



# Alternative routes to teaching as a state policy mechanism: Implications for teacher supply and composition

## Citation

Lamb, Anne. 2022. Alternative routes to teaching as a state policy mechanism: Implications for teacher supply and composition. Doctoral dissertation, Harvard University Graduate School of Education.

## Link

<https://nrs.harvard.edu/URN-3:HUL.INSTREPOS:37371526>

## Terms of use

This article was downloaded from Harvard University's DASH repository, and is made available under the terms and conditions applicable to Other Posted Material (LAA), as set forth at

<https://harvardwiki.atlassian.net/wiki/external/NGY5NDE4ZjgzNTc5NDQzMGIzZWZhMGFIOWI2M2EwYTg>

## Accessibility

<https://accessibility.huit.harvard.edu/digital-accessibility-policy>

## Share Your Story

The Harvard community has made this article openly available.

Please share how this access benefits you. [Submit a story](#)

**Alternative routes to teaching as a state policy mechanism:  
Implications for teacher supply and composition**

Anne T. Lamb

Martin West  
Eric Taylor  
Celine Coggins

Thesis Presented to the Faculty  
of the Graduate School of Education of Harvard University  
In partial fulfillment of the Requirements  
For the Degree of Doctor of Education

2022

© 2022  
Anne T. Lamb  
All Rights Reserved

## **Dedication**

To my dad, who always hoped I would become a doctor.

## Acknowledgments

I am immensely grateful for the opportunity to have learned from and worked alongside many brilliant professors, instructors, and mentors during my time at Harvard Graduate School of Education (HGSE). I would like to thank my advisor, Marty West, who always provided kind words and encouragement throughout the years, and particularly as I completed my dissertation amid a pandemic. Thank you to Eric Taylor, whom I can always count on to provide feedback that improves the clarity and content of my work, and from whom I have learned a great deal. Thank you to Celine Coggins, who has brought an important practitioner perspective that I find invaluable.

Additionally, I would like to particularly thank Dick Murnane who modeled the collaborative process of research, and the importance of curiosity in driving the work. Thank you to Andrew Ho for the opportunity to learn from him in his excellent courses, as a teaching fellow, and as a member of his research team. I still return to the lessons I have learned from Andrew whenever I dive into a new project.

One of the brightest spots about attending HGSE was my cohort. Thank you especially to the following: Zack Mabel for his patience and support in our shared methods courses, Marcus Waldman and Pierre de Galbert for their comments on early drafts and ideas, and especially to Preeya Mbekeani for her feedback, collaboration, and friendship.

Finally, and most importantly, thank you to my family for your support and encouragement over the years. Thank you to my parents, Phil and Mary, and my in-laws, Cindie and Ed, who have encouraged me to keep the end in sight, and also have provided the necessary childcare so that I could complete this dissertation. To Jon, Nellie, and Mae – thank you for your patience. I am looking forward to spending my weekends with you again.

## Table of Contents

<a href="#">Abstract</a> .....	v
<a href="#">Introduction</a> .....	1
<a href="#">Chapter 1. Classifying alternative routes to teaching</a> .....	17
<a href="#">Chapter 2. State approaches to flexibility in teacher entry</a> .....	53
<a href="#">Chapter 3. Can alternative routes to teaching influence teacher composition and sorting?</a> .....	73
<a href="#">Chapter 4. Expansion of alternative routes to teaching and the effect on teacher supply and hiring</a> .....	117
<a href="#">Conclusion</a> .....	164
<a href="#">Works Cited</a> .....	167

## Abstract

States first implemented alternative routes to teaching (ARTs) as a policy mechanism to attract qualified candidates into teaching and alleviate rising teacher shortages. They hoped that ARTs would reduce reliance on emergency teaching permits to fill existing shortages. Proponents of ARTs suggest that by revising traditional preparation programs and requirements, ARTs can induce individuals to enter teaching who would not otherwise have done so. They also cite promising evidence that ARTs can diversify the teacher workforce given that they enroll proportionally more Black, Latinx, and other candidates of color. Alternative preparation programs still account for a relatively small share of all teacher preparation programs, so others doubt whether they can substantively impact teacher labor markets.

Using data from the Title II Data Collection and the Schools and Staffing Survey (SASS), I explore whether ARTs have influenced the supply and composition of teacher labor markets. First, I examine variation in the features of alternative and traditional preparation programs and more precisely categorize distinct models of teacher preparation. Next, I examine the characteristics of candidates who enroll in and complete alternative preparation programs relative to traditional programs, paying particular attention to differences in the racial composition of teachers, their content background qualifications, and their placement in districts and schools serving high proportions of students from low-income backgrounds. Finally, I exploit variation in the timing of early-entry policies that expand alternative certification pathways to examine whether such expansions reduce teaching vacancies. I find that the fastest-growing segment of the teacher preparation market includes for-profit programs (both traditional and alternative) and non-IHE based alternative programs, while enrollment at IHEs has declined in both traditional and alternative

programs. Additionally, states with more widely available alternative routes to teaching also have proportionally more racially diverse teaching workforces relative to states with less widely available ARTs. Lastly, I find evidence that the expansion of early-entry routes to teaching increased the number of educator preparation program completers but led to declines in the number of initial teaching licenses issued in states.



## Introduction

In 1996, the Commission on Teaching and America's Future, a body comprising education leaders, politicians, and stakeholders from across the country, issued a scathing rebuke of traditional teacher preparation programs and teacher hiring processes. It called into question the ability of traditional programs to produce enough effective teachers to meet the demands of the market. The commission called for a "reinvention" of both teacher preparation and teacher selection pipelines (1996). Since then, similar criticisms have appeared from both those within traditional schools of education and from those on the outside (Levine, 2006; Putman, Hansen, Walsh, & Quintero, 2016).

The first criticism is that the *structure* of traditional preparation is neither aligned with nor sufficient to meet the demand for teachers. Critics suggest that the selection structure of traditional programs will continue to yield teacher shortages, as there is no guarantee that candidates trained through traditional programs will matriculate into teaching. For instance, between the late 1980s to 2011, the number of individuals completing college with a degree in education increased, but the number of those candidates matriculating into teaching declined (Cowan, Goldhaber, Hayes, & Theobald, 2016). Moreover, shortages are widespread among high-needs schools and high-needs subject areas, such as science, math, foreign languages, and special education (Thomas S Dee & Goldhaber, 2017b; R. M. Ingersoll, 2004). Most traditional programs allow teacher candidates to select their content area rather than fill candidate positions based on need, perpetuating the mismatch in vacancies and available candidates (Levine, 2006).

The second criticism pertains to *whom* traditional teacher preparation programs select and train to be teachers. Traditional teacher preparation pipelines produce teachers who are overwhelmingly white women despite the increasingly racially diverse student population in

the United States (Guarino, Santibanez, & Daley, 2006). Research has documented both the racial diversity gap in the teaching profession (Putman et al., 2016), as well as the benefits for students of color when they have teachers of the same race (Egalite, Kisida, & Winters, 2015; Fox, 2016; Gershenson, Holt, & Papageorge, 2015; D. Goldhaber & Hansen, 2010; Grissom & Redding, 2015).<sup>1</sup> A report by the Brown Center for Education suggests two primary reasons why traditional preparation programs (TPPs) are unable to produce more teachers of color. First, Black and Hispanic students are less likely to graduate from college, and therefore, ineligible for teacher certification. Second, Black and Hispanic bachelor's degree holders express less interest in teaching as a profession, suggesting that college students of color are less likely to want to major in Education (Putman et al., 2016). Others have found that even among the pool of potential teaching candidates, there are other structural reasons why candidates of color may not enter teaching. For instance, white candidates are substantially more likely to pass standardized tests required for teaching relative to their black counterparts (Gitomer, Latham, & Ziomek, 1999).

The third major criticism of TPPs is in regard to *how* candidates are trained: that preparation programs are fragmented, fail to adequately prepare candidates to be successful in implementing the most important pedagogical knowledge and skills, and do not adequately prepare candidates for the reality of teaching, possibly leading to lower teacher retention rates (R. Ingersoll, Merrill, & May, 2014). Those within IHEs typically cite the lack of common standards for teaching, limited assessment of teaching efficacy, and too little focus on practical application of teaching practice (Ball & Forzani, 2011; Cohen, 2011;

---

<sup>1</sup> Teachers of color profess both implicitly and explicitly higher expectations for their students of color (Fox, 2016; Gershenson et al., 2015), are more likely to use low-intervention disciplinary techniques (Holt & Gershenson, 2015), and have beneficial effects on the rate at which students of color are recommended for gifted-and-talented programming (Grissom & Redding, 2015) and on academic achievement scores (Thomas S. Dee, 2004; Egalite et al., 2015; D. Goldhaber & Hansen, 2010).

Kennedy, 1999; Levine, 2006). They call for a professionalization of teaching with more rigorous and well-defined set of common practices, and alignment between content pedagogy and content knowledge (P. Grossman, Hammerness, & McDonald, 2009). Critics outside of schools of education observe that teacher certification may not serve as a marker of teacher efficacy, especially given the non-selective nature and fragmented training of IHEs (Ballou & Podgursky, 1998; Kane, Rockoff, & Staiger, 2008).

Since the commission's report in 1996, one of the most touted solutions for addressing the shortcomings of traditional teacher preparation has been the expansion of alternative routes to teaching (ARTs). ARTs are pathways to teacher licensure that relax the timeline or requirements for meeting certification standards relative to traditional pathways. Since the 1990s, ARTs have been the subject of fierce debate around their use as a policy mechanism to improve upon the perceived shortcomings of traditional preparation programs. Proponents of ARTs claim that by lowering barriers to entry—whether in terms of time, costs, or other non-pecuniary barriers—ARTs can alleviate teacher shortages and increase the diversity of the teacher workforce, all without sacrificing teacher efficacy (Finn Jr & Madigan, 2001; Frederick M. Hess, 2003; Muñiz, 2020; Paige, 2002). Critics cite concerns that revised regulations for teacher candidates will yield less effective teachers (Ball & Forzani, 2011; Walker, 2016). Other observers note that ARTs still account for a relatively small proportion of the teacher preparation space, producing only about 1 in 5 program completers in 2017,<sup>2</sup> suggesting that ARTs may not be large enough to meaningfully impact the teacher workforce, or may not be able to maintain results when scaled.

---

<sup>2</sup> Figure based on the author's own calculations of teacher preparation program completers from the Title II Data Collection, SY 2017-18.

One factor that prevented a more complete understanding of the rise and reach of ARTs in the 1990s and early 2000s was the lack of consistent and complete data on teacher preparation programs themselves. In the 2008 reauthorization of the Higher Education Act, Congress mandated that any program receiving federal funding begin reporting information on the demographic characteristics of candidates enrolled in their teacher preparation programs and their passing rates on state licensure exams. Moreover, states had to report the number of initial teaching licenses granted annually, and requirements for various types of licensure (Fountain, 2021). These data are collected and publicly available through the Office of Postsecondary Education's Title II Data Collection.

In the analyses that follow, I use these new data to study the impact of ARTs on the teacher preparation landscape and the composition of the teacher workforce. Specifically, I seek to answer the question: *how do alternative routes to teaching influence the supply and composition of the teacher workforce?* To answer this question, I use data collected through HEA's Title II Data Collection, in combination with other nationally representative data sources, the Schools and Staffing Survey (SASS) and the National Teacher and Principal Survey (NTPS). I analyze differences in the relative production of teacher candidates at the programmatic level, and by the model type, as well as how state-level policies around certification and licensure impact the use of alternative routes to teaching. Using data on the production of new teacher candidates, I examine whether the introduction of alternative routes to teaching influenced the supply of teachers and teacher hiring. Finally, I explore the relationship between a state's reliance on alternative routes to teaching and the relative racial composition of the teaching workforce.

## **Defining alternative routes to teaching & key terms in teacher preparation**

Three decades ago, Gary Fenstermacher wrote, “The concept of alternative certification suffers two liabilities at the moment. Its meaning is obscure and its forms of implementation are many” (1990). These liabilities have continued to plague research and development in alternative teacher preparation. Specifically, the concept of alternative certification has continued to suffer because states, researchers, practitioners have continued to use different methods and definitions to operationalize “alternative certification.” Moreover, these definitions and conceptualizations have changed over time. Finally, regardless of definition, wide variation has always existed in actual teacher policy, making clear parameters for alternative certification difficult to define.

Based on early iterations of alternative routes, Feistritzer defined alternative certification programs as those programs “designed specifically to bring into the teaching profession qualified adults with at least a bachelor’s degree and, in many cases, considerable life experience” (E. Feistritzer, 1994). This definition acknowledged the wide variety of ways that nontraditional candidates could be brought into the profession, but also emphasized that such programs aimed to recruit candidates with substantial skills and that the programs included some sort of mentoring or induction support.

Feistritzer’s early definition is more specific and restrictive than other common definitions of “alternative certification” that evolved throughout the 1990s. For instance, the National Center for Education Statistics (NCES) administers the Schools and Staffing Survey, a nationally representative survey that collects information on teachers. Since 1987, the SASS has been administered approximately every four years. In 1993, for the first time, teachers were asked about their participation in alternative certification programs. The survey asked whether teachers had been certified through a “state-defined” alternative certification program but did not give additional details to clarify the definition. At that time,

and still today, states all have slightly different definitions of what constitutes an “alternative” program, leading to variation in defining such programs across state boundaries.

Much early research defined “alternative routes” as any routes other than a traditional undergraduate teacher preparation program. Because this definition includes any post-baccalaureate program at an institution of higher education (IHE), it does not hold true to the original intent of lowering barriers into teaching (Zeichner & Hutchinson, 2008). The Office of Postsecondary Education (OPE) within the U.S. Department of Education defines alternative certification routes more narrowly as those that allow the candidate to operate as the teacher of record in a classroom while concurrently enrolled in a certification program (OPE, 2016). However, they also allow states to self-report whether a route is an alternative preparation route, with little oversight to the fidelity of this definition. Moreover, the definition that OPE uses could more precisely identify a type of alternative preparation known by Grossman and Loeb as an “early-entry program” (2008).

In this dissertation, I define an *alternative route to teaching* (ART) as any teacher certification route that alters the programmatic format, methods, or timeline to certification relative to traditional programs. Such a definition allows for a variety of methods by which educator preparation providers have loosened or revised state requirements for obtaining teaching certification. It also captures the ideological and pragmatic shifts in teacher preparation that differentiate alternative models of teacher preparation from traditional teacher preparation. Finally, it is pragmatically useful for researchers. The U.S. Office of Postsecondary Education, which collects state and program-level data on the production of

new teachers, disaggregates completion data broadly according to whether an Educator Preparation Program is “traditional” or “alternative.”<sup>3</sup>

In proposing this definition, it is important to make a distinction between what I have defined as alternative routes to teaching,<sup>4</sup> alternative preparation programs, and alternative certification. Alternative *routes* to teaching, as I defined above, broadly refer to state-approved pathways that alter the barriers to teacher licensure in terms of time, costs, and/or coursework relative to traditional preparation programs. *Alternative preparation programs* (APPs) refer to holistic, cohesive programs of study offered through an organization to train aspiring teachers to support them in learning the skills, knowledge, and mindsets needed to be a teacher and in meeting the state requirements for certification. An alternative route to teaching is a broader term notating an approved state-level pathway, while an alternative preparation program is specific to an organization’s teacher preparation program. All APPs are ARTs, but not vice versa. For instance, in Indiana, the Transition to Teaching is a state-approved route. It allows organizations to offer preparation programs that are accelerated, reducing the number of credit hours that candidates need to obtain certification. Various institutions of higher education then build programs that align to the requirements of the Transition to Teaching program and offer a path for aspiring teachers to complete their training. Conversely, Vermont allows aspiring teachers to meet state licensure requirements through a process of competency-based peer review. This pathway would be considered an alternative *route* to certification, but not an alternative preparation *program*, as there is not an

---

<sup>3</sup> OPE collects and reports these data through the Title II Data Collection. OPE further disaggregates alternative programs into “IHE-based” and “non IHE-based.”

<sup>4</sup> Throughout this dissertation, I use the terms “program” and “pathway” synonymously. However, I do draw a distinction between routes and programs. Routes are defined at the state-level and have state-mandated policies that are required for certification. Programs are specifically developed by an institution to meet the certification requirements outlined in a given route. In some states, the state routes to certification are programs. In other states, programs are embedded within routes.

organizational entity specifically organizing a program of study to support new teachers in their development.

*Certification* refers to the actual licensing process administered within a state. Some states choose to offer teaching licenses that are called residency licenses, alternative licenses, etc., and others use provisional licenses for candidates enrolled in alternative certification pathways. For the sake of clarity, I will refer to an initial license as a license that a teacher candidate first obtains after meeting all certification requirements, whether prepared through an APP or TPP. A professional license is the permanent teaching license, obtained after teaching for a minimum number of years in a state while also achieving other professional development or competency benchmarks. A provisional license is a license that is a temporary license granted to a candidate who is still working toward certification requirements of an initial license. This is the type of license granted to most candidates enrolled in an early-entry program that allows a candidate to work as a lead-teacher while concurrently enrolled in a certification program. In short, it is important to distinguish the pathway (program or route) through which a teacher candidate is trained from the licensing process itself (Gist, 2019).

### **The rise of alternative routes to teaching**

Education historian David Labaree traces the struggle over teacher supply and quality as far back as the early 1800s when the roots of modern teacher preparation were established with the normal school, or institutions meant to provide standardized training to produce well-educated professional teachers to serve the needs of publicly funded schools. Labaree writes that to meet the large demand for trained teachers, normal schools sacrificed rigor by “making teacher education easy to enter, short in duration, modest in academic rigor, and inexpensive to maintain.” (2008). By the 1930s, most normal schools had evolved



into teachers' colleges and by the 1950s, teacher preparation found its home within schools or departments of education within liberal arts colleges and universities (Labaree, 2008; Tikkanen, 2016).

While normal schools were evolving and merging with IHEs, social and political changes led to increased educational and labor market opportunities for women. In the early 1900s, teaching was one of the only careers eligible for women (Goldin, 2006). Throughout the late 1960s in particular, women increasingly had access to wider arrays of opportunities, and women who previously may have entered the teaching profession turned to other fields (Corcoran, Evans, & Schwab, 2004). By the early 1980s, many states were faced with a shortage of certified teachers, particularly those qualified to teach math and science, and in high-needs rural and urban schools (Birkeland & Peske, 2004; E. Feistritzer, 1994; Suell & Piotrowski, 2007).

States responded to these teacher shortages by implementing the first alternative routes to teaching, with South Carolina and New Jersey being the first states to implement such routes. Early ARTs were designed to attract nontraditional teacher candidates into the field, or candidates who had already graduated with a bachelor's in a subject other than education. States allowed the non-traditional candidates to be hired as the teachers-of-record on time-restricted provisional licenses, and they were eligible for initial licensure after completing the requirements of the alternative route.<sup>5</sup> Prior to the 1980s, states relied on temporary or emergency licenses to fill shortages with nontraditional candidates. According to Emily Feistritzer, one of the most prominent researchers to document the rise of ARTs, in the 1980s, at least 20 states allowed emergency certificates to be issued to candidates who

---

<sup>5</sup> A lead-teacher is the teacher-of-record in a classroom, meaning they are the licensed teacher ultimately responsible for leading a classroom. *Lead-teacher* and *teacher-of-record* are used synonymously throughout this book.

had not even completed a Bachelor's degree (C Emily Feistritzer, 1984). Additionally, the use of emergency certificates was problematic because they were disproportionately used to fill shortages in high-needs schools and classrooms, including in schools serving majority BIPOC students (Darling-Hammond & Green, 1988; Pascal, 1987). Alternative programs served as a means of lowering barriers to entry into teaching relative to traditional programs while providing more support and higher entry requirements relative to emergency certificates (E. Feistritzer, 1994; Neumann, 1994; Suell & Piotrowski, 2007). While these "early-entry" alternative routes helped address shortages, critics contended that they put teachers in classrooms who were ill-prepared to be effective (Bullough Jr, Burbank, Gess-Newsome, Kauchak, & Kennedy, 1998). Despite the criticism, alternative routes continued to expand throughout the 1990s as states continued to face teacher shortages.

