant influence in higher education.

The findings about F-1 student influence on their institutions is an important one, suggesting that these students may exercise more power than the current academic literature often suggests–although it is unclear if the students themselves view this as such. While there is research examining F-1 students' sense of place and belonging at their HEIs, there is surprisingly little investigating how those students take action, protest, or seek to influence or reform their campus community. The potential role that F-1 students may have in shaping their HEIs–or,

perhaps, the interplay between these students and their HEIs in other educational policies– presents new possibilities for researchers in international higher education.

The international higher education field–quite naturally–often focuses on the academic, linguistic, cultural, and sociological aspects of international student mobility. This study adds to the current discourse by exploring a crucial but less discussed dimension–that of immigration policy and regulation and its affects on higher education. As international education increasingly abuts neo-nationalism, securitization, and escalating geopolitical conflict (Douglass, 2021), international students and the institutions that host them will be under heightened scrutiny. Further research is therefore warranted to explore how students and HEIs navigate these shifting, increasingly political spaces.

References

Alberts, H. C., & Hazen, H. D. (2005). "There are always two voices...": F-1 students' intentions to stay in the United States or return to their home countries. *International Migration*, *43*(3), 131–154. https://doi.org/10.1111/j.1468-2435.2005.00328.x

Amaral, B. (2023, February 13). *Underfunded for decades, URI has enrolled more higher paying out-of-state students than in-state students. Now it's at a crossroads.* BostonGlobe.com. https://www.bostonglobe.com/2023/02/13/metro/underfunded-decades-uri-has-enrolled-more-higher-paying-out-of-state-students-than-in-state-students-now-its-crossroads/

Anderson, R. (2016). British university traditions. *Encyclopedia of International Higher Education Systems and Institutions*, 1–6. https://doi.org/10.1007/978-94-017-9553-1_5-1

Anderson, R. D. (2016-a). The German (humboldtian) university tradition. *Encyclopedia of International Higher Education Systems and Institutions*, 1–6. https://doi.org/10.1007/978-94-017-9553-1_4-1

Anderson, S. (2020, May 4). *Next Trump immigration target: OPT for F-1 students*. Forbes. https://www.forbes.com/sites/stuartanderson/2020/05/04/next-trump-immigration-target-opt-for-international-students/?sh=131e5cc145f9

Austin, I., & Jones, G. A. (2016). *Governance of Higher Education: Global Perspectives, Theories, and Practices*. Routledge.

Aw, F. (2012). The F-1 student Question: 45 Years Later. *Journal of College Admissions*, 10–11. https://eric.ed.gov/?id=EJ992663

Bastedo, M. N. (2016). Curriculum in Higher Education: The Organizational Dynamics of Academic Reform. In P. G. Altbach, M. N. Bastedo, & P. J. Gumport (Eds.), *American Higher Education in the 21st Century* (4th ed., pp. 60–83). essay, Johns Hopkins University Press.

Bennett, S., Ichikawa, A., Lin, Y., Pannirselvam, M., & Uerpairojkit, T. (2023). Working towards inclusive definitions of F-1 students. *Research with F-1 students*, 11–20. https://doi.org/10.4324/9781003290803-3

Boston University. (n.d.). Class profile. https://www.bu.edu/admissions/why-bu/class-profile/

Bowen, G. A. (2006). Grounded theory and sensitizing concepts. *International Journal of Qualitative Methods*, *5*(3), 12–23. https://doi.org/10.1177/160940690600500304

Brooks, R., & Waters, J. (2022) Partial, hierarchical and stratified space? Understanding 'the international' in studies of F-1 student mobility. *Oxford Review of Education, 48*(4), 518-535. https://10.1080/03054985.2022.2055536

Brown University. (2024, February 28). Brown's newest students, by the numbers. https://www.brown.edu/news/2023-09-01/2027-numbers

Carey, K. (2022, November 14). *The Incredible Shrinking Future of College*. Vox. https://www.vox.com/the-highlight/23428166/college-enrollment-population-education-crash

Charmaz, K. (2006). *Constructing grounded theory: A practical guide through qualitative analysis*. SAGE.

Chiappari, T. J., & Paparelli, A. A. (2008). *A Rare Carrot for Employers: F-1 Optional Practical Training Extended*. Seyfarth Shaw LLP. Reprinted from New York Law Journal. Retrieved March 10, 2023, from https://www.seyfarth.com/dir_docs/publications/AttorneyPubs/A%20Rare%20Carrot%20for%20Employers.pdf

Johns Hopkins University. (n.d.). *CIP code change request guidelines*. University Registrar. https://registrar.jhu.edu/policies/cip-code-change-request-guidelines/

Carnegie Classification of Institutions of Higher Education. (n.d.-a). INSTITUTION SEARCH. https://carnegieclassifications.acenet.edu/institutions/page/4/?inst&stabbr%5B0%5D=MA&stabbr%5B1%5D=RI

Corbin, J., & Strauss, A. (1990). Grounded theory research: Procedures, canons and evaluative criteria. *Zeitschrift Für Soziologie*, *19*(6), 418–427. https://doi.org/10.1515/zfsoz-1990-0602

Creswell, J.W. (1998) Qualitative İnquiry and Research Design: Choosing among Five Traditions, Thousand Oaks, CA: Sage.

De Wit, H., Hunter, F., Egron-Polak, E., & Howard, L. (Eds). (2015). Internationalisation of higher education: A study for the European parliament. http://www.europarl.europa.eu/RegData/etudes/STUD/2015/540370/IPOL_STU(2015)540370_EN.pdf

De Wit, H. (2020). Internationalization of Higher Education. *Journal of F-1 students*, *10*(1), i–iv. https://doi.org/10.32674/jis.v10i1.1893

Department of Homeland Security. (n.d.). *F-1 student Life Cycle*. Study in the States. https://studyinthestates.dhs.gov/students/get-started/international-student-life-cycle

Dill, D. (2010). Quality assurance in higher education – practices and issues. *International Encyclopedia of Education*, 377–383. https://doi.org/10.1016/b978-0-08-044894-7.00833-2

DiMaggio, P. J., & Powell, W. W. (1983). The Iron Cage Revisited: Institutional isomorphism and collective rationality in organizational fields. *American Sociological Review*, *48*(2), 147–160. https://doi.org/10.2307/2095101

Douglass, J. A. (2021). Neo-nationalism and universities. *Neo-Nationalism and Universities: Populists, Autocrats, and the Future of Higher Education.*, 1–21. https://doi.org/10.1353/book.85165

Douglass, J. A. (2021-a). Trumpian Nationalism and American Universities. In *Neo-nationalism and universities: Populists, autocrats, and the future of Higher Education*. essay, Johns Hopkins University Press. https://doi.org/10.1353/book.85165

Eckel, P. D. & Kezar, A. (2016). The Intersecting Authority of Boards, Presidents, and Faculty: Toward Shared Leadership. In P. G. Altbach, M. N. Bastedo, & P. J. Gumport (Eds.), *American Higher Education in the 21st Century* (4th ed., pp. 155–189). essay, Johns Hopkins University Press.

Extending Period of Optional Practical Training by 17 Months for F-1 Nonimmigrant Students With STEM Degrees and Expanding Cap-Gap Relief for All F-1 Students With Pending H-1B Petitions, 73 Fed. Reg. 18944 (April 8, 2008). https://www.federalregister.gov/documents/2008/04/08/E8-7427/extending-period-of-optional-practical-training-by-17-months-for-f-1-nonimmigrant-students-with-stem

Feeney, M. K., Jung, H., Johnson, T. P., & Welch, E. W. (2023). U.S. Visa and Immigration Policy Challenges: Explanations for Faculty Perceptions and Intent to Leave. *Research in higher education*, 1–27. Advance online publication. https://doi.org/10.1007/s11162-023-09731-0

Gabriel, Y., & Lang, T. (2015). *The unmanageable consumer*. SAGE Publications. March 6, 2024, https://www.google.com/books/edition/_/ZBtiCgAAQBAJ?hl=en&gbpv=0

Gardner, S. K., Blackstone, A., McCoy, S. K., & Véliz, D. (2014, November 14). *The effect of state budget cuts on the department climate*. AAUP. https://www.aaup.org/article/effect-state-budget-cuts-department-climate

Geiger, R. L. (2016). The Ten Generations of American Higher Education. In M. N. Bastedo, P. G. Altbach, & P. J. Gumport (Eds.), *American higher education in the twenty-first century: Social, political, and economic challenges* (pp. 3–34). essay, Johns Hopkins University Press.