In 2001, Congress passed No Child Left Behind (NCLB), a reauthorization of the Elementary and Secondary Education Act (ESEA). The legislation attempted to address teacher shortages without sacrificing teacher quality. Congress allocated funding to "increase student achievement through strategies such as improving teacher...quality and increasing the number of highly qualified teachers in the classroom" ("No Child Left Behind Act of 2001, Pub. L. No. 107-110, § 115," 2002). The law mandated that teachers of record in core classes meet federal standards for being highly qualified, including holding a bachelor's degree from a four-year institution, being fully certified by the state, and demonstrating competence in the subject they taught, generally through passing a rigorous content exam. An analysis of the Schools and Staffing Survey found that by the 1999-2000 school year, only about half (54%) of the nation's teachers were considered highly qualified under this definition (OPPI, 2003). All three requirements align with tighter restrictions on candidates entering the teaching profession. Whether alternative certification could be used as a strategy

for meeting these conditions became a major point of contention in the wake of NCLB. Eventually, the U.S. Department of Education allowed teacher candidates in early-entry alternative preparation programs to be considered highly qualified if their APP met certain requirements.

Since then, as the debate around their use has continued, ARTs have expanded as a share of the teacher preparation landscape. In 2000-01, only 70 alternative preparation program providers existed nationally, but by 2017-18, there were 660 alternative preparation programs. While the production of teachers from both APPs and TPPs declined during the Great Recession, the decline has continued for TPPs, while APPs have steadily increased the number of program completers. As a result, while APPs prepared just 14% of all teacher candidates in 2000-01, by 2018-19, they prepared about 23% of program completers (see Figure I.1).<sup>6</sup>

Within the past ten years, there have been several important developments in the alternative teacher preparation space. First, some APP models that seem to combine features of early ARTs with more traditional programs have developed as a way of ensuring new teacher efficacy, including teacher residencies and grow-your-own (GYO) programs. Both models, which are discussed more in Chapter 1, provide an extended clinical immersion with support from a veteran teacher, and a longer training timeline, but also are typically accelerated programs, are responsive to the needs of the local community, and typically are lower cost. Models like these tend to have support from all sectors of teacher training,

---

<sup>6</sup> Figures from 2000-01 are calculated based on published reports from OPE. See U.S. Dept. of Education, Office of Postsecondary Education. (2009) *The Secretary's Sixth Annual Report on Teacher Quality*. Figures from 2018-19 are based on the author's own calculations of publicly available [Title II Data](#) from that academic year.

including supporters of traditional teacher certification programs (Guha, Hyler, & Darling-Hammond, 2017).

A second trend is the rapid expansion of online and for-profit providers. As shown in Chapter 2, for-profit programs now account for over half of candidates prepared in a handful of states. Because these providers offer fully online programs, it is unclear whether most of the candidates prepared through these programs end up entering the teacher labor market in these states, or whether they use the program to seek reciprocal certification in another states. More troubling, for-profit programs enroll proportionally larger numbers of candidates who are people of color and from low-income backgrounds, and many have low graduation rates, and high default rates (Deming, Goldin, & Katz, 2013; Kutz, 2010).

Finally, although not a trend per se, it is nevertheless important to note is that because many states have now had ART policies in place for over thirty years, within the past decade, many states have tightened restrictions on teacher licensure, while others have continued to relax them. For instance, in 2015, New Jersey reformed state policies regarding alternative preparation, adding more stringent entry and exit requirements for candidates (Ngoma, 2015). Meanwhile, North Carolina just passed a bill to relax requirements to allow nontraditional candidates to enter classrooms more easily (Hui, 2021).

### **Research on the efficacy of teachers trained through ARTs**

Since the rise of alternative teacher preparation routes, researchers have tried to assess the relative efficacy of teachers trained through alternative programs relative to traditional programs. Practitioners have feared that lowering barriers to entry and lowering training requirements would yield teachers who are both less academically capable and less prepared. Additionally, because candidates from ARTs are more likely to teach in high-needs

schools, ARTs could exacerbate existing inequities in access to effective teachers among students of color and low-income students.

Empirical studies over the past few decades have tried to address whether these arguments are valid. Taken together, the results of the most rigorous empirical evidence suggest that the efficacy of teachers may depend on the selectivity of the program itself. Highly selective alternative route pathways, such as Teach for America (TFA) and the New York City Teaching Fellows (NYCTF), attract candidates with higher entry qualifications in terms of test scores and academic achievement when compared with traditional routes and less selective alternative certification routes. More recent experimental and quasi-experimental studies suggest that candidates from highly-selective alternative routes tend to generate gains in student achievement equal to those of candidates from traditional routes in elementary and ELA, and outperform teachers from traditional routes in middle- and high-school math (D. Boyd et al., 2010; D. Boyd, Grossman, Lankford, Loeb, & Wyckoff, 2006; M. A. Clark, Chiang, Sonnenfeld, Erbe, & Puma, 2013; Decker, Mayer, & Glazerman, 2004a; Henry et al., 2014; Kane et al., 2008; Xu, Hannaway, & Taylor, 2011). While student achievement outcomes among teachers from highly-selective alternative routes are equal to or better than those of traditionally trained teachers, teachers in these routes may also exit the teaching profession at higher rates, although this seems mainly due to their higher opportunity cost of teaching relative to less-selective teacher candidates (Kelly & Northrop, 2015). The same pattern of attrition seems true for highly-selective candidates regardless of the route by which they enter the profession (Kelly & Northrop, 2015).

Most alternative certification routes are not considered highly selective. What are the effects on student achievement and teacher attrition from these less-selective routes relative to traditional certification routes? J. Constantine et al. (2009) examined the effects of

students being randomly assigned to either an alternatively certified teacher or a traditionally certified teacher. The alternative routes to teaching included in the study were less selective than TFA or NYCTF, although they varied substantially in the amount of coursework they required for certification. Still, the authors found no difference in student outcomes by certification route. Moreover, neither the amount of work required by the program nor the substance of the coursework was correlated with more effective teachers (J. Constantine et al., 2009)

Throughout the literature on both the efficacy of teachers trained through alternative routes and in the certification literature more broadly, it is important to note that research consistently finds that variation in teacher effects are greater within programs or routes compared to variation across them (D. Goldhaber, 2008). While it is important to understand and compare the efficacy of teachers trained through alternative certification routes in terms of their effects on student achievement outcomes, it is equally important to consider mechanisms for improving student outcomes other than those measured by standardized tests. For instance, an increasingly important goal for many school districts is to ensure a diverse teacher workforce, in which the racial and ethnic identities of the teachers match those of the student body. Because alternative routes to teaching tend to enroll more diverse candidates, whether they can influence the composition of the teacher workforce is an important line of research.

## **Overview of this dissertation**

In this study, I explore answers to the question: how have alternative routes to certification influenced the supply of and composition of teacher candidates and teachers? In Chapter 1, I use existing literature to propose a framework for understanding and categorizing both features of preparation programs and holistic models of teacher

preparation. Following the lead of Grossman and Loeb (2008), I am interested in articulating the salient features of teacher preparation in order to understand differences in how such features, and holistic models, attract and support candidates in the teacher preparation pipeline. I use the framework to describe some contemporary trends in the teacher preparation landscape.

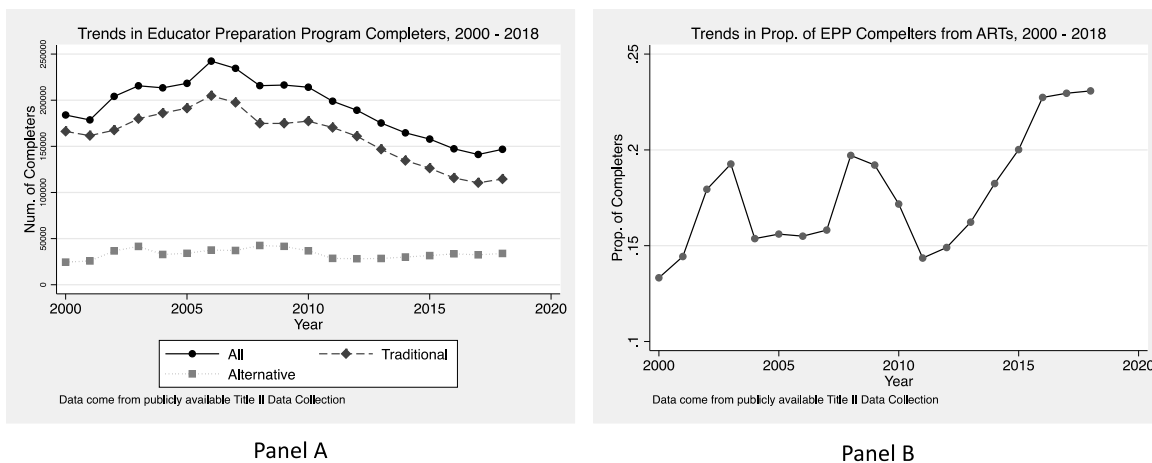
In Chapter 2, I turn to the role that state policy plays in teacher preparation. I document the variation in approaches to licensure types permitted within and across states, regardless of a state's stance on alternative preparation programs. Additionally, I examine variation in the proportion of potential teachers who complete APPs versus TPPs within and between states. I examine the extent to which certification policies and ART completion are measures of the same construct – state flexibility in teacher licensure. Interestingly, I find less overlap than connotations of alternative certification would suggest.

In Chapter 3, I ask whether and how ARTs influence the racial composition of enrolled teacher preparation candidates and a state's teaching workforce. Prior analysts have documented that ARTs are better at attracting racially diverse candidates into the teacher pipeline (L Partelow, 2019), but less is known about whether ARTs supply more diverse teachers to the workforce. I use nationally representative data to show that ARTs are particularly effective at supply teachers of color to the labor market. Additionally, using a simple policy simulation, I find that increasing the proportion of new teachers supplied from ARTs from 28% to 38% would yield a 6 percent increase in the number of new teachers of color.

Finally, in Chapter 4, I examine whether the expansion of early-entry routes to certification at the state level increases new teacher supply and decreases teacher vacancies. Early-entry is the most common feature of ART programs. Many states enacted early-entry

routes to alleviate teacher shortages, so this is an important policy question. I use information on early-entry implementation and expansion from the Title II Data Collection along with survey data from the nationally representative Schools and Staffing Survey to answer this question. I find that while implementation of early-entry routes increased the number of program completers, it led to a decline in the number of initial licenses granted in a state. This result is likely explained by the way that early-entry shifted states from relying on short-term, low-barrier emergency licenses to more stringent, longer-duration provisional licensure. In the conclusion to this volume, I reflect on the contribution of these chapters to the broader research agenda on teacher preparation, and alternative teacher preparation in particular.

### Figures for Introduction



**Figure I.1. Trends in educator preparation program completers, by type of program, and ARTs as a proportion of the total production of program completers, 2000 – 2018**



## Chapter 1. Classifying alternative routes to teaching

In the introduction to this book, I advocate a purposefully broad definition of alternative preparation as those post-baccalaureate level programs that revise state regulatory requirements for initial teacher licensure. With such a broad definition, it is important to distinguish among categories of preparation programs within the alternative preparation space. Researchers and policy-makers have called for more nuanced discussions and research agendas to describe the effects of specific alternative teacher certification programs and policy approaches. Wilson, Floden, and Ferrini-Mundy (2001) have proposed that research on teacher preparation should compare practices across institutions to examine the relationship between specific features of teacher preparation programs and the outcomes of those programs. Similarly, Grossman and Loeb, in their 2008 survey book on alternative certification, encourage future research to focus more on the nuanced differences within alternative teacher preparation programs rather than by examining the programs as a monolithic category.

Researchers who have heeded this call have examined specific programmatic features of teacher preparation, and linked these specific features to teaching efficacy and student outcomes (D. J. Boyd, Grossman, Lankford, Loeb, & Wyckoff, 2009; Henry et al., 2014; Lincove, Osborne, Mills, & Bellows, 2015; Sass, 2015). These empirical studies have laid the foundation for understanding how various programmatic components may impact who enters teaching and the efficacy of those candidates. Largely, these studies have taken the approach of examining programmatic differences and differences among candidates within a city or state. The benefit of these studies is that researchers can examine rich data that link students to teachers, and teachers to preparation programs.

In contrast to these approaches, other researchers have argued that it may not be prudent to attempt to disentangle the effects of specific programmatic features since teacher preparation programs are designed comprehensively (Mayer, Decker, Glazerman, & Silva, 2003). Instead, these researchers suggest examining specific programs to holistically describe the impact of the program without trying to disentangle the effects of specific programmatic features (i.e., without an attempt to distinguish selection effects from training effects).<sup>7</sup> Such studies are useful if there are well-defined programmatic models that can be adopted or adapted based on the findings of such studies. The drawback of these studies is that many of the programs that have been examined are not representative of the average alternative preparation model. For instance, Teach For America has been evaluated or examined in multiple studies, across multiple sites, yet the model relies heavily on recruiting candidates with strong content knowledge and high academic achievement, which is a model unlikely to be easily replicated.

Taken together, the charge is to (1) develop an updated framework for describing the key programmatic features of alternative educator preparation programs and how they might differ from traditional preparation programs, (2) to classify programs into more holistic models based on their combination of features, and (3) to understand the effects of these programmatic features as well as the holistic program model on teacher characteristics, efficacy, and student outcomes. By doing so, researchers and practitioners can understand how variation in these dimensions (and holistic categories of programs) is related to outcomes of interest (teacher quality, supply, and characteristics).

---

<sup>7</sup> For instance, see studies on the efficacy of Teach For America (Backes & Hansen, 2015; Donaldson & Johnson, 2011; Glazerman, Mayer, & Decker, 2006; Henry et al., 2014), Boston Teacher Residency (Papay, West, Fullerton, & Kane, 2012), and a purposefully selected sample of programs for case study analysis (Humphrey & Wechsler, 2007). These are only a handful of the existing studies and are meant to be representative of this approach at examining the holistic impacts of specific programs.

Unfortunately, a limiting factor in these lines of research is the Title II Data Collection, the only comprehensive national data providing annual information about teacher preparation programs and program completers. The original goal of the Title II Data was to aid the federal government in monitoring educator preparation program quality through collecting and publishing data on licensure pass rates, the number of candidates trained, and other characteristics of enrolled candidates. Information about the design features of programs is sparse, but includes the graduate level of the program, the institution administering a program, whether the program is housed at an institution of higher education (IHE) and whether each program is alternative or traditional. For researchers and practitioners attempting to distinguish the effects of certain components of teacher preparation programs or to compare program models, the classification from Title II is too simplistic, preventing more robust comparisons or tracking.

As Congress considers a reauthorization of the Higher Education Act, it is an opportune time to consider what additional information could be provided without unduly increasing the burden on programs and states during the Title II reporting process. In this paper, I propose a more robust framework for categorizing teacher preparation programs based on their institutional management, programmatic features, and timing relative to licensure, and how the Title II data could support such a classification. I first discuss the limitations of the current Title II framework for providing information about teacher preparation programs. I propose a framework to help build a common understanding of the key programmatic features of ARTs along three dimensions: institutional management, relative time to licensure, and program requirements. I discuss how this framework could contribute to a better understanding of the growth and development of new models of teacher preparation, support researchers in using common language to analyze the effects of

specific teacher preparation features, and still meet the accountability mandate of the HEA Title II Act.

## **1. Background on alternative educator preparation taxonomies**

As alternative routes to teaching have continued to expand and evolve, researchers and policymakers have tried to identify and understand the salient features that distinguish alternative routes to teaching from traditional programs and from one another. By identifying salient features of alternative routes to teaching, researchers can document the expansion of types of alternative routes and explore the relationship between programmatic features and program efficacy. Since the rise of alternative routes to teaching, researchers have attempted to document these features. Some have also proposed more formal typologies of alternative routes to teaching. In this section, I discuss how the default classification system evolved, and the most important features that researchers have identified as areas of empirical interest.

### **1.1. NCEI Classification of Alternative Preparation Approaches**

In the 1980s and 1990s, most information on alternative teacher preparation programs was collected through a private organization, the National Center for Education Information (NCEI), founded by researcher Emily Feistritz. Beginning in 1983, NCEI surveyed state administrators, attempting to document approaches to and enrollment in alternative certification pathways (C Emily Feistritz, 1993). Through these surveys, Feistritz concluded that most alternative certification programs arose out of a need to address teaching shortages that did not rely so heavily on emergency or temporary certification.

NCEI developed their own taxonomy for classifying state approaches to alternative certification using letters A – I. States were classified according to whether they offered

alternative pathways to teaching, as well as the extent to which they attracted non-traditional candidates into teaching and provided adequate support in their development. For instance, programs categorized as Class A had to meet the following criteria: (1) candidates had to have a bachelor's degree in a field other than education; (2) the program could not place restrictions on the certification areas of candidates (for instance, restricting them to shortage areas); and (3) a candidate's development had to include co-teaching with a trained veteran teacher throughout the course of their training year. Conversely, Class H programs allowed very narrow pathways to alternative certification in which candidates with "special" qualifications could teach classes in their area of expertise, such as a well-known author teaching a high-school writing class, or an accomplished scientist teaching a chemistry class (C Emily Feistritzer, 1993).

Feistritzer continued to publish reports classifying states according to the NCEI taxonomy until 2011 (C Emily Feistritzer, Griffin, & Linnajarvi, 2011).<sup>8</sup> Feistritzer's classification system did not persist beyond the end of NCEI. Its classification criteria were based on what NCEI perceived to be "effective" alternative certification policies rather than common features or approaches to certification. As such, it served more as a policy mechanism to inform state approaches to alternative certification rather than a useful way to analyze trends in teacher preparation. Additionally, because NCEI was a private organization, states had little incentive to complete their surveys and so response rates were low and inconsistent. Finally, the classification system was too complicated, with specific and different criteria used for each "class." The "classes" did not constitute a clear continuum.

---

<sup>8</sup> After that, Feistritzer used what she had learned to build her own independent, for-profit, fully online teacher preparation program, Teach-Now, currently known as Moreland University.

Finally, while NCEI classified programs as A – I, it mainly discussed states, and so conflated state approaches and individual programs.

## **1.2. Current Title II classification**

Today, the default classification system for alternative certification programs has been dictated by the Title II Data Collection. In the 2008 reauthorization of the Higher Education Act of 1965, Congress provided funding to incentivize improvements to teacher preparation programs. Specifically, Title II-A of the HEA included two provisions to accomplish this goal. The first provision authorized the Teacher Quality Partnership program, which funded competitive grants to improve pre-baccalaureate preparation programs (i.e. improved literacy training, more robust clinical experiences, etc.), support teacher residency models, and develop leadership pipelines for teachers to move into school administration (Hegji, 2021). The second provision of Title II-A expanded mandatory reporting by programs and states on key features and outcomes of teacher preparation. This mandatory reporting program is today known as the Title II Data Collection, and has provided information about state licensure requirements, educatory preparation program requirements, and characteristics of candidates enrolled in EPPs since 2008. Additionally, for the first time, states reported which programs were traditional versus alternative programs, allowing researchers and practitioners to begin tracking trends in expansion and enrollment over time.

In the Title II Data Collection, the Department of Education requires all programs receiving federal funding or schools in which students receive federal assistance to participate in the data collection as a means of monitoring program quality. The Title II Data Collection includes information on multiple levels of teacher preparation: state policies and

requirements, types of state licensure, alternative route information, and information on candidates enrolled in and completing educator preparation programs in each state.

The data collection's original purpose was to serve as an accountability mechanism for program quality. States had to institute metrics used to identify low-performing programs. As a result, fewer design characteristics were reported at the individual program level, and more data is collected related to state policy. In the simple Title II classification system, the two primary characteristics that distinguish programs are whether the provider, or organization that administers the program, is an institute of higher education (IHE), and whether the program is considered alternative according to state policy. Thus, programs are classified into three primary "categories": IHE-based traditional programs, IHE-based alternative programs, and non-IHE based alternative programs.

### **1.3. Limitations of current classification approach**

In its current form, the HEA Title II Data Collection is limited in its utility due to both the information it collects as well as how the data are published and managed.<sup>9</sup> Generally, the Title II Data Collection collects insufficiently detailed information and provides insufficiently disaggregated data. Little information is collected about institutional management or program characteristics of programs. Programs are required to disaggregate data on candidates who are enrolled in programs in a given year by their self-reported race and ethnicity. However, they do not disaggregate race and ethnicity for the arguably more important set of program completers, those individuals who successfully complete a program and are eligible for certification. Relatively easy data to collect are not done so. For instance, routes and programs report whether they set a GPA minimum, but not what the

---

<sup>9</sup> For additional examples of limitations in the current Title II Data Collection, see Lisette Partelow (2019), *What to make of declining enrollment in educator preparation programs*.

minimum is. Data that are collected are insufficiently disaggregated. As an example, program providers that operate preparation pathways for both undergraduate and graduate students report aggregated data on the number of enrolled students by race and ethnicity, and the number of program completers. Because of this, it is very difficult to make “apples-to-apples” comparisons of programs, especially between traditional post-baccalaureate programs and alternative programs, of which nearly all are post-baccalaureate. Together, these factors limit the analyses and conclusions that can be drawn from trends in the data.