Gonzalez, H. B. & Kuenzi, J. J. (2012). *Science, Technology, Engineering, and Mathematics (STEM) Education: A Primer*. (CRS Report No. R42642). Congressional Research Service. https://sgp.fas.org/crs/misc/R42642.pdf.

Gordon College. (n.d.). Enrollment. https://www.gordon.edu/profile/enrollment

Green, W. (2018). Engaging "students as partners" in global learning: Some possibilities and provocations. *Journal of Studies in International Education*, *23*(1), 10–29. https://doi.org/10.1177/1028315318814266

Gumport, P. M., Ianozzi, M., Shaman, S., & Zemsky, R. (1997). (rep.). *Trends in United States Higher Education from Massification to Post Massification* (pp. 1–37). Stanford, CA: National Center

for Postsecondary Improvement. Retrieved September 12, 2023, from https://web.stanford.edu/group/ncpi/documents/pdfs/1-04_massification.pdf.

Han, X., & Appelbaum, R. P. (2016). (rep.). *Will They Stay or Will They Go?: International STEM Students Are up for Grabs*. Ewing Marion Kauffman Foundation. Retrieved August 16, 2023, from https://files.eric.ed.gov/fulltext/ED570660.pdf.

Harada, M. (1994). *History of Higher Education: Curriculum*, 3–30. https://eric.ed.gov/?id=ED379977

Harris, J. G., DeLoatch, E. M., Grogan, W. R., Peden, I. C., & Whinnery, J. R. (1994). Journal of Engineering Education Round Table: Reflections on the grinter report. *Journal of Engineering Education*, *83*(1), 69–94. https://doi.org/10.1002/j.2168-9830.1994.tb00120.x

Harvard University. (n.d.-b). Admissions statistics. https://college.harvard.edu/admissions/admissions-statistics

Harvey, L., & Mason, S. (1995). *The role of professional bodies in Higher Education Quality Monitoring*. Quality in Higher Education Project. January 8, 2024, https://www.qualityresearchinternational.com/Harvey%20papers/Harvey%20and%20Mason%20Professions%201995%20[2014].pdf

Hazelkorn, E. (2015). Globalization, internationalization and rankings. *International Higher Education*, (53). https://doi.org/10.6017/ihe.2008.53.8053

Higher Ed Immigration Portal. (2023, December 14). U.S. state policies on DACA & Undocumented Students. https://www.higheredimmigrationportal.org/states/

ICE. (n.d.-a). 2007 to 2021 Annual Growth in OPT, STEM OPT and CPT Authorizations and Employment Authorization Document (EAD) Issuances. https://www.ice.gov/doclib/sevis/pdf/data-ApprovedEmploymentAuthorizations2007-2019.pdf

ICE. (n.d.-b). *Practical training*. ICE. https://www.ice.gov/sevis/practical-training

ICE. (2020, July 6). *SEVP modifies temporary exemptions for Nonimmigrant Students taking online courses during Fall 2020 Semester*. ICE. https://www.ice.gov/news/releases/sevp-modifies-temporary-exemptions-nonimmigrant-students-taking-online-courses-during

IES. (2020). *Introduction to the classification of instructional programs*. National Center for Educational Statistics, 1-5. https://nces.ed.gov/ipeds/cipcode/Files/2020_CIP_Introduction.pdf

IES. (n.d.). *Browse CIP Codes*. CIP user site. https://nces.ed.gov/ipeds/cipcode/browse.aspx?y=55

IES. (n.d.-a). *Detail for CIP Code 40.0504*. National Center for Education Statistics. https://nces.ed.gov/ipeds/cipcode/cipdetail.aspx?y=56&cipid=89582

IES. (n.d.-b). *Detail for CIP Code 50.0411*. National Center for Education Statistics. https://nces.ed.gov/ipeds/cipcode/cipdetail.aspx?y=55&cipid=89301