In addition to the limitations in the content of the Title II Data, the structure and management of the data limit their use. First, while there are reporting guidelines and definitions, little detail is provided to clarify or guide reporters. As a result, it is easy to see that programs take liberties in reporting. For instance, states and programs may differently identify programs as traditional or alternative because there is no national definition. The structure of the published data makes it difficult to link both internally and to external data. Programs do not receive unique identifiers. Additionally, data on various aspects of programs (test score pass rates, certification rates by content area, etc.) are published in different files, meaning that it is difficult to link. For instance, states that manage their own routes outside of institutions of higher education, but that do not operate a formal program do not report information about enrolled candidates and completers.

In general, while Title II provides enough information to track aggregate statistics on the number of candidates completing educator preparation programs, it does not collect detailed enough data on program characteristics such as institutional management or programmatic model and requirements, and it does not disaggregate data in ways that promote useful comparisons between models.

## **2. Data & Methodology**



The goal of this chapter is to use prior literature and existing data on the population of U.S. teacher preparation programs to identify the key features of alternative preparation. To reach this goal, I first use the literature review above and the call by researchers for such a framework to identify criteria for an effective framework. I then use and justify a framework proposed by Arthur Levine to identify the key features that distinguish alternative preparation. Finally, I use the framework to analyze trends in contemporary teacher preparation.

For any empirical analyses in this chapter, I use publicly available data from the Title II Data Collection for years 2016-17 and 2017-18. This data collection is administered by the Office of Postsecondary Education. All teacher preparation programs that receive federal funds or whose candidates receive federal funds are required to report data annually on the characteristics of their programs and candidates. Alternative route-level data are reported by state officials, noting the characteristics of state-approved routes that relax traditional certification requirements. Additionally, approved educator preparation programs are mandated to report on the characteristics of teacher candidates enrolled in their program each year. Data are not reported at the individual level, but summary data are included on cohorts of preparation candidates. Programs also report the characteristics of candidates, including self-identified race, gender identity, and certification area.

I primarily use a program-level dataset that contains information on every available teacher preparation program in all states and the District of Columbia. I link each alternative preparation program with its respective state-level alternative route using a linking document provided by the Office of Postsecondary Education. Doing so provides additional information about the scope and targeting of the route, whether employment is required, and which types of institutional management are allowed for the route. I limit the sample to

encompass the population of teacher preparation programs that lead to initial licensure in core subject areas. For instance, I drop programs from the dataset that only allow for an additional licensure to a candidate who already holds a state license (although not many such programs exist). Additionally, I drop programs that only lead to specialty licensures, or that are geared toward the pre-baccalaureate level (for instance, associate's programs for CTE candidates). Finally, I drop a handful of programs that report having no enrolled candidates, nor any completers in the current year or years prior. The final sample includes 2,071 programs

Because I am interested particularly in understanding the features and models used within the subset of non-IHE based alternative programs, I supplement the data provided by Title II with more detailed information available through program websites. Using available data on programs and data collected manually, I code each non-IHE based alternative program along the following three dimensions:

- **Institutional management:** each program is coded based on the type of institution that manages the program: IHE or IHE partnership, LEA or school, government or government cooperative, non-profit, for-profit, NGSE, or other organization.
- **Timing:** Each program is coded as to whether it allows early-entry. Some programs mandate early-entry, but I did not distinguish between whether early-entry was mandatory or optional.
- **Program & Coursework:** I coded programs according to five of the more common ways that programs have appeared to differentiate coursework requirements for candidates relative to traditional programs. *Accelerated coursework* allows a candidate to complete the coursework components in 16 months or less, relative to a traditional post-baccalaureate program that would typically take 24 months to complete.

*Competency-based coursework* allows candidates to meet program competencies more flexibly rather than meet a specific number of required course hours. *Job-embedded coursework* included programs in which the teacher candidate engaged in a residency or lead-teaching role and the coursework was aligned with that work. Finally, *fully online* programs were those in which candidates could complete the entire program, except for any clinical requirements, fully online.

Each non-IHE based alternative program received a binary code for each of these programmatic features, allowing me to examine the extent to which these features are embedded in the current alternative preparation landscape. Because much of the coding took place manually, I limited coding programmatic features to alternative programs not housed in IHEs. Both IHE-based alternative programs and traditional programs have adopted many of the features described above, particularly fully online coursework. Typically, IHE-based APPs alter either the timing of preparation or the program delivery. Some of these programs are nearly identical to traditional programs, save for the fact that candidates can engage in them while already lead-teaching. Other IHE alternative programs are more innovative from traditional models. In general, while it would be preferable to make further distinctions within IHE-based APPs, there are too many nuances and not enough available information to do so.

### **3. Framework for categorizing Alternative Routes to Teaching**

As discussed in the introduction and prior section, prior researchers have advocated for identifying common features of interest to utilize when discussing and researching the efficacy of teacher preparation programs in general, such that the field can move beyond reliance on small studies of specific teacher preparation programs to more effectively generalize about the role of specific features and models (Marylin Cochran-Smith et al.,

2016). Among researchers who have followed this advice, the features they identify are typically those on which they have available evidence and are defined in ways that are specific to the programs or pathways under study. To heed the call of Cochran-Smith et al., researchers must have common language and definition for discussing and categorizing features of alternative teacher preparation to generate a large body of empirical evidence to inform the field.

As such, it is important to first clarify the criteria that a classification framework must achieve to effectively support the field. A useful and sustainable framework would:

1. *Distinguish the most important features of alternative preparation programs and models from traditional preparation models.* Data systems should then allow researchers to track these distinguishing features in order to understand trends over time. Researchers can also isolate and understand the effect of these features on teacher selection, efficacy, and retention (as advocated for by P. L. Grossman and Loeb (2008) and Lincove et al. (2015)).
2. *Describe, using these features, distinct models of teacher preparation that differs from a traditional model.* In addition to examining specific features of teacher preparation, it is important to understand models of preparation and their efficacy. So far, most research has done this by simply examining specific models in isolation, rather than using multi-site or multiple programs within similar categorizations.
3. *Guide efficient and detailed data collection.* Any teacher preparation program in which either the provider or students attending the school receive federal funds must participate in mandatory Title II reporting under the Higher Education Opportunity Act. Many states also likely require or encourage participation in the reporting process even if the above conditions are not met. A framework should provide

guidance for revising the collection and reporting data from the Title II Data Collection while not generating overly burdensome reporting requirements. For instance, Lincove, et al. (2015) suggest organizing teacher preparation providers by their institutional goals, which seems both ambiguous and difficult to collect data on. If data cannot be collected at scale, then the feature will be less useful or able to be widely studied.

### **3.1. Key features of alternative teacher preparation**

The former president of Teachers' College and teacher preparation innovator Arthur Levine (2006) suggests three key dimensions that distinguish alternative from traditional approaches to teacher preparation: where teachers are trained, when teachers are trained, and how teachers are trained. Grossman and Loeb (2008) add another dimension to this list: who is recruited and selected. I do not include this dimension, arguing later that this is an outcome of the other distinguishing features.<sup>10</sup> Below, I define each dimension and how alternative preparation programs have distinguished their approaches from traditional preparation programs.

#### ***WHERE teachers are trained (institutional management)***

Since the 1950s, institutions of higher education have predominately managed traditional teacher preparation programs (Labaree, 2008). ARTs have increasingly moved teacher training beyond the walls of the academy to local governments, school districts, schools, non-profits, for-profits, and free-standing schools of education. The institutional management structure of teacher preparation has the potential to influence recruitment,

---

<sup>10</sup> Others have suggested differentiating alternative programs based on other dimensions, such as organizational goals or market incentives (Lincove et al., 2015). I adopt the dimensions put forth by Levine (2006) and Grossman and Loeb (2008) because these dimensions are clearly defined, able to be measured in the Title II data, and are arrived at concurrently by both cited studies.

selection, program design, and labor market alignment. Often, independent institutions or local governments are nimbler than IHEs, and can more easily innovate in how training is structured and delivered. As an example, a key component of many independent teacher residencies and selective early-entry programs is frequent instructional coaching, one of the most effective levers of teacher development (Kraft, Blazar, & Hogan, 2018). Similarly, many independent organizations build partnerships with local schools, which allows them to better match teacher placements with the needs of the local labor market (see for instance National Center for Teacher Residency's report (2016) on the Boettcher Teacher Residency expanding to meet the needs of rural districts). In a traditional program, any qualified candidate is accepted into the program and chooses their content area focus. In many independent TPPs, organizations accept teacher candidates into specific content placements based on the needs of partner schools and districts. Doing so allows them to target candidates in the most urgent shortage areas, including subjects, such as math, science, and special education (Cowan et al., 2016; Thomas S Dee & Goldhaber, 2017b; D. Goldhaber, Krieg, Theobald, & Brown, 2015), or in schools with specific designations, such as rural schools or schools serving predominantly low-income students (Thomas S Dee & Goldhaber, 2017b; D. Goldhaber, Krieg, et al., 2015). Other programs, especially grow-your-own programs, target candidates from local communities, with the hope that selecting teachers from within a community will increase the likelihood that they would want to remain living and working in that community.

***WHEN teachers are trained (timing to teaching entry)***

In traditional teacher preparation, candidates complete their program of study and their teaching practicum prior to obtaining initial licensure. They then secure a position as a teacher of record. In this traditional model, initial licensure serves as a signal for schools that

the teacher possesses the right knowledge and skills to be successful. Critics of traditional teacher preparation programs contend that certification has little to no association with teacher efficacy, suggesting that lowering barriers to entry could attract qualified candidates to teaching who would not otherwise be willing to spend two years out of the labor force pursuing a teaching degree (Ballou & Podgursky, 1998; Finn Jr & Madigan, 2001; Frederick M Hess, 2005). At least some empirical studies find evidence that lowering barriers to entry does attract candidates with higher levels of prior academic achievement to the profession (Sass, 2015).

In many alternative routes and programs, teachers secure a provisional, transitional, or alternative license that allows them to serve as the teacher-of-record while completing requirements toward initial licensure, including meeting coursework or pedagogical requirements. Grossman and Loeb (2008) term these programs “*early-entry*” because teachers enter the classroom as teachers-of-record before completing their training. In this way, ARTs call into question the signaling validity of the initial licensure.

### ***HOW teachers are trained (program and coursework)***

How teachers are trained refers to the programmatic and clinical requirements for candidates, including both the content and format of these requirements. In traditional teacher preparation, candidates demonstrate competency in required content knowledge and pedagogical knowledge and skills through coursework requirements and a clinical student teaching experience. Increasingly, alternative routes and programs differentiate themselves in how candidates demonstrate competency, with a focus more squarely on clinical application versus educational theory (McDonald, Kazemi, & Kavanagh, 2013), an approach that has promising evidence of producing more effective teachers (D. J. Boyd et al., 2009).

Many alternative programs have less burdensome program requirements in terms of overall program length and the format by which candidates demonstrate competency. For instance, some routes seek to reduce the amount of time it takes to meet coursework requirements (I term these routes “*accelerated*”). In states like Florida, Educator Preparation Institutes (EPIs) are accelerated pathways to teaching. They are operated by IHEs and provide two semesters of courses that enable a candidate to qualify for their initial teaching license. Other programs offer fully online learning or allow flexible formats for enrolling in and completing their coursework requirements.

### **3.2. Evaluating this framework**

In **Table 1.1**, I provide a summary of my proposed framework for categorizing three key dimensions of teacher preparation to distinguish alternative from traditional preparation. Before showing how this framework can usefully describe current trends in teacher preparation, I first briefly justify how the framework meets the criteria for an effective framework identified earlier. The first criteria suggests that the framework must identify the most salient and distinct features of alternative preparation. I argue that these are the most important features due to theoretical justifications for how each dimension can help distinguish the approach of a program or route from a traditional mode of preparing teachers. Naming the features allows us to collect data on these features and understand their prevalence among the population of teacher preparation programs, which I do in the next section. Additionally, these features must allow practitioners and researchers to describe differences in models of teacher preparation. In the next section, I use these features to show how they can distinguish approaches that common models of teacher preparation take.

Another criterion is the need for information to be easily collected and reported on key program features, and not place an undue burden on program administrators. In part for



this reason, I include only observable inputs to teacher preparation, suggesting that these are easy to operationalize at a broad scale. For instance, I do not include as a dimension the selectivity of the program. Primarily, I do not, because it would be difficult to set or collect data about program selectivity. It is not useful to compare program selectivity rates per se if they have quite different sizes or applicant pools. It may not also be useful to examine only candidate GPA and collecting and reporting on aggregate measures such as GPA and tests scores is much more burdensome on a provider versus providing specific information about the characteristics of the program itself.

In sum, I propose using the key dimensions proposed by Arthur Levine (2006) to categorize and understand alternative teacher preparation relative to traditional preparation. This framework is simple and includes easily observable characteristics of programs that will allow practitioners and researchers to collect data on the population of programs without unduly burdening program administrators. The features also provide a common language for describing holistic models of teacher preparation. Finally, the framework, by distinguishing key characteristics of interest, can help researchers document and describe common trends in teacher preparation.

#### **4. Applying the framework to trends in teacher preparation**

I advocate for a framework by which to describe the key features of alternative teacher preparation and to categorize holistic models because it will provide common language and understanding around emerging and existing trends of interest in teacher preparation. In this section, I use the framework to analyze some of these trends to illustrate the additional impact or understanding that this common lens could bring to the research community. First, I describe the prevalence of key program features. Next, I describe how these features help describe distinct models of teacher preparation. Finally, I use what we

learn about features and models to describe additional emerging trends in the alternative teacher preparation landscape.

#### 4.1. Features of alternative preparation routes

In **Table 1.2**, I categorize the distinguishing features of ARTs among the 645 alternative preparation programs that existed in SY2017-18 in the Title II Data Collection. Even among alternative programs, most programs are still operated by institutions of higher education (65% of all alternative programs), as shown in **Figure 1.1**. The next most common organization to manage alternative programs are schools or local education agencies (which manage 16% of all APPs). Among all programs, early-entry is the most common distinguishing feature of alternative programs. Among all APPs, 90% allow candidates to utilize early-entry, meaning candidates can serve as a lead-teacher while completing certification requirements. Moreover, 63% of programs require early-entry as a component of their program. A common example would be Teach For America, in which candidates must serve as teachers-of-record while completing the program. Early-entry serves as a core requirement when a program works with local schools to help fill shortages, and/ or when a program designs the rest of their program structure and support around the fact that candidates will be lead teaching.

Program coursework in many alternative programs is not substantially different from traditional programs. In fact, in 70% of alternative preparation programs, the coursework requirements are the same as those of candidates in traditional programs. The most common way that programs differentiate coursework is through acceleration, in which they reduce the time or seatwork hours required for certification. About one-quarter of alternative programs are accelerated. At least 8 alternative programs are competency-based. Most of these are state-managed programs that clearly specify how candidates can demonstrate competency.

Unfortunately, most of these programs still require candidates to demonstrate competency through past coursework rather than through portfolios of practice or practice-based assessments, which may be more indicative of teachers' competency.

#### **4.2. Models of teacher preparation**

These features also distinguish and describe holistic models of teacher preparation. In **Figure 1.2**, I provide examples for how the features proposed in this framework can describe common models of alternative teacher preparation. These represent the five most common models, although they do not include all possible models. Here, I offer a brief description of each model described in **Figure 1.2**.<sup>11</sup> Additionally, I describe how this framework sheds light on these models in ways that the current Title II Data Collection does not allow.

##### ***For-profit preparation programs***

*For-profit* programs are characterized by their institutional management structure. While most independent teacher preparation programs are non-profit organizations or non-profit IHEs, a growing segment of the teacher education landscape is comprised of for-profit organizations or for-profit IHEs. Many of these for-profit providers are for-profit institutions of higher education that are well-known, such as University of Phoenix and Grand Canyon University. However, other organizations only offer teacher preparation. Programs in the latter category include Teach-Now (now known as Moreland University),

---

<sup>11</sup> In figure 1.1, these five models encompass nearly all non-IHE alternative preparation programs. However, it is important to note that IHE-based alternative preparation programs are the most common type of preparation program. Many IHE-based programs can be further classified, such as IHE-based teacher residencies. Additionally, I do not include another common model, programs that cater specifically to candidates who are qualified in the technical education trades. These programs are known as career and technical education teacher preparation programs. Many of these candidates may not have a BA, and so at least some of these programs combine a bachelor's with certification. In other cases, candidates already have a bachelor's, and the program prepares them for state CTE certification, which has different requirements in some states and qualifies the candidate only to teach CTE classes.

Teachers of Tomorrow, and iTeach. Many scholars have documented the rise of for-profit institutions of higher education, but few have examined organizations that offer only teacher education and other education-related preparation, despite their rapid expansion.<sup>12</sup>

Despite considerable interest among policymakers and researchers in the for-profit market, the Title II Data Collection does report whether organizations are for-profit or non-profit. For traditional for-profit IHEs, the IPEDs data can be used to identify such organizations. However, this is not possible for the newer organizations that offer only teacher preparation. These organizations are growing fast but are difficult to track without being able to identify them. For the SY2017 data, I code these institutions by hand. By doing so, I find that for-profit programs of any kind, including both traditional and alternative programs, produced 9.5% of all program completers in 2017-18. For context, they produce a similar share (in fact, slightly larger share) of completers as all non-profit IHE alternative programs, which produced 9% of all completers. Completion among for-profit teacher preparation programs has steadily increased over the past few years, in both traditional programs and alternative programs. Combined, for-profit teacher preparation programs increased enrollment by almost 16 percentage points, or about 2,000 teacher candidates. Interestingly, there are far more teacher candidates produced by alternative for-profit programs relative to traditional for-profit programs each year.

### ***Selective early-entry programs***

*Selective early entry* programs recruit candidates from more selective colleges or career pathways, partnering with local public-school networks and districts to allow their candidates

---

<sup>12</sup> This nascent line of descriptive research has so far mainly focused on Moreland University, formerly known as Teach Now. See Carney (2021), *Designed for the digital age: Teacher preparation at TEACH-NOW Graduate School of Education*.

to serve as the teacher-of-record while working toward state certification requirements. Selective early entry programs include Teach For America, Baltimore City Teaching Residency, and Urban Teachers, all programs distinguished by their early-entry *requirement* and the selectivity of their admissions process. Some of these programs are certifying bodies, but others partner with local IHEs to help their candidates meet certification requirements. Selective early-entry programs have long been programs of great interest to researchers, and a considerable portion of empirical and causal research has been devoted to determining their efficacy relative to traditionally trained-programs. Still, only 26 selective-early entry programs are independent teacher preparation programs. All other selective-early entry programs offer certification through partnerships with institutions of higher education. Therefore, it is still difficult to fully differentiate the scope of selective early-entry programs on the market share of new teacher candidates.

### **Grow-your-own programs**

*Grow-your-own (GYO)* programs are teacher preparation programs that target recruitment of nontraditional candidates “who are more likely to reflect local diversity and are more likely to continue to teach in their communities” (Espinoza, Saunders, Kini, & Darling-Hammond, 2018). Grow-your-own programs are most often housed within a district or local cooperative of districts but may also be managed by non-profit organizations in partnership with local schools. The goal of these programs is to develop members of the local community into teachers, with the aim that they are more likely to stay committed to the community schools in the long term. Researchers and policy-makers have touted such programs as a viable option for increasing teacher diversity and retention, particularly for rural schools (Espinoza et al., 2018; Valenzuela, 2017). Grow-your-own programs vary considerably in terms of their management and program requirements. Some include

opportunities for paraprofessionals to become teachers, others are structured as teaching residencies, and many include reduced training costs for candidates (Espinoza et al., 2018). For the purposes of this paper, I only include grow-your-own programs that are *not* managed by institutions of higher education. In 2017-18, GYO programs produced around 2.7% of all teacher preparation program completers. In recent years, enrollment and production from GYO programs has increased quickly, by about 30% over just three years.