IES. (n.d.-c.) *FAQs*. National Center for Education Statistics. https://nces.ed.gov/ipeds/cipcode/FAQ.aspx?y=55

IES. (n.d.-d.). *What is the CIP?* National Center for Educational Statistics. https://nces.ed.gov/ipeds/cipcode/default.aspx?y=55

Institute of International Education. (2023, November 13). *Leading Institutions*. Open Doors. https://opendoorsdata.org/data/international-students/leading-institutions/

Institute of International Education. (2023, November 13-a). *State Fact Sheets.* https://opendoorsdata.org/fact_sheets/state-fact-sheets/

Johnstone, B. (2002). Challenges of financial austerity: Imperatives and limitations of revenue diversification in higher education. *The Welsh Journal of Education / Cylchgrawn Addysg Cymru*, *11*(1), 18–36. https://doi.org/10.16922/wje.11.1.3

Knight, J. (2008). Higher education in turmoil: The changing world of internationalization. Sense Publishers

Le, T., & Gardner, S. K. (2010). Understanding the doctoral experience of Asian F-1 students in the Science, Technology, engineering, and Mathematics (STEM) fields: An exploration of one institutional context. *Journal of College Student Development*, *51*(3), 252–264. https://doi.org/10.1353/csd.0.0127

Martel, M., Baer, J., Mason, L., Anrejko, N., Nemeth, N. (2023). *Open Doors 2023 Report on International Education Exchange*. Institute of International Education. https://report.opendoorsdata.org/opendoors/library/page/open_doors_2023/2/?utm_source=newsletter&utm_medium=email&utm_campaign=TXOPEN240209002&utm_content=gtxcel

Massification. (n.d.). *Dictionary.com*. Retrieved March 20, 2020, from https://www.dictionary.com/browse/massification.

Matthews, R., Warner, B., & Stokes, P. (2023, October 16). *Managing the other enrollment cliff (opinion)*. Inside Higher Ed. https://www.insidehighered.com/opinion/views/2023/10/16/managing-other-enrollment-cliff-opinion

Mendoza, P., & Berger, J. B. (2008). Academic capitalism and academic culture: A case study. *Education Policy Analysis Archives*, *16*, 23. https://doi.org/10.14507/epaa.v16n23.2008

Michael, S. O., & Schwartz, M. (1999). Perceived role of trustees. *Journal of Educational Administration*, *37*(2), 165–183. https://doi.org/10.1108/09578239910263042

MIT. (n.d.-c). First-year class profile. https://mitadmissions.org/apply/process/profile/

National Archives and Records Administration. (n.d.). *Records of the Immigration and Naturalization Service [INS]*. National Archives and Records Administration. https://www.archives.gov/research/guide-fed-records/groups/085.html#85.2

NACUBO. (2022, 1 March). *2021 NTSE Endowment Market Values US And Canadian Universities*. https://www.nacubo.org/-/media/Nacubo/Documents/research/2021-NTSE-Endowment-Market-Values-US-and-Canadian-Institutions--REVISED-March-1-2022.ashx?la=en&hash=B62365B0402B89E8FB7EBF0EA61D73474A529A72

Nixon, E., Scullion, R., & Hearn, R. (2016). Her majesty the student: Marketised higher education and the narcissistic (dis)satisfactions of the student-consumer. *Studies in Higher Education*, *43*(6), 927–943. https://doi.org/10.1080/03075079.2016.1196353

NSF. (2023). Rankings by total R&D expenditures. https://ncsesdata.nsf.gov/profiles/site?method=rankingBySource&ds=herd

Number of F-1 students in the United States hits all-time high: (2019). IIE. https://www.iie.org/news/number-of-international-students-in-the-united-states-hits-all-time-high/

Office of the Inspector General. (2002, May 20). *The Immigration and Naturalization Service's Contacts With Two September 11 Terrorists*. Special report. https://oig.justice.gov/sites/default/files/archive/special/0205/chapter6.htm

Origins of the Federal Naturalization Service. USCIS. (2019, December 4). https://www.uscis.gov/about-us/our-history/explore-agency-history/overview-of-agency-history/origins-of-the-federal-naturalization-service

Peterson, D. M., Briggs, P., Dreasher, L., Horner, D. D., & Nelson, T. (1999). Contributions of F-1 students and programs to campus diversity. *New Directions for Student Services*, *1999*(86), 67–77. https://doi.org/10.1002/ss.8609

Reeves, M. H. (2005). *A descriptive case study of the impact of 9/11 on F-1 student visa policy in the 20 months following the attacks* (dissertation). Norman, OK. Retrieved September 15, 2023, from https://shareok.org/bitstream/handle/11244/917/3187222.PDF?sequence=1.