### **Independent teacher preparation programs**

*Independent teacher preparation* programs are those programs managed by independent non-profit teacher residencies or new Graduate Schools of Education. Teacher residencies are clinically-oriented teacher preparation programs that utilize an apprenticeship model, where teacher candidates co-teach with a veteran teacher while working to meet certification requirements, including engaging in certification coursework (Dickstein Staub & Scott Frank, 2015). Teacher residencies are found in both traditional and alternative preparation programs, but independently managed residencies have more flexibility in terms of how their programs are arranged, performance evaluation of candidates, recruitment, and program costs. New Graduate Schools of Education (nGSEs) are independent organizations that are authorized to prepare teachers, grant teacher certification, and grant Master's degrees (Marilyn Cochran-Smith et al., 2020). I combine independent teacher residencies and nGSEs because both models have the power to grant state certification and are independently operated. Additionally, many nGSEs offer teacher residencies as a program for teacher certification in addition to other options. Both categories of programs are distinct from early-entry programs in a few important ways. First, both independent teacher residencies and nGSEs use a more traditional timing module, where candidates complete substantial training prior to serving as the teacher-of-record. In many or most of these programs,

candidates are fully certified prior to serving as the teacher of record. Second, they are typically less selective than selective early-entry programs. They likely also cater to candidates who are interested in teaching as a career, whereas at least some selective early-entry programs require only short-term teaching commitments.

### **State-managed and state-wide accelerated programs**

In *state-managed or state-wide accelerated* programs, states provide routes that substantially reduce barriers to certification, usually by eliminating the seat hour requirements for certification or offering competency-based approaches to certification. The most prevalent program in this model is American Board (formerly known as American Board for Certification of Teacher Excellence, or ABCTE). American Board is one of the oldest non-profit providers, founded in 2001 with a grant from the U.S. Department of Education in response to increased policy demands for alternative teacher certification pathways (Glazerman & Tuttle, 2006). Currently, fifteen states allow for teacher licensure through American Board, which primarily recruits career changers, and relies on candidates to demonstrate both content and pedagogical knowledge through a series of rigorous standardized tests. Many states also offer programs unique to the state, and available only through one or a few approved providers within a state. For instance, the Teach Mississippi Institute allows candidates to engage in a 13-week online course to receive a provisional teaching license. They then serve as a teacher-of-record for a full year while receiving mentoring and participating in additional professional development sessions. At the completion of the year, they receive their initial professional certification from the state of Mississippi. The program is thus early-entry, and because it takes place outside of an official EPP, it is very low-cost, with all tuition and fees at around just \$2,600. In other states, such as Vermont, Maine, and Kentucky, there are options to gain teacher certification through

portfolio or transcript review, allowing candidates to bypass enrollment in traditional certification programs if they can demonstrate equivalent competencies or experiences.

### 4.3. Exploring emerging trends

In this section, I have documented both how pervasive various features of preparation programs are, as well as how these features can help describe common and growing models of alternative teacher preparation. The proposed framework can also help researchers track the relationship between program enrollment, characteristics of candidates, and the characteristics of teacher preparation models. I will document a few observable trends that warrant more in-depth research to understand how characteristics of preparation models will impact the landscape of teacher education.

First, for-profit teacher preparation programs now account for almost one-tenth of all program completers (see **Figure 1.3**). They produce equal numbers of program completers as do alternative programs housed at IHEs, and more candidates than non-IHE based programs. For-profit programs are particularly likely to enroll Black candidates. In fact, among all Black candidates enrolled in any teacher preparation program in SY 2017-18, 41% were enrolled at for-profit preparation programs. By comparison, just 15% of white candidates enrolled at for-profit programs.<sup>13</sup> It is possible that for-profit programs are more likely to offer flexible pathways through their programs relative to other model types, which may be particularly beneficial to Black candidates. Additionally, like any program model, for-profit programs vary widely in term of quality. However, given some prior concerns raised about predatory practices, more research is needed to understand whether Black candidates

---

<sup>13</sup> Based on author's own calculations using the 2017-18 data from Title II Data Collection. Figures for these statistics are included in Table A2 in the appendix.



are successfully completing these programs and matriculating into teaching, and whether they are well-equipped when they enter the labor market.

Second, both IHE-based alternative programs and non-IHE based alternative programs appear to train proportionally more teachers for high-needs content and grade areas. In **Figure 1.4**, I show the proportion of completers from each model that were prepared for early-childhood, elementary, or secondary teaching placements, and in **Figure 1.5**, I display the proportion of completers from each model that were prepared for various content areas.<sup>14</sup> While approximately 70% of alternative preparation program completers are prepared for secondary grades, just less than half of candidates from traditional preparation programs were prepared for secondary grades. Alternative for-profit programs train a proportionally more completers for early-childhood education (about 30%) relative to traditional non-profit programs (about 15%) and non-profit alternative programs (less than 10%). In terms of content preparation, non-IHE based alternative non-profit programs train proportionally more candidates for math and science (9% and 12% respectively) relative to traditional non-profits (7% and 7%). Traditional for-profits and alternative IHE nonprofits train a high proportion of their candidates to teach special education (around 30% and 23% respectively) relative to other models, which train between 12 – 16%. Taken together, these figures suggest that ARTs may be an important source for supplying secondary teachers and STEM teachers, both areas where there are traditionally shortages.

Finally, tracking more detailed information about programs can help us better understand trends in teacher production. Prior researchers have documented concerns in the declining overall production of candidates from educator preparation programs over the past

---

<sup>14</sup> In Title II, programs can report preparing a candidate for more than one content area, so the proportions do not always add to 1.

decade, driven primarily by a decline in traditional program completers (L. Partelow, 2019). However, despite these trends, alternative preparation completion has held constant, and a few models of alternative teacher preparation have expanded production. As shown in **Figure 1.6**, between 2016 – 2018, the number of completers produced by for-profit programs and non-IHE based programs increased, while the number from non-profit IHEs declined (both alternative and traditional). Moreover, as displayed in **Figure 1.7**, among non-IHE based non-profit programs, candidate production increased over that same period for independent teacher preparation programs, grow-your-own programs, and state-managed accelerated programs, while declining for early-entry programs. These trends may indicate a growing preference toward teacher preparation that is highly local and targets candidates interested in teaching for longer durations than those typically required by selective early-entry programs.

## 5. Conclusion

Congress has yet to reauthorize HEA, although appropriations are allocated that fund the Title II Data Collection. As Congress re-examines provisions and outcomes related to reauthorization, they will likely address some of the key goals of Title II-A, including: the role of the federal government in funding and promoting innovations in teacher preparation through Teacher Quality Grants; which types of programmatic features should be supported if funding is continued; and the extent to which current reporting mandates actually support analysis of program quality (*Teacher preparation policies and issues in the Higher Education Act, Report Number R45407*, 2018). In this paper, I advocate for developing a more detailed framework for distinguishing both the key features of alternative preparation and holistic models of preparation that iterate upon existing traditional approaches. This framework should both inform reporting standards for programs, as well as future research on teacher

preparation. By collecting some additional characteristics of teacher preparation programs, researchers and practitioners could more easily track and build an understanding of key relationships between teacher preparation characteristics, models, and candidate enrollment and completion.

## **Tables & Figures for Chapter 1**

**Table 1.1. Distinguishing design features of alternative route to teaching programs**

Key Design Features	Description	Traditional	Alternative
<b>1. Institutional Management</b>	<b>WHERE teachers are trained:</b> Institution that administers the program	<b>Institutions of Higher Education (IHEs)</b>	<b>State or Local Governments</b> <b>Districts or Schools</b> <b>Nonprofit Organizations</b> <b>For-profit Organizations</b> <b>New Graduate Schools of Education</b>
<b>2. Time to Teaching</b>	<b>WHEN training occurs:</b> Relative timing of training, certification, and lead-teaching	<b>Traditional Timing:</b> Training and certification are completed prior to lead-teaching	<b>Early Entry:</b> Training occurs concurrently with lead-teaching. Certification is completed after training.
<b>3. Program &amp; Certification Requirements</b>	<b>HOW teachers are trained:</b> Curriculum, format of program, and clinical training requirements	<b>Traditional Model:</b> Candidate takes theory, pedagogy, and content courses in an in-person, semester-long format. Various professors determine the content of each course. Student teachers in a clinical experience at the end of coursework.	<b>Coursework Reduction:</b> Reduces the required number of seat hours necessary for initial certification  <b>Competency-based:</b> Demonstrate competency through multiple measures  <b>Accelerated Coursework:</b> Complete training in 16 months or less  <b>Flexible Modes:</b> Participants can set their own pace, participate fully online, or start and stop easily  <b>Job-embedded:</b> Preparation includes at least one year of co-teaching with a veteran teacher

**Table 1.2. Summary statistics on alternative preparation programs in the Title II Data Collection, SY 207-18**

<b>Measure</b>	<b>Proportion</b>	<b>Number</b>
<b><u>Institutional Management</u></b>		
Traditional IHE	0.65	413
IHE Partnership or non-traditional	0.02	12
State or Local Gov. Cooperative	0.05	29
District or School	0.16	101
Non-profit	0.05	32
For-profit	0.05	32
NGSE	0.03	19
<b><u>Timing to Licensure</u></b>		
Allows early-entry	0.89	572
Requires early-entry	0.63	408
<b><u>Program &amp; Coursework</u></b>		
Competency-Based	0.01	8
Accelerated	0.24	153
Flexible	0.04	25
Job-embedded	0.16	103
Traditional	0.71	459

Note: Data come from the Title II Data Collection and author's own research of publicly available information on Educator Preparation Routes. There were a total of 645 alternative preparation programs in SY 2017-18.

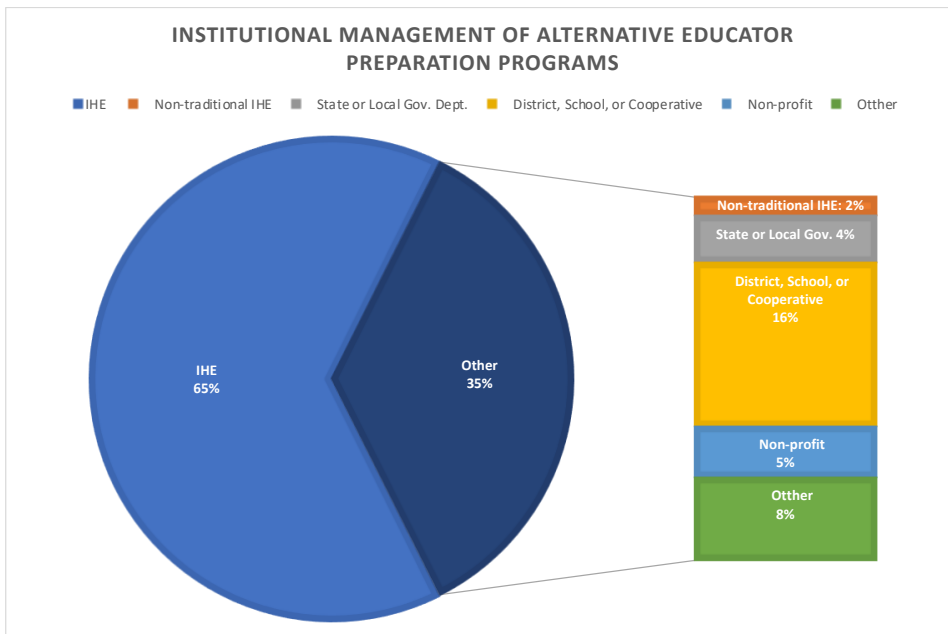


Figure 1.1. Institutional management of alternative preparation programs, SY 2016-17 (n=638)

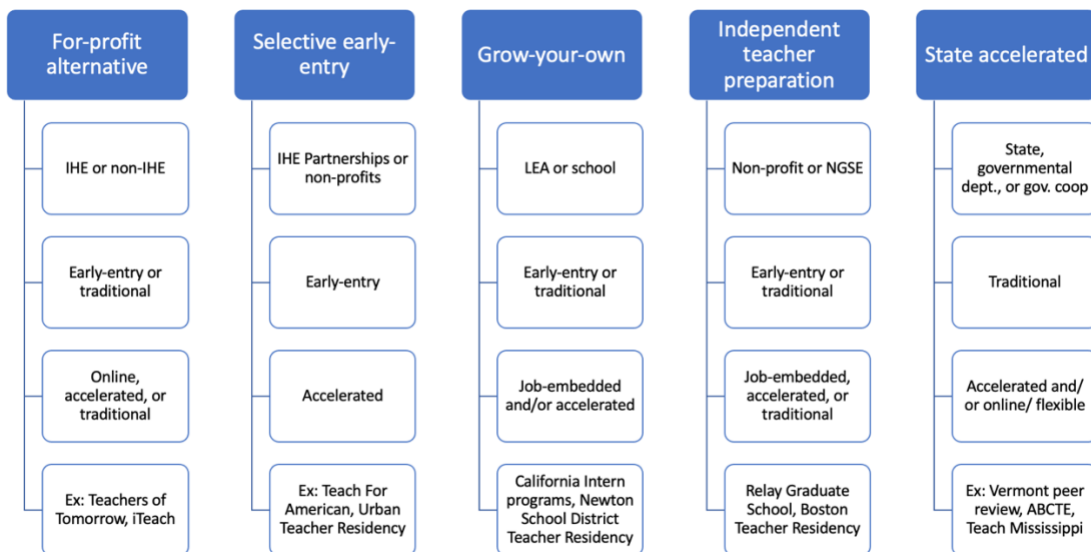


Figure 1.2. Identifying holistic models of alternative teacher preparation using a proposed framework for classifying alternative teacher preparation features

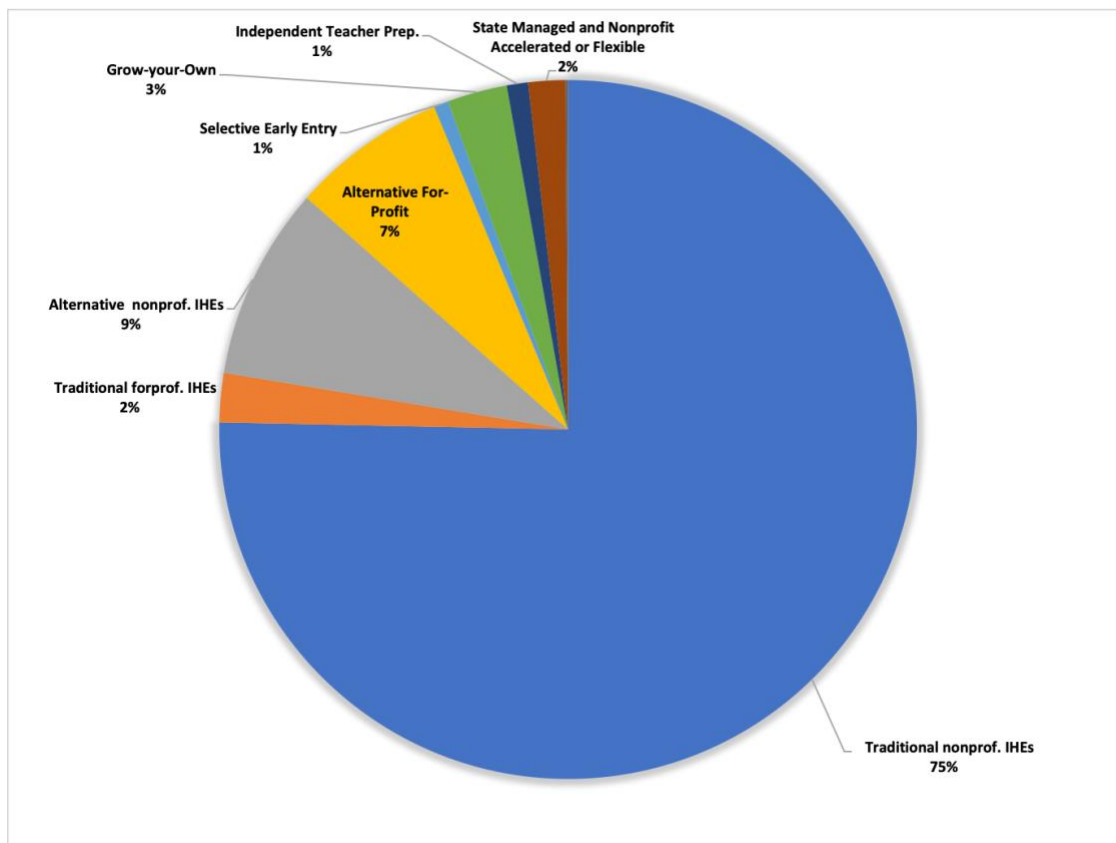


Figure 1.2. Proportion of total educator preparation program completers by model of preparation, SY 2017-18

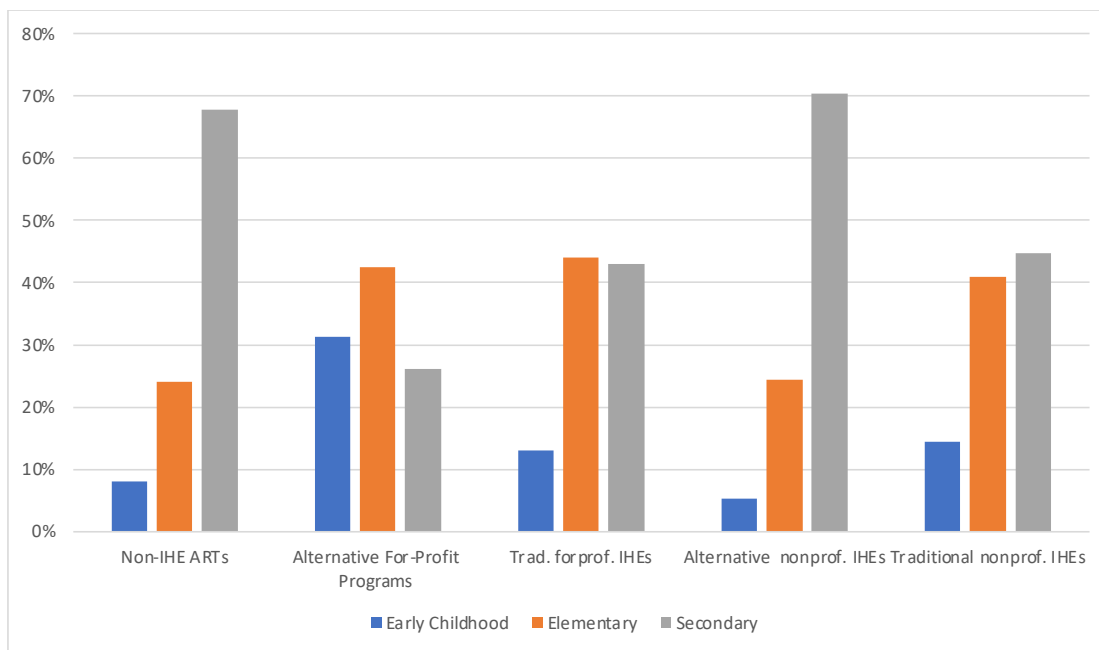
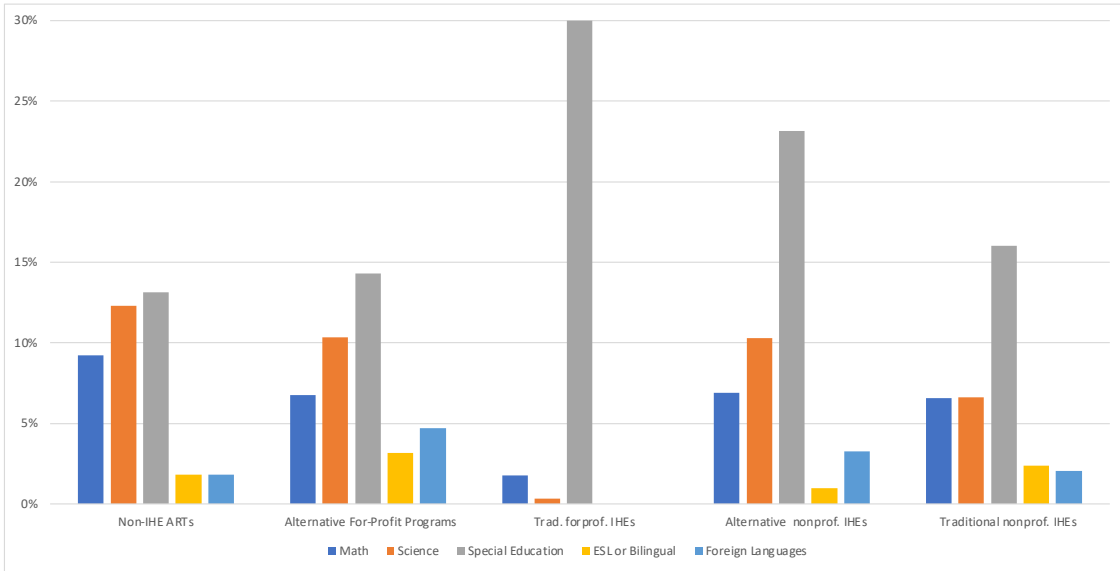
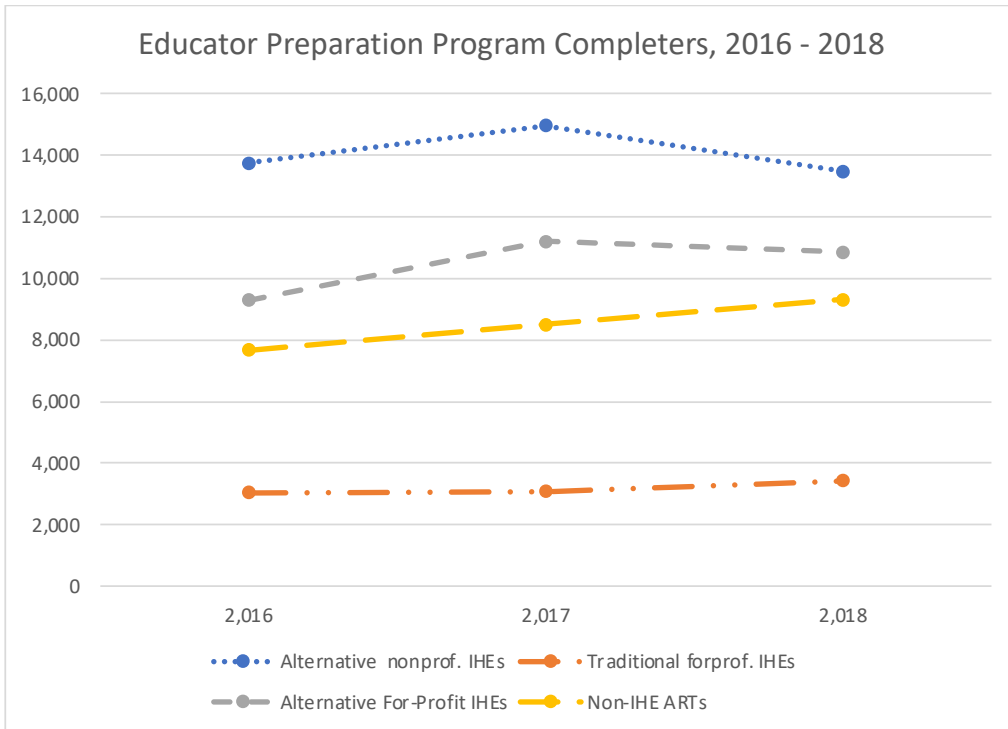


Figure 1.4. Proportion of program completers prepared for each grade level, SY 2017-18

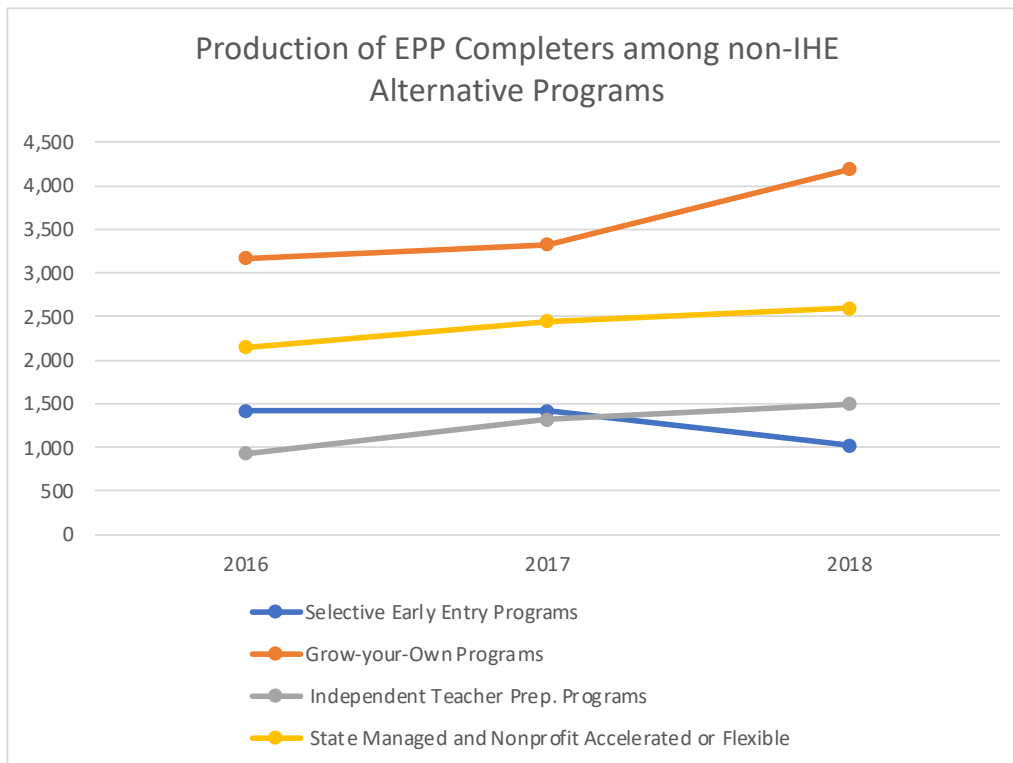


**Figure 1.5. Proportion of program completers prepared for each content area, SY 2017-18**



**Figure 1.6. Number of program completers by preparation model from 2016-18 based on figures from the Title II Data Collection**





**Figure 1.7. Number of program completers among non-IHE based models from 2016-18 based on figures from the Title II Data Collection**

## Appendix for Chapter 1

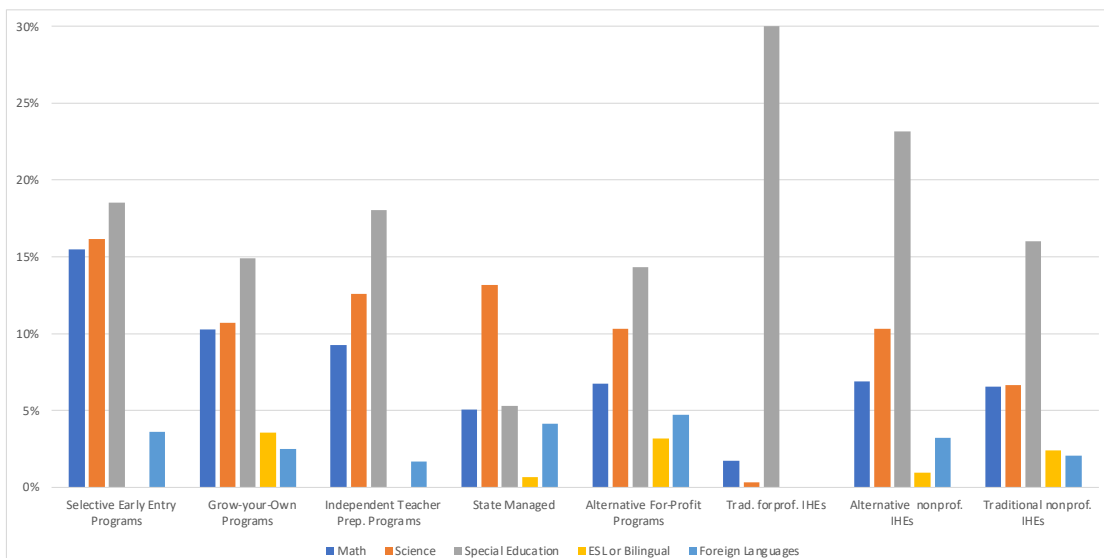
### A1.1. Coding of key design features

Design Features	Key Variables & Descriptions
<p><b>Institutional Management:</b> <i>Institution that administers the program</i></p>	<p><b>IHE:</b> managed by an institution of higher education</p> <p><b>Government:</b> managed by a state or local government, or governmental department; this was coded based on information available at the route level and from publicly available information on state websites</p> <p><b>LEA:</b> managed by an independent or charter school, a district, or an inter-district cooperative information available in route-level information, program description, and publicly available information</p> <p><b>Non-profit:</b> Managed by a nonprofit organization</p> <p><b>For-profit:</b> Managed by a for-profit organization; information coded based on publicly available information and from information available through the state of Texas (where most for-profit are located)</p> <p><b>NGSE:</b> New Graduate School of Education, coded using guidance on the definition of an nGSE Cochran-Smith et al. (2020)</p>
<p><b>Time to Teaching:</b> <i>Relative timing of training, certification, and lead-teaching</i></p>	<p><b>Early-entry:</b> early entry, training occurs concurrently with lead-teaching; routes report whether employment as a teacher is required as part of the program, and this was cross-checked by publicly available information on each program</p>
<p><b>Program Requirements:</b> <i>Curriculum, format of program, and clinical training requirements</i></p>	<p><b>Competency-based:</b> Demonstrate competency through multiple measures</p> <p><b>Accelerated:</b> Complete training in 16 months or less</p> <p><b>Flexible:</b> Participants can set their own pace, participate fully online, or start and stop easily</p> <p><b>Job-embedded:</b> Preparation includes at least one year of co-teaching with a veteran teacher and/or coursework is aligned with and applied in a clinical setting</p>

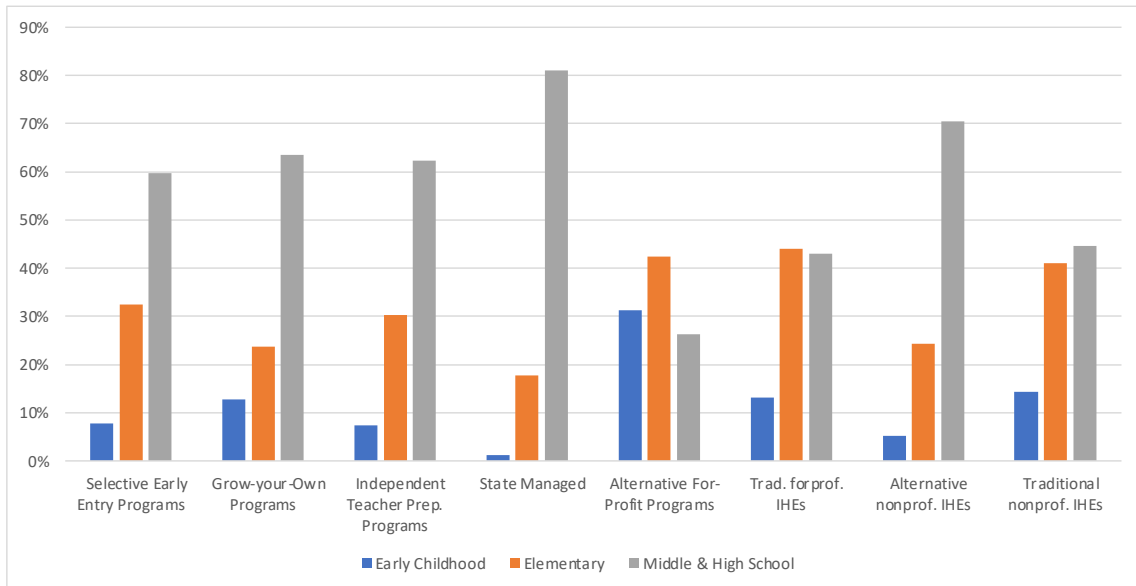
**Table A1.2. Proportional share of Black, Hispanic, Asian/Pacific Islander, Multicultural, and candidates of color enrolled in each program model, SY 2017-18**

	N	Total Enrollment (A)	Black (B)	Hispanic (C)	Asian or Pacific Islander (D)	Multiracial (E)	POC (F)	White (G)	Male (H)
<b>Teacher Preparation Model</b>									
Traditional nonprof. IHES: BA Insts.	497	0.14	0.07	0.11	0.08	0.14	0.10	0.17	0.12
Traditional nonprof. IHES: Post-BA Insts.	894	0.53	0.32	0.48	0.61	0.56	0.44	0.58	0.49
Traditional forprof. IHES	20	0.07	0.16	0.08	0.04	0.08	0.10	0.06	0.05
Alternative nonprof. IHES	422	0.07	0.08	0.07	0.08	0.07	0.07	0.06	0.09
Selective Early Entry Programs	26	0.01	0.01	0.00	0.01	0.01	0.01	0.00	0.01
Grow-your-Own Programs	117	0.02	0.03	0.02	0.02	0.02	0.03	0.01	0.02
Independent Teacher Prep. Programs	33	0.01	0.02	0.01	0.02	0.01	0.02	0.01	0.01
State Managed	19	0.02	0.05	0.01	0.01	0.02	0.03	0.02	0.03
Career Tech or Associate Level	5	0.001	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Alternative For-Profit Programs	38	0.14	0.25	0.22	0.13	0.08	0.21	0.09	0.19
<b>Total</b>	<b>2,071</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>
Traditional Preparation Programs	1,411	0.74	0.55	0.66	0.73	0.78	0.64	0.81	0.65
Alternative Preparation Programs	660	0.26	0.45	0.34	0.27	0.22	0.36	0.19	0.35

*Note: Data come from the Title II Data Collection and author's own calculates. These are figures reported for SY2017-18 by program administrators as part of the mandatory Title II Data Collection. Candidates who identify as LatinX or Hispanic are excluded from other racial identity groups, regardless of race. In this table, each column sums to 1 within mutually exclusive racial identity categories. Ex: Read column G as "Among all male candidates enrolled in educator preparation programs, 12% attend nonprofit institutions with only BA-level programs." See methodology section in the appendix for additional details related to these categories and calculations.*



**Figure A1.1. Proportion of candidates prepared for each shortage-area subject by teacher preparation model, SY 2017-18**



**Figure A1.2. Proportion of candidates prepared for each grade level, by teacher preparation model, SY 2017-18**

**Table A1.3. Number of program completers for each type of alternative preparation characteristic, school years 2015-16, 2016-17, and 2017-18**

Program Type	Number of Programs	Completers	Completers	Completers	Percentage
		in SY 2015-16 (A)	in SY 2016-17 (B)	in SY 2017-18 (C)	Change in Completers 2015 - 2017 (D)
Traditional Undergraduate Programs in IHEs	503	25,045	23,747	22,446	-10.4%
Traditional UG & Postgraduate Programs in IHEs	784	93,932	89,880	86,882	-7.5%
Traditional Postgraduate Programs in IHEs	128	8,551	8,900	7,912	-7.5%
Alternative Programs in IHEs	416	13,673	14,949	13,421	-1.8%
Selective Early Entry Programs	26	1,420	1,420	1,021	-28.1%
Grow-your-Own Programs	118	3,205	3,370	4,237	32.2%
Independent Teacher Prep. Programs	30	1,160	1,514	1,798	55.0%
For-Profit Programs	31	8,819	10,638	10,160	15.2%
State Managed and Nonprofit Accelerated or Flexit Career Tech or Associate Level	28	2,238	2,526	2,772	23.9%
	5	325	383	170	-47.7%
<b>Total</b>	<b>2,071</b>	<b>158,487</b>	<b>157,466</b>	<b>150,909</b>	<b>-4.8%</b>
Traditional Preparation Programs	1,415	127,528	122,527	117,240	-8.1%
Alternative Preparation Programs	656	30,959	34,939	33,669	8.8%

Note: Data come from the Title II Data Collection

## Chapter 2. State approaches to flexibility in teacher entry

In the previous chapter, I introduced a framework for categorizing holistic teacher preparation programs by their various features. However, these programs exist in the context of state certification requirements. Because no professional licensing board exists to set standards for teacher licensure nationally, states vary considerably from one another in terms of their management of teacher licensure, the types of licensures they offer, variation in requirements from route to route, and the programs models that are offered. To understand how state policy can influence who enters and is retained in teaching, it is important to understand variation in state requirements for certification and how states allow or foster various models of preparation.

Most debates surrounding the implementation and expansion of ARTs include arguments about the extent to which altering, or lowering, some of the barriers to teacher certification will result in attracting more candidates, more diverse candidates, and candidates with more aligned subject matter knowledge, into the teaching profession. The assumption that this argument builds from is that ARTs do, in fact, lower barriers to teaching, and that doing so will induce more candidates to teaching. In this chapter, I examine state approaches to teacher preparation, and seek to understand how states attempt to use non-traditional models of teacher preparation to allow for lower barriers or more flexibility to induce teachers into teaching.

State approaches to educator preparation vary widely, and this manifests in the approaches that states take toward alternative or non-traditional pathways to teaching. This chapter is not meant to provide a holistic overview of variation in teacher preparation

among states.<sup>15</sup> Instead, I focus specifically on the factors that states manipulate from a policy perspective to both attract candidates to teaching and to ensure the quality of those candidates.

## 1. Variation in requirements for initial licensure

States vary considerably in their approach to licensing of teachers, types of licensures they offer, how the licensures are utilized, and the requirements for licensure. Most states have centralized licensing boards or a department of education that outline the approved routes to teacher licensure and the requirements for licensure. In most states, institutions or organizations then develop preparation programs that meet the requirements outlined in the route. In other states, programs themselves are directly approved from the state, and each program represents an individual route to certification. In a typical model of traditional teacher licensure, a teacher completes a state-approved teacher preparation program, typically consisting of 30 hours of coursework and a clinical student-teaching experience. The program then recommends the candidate for an initial professional license. The candidate often is also required to demonstrate a baseline level of proficiency or ability, either through a minimum cumulative GPA, standardized exams, and/or minimum coursework credit hours in the subject area. An initial teaching license typically lasts for around 3 – 5 years, at which time the candidate can upgrade to a more permanent professional license, which often lasts for the remainder of their career.<sup>16</sup>

---

<sup>15</sup> For the most recent overview of the national teacher preparation landscape, see the Title II Annual Report, [Preparing and Credentialing the Nation's Teachers: The Secretary's tenth annual report on teacher quality](#). For trends in state enrollment in teacher preparation programs, I recommend reviewing the Center for American Progress report by Lisette Partelow (2019), [What to Make of Declining Enrollment in Teacher Preparation Programs](#).

<sup>16</sup> States vary in terms of initial licensure. Some bypass the initial licensure straight to a professional license that is more permanent. Others make new teachers teach on shorter-term licenses before progressing to the next stage.

In **Figure 2.1**, I show the number and type of different licensures available for each state in academic year 2017-18. Most initial, or first-time licenses, fall into one of three categories: *standard initial licenses* are those issued to a traditional candidate who has completed an approved traditional route; *provisional or alternative licenses* are typically available to candidates in alternative routes who would like to teach while working toward meeting the state certification requirements; and *emergency or temporary licenses* are typically the shortest-term types of licensure with the lowest requirements, and are usually meant to help fill shortage teaching placements. As shown from the mix of licensure types in **Figure 2.1**, states vary in terms of their holistic approach to licensure, possibly having many provisional options, and no emergency options, or vice versa. In 2017-18, three states offered only standard initial licenses, and did not have options for provisional or alternative licenses: Alaska, Minnesota, and Texas. In comparison, states such as Louisiana, Connecticut, and Kentucky had multiple provisional and temporary license options.

One of the most important policy mechanisms that states can use to raise or lower barriers to certification are gateway requirements for licensure related to coursework requirements, academic proficiency, and content knowledge. Specifically, states may mandate the following requirements for initially certified teachers:

- *Completion of an Educator Preparation Program*: Traditional programs have required a candidate to complete 30 credit hours of education-related coursework (or equivalent to a master's degree).
- *GPA Minimums*: A GPA minimum is meant to set a threshold for academic proficiency, and typically requires a candidate to meet a cumulative GPA from all undergraduate and graduate coursework or have a minimum GPA in their teacher preparation program of study.

- *Licensure tests*: Licensure tests may include basic skills tests or content knowledge tests. Most post-baccalaureate programs require only content knowledge tests, and content knowledge tests have been demonstrated to be more predictive of teacher efficacy (D. Goldhaber & Hansen, 2010), so I focus on these rather than basic skills tests.
- *Bachelor's Degrees or Minimum Coursework Credit Hours in the Content Area*: Traditionally, candidates seeking licensure in a secondary teaching field demonstrated their content expertise through baccalaureate coursework aligned to the content area. With the increased use of standardized tests of content knowledge, many states have relaxed the BA requirement in lieu of passing a standardized exam, while other states continue to keep the requirement in place, even for alternative route candidates. I consider states to have a minimum coursework requirement in place if they require a candidate to possess a bachelor's in the content area or closely related field, or to have a minimum of 24 credit hours in the content area.