Regini, M. (2020). Institutional Governance: Factors, Actors, and Consequences of Attempting to Converge on the Anglo–American Model. In G. Capano & D. S. L. Jarvis (Eds.), *Convergence*

and Diversity in the Governance of Higher Education: Comparative Perspectives (pp. 103–137). chapter, Cambridge: Cambridge University Press.

Reif, L. R. (2020, July 8). *MIT and Harvard file suit against New Ice Regulations*. MIT News | Massachusetts Institute of Technology. https://news.mit.edu/2020/mit-and-harvard-file-suit-against-new-ice-regulations-0708

Salve Regina University. (2021, October 4). Fall 2021 university profile. https://salve.edu/document/fall-2021-university-profile

Scott, P. (2011). The University as a Global Institution. In R. King, S. Marginson, & R. Naidoo (Eds.), *Handbook on Globalization and Higher Education* (pp. 59–75). essay, Edward Elgar. Retrieved August 9, 2023, from 10.4337/9780857936233.00013.

Shattock, M. (2006). *Managing good governance in higher education*. New York, NY: Open University Press.

Shenton, A. K. (2004). Strategies for ensuring trustworthiness in qualitative research projects. Education for Information, 22, 63-75.

Smith, M. L. (2002). Race, Nationality, and Reality. *Prologue Magazine*, *34*(2). https://www.archives.gov/publications/prologue/2002/summer/immigration-law-1

Staff Statement No. 1. Entry of the 9/11 Hijackers into the United States. (2002). *National Commission on Terrorist Attacks upon the United States: Borders, Transportation, and Managing Risk.* Seventh Public Hearing. https://govinfo.library.unt.edu/911/staff_statements/staff_statement_1.pdf

Stein, S., & de Andreotti, V. O. (2015). Cash, competition, or charity: F-1 students and the global imaginary. *Higher Education*, *72*(2), 225–239. https://doi.org/10.1007/s10734-015-9949-8

Student population comparison between Rhode Island Colleges. (n.d.). College Tuition Compare. https://www.collegetuitioncompare.com/compare/tables/?state=RI&degree=Undergraduate&factor=student-population

Suter, L. E., & Camilli, G. (2018). F-1 student Achievement Comparisons and US Stem Workforce Development. *Journal of Science Education and Technology*, *28*(1), 52–61. https://doi.org/10.1007/s10956-018-9746-0

The Presidents' Alliance on Higher Education and Immigration. (2023, December 14). *U.S. state policies on DACA & Undocumented Students: Higher Ed Immigration Portal*. Higher Ed Immigration Portal. https://www.higheredimmigrationportal.org/states/

Times Higher Education. (2023). World University Rankings 2023. https://www.timeshighereducation.com/world-university-rankings/2023/world-ranking

Timms, E., & Noble Suhler, J. (1998, September 20). Security worries putting spotlight on student visas. *The Dallas Morning News*. Retrieved July 18, 2023, from https://web.archive.org/web/20070512122504/http://www.cis.org/articles/Katz/katz1999.html.

Trow, M. (1973). Problems in the Transition from Elite to Mass Higher Education. *Carnegie Commission on Higher Education*, 1–57. https://eric.ed.gov/?id=ED091983

University of Rhode Island. (n.d.). *Who we are*. University of Rhode Island. https://www.uri.edu/about/facts-2022/demographics/

Update to the Department of Homeland Security STEM Designated Degree Program List, 88 FR 44381 (2023, July 12). https://www.federalregister.gov/documents/2023/07/12/2023-14807/update-to-the-department-of-homeland-security-stem-designated-degree-program-list#:~:text=How%20may%20a%20nomination%20be,%3A%20STEM%20CIP%20Code%20Nomination.%E2%80%9D