In addition to the standard initial license, states have long used temporary and/ or emergency licenses to allow schools and districts to fill positions when certified teachers are unavailable to fill them. In general, temporary licenses have fewer and less stringent requirements than standard initial licenses. In fact, the earliest alternative routes to teaching were implemented as alternatives to emergency permits, and *increased* barriers to entry by shifting teacher candidates from emergency routes to routes that have relatively more stringent gateway requirements. Nevertheless, many states still use temporary certificates alongside standard initial certificates and provisional or alternative certificates.

In **Figure 2.2**, I compare the prevalence of certification requirements based on the proportion of states that implement them for each type of licensure. Unsurprisingly, states



have the most stringent requirements in place for standard initial certification and the fewest requirements in place for temporary or emergency certification. The most common requirement for an initial certificate is passage of a licensure test (or tests). While 94% of states require that candidates pass a licensure test, only 35% have this requirement in place for temporary certificates. As expected, the requirements for provisional or alternative licenses are lower than for standard certification, but higher than temporary certification. Three-quarters of states require candidates to pass a test to obtain a provisional, and at least half require candidates to be enrolled in an educator preparation program.

States utilize these types of licensure and certification requirements in different ways to balance supply and quality of teachers. Some states require high barriers to entry in all three types of licensures. Other states have high barriers for standard licenses but relax barriers for emergency licensures. Researchers have spent considerable time understanding the relationship of various gateway requirements and teacher quality, but less is known about how more holistic approaches to licensure requirements impact the teacher workforce.

In **Table 2.1**, I categorize states by whether they have high, moderate, or low barriers to licensure, for their standard initial licensure and for provisional or temporary licensure. States with high barriers to licensure require at least three of four requirements discussed above. States with moderate barriers require two, and states with low barriers require only one or none of the requirements (this only occurs in the case of temporary or provisional licensures). All states have at least moderate barriers to licensure for standard initial licensure. Why might some states be classified as “moderate” barriers to standard initial certification? The reason is that some states allow candidates to meet the requirements for standard initial licensure through alternative pathways that do NOT require completion of a traditional educator preparation program. Additionally, they may allow candidates to

meet the requirements through a competency-based review process: this is the case in Vermont and Maine. In other states, even if a candidate pursues certification through an alternative process, they are still eventually required to complete an approved educator preparation program, such as in Illinois and Oregon (described above).

The matrix is meant to illustrate holistic approaches to teacher entry, such that some states are categorized as maintaining high barriers to entry across all types of licensures. For instance, the requirements for teacher licensure are the same for all types of licensures in New York: whether a candidate is in a traditional licensure pathway or alternative pathways, they will have to pass a licensure test, meet a GPA minimum, have a BA in their subject area, and complete an educator preparation program (or be enrolled in a preparation program for the provisional certificate).<sup>17</sup> Conversely, some states have much lower barriers for provisional certificates. In Massachusetts, a candidate for a standard certificate must complete an educator preparation program (including a certificate in sheltered English language immersion) and pass licensure tests. However, obtaining a provisional is relatively easy: a candidate must have a bachelor's and pass the required content licensure test.

## **2. Variation in teacher preparation models**

Apart from the state requirements for certification, states differ in the types of teacher preparation program models that are available to teacher candidates, and consequently the number of candidates that enroll in such programs. This variation, and the difficulty in describing the variation among states, can be illustrated by the simple question: which states *offer* alternative routes to certification? For instance, in their State Policy

---

<sup>17</sup> Multiple provisional certificates existed in New York in SY 2017-18, but there were two primary certificates for core academic subjects. One of the provisional certificates was aimed for candidates completing teacher residencies, and they were exempted from passing the licensure tests prior to obtaining the provisional. In the other provisional certificate for early-entry teachers, candidates were required to pass the licensure tests prior to obtaining the provisional.

Database, the National Center for Teacher Quality notes that in 2017, three states did not offer ARTs: Alaska, Oregon, and Wyoming. While Wyoming has never approved any alternative routes to licensure, Alaska did implement a state-approved alternative route to teaching from 2007 – 2009. It produced only a handful of teachers before it when defunct. Oregon does offer provisional licensure that allows for early-entry to teaching among candidates if they already have a bachelor's degree and can pass a content area licensure exam. This provisional licensure has been an option since 2004 when the state originally approved it. However, candidates on provisional licensure must be enrolled in a traditional teacher preparation program. In published data, a candidate who enters an Oregon classroom on a provisional would still be a traditional program completer. Each year, Oregon reports no alternative route completers because of this fact. Oregon illustrates the “fuzziness” in dichotomously distinguishing alternative from traditional preparation.

In this chapter, I focus on describing variation in states by the types of programs they offer, and in terms of the proportion of potential teachers produced through ARTs. In **Figure 2.3**, the proportion of all educator preparation programs is shown for each state by model type.<sup>18</sup> The number and type of programs available is suggestive of a state's flexibility and approach toward cultivating new teachers. Most potential teaching candidates, particularly post-baccalaureate candidates will engage in pathways to teaching available in their geographic area. The programs available in their area can meaningfully impact the mode by which candidates enter teaching, or by which they are induced to enter teaching. In some states, such as Alabama, alternative preparation programs account for nearly 40% of the

---

<sup>18</sup> In Appendix Table A1, I include a table that disaggregates all state-approved EPPs by the model type and total enrollment. I focus on program completers in this chapter because they are more likely to be eligible for state licensure.

programs in the state, and all of them are housed in IHEs. Conversely, in West Virginia, over half of the programs are alternative, and none of them are housed at IHEs.

If a primary concern is whether alternative routes to teaching can meaningfully impact the teacher workforce in a state, then perhaps the most important consideration is the relative *size* of enrollment and completion from alternative programs compared to traditional programs in a state. As the discussion of Oregon above demonstrates, many states utilize alternative routes in combination with traditional programs so that it is difficult to dichotomize a candidate's path. Still, states with distinct alternative preparation *programs* typically have a more holistic approach toward recruitment and alignment with local labor markets compared to states that simply offer flexibility in early-entry.

Therefore, in panel A of **Figure 2.4**, I plot the distribution of educator preparation program *completers* by whether they graduate from a traditional or alternative program.<sup>19</sup> Several states stand out based on the relatively large proportion of candidates produced through alternative preparation programs. ARTs produce over half of all teacher preparation graduates in DC, Texas, Louisiana, and Hawaii, and just under half in North Carolina and New Mexico. Regardless of differences in the size of these labor markets, if alternative programs attract more diverse candidates, then states with a larger proportion of teachers trained through APPs could experience a substantial impact on the composition of the teacher workforce than similar states without large proportions of completers from alternative programs.

---

<sup>19</sup> Program completers are reported in two ways in the Title II Data Collection. Aggregate counts are reported by each state. Additionally, each program reports their own number of completers for each year. For most states, these two figures match. However, for some states, the figures differ, likely due to mistakes in following Title II reporting definitions. Therefore, in this figure, I use the state-reported figures.

In panel B of **Figure 2.4**, I further disaggregate program completers by whether they attend traditional IHE programs, alternative IHE programs, for-profit programs of any kind, and non-IHE based alternative programs. As in panel A, the states are sorted by the proportion of candidates produced in non-traditional programs. By disaggregating for-profit from non-profit programs, it is obvious to see that the order of states changes slightly. Some have posited that the most “flexible” or true “alternative” to traditional certification is in non-IHE based preparation programs. In looking at panel B, it is much more obvious to see which states offer these programs, and in which states these programs comprise a larger share of program completers. For instance, program completers from non-IHE based programs comprise over one-fifth of all completers in DC, North Carolina, and Idaho. If these programs are more flexible with requirements, then they could represent more efficient policy mechanisms for altering the composition of teachers in states.

Over the past decade, increasing attention has been paid to for-profit teacher preparation programs. As discussed in Chapter 1, for-profit preparation programs are the fastest-growing teacher preparation model. They include programs offered through for-profit IHEs as well as independent IHEs (such as Teachers of Tomorrow or iTeach). Most for-profit programs are fully online (or occasionally hybrid), which provides substantial flexibility to candidates, especially for nontraditional career changers and candidates who must continue to work full-time while attending school. As a result, for-profit programs can recruit and enroll candidates in large numbers, such that they can grow to represent a substantial segment of a state’s EPP enrollment. In **Figure 2.5**, the twelve states that have approved for-profit teacher preparation programs are shown, along with the proportion of 2017-18 completers from for-profits of any kind (traditional and alternative programs are combined in this categorization). In Arizona, 62% of program completers attended one of

the state's four for-profit teacher preparation providers: Grand Canyon University, University of Phoenix, Teachers of Tomorrow, and Moreland University (formally called TEACH-NOW). Over half of completers in DC also attended for-profits, and nearly half in Texas, the state with the largest number of candidates enrolled in educator preparation programs. Throughout this analysis, where possible, I disaggregate by for-profit status due to their potential to attract large numbers of candidates.

### 3. Defining “flexibility” in labor market entry

To assess how a state's flexibility may influence teacher supply and the composition of the teacher workforce, those states that lower barriers must be distinguished from states with higher barriers (or less flexibility). In the previous few sections, it is clear that states take multiple approaches to creating more flexibility in teacher labor market entry and in meeting requirements for licensure. First, some states provide greater flexibility by *lowering certification requirements* for initial licensure, as discussed in **Table 2.1**. States in the right, upper-most quadrant have the least-flexible certification requirements, since candidates need to demonstrate academic proficiency through at least three certification requirements, regardless of whether they teach on a provisional or standard license. States in the left, lower quadrant provide the most flexibility to candidates in meeting certification requirements.

Next, some states provide greater flexibility through differentiated *models* of teacher preparation. Having multiple models allows states to better target subpopulations of potential teachers and build program incentives that can help induce specific groups of candidates to enter teaching. However, just because a state offers multiple alternative preparation program models, it may be more important to consider *uptake* in alternative programs. Therefore, states can be distinguished based on the proportion of educator preparation program completers that graduate from alternative versus traditional programs,

as shown in **Figure 2.4**. Finally, because both state policy and program design matter, states could be categorized by a combination of their certification requirements and the prevalence of completion from APPs.

In **Table 2.2**, I use these approaches to categorize states by the level of flexibility they provide to induce labor market entry. Opponents of alternative routes to teaching sometimes imply that the use of ARTs is synonymous with lowering barriers to certification. However, there is only some overlap between states with heavy APP enrollment and states with the lowest barriers to certification. In fact, many of the states with the lowest certification requirements are those with the fewest pathways to certification and with no candidates enrolled in APP (i.e., Wyoming and Oregon). Conversely, some states with the highest enrollment in ARTs also have high certification requirements (i.e., Louisiana and Kentucky).

#### **4. Conclusion**

Understanding the variation and landscape of state policies regarding certification and ART availability is important to help policymakers make decisions around how to maintain balance between teacher supply and quality. In this chapter, I explore variation in two key factors related alternative routes to teacher preparation: state certification requirements and variation in preparation program models. I find that the two factors are not necessarily correlated, and that states with large proportions of candidates in APPs may not necessarily be the states with the lowest barriers to entry into teaching. Conversely, states with high barriers may have many diverse preparation models. Additionally, it is difficult to know how to factor for-profit models into considerations around the flexibility for teacher certification.

## Tables & Figures for Chapter 2

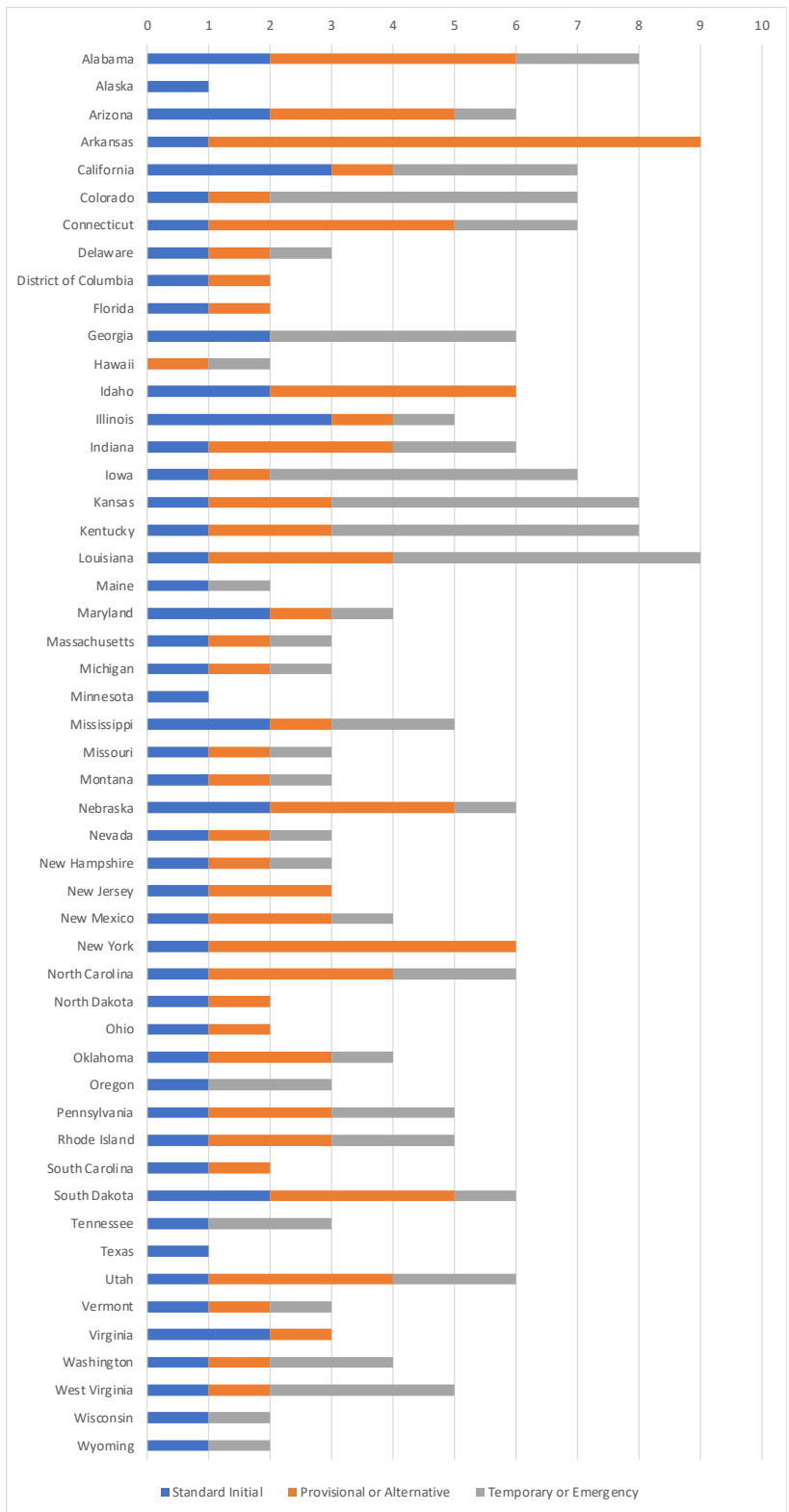


Figure 2.1. Number and type of first-time, initial teaching licenses for core teaching areas, SY 2017-18



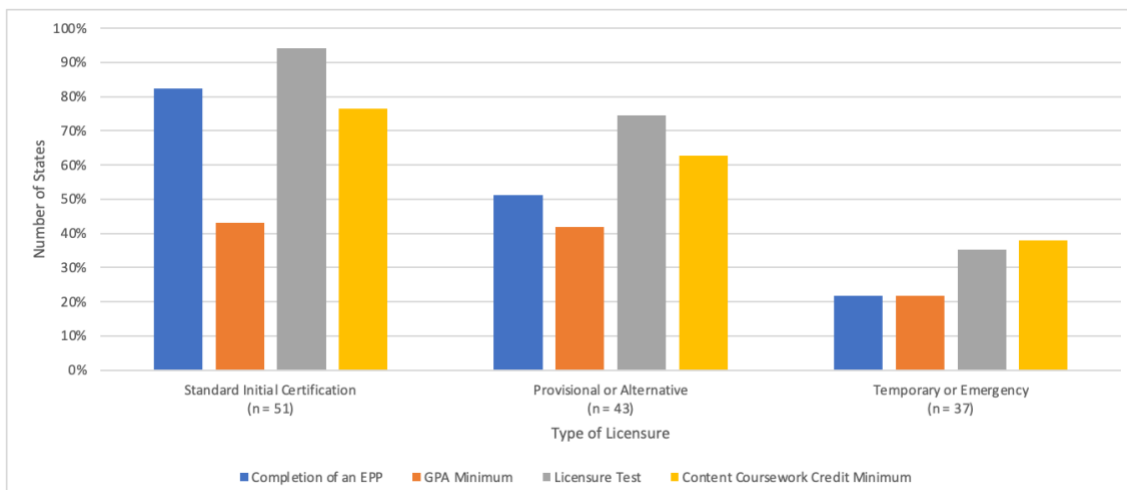


Figure 2.2. Proportion of states that have each of four certification requirements, by licensure type, SY 2017-18

**Table 2.1. Matrix of states by relative certification barriers, for standard initial and provisional or temporary certification, SY 2017-18**

		Standard Certification Requirements	
		Moderate	High
Provisional or Temporary Certification Requirements	<b>High Barriers to Cert.</b>	Arkansas Ohio	Connecticut Kentucky Louisiana Maryland Missouri** Nebraska New Jersey New York South Carolina West Virginia
	<b>Moderate Barriers</b>	District of Columbia Iowa Nevada* Rhode Island Virginia	Illinois* Kansas Mississippi New Mexico* Pennsylvania*
	<b>Low Barriers to Cert.</b>	Arizona Colorado* Delaware* Maine Massachusetts* Montana Oklahoma Oregon Vermont Washington Wyoming	Alabama* California* Florida** Georgia Hawaii Idaho* Indiana* Michigan New Hampshire North Carolina North Dakota South Dakota Tennessee Utah Wisconsin
<b>Offers only Standard Initial License</b>		Alaska	Minnesota Texas

\* States have both provisional & temporary certification, so categorization reflects the certification type with the lowest barriers.

\*\* State is listed as "high" barriers to standard certification, but has pathways to meet standard certification other than completing an educator preparation program.

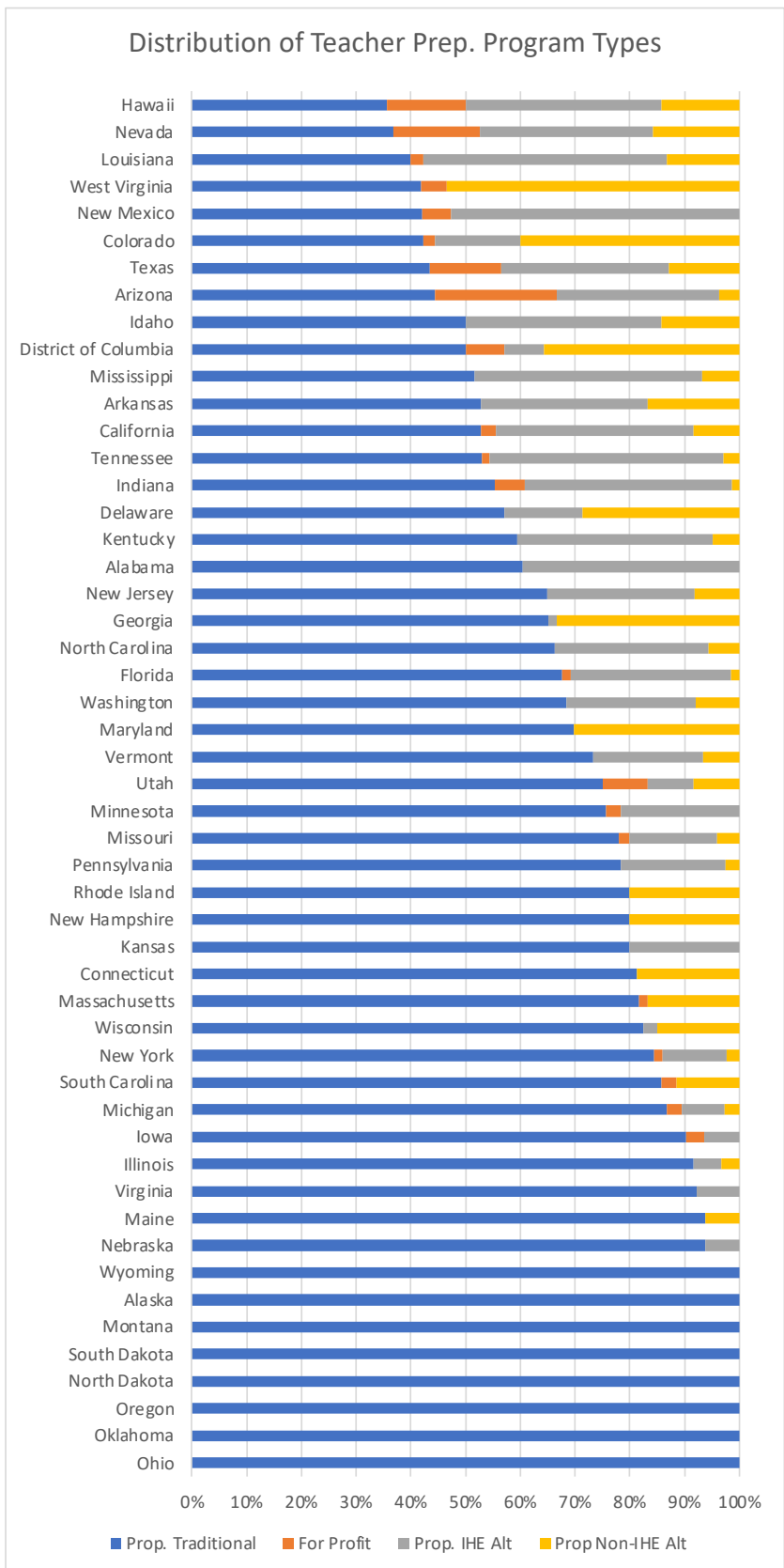
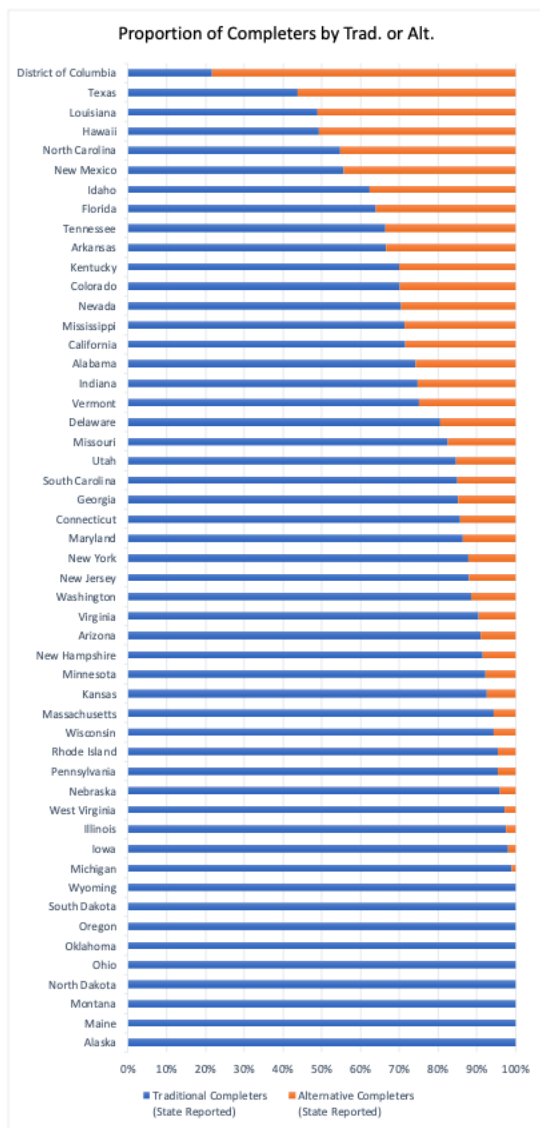
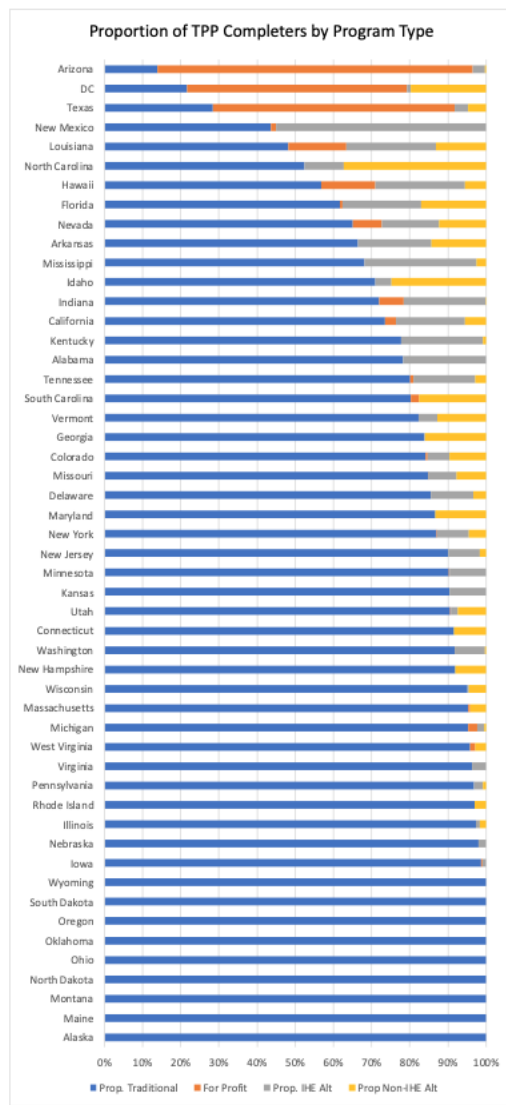


Figure 2.3. Distribution of program types within states, SY 2017-18



**Panel A**



**Panel B**

**Figure 2.4. Distribution of teacher preparation program completers by type of program (including for-profits) versus by traditional or alternative, SY 2017-18**

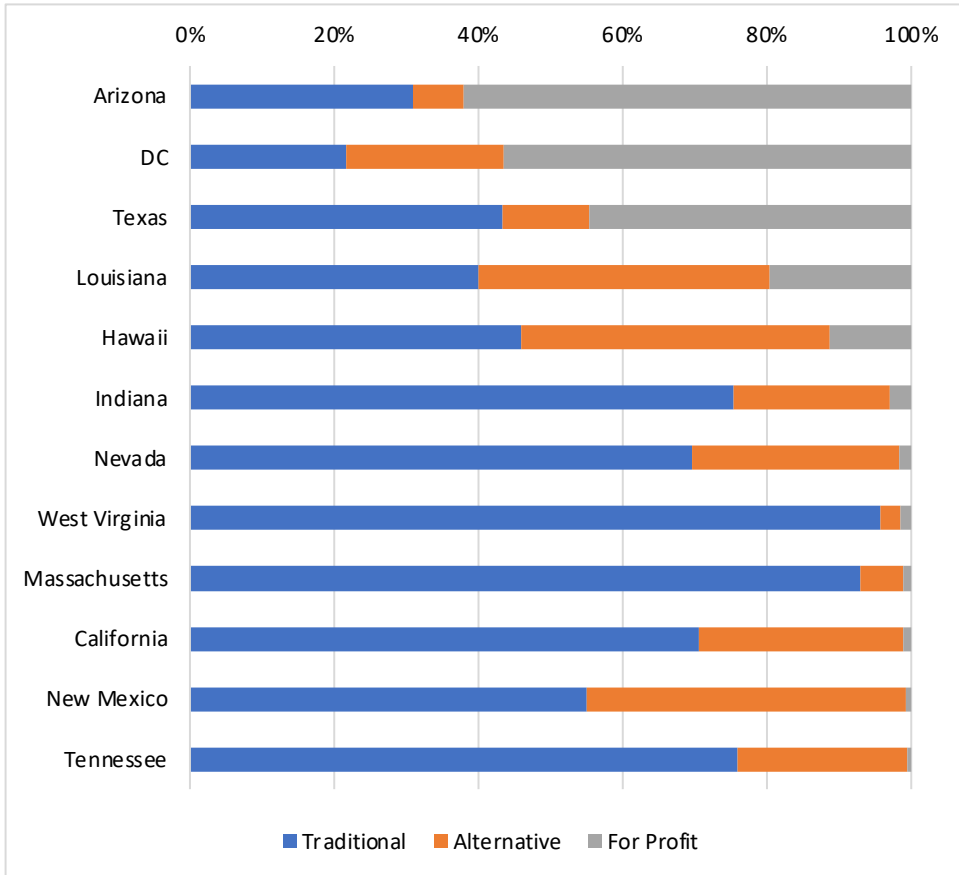


Figure 2.5. Distribution of educator preparation program completers between traditional, non-profit alternatives, and for-profit programs (traditional and alternative)

**Table 2.2. Defining state flexibility in approaches to teacher licensure**

Method	Operationalization	States		
Proportion of ART Completers	At least 25% of Prog. Completers from ART Routes	Alabama Arkansas California Colorado Dist. Of Columbia Florida	Hawaii Idaho Indiana Kentucky Louisiana Mississippi	New Mexico Nevada North Carolina Tennessee Texas Vermont
	10% or fewer are ART Route Completers	Alaska Arizona Illinois Iowa Kansas Massachusetts Michigan	Minnesota Montana Nebraska New Hampshire North Dakota Ohio Oregon	Pennsylvania Rhode Island South Dakota Virginia West Virginia Wisconsin Wyoming
Availability of Program Types	Offer Multiple non-IHE based ARTs	Arkansas California Connecticut Dist. Of Columbia	Florida Hawaii Louisiana Massachusetts Nevada	North Carolina Pennsylvania South Carolina Texas
	Offer only IHE-based ARTs/ No ARTs	Alabama Alaska Iowa Kansas Maine Minnesota	Montana Nebraska New Mexico North Dakota Ohio	Oklahoma Oregon South Dakota Virginia Wyoming
Flexibility of Certification Requirements	Lowest Barriers to Certification	Arizona Colorado Delaware Maine	Massachusetts Montana Oklahoma	Oregon Vermont Washington Wyoming
	Highest Barriers to Certification	Connecticut Kentucky Louisiana	Maryland Missouri Nebraska New Jersey	New York South Carolina West Virginia
ART Completers + Certification Requirements	25% or more ART Completers + Low Provisional or Temporary Certification Requirements	Alabama* California Colorado*	Florida Hawaii Idaho Indiana	North Carolina Tennessee Vermont
	10% or fewer ART Completers + High Certification Requirements	Illinois Kansas	Nebraska West Virginia	Ohio Pennsylvania

Notes: Table shows four possible ways to define state flexibility regarding certification. First, states are categorized by the proportion of reported ART completers based on most recently available data from SY 2017-18. Second, states are categorized by availability of preparation program models in the state. States offering at least two or more types of non-IHE based programs. Third, states are categorized by the flexibility of their certification requirements. States with the highest barriers have high barriers regardless of a candidate choosing an alternative versus traditional program. States with the lowest barriers have low barriers for all types of programs as well. The final approach combines methods 1 & 3. However, as shown, there are few states with low ART completion and high certification requirements.

## Appendix for Chapter 2

Table A2.1. Total enrollment in educator preparation programs, by model type, SY 2017-18

State	Non-Profit		For-Profit		Non-Profit,	Total Enrollment
	Trad. IHE	Alt. IHE	Trad. IHE	Alt. IHE	non-IHE	
Alabama	5225	1451				6676
Alaska	875					875
Arizona	5850	1329	33915	690	126	41910
Arkansas	3849	1117			835	5801
California	27592	6816	1014	68	2067	37557
Colorado	7769	524	58		891	9242
Connecticut	4370				398	4768
Delaware	1617	214			62	1893
DC	640	27		1697	583	2947
Florida	11468	3826		115	3163	18572
Georgia	13012	31			2478	15521
Hawaii	877	363	79	138	86	1543
Idaho	2889	168			1010	4067
Illinois	16614	168			293	17075
Indiana	7126	2133	8	616	8	9891
Iowa	7870	86	27			7983
Kansas	6633	711				7344
Kentucky	5425	1493			62	6980
Louisiana	3257	1592		1026	885	6760
Maine	2259					2259
Maryland	5795				885	6680
Massachusetts	15539			91	691	16321
Michigan	9234	171		238	51	9694
Minnesota	9972	1066	20			11058
Mississippi	2771	1203			99	4073
Missouri	9668	833	6		890	11397
Montana	2408					2408
Nebraska	4099	84				4183
Nevada	3918	906	74	381	745	6024
New Hampshire	2574				226	2800
New Jersey	9874	889			192	10955
New Mexico	1094	1381	35			2510
New York	45764	4358	80		2360	52562
North Carolina	10505	2075			7490	20070
North Dakota	2082					2082
Ohio	18326					18326
Oklahoma	4949					4949
Oregon	3835					3835
Pennsylvania	18425	441			169	19035
Rhode Island	1820				56	1876
South Carolina	6016			163	1321	7500
South Dakota	2148					2148
Tennessee	7294	1471	74		264	9103
Texas	30204	3862	5	67198	4987	106,256
Utah	7960	161	14		648	8783
Vermont	1464	87			229	1780
Virginia	10409	402				10811
Washington	11054	944			46	12044
West Virginia	3140		45		93	3278
Wisconsin	10748	46			508	11302
Wyoming	1072					1072

Notes: Enrollment figures include BOTH candidates reported as enrolled, but not completing, and those completing programs in SY 2017-18. Title II notes that some programs accidentally double count completers, so these figures may reflect some reporting error.

**Table A2.2. Number and proportion of educator preparation program completers, by whether they completed traditional or alternative preparation programs, reported by the state versus by programs, SY 2017-18**

State	State Reported					Program Reported				
	Total Completers	Traditional Completers	Alternative Completers	Prop. Traditional	Prop. Alternative	Total Completers2	Traditional Completers3	Alternative Completers4	Prop. Traditional5	Prop. Alternative6
Alabama	1817	1349	468	74%	26%	2391	1923	468	80%	20%
Alaska	119	119	0	100%	0%	185	185	0	100%	0%
Arizona	5339	4860	479	91%	9%	5344	4860	484	91%	9%
Arkansas	1610	1073	537	67%	33%	1739	1202	537	69%	31%
California	12601	9015	3586	72%	28%	12603	8996	3607	71%	29%
Colorado	2250	1579	671	70%	30%	2543	1773	770	70%	30%
Connecticut	1475	1263	212	86%	14%	1453	1261	192	87%	13%
Delaware	437	352	85	81%	19%	437	352	85	81%	19%
District of Columbia	821	178	643	22%	78%	821	178	643	22%	78%
Florida	5341	3411	1930	64%	36%	5392	3418	1974	63%	37%
Georgia	3788	3229	559	85%	15%	3807	3229	578	85%	15%
Hawaii	504	248	256	49%	51%	508	248	260	49%	51%
Idaho	1149	717	432	62%	38%	1213	763	450	63%	37%
Illinois	4189	4087	102	98%	2%	4219	4099	120	97%	3%
Indiana	2977	2223	754	75%	25%	3105	2342	763	75%	25%
Iowa	1944	1907	37	98%	2%	1944	1907	37	98%	2%
Kansas	1681	1557	124	93%	7%	1902	1778	124	93%	7%
Kentucky	1857	1298	559	70%	30%	2404	1842	562	77%	23%
Louisiana	1594	780	814	49%	51%	2106	844	1262	40%	60%
Maine	417	417	0	100%	0%	417	417	0	100%	0%
Maryland	2084	1802	282	86%	14%	2079	1802	277	87%	13%
Massachusetts	3857	3637	220	94%	6%	4035	3752	283	93%	7%
Michigan	2506	2482	24	99%	1%	2511	2487	24	99%	1%
Minnesota	2904	2677	227	92%	8%	3154	2677	477	85%	15%
Mississippi	1334	953	381	71%	29%	1501	953	548	63%	37%
Missouri	3357	2768	589	82%	18%	3347	2768	579	83%	17%
Montana	566	566	0	100%	0%	566	566	0	100%	0%
Nebraska	1194	1146	48	96%	4%	1361	1313	48	96%	4%
Nevada	749	528	221	70%	30%	773	551	222	71%	29%
New Hampshire	703	643	60	91%	9%	703	630	73	90%	10%
New Jersey	2209	1943	266	88%	12%	3366	3100	266	92%	8%
New Mexico	733	408	325	56%	44%	733	408	325	56%	44%
New York	13237	11615	1622	88%	12%	13326	11684	1642	88%	12%
North Carolina	2896	1588	1308	55%	45%	4222	2819	1403	67%	33%
North Dakota	637	637	0	100%	0%	637	637	0	100%	0%
Ohio	4535	4535	0	100%	0%	4563	4563	0	100%	0%
Oklahoma	1314	1314	0	100%	0%	1314	1314	0	100%	0%
Oregon	1645	1645	0	100%	0%	1645	1645	0	100%	0%
Pennsylvania	5209	4970	239	95%	5%	5821	5581	240	96%	4%
Rhode Island	582	555	27	95%	5%	582	555	27	95%	5%
South Carolina	2106	1790	316	85%	15%	2106	1790	316	85%	15%
South Dakota	653	653	0	100%	0%	653	653	0	100%	0%
Tennessee	1960	1302	658	66%	34%	2803	2145	658	77%	23%
Texas	21549	9422	12127	44%	56%	21598	9379	12219	43%	57%
Utah	1715	1451	264	85%	15%	2133	1869	264	88%	12%
Vermont	491	369	122	75%	25%	488	375	113	77%	23%
Virginia	3208	2900	308	90%	10%	3101	2900	201	94%	6%
Washington	3020	2674	346	89%	11%	3020	2694	326	89%	11%
West Virginia	992	965	27	97%	3%	994	965	29	97%	3%
Wisconsin	2830	2671	159	94%	6%	2830	2671	159	94%	6%
Wyoming	241	241	0	100%	0%	241	241	0	100%	0%

Notes: This table compares differences in program completion by reporting through state representatives compared to program representatives. State-reported figures are reported through the state Title II reporting officer, who works for the state department of education. Programs also individually report completers directly to Title II, and the five columns on the right show the aggregated completion totals. For most states, the figures match. However, due to some reporting errors on the part of programs, the figures differ slightly. For most analyses and definitions, I use the state-reported figures, since these are used consistently in comparing trends across years. For program-level analyses, I use the program reported figures.



### **Chapter 3. Can alternative routes to teaching influence teacher composition and sorting?**

Alternative routes to teaching (ARTs) originally developed as a policy mechanism for alleviating teacher shortages in the 1980s and 90s (E. Feistritzer, 1994). As ARTs evolved, some policy-makers and ART program leaders claimed that they could alleviate educational inequities through improving teacher quality (Paige, 2002). Some alternative programs have attempted to increase the quality of teachers relative to traditional programs through whom they select. Highly selective alternative route pathways, such as Teach for America (TFA) and the New York City Teaching Fellows (NYCTF), attract candidates with higher entry qualifications in terms of test scores and academic achievement when compared with traditional routes and less selective alternative certification routes. Other alternative programs attempt to increase teacher quality through improved training, relying on pedagogies of practice and applied coursework to address the “problem of enactment” (Kennedy, 1999; McDonald et al., 2013).

Prior research has extensively explored the extent to which teachers trained through ARTs improve the academic outcomes of students relative to peers trained through traditional routes. Outcomes from experimental and quasi-experimental studies suggest that candidates from highly-selective alternative routes tend to demonstrate gains in student achievement equal to those of candidates from traditional routes in elementary and ELA, and outperform teachers from traditional routes in middle- and high-school math (D. Boyd et al., 2010; D. Boyd et al., 2006; M. A. Clark et al., 2013; Decker et al., 2004a; Henry et al., 2014; Kane et al., 2008; Xu et al., 2011). However, an experimental study of less-selective alternative routes to teaching also found no difference in student outcomes between ART-trained teachers and traditionally-trained teachers (J. Constantine et al., 2009).

In addition to improving educational outcomes through improving teacher quality, ARTs may operate to improve educational outcomes through other mechanisms. First, ARTs may improve educational outcomes by increasing the racial diversity of teachers in the workforce. Additionally, ARTs may improve outcomes if ART entrants sort to schools that would otherwise have the most difficult time hiring certified teachers, typically schools that serve high proportions of students of color and students from low-income neighborhoods. Both claims are particularly true if ART entrants are equally qualified to teach as traditionally trained teachers sorting to these schools and content areas. However, little evidence currently exists about whether ARTs can improve educational outcomes through these compositional and sorting mechanisms.