US foreign enrollment once again exceeds one million students. ICEF Monitor - Market intelligence for F-1 student recruitment. (2023, March 29). https://monitor.icef.com/2023/01/us-foreign-enrolment-once-again-exceeds-one-million-students/

USCIS. (2019, December 4). *Era of restriction*. USCIS. https://www.uscis.gov/about-us/our-history/explore-agency-history/overview-of-agency-history/era-of-restriction

USCIS. (2023, August 25). *Our history*. USCIS. https://www.uscis.gov/about-us/our-history

USCIS. (n.d.-a). Chapter 6 - Evidence. https://www.uscis.gov/policy-manual/volume-1-part-e-chapter-6

USCIS. (n.d.-b) *H-1B Specialty Occupations, DOD Cooperative Research and Development Project Workers, and Fashion Models*. https://www.uscis.gov/working-in-the-united-states/h-1b-specialty-occupations

USCIS. (n.d.-c). Nonimmigrant-Based Employment, 1-106. https://www.uscis.gov/sites/default/files/document/foia/Nonimmigrant_Empl.pdf

US Department of Education. (n.d.). Science, Technology, Engineering, and Math, including Computer Science.

https://www.ed.gov/stem#:~:text=Science%2C%20Technology%2C%20Engineering%2C%20and,Science%20%7C%20U.S.%20Department%20of%20Education

US Department of Homeland Security. (n.d.-a). *Eligible CIP codes for the STEM OPT extension*. Study in the States. https://studyinthestates.dhs.gov/stem-opt-hub/additional-resources/eligible-cip-codes-for-the-stem-opt-extension

US Department of Homeland Security. (n.d.-b). *Form I-983 overview*. Homepage. https://studyinthestates.dhs.gov/stem-opt-hub/additional-resources/form-i-983-overview

US Department of Homeland Security. (n.d.-c). *Stem OPT Extension Overview*. Study in the States. https://studyinthestates.dhs.gov/stem-opt-hub/additional-resources/stem-opt-extension-overview

Wang, T. (2018, March 8). *I wasn't selected in the H1B Visa Lottery but it turned out to be a rewarding experience*. LinkedIn. https://www.linkedin.com/pulse/i-wasnt-selected-h1b-visa-lottery-turned-out-rewarding-tian-wang

Wasem, R. E. (2012). *Immigration of Foreign Nationals with Science, Technology, Engineering, and Mathematics (STEM) Degrees.* (CRS Report No. R42530). Congressional Research Service. https://sgp.fas.org/crs/misc/R42530.pdf

Washington Alliance of Technology Workers v. United States Department of Homeland Security et al. (United States District Court for the District of Columbia October 4, 2022). Retrieved March 10, 2023, from https://www.cadc.uscourts.gov/internet/opinions.nsf/0/EA1023130EF82217852588D1004ED5AB/$file/21-5028-1967339.pdf.

Williams, G. L., & Sporn, B. (1995). The "Marketization" of Higher Education: Reforms and Potential Reforms in Higher Education Finance. In D. D. Dill (Ed.), *Emerging Patterns of Social Demand and University Reform: Through a Glass Darkly* (pp. 170–193). essay, IAU Press.

Xue, Y., & Larson, R. (2015). Stem crisis or stem surplus? yes and yes. *Monthly Labor Review*. https://doi.org/10.21916/mlr.2015.14

Yan, K., & Berliner, D. C. (2010). Chinese F-1 students in the United States: Demographic trends, motivations, acculturation features and adjustment challenges. *Asia Pacific Education Review*, *12*(2), 173–184. https://doi.org/10.1007/s12564-010-9117-x

Yang, P. (2019). Toward a framework for (re)thinking the Ethics and Politics of F-1 student mobility. *Journal of Studies in International Education*, *24*(5), 518–534. https://doi.org/10.1177/1028315319889891

Zhou, E. (2022). (publication). *INTERNATIONAL GRADUATE APPLICATIONS AND ENROLLMENT: FALL 2021* . Council of Graduate Schools . Retrieved September 6, 2023, from https://cgsnet.org/wp-content/uploads/2022/09/CGS-International-Graduate-Applications-and-Enrollment-Fall-2021-2022.09.12.pdf.