In this chapter, I share evidence to answer the important policy question of whether the expansion of ARTs could feasibly improve the racial diversity of teachers in the U.S. I use data from the National Teacher and Principal Survey and the Higher Education Act Title II Data to examine the extent to which ARTs currently prepare and supply teachers of color in the workforce. I also examine whether teachers trained through ARTs sort to schools and content areas that are most impacted by shortages. Finally, I compare measures of academic achievement and content area preparation to determine whether any compositional or sorting effects are offset by differences in academic preparation or content expertise. I find suggestive evidence that ARTs do supply more racially diverse teachers to the workforce, and states that rely more heavily on ARTs have proportionally more racially diverse teaching workforces. Additionally, it appears that ARTs supply teachers from the highest and lowest tails of the academic achievement distribution, making it unclear about the extent to which teach quality could offset additional effects produced by increased racial diversity. Finally, I attempt to explore under what conditions and assumptions an expansion of ART enrollment

could feasibly impact the diversity of the teaching workforce. I find that by increasing the proportion of new teachers from ARTs by ten percentage points, holding all else constant, would increase the proportion of new teachers of color by 6%.

## **1. Background: preparation pathways, teacher characteristics, and sorting**

Disparities exist in the characteristics of candidates who enter the teaching workforce, who are retained over time, the schools in which they choose to teach, and in their content knowledge and preparation across subject and placement areas. Candidates entering the traditional teacher pipeline are predominately white women, and they disproportionately choose to concentrate in elementary education and the humanities (Putman et al., 2016). Some evidence suggests that teachers with higher opportunity costs are more likely to exit the profession, including those teachers with higher average ability and teachers with expertise in technical subjects like math and science (R. M. Ingersoll & May, 2012). Moreover, teachers generally choose to work in schools and districts with the most favorable working conditions. These selection mechanisms have led to adverse sorting of teachers across schools and a teacher workforce whose qualifications are unequally distributed across student populations (D. Goldhaber, Lavery, & Theobald, 2014).

ARTs may offer hope in addressing some compositional and sorting concerns in the teacher workforce by increasing the racial diversity of teachers and by sorting teachers to the schools that are most in need of teachers. Alternative preparation programs do attract more diverse candidates relative to traditional programs (Hammerness & Reiningger, 2008; Zeichner, 2003), and train proportionally more candidates to teach in economically disadvantaged schools (M. Clark, McConnell, Constantine, & Chiang, 2013). Additionally, ARTs are expected to be more responsive to local labor markets, potentially allowing them to better meet the needs of local schools. For instance, in 2016-17, just over half of all

alternative routes to teaching had been specifically designed to address critical shortage areas, and 45% of routes were limited to specific grades and or subject areas.

Some observers suggest that the composition of ART programs reflects state policies that relax qualifications for certification, such that ultimately these teachers are less prepared and less effective than traditionally trained and certified teachers. For instance, after an analysis of a sample of 85 alternative preparation programs across 23 states in 2014, the vice president of the National Council on Teacher Quality (NCTQ) concluded that alternative programs are not selective enough, nor do they ensure that teachers have an appropriate level of content expertise for the subjects in which they are prepared to teach (Greenberg, Walsh, & McKee, 2015).<sup>20</sup> Others note that ARTs still comprise a relatively small share of the teacher preparation market, and question whether they could feasibly improve the racial diversity of teachers on a national scale (Putman et al., 2016).

### **1.1. Existing studies on ARTs and compositional effects**

Descriptive analyses considering who enters teaching through alternative relative to traditional pathways have indeed examined differences in the demographic and achievement characteristics of candidates and completers. However, such studies have suffered from one of two shortcomings. In some cases, the data are nationally representative, but most of these data come from surveys administered by one researcher and her now defunct private research organization, the National Center for Education Information (C Emily Feistritzer, 1984, 1993, 2005; C. Emily Feistritzer, 2006; C Emily Feistritzer & Haar, 2008; E. Feistritzer, 1994).<sup>21</sup> While the reports were ground-breaking as the first to offer more detailed glimpses

---

<sup>20</sup> Critics of the NCTQ report noted that the sample of programs was both small and not representative (Robinson, 2014).

<sup>21</sup> Between 1984 and 2006, Feistritzer surveyed states regularly to gather information on the policy routes available for alternative teacher certification, and also collected detailed information about the number of candidates enrolled in alternative route programs. See the series *Alternative teacher certification: A state-*

into alternative certification, they suffered from low response rates. Additionally, the final report published from NCEI appeared in 2006 (C. Emily Feistritzer, 2006). Teacher licensure policy changes often, and the landscape looks different today than it did even ten years ago.

Other studies that examine the characteristics of candidates enrolled in alternative preparation programs often examine only a purposefully selected subset of programs that may not be representative of all program (Donaldson & Johnson, 2011; Evans, 2011; Humphrey & Wechsler, 2007; Mac Iver & Vaughn III, 2007). These studies provide detailed insight into candidates in one model of teacher preparation, but cannot be generalized to all alternative route candidates, nor can they help describe differences between various models of preparation.

## **1.2. Effect of same-race teachers**

How might ARTs improve student outcomes by impacting the racial composition of teachers? Students benefit academically and socially from having teachers of the same race, and this is particularly true for previously low-achieving students (Egalite et al., 2015) and black students (McGrady & Reynolds, 2013). Teachers' expectations of students often differ across lines of racial difference. White teachers, on average, hold lower expectations for their black students relative to black teachers' expectations of those same students (Thomas S Dee, 2005; Gershenson et al., 2015; McGrady & Reynolds, 2013). Moreover, teachers of color are less likely to use suspensions in disciplining students of color relative to white

---

*by-state analysis* published by the National Center for Education Information in 1990, 1991, 2003, and 2006. Additionally, many other reports on the state characteristics of alternative route programs and candidate profiles were published during this same period. See Feistritzer 1984, 1993, 1994, 2005, and 2008.

teachers (Holt & Gershenson, 2015), and are more likely to recommend students of color for gifted-and-talented programming (Grissom & Redding, 2015).

Taken together, these studies reinforce the importance of a diverse teacher workforce, particularly given the increasingly diverse student body population. According to the Census Bureau, in 2018, students identifying only as white and non-Hispanic comprised just 50% of the total K-12 public and private school student population (Bauman & Cranney, 2020). Between 2000 and 2017, the proportion of white students in public schools fell from 62% to just 48% of all students (NCES, 2020). Nevertheless, the majority of the teacher workforce has historically and continues to be comprised of white women (Putman et al., 2016).

Proponents of alternative certification have suggested that such programs can help increase the number of teachers of color who enter teaching. Based on data collected from the Title II Data Collection, APPs do tend to enroll relatively more people of color than do traditional routes. In 2015, over 35% of candidates enrolled in APPs identified as people of color compared to just one-quarter of candidates in traditional programs (OPEPD, 2016). Although the question remains whether these candidates alleviate the student-teacher racial mismatch, if increasing the diversity of the teacher workforce is important, then it is important to understand whether there are certain routes or models of teacher preparation that are more effective at recruiting teachers of color into the profession.

### **1.3. Academic Achievement**

Of all teacher characteristics that researchers have studied, academic achievement seems to be the most predictive of student achievement, as measured by standardized test scores. Academic achievement may be measured in a variety of ways: college entrance exams, tests of verbal ability or quantitative reasoning, and scores on standardized licensure exams.

In the late 20<sup>th</sup> century, multiple studies suggested that measures of academic proficiency were some of the best observable predictors of teacher efficacy (Ferguson, 1991; Greenwald, Hedges, & Laine, 1996; Hanushek, 1971; Summers & Wolfe, 1977).<sup>22</sup> More recent empirical studies are contradictory, and yield mixed conclusions about the relationship of teachers' academic ability and student achievement. Aaronson, Barrow, and Sander (2007) find no relationship between the quality of undergraduate institution attended by a teacher and their students' achievement gains in Chicago Public Schools. Similarly, Kane et al. (2008) find no relationship between undergraduate GPA and teacher efficacy in elementary and middle schools. D. Boyd, Grossman, Lankford, Loeb, and Wyckoff (2008) argue that measures of teacher ability may be understated and suggest that both SAT scores and selectivity of undergraduate college may be associated with student achievement. Taken as a whole, when compared with other teacher credentials, observable measures of teachers' cognitive ability do seem to be at least somewhat predictive of teaching efficacy.

Critics of alternative routes to certification claim that such pathways admit teacher candidates who have lower academic qualifications relative to traditional certification pathways (Bullough Jr et al., 1998; Walsh & Jacobs, 2007), implying that they could negatively impact student achievement. Alternative models of teacher certification vary widely in terms of their selectivity, with selective early-entry models, on average, selecting candidates from more prestigious schools with higher academic qualifications relative to traditional models (Decker, Mayer, & Glazerman, 2004b; Mayer et al., 2003). Many other models of alternative certification are less selective or equally selective as traditional models (Jill Constantine et al., 2009; Mayer et al., 2003). Because of the wide variation in alternative

---

<sup>22</sup> I exclude some important studies from the 2000s that examined teacher credentials but focused on measures other than input measures of academic or cognitive ability, such as teacher work experience or certification status.

teacher preparation routes, it is difficult to predict, without examining national data, the cumulative outcome in terms of the quality of teachers who enter through ARTs.

#### **1.4. Content Expertise**

Research has demonstrated that teachers with stronger content knowledge have positive effects on student achievement (Hill, Rowan, & Ball, 2005; Monk, 1994; Rowan, Chiang, & Miller, 1997). Similarly, multiple studies have found that licensure tests of subject-specific content knowledge are predictive of teacher efficacy (Cowan, Goldhaber, Jin, & Theobald, 2020). Because of this association, nearly every state requires candidates for initial licensure to pass a standardized test of content knowledge. Content knowledge seems especially important for math and science teachers in improving student outcomes. For instance, Goldhaber and Brewer (1997) find that teachers with advanced degrees in math and science increased student achievement more than their peers without advanced degrees, but this association did not exist for English or History teachers in high school. Similarly, teachers who took additional subject-specific coursework in math and science improved student outcomes in those content areas, but additional coursework did not have an effect for elementary and humanities teachers (Monk, 1994).

Descriptive studies on ARTs find that they enroll proportionally more candidates in math, science, and other areas. At the same time, ARTs relax certification requirements for all candidates. Therefore, it is possible that while ARTs produce relatively more teachers in shortage fields, these teachers may not be as qualified or knowledgeable in their subject areas. If these teachers are more likely to sort to schools with higher proportions of students of color or low-income students, then there are additional equity concerns about the role of ARTs in the teacher workforce.

#### **1.5. Teacher sorting and tradeoffs**



ARTs are touted as a possible mechanism for increasing the racial diversity of the teaching profession. At the same time, if ARTs lower barriers to entry, they may attract candidates with lower demonstrated academic achievement or content expertise. Because of historical inequities in access to educational opportunities, people of color are often less academically prepared overall relative to white peers (Fryer & Levitt, 2004). Some empirical research has documented a trade-off between racial diversity and academic ability in teaching cohorts. In a longitudinal analysis of three cohorts of the Baccalaureate & Beyond study, Master, Sun, and Loeb (2018) find an increase of average cohort cognitive ability coincides with a decrease in racial diversity of the cohort. Other empirical evidence suggests that by removing burdensome requirements like mandatory seat hours, alternative programs in Florida actually attracted more qualified candidates relative to those programs with more stringent requirements (Sass, 2011). Thus, while it is possible that a trade-off exists between increasing racial diversity of the teacher workforce and the overall demonstrated academic achievement and content area expertise of teachers, this relationship is not certain nor straightforward.

Additionally, nearly all states have a standardized licensure test for content area certifications. If candidates are able to pass the high standards set by the exam, it is possible that these exams are sufficient for ensuring teacher quality regardless of the route by which they are prepared. Licensure tests do seem to have predictive validity in signaling more effective teachers (D. Goldhaber, 2007; D. Goldhaber & Hansen, 2010; Shuls, 2018), and states have long used them for this purpose. Unfortunately, among candidates who take licensure exams, candidates of color have lower pass rates, on average (Gitomer et al., 1999; D. Goldhaber & Hansen, 2010). This disparity is likely explained by both inequities in prior academic preparation as well as test bias and stereotype threat.

ARTs may improve educational equity depending on who they attract, retain, and successfully matriculate into the teaching workforce. ARTs enroll more racially diverse candidates and train more candidates for shortage areas. However, it is not clear the extent to which ARTs successfully matriculate candidates into the teacher workforce, or whether they do so at high-enough rates to increase the racial diversity of the workforce.

Additionally, to address racial mismatch between teachers and students, candidates of color from ARTs would also need to sort to schools that serve more students of color. Finally, ART entrants must have sufficient academic and content area qualifications to not exacerbate existing teacher quality inequities.

### **3. Data & Methodology**

#### **3.1. Research Questions**

In this study, I explore whether evidence exists to suggest that ARTs can influence educational outcomes by influencing the composition of the teacher workforce and sorting of teachers toward schools and subjects that are most impacted by shortages. I compare descriptive characteristics about teachers based on whether they enter the labor market through an alternative route to teaching or a traditional teacher preparation program. I use the following questions to guide the analyses:

1. Do states who rely more heavily on ART completers have more racially diverse teaching workforces?
2. Are teachers of color who enter teaching through ARTs more likely to teach in shortage content areas and schools that serve predominately students of color?
3. Do teachers who sort to high-needs content areas and schools have similar levels of academic preparation as teachers from traditional routes?

#### **3.2. Data**

To answer these research questions, I compile data from multiple sources that provide information related to the demographic characteristics of the population of educator preparation program candidates and completers, as well as a nationally representative sample of current teachers. First, I use the 2017-18 restricted-use National Teacher and Principal Survey (NTPS), a nationally representative survey of teachers and school leaders administered every other year beginning in 2015. I restrict my analyses to the public school teacher survey in which public school teachers report their demographic and background characteristics, current teaching position, and characteristics about their current licensure and school placement. I include all teachers who teach in grades K – 12<sup>th</sup>. I exclude teachers from the sample who do not have a bachelor’s degree. For analyses with the NTPS, I use the provided sampling weights to control for stratified and purposeful sampling and to generate nationally representative estimates. The final sample is comprised of around 42,900 public school teachers from all 50 states and DC. Because these analyses rely in large part on the 2017 NTPS public school teacher survey, it is important to make a few points about the survey data and sample. First, while the NTPS is nationally representative, it is not representative at the state level. For this reason, I do not try to perform analyses at the state level, nor do I include state fixed effects in any regression models using the NTPS sample.

In addition to the NTPS, I also use data from the Higher Education Act Title II Data Collection. The Title II Data Collection include data reported at both the state-level and educator-preparation program level. I use state-level data on the number of educator preparation program completers, disaggregated by alternative versus traditional preparation routes.<sup>23</sup> Additionally, I compile a cross-sectional data file that contains every teacher preparation program in the academic year 2017-18. The file includes each institutional

---

<sup>23</sup> See the data appendix on why it might be important to use state-reported data on program completers.

provider, whether the program is alternative or traditional, the number of candidates enrolled by their self-reported racial identity, and the number of program completers for the current year and the two years prior. I restrict the sample of programs by dropping any program that reported having no currently enrolled students and did not report program completers in the three prior academic years. Additionally, I drop programs that only certify teachers in career technologies, and associate-level teacher preparation programs. The final sample includes 2,066 programs.

I use the Title II program and state data primarily when analyzing the characteristics of candidates in the potential pool of teachers.

### **3.3. Analytic Approach**

For each of the primary research questions, I first compare the relative characteristics of candidates enrolled in traditional versus alternative models of teacher preparation. These candidates represent the pool of potential teachers. Although not all candidates that graduate a teacher preparation program matriculate into teaching, a large proportion of them do (Sutcher, Darling-Hammond, & Carver-Thomas, 2016), and all program completers can more easily enter teaching than non-program completers. I then use the National Teacher and Principal Survey from SY 2017-18 to analyze the composition of the teacher workforce, the new teacher workforce, and/or teachers of color by whether they were trained through a traditional route or alternative route. I include both descriptive figures and multivariate analyses to better isolate the relationship between ART availability and the characteristics of interest.

### **3.4. Key Measures**

#### ***Alternative routes to teaching (ARTs)***

Alternative routes to teaching are those teacher preparation pathways that alter the barriers to entry into teaching relative to traditional pathways, often through the institutional management structure, the timing to teaching, or program coursework requirements.

Alternative routes to teaching most often refer to programs that allow for early-entry, or allow for candidates to serve as the lead teachers-of-record while concurrently enrolled in a teacher preparation program. However, some alternative programs alter other aspects of teacher preparation relative to traditional programs, such as reducing coursework hours or the clinical experience.

In the NTPS, teachers self-report whether they were prepared through a traditional route or alternative route. The questionnaire provides guidance for teachers on which option to select and gives examples of the types of routes that might qualify. It is important to note that entering teaching through an alternative route is not necessarily the same as entering teaching through an alternative program. Alternative programs represent a subset of alternative routes. It is possible, for instance, for a candidate to enter teaching on a provisional licensure but complete a traditional preparation program. I am unable to distinguish these details in the NTPS

In the Title II Data Collection, each program director reports whether the program is a traditional program, an IHE-based alternative program, or a non-IHE based alternative program. Each state classifies programs as alternative or traditional based on their own definition of an alternative route. Non-IHE based alternative programs include programs managed by states, local education agencies or charter schools, and by independent organizations. Additionally, I separate all for-profit teacher preparation programs from not-for-profit programs. These programs have a unique profit model such that their incentives

for enrollment and production of teachers differs from not-for-profit programs. I code for-profits as either traditional for-profits or alternative for-profits.<sup>24</sup>

### ***Racial and ethnic diversity***

In the HEA Title II data, I examine racial and ethnic diversity among candidates enrolled in educator preparation programs by examining aggregate counts of the number of a program's enrolled candidates that self-report their racial identities. Candidates identify their ethnicity as Hispanic or Latino, and their race as Black or African American; Asian; Hawaiian Native or Pacific Islander; American Indian or Alaska Native; White; or two or more races. These racial and ethnic categories are mutually exclusive in the Title II reporting. Students who identify as Hispanic or Latino will be coded as such, regardless of their racial identity. For example, if a student identifies as Latino, and identifies their race as Black, the student will be coded as Hispanic. Self-reporting of racial and ethnic identification is optional. As such, the sum of candidates by race and ethnicity does not always equal the sum of total enrollment as reported in the Title II reports. In the NTPS, teachers also self-report their racial and ethnic identities. I create mutually exclusive race and ethnicity categories and pay particular attention to Black teachers and teachers who identify as Hispanic or LatinX of any race.

The primary outcome in analyzing racial and ethnic diversity among the teacher workforce is a state-level statistic that I call a racial similarity index (RSI). The index is calculated as the proportion of teachers of color in a state (based on NTPS estimates) relative to the proportion of people of color in the working-age population of a state (ages 22 -to – 68-year-olds, based on ACS estimates). If the index is closer to 1, it suggests that the

---

<sup>24</sup> For a more in-depth discussion of the models of teacher preparation programs, see Chapter 1 of this dissertation.

teaching workforce is similarly diverse to the general working-age population, or that teachers in the state are as diverse as the general adult population. If the index is closer to 0, it suggests high levels of racial disproportionality between the general working-age population and the teacher workforce, with teachers being less diverse than the working-age population. In the case that an index is greater than 1, it means there are more teachers of color relative to the general working-age population.

### ***Teaching shortage content areas & schools***

Teaching shortages are well documented, and extensively documented. I use existing research to identify content areas in which shortages are most likely to be pervasive. I identify the following as shortage areas: math, science, foreign languages, special education (SPED), and English as a second language (ESL) or bilingual instruction (Cross, 2017; Thomas S Dee & Goldhaber, 2017b; R. M. Ingersoll, 2004). In the NTPS, I code a teacher as teaching in a shortage area based on the teacher's primary teaching assignment.

Shortages also differ by the relative affluence of a school and its district. Schools that serve more economically disadvantaged students and higher proportions of students of color are more likely to have vacancies, difficulty filling vacancies, and uncertified instructional staff (Malkus, Mulvaney Hoyer, & Sparks, 2015). Therefore, I define "high-needs" schools as those serving at least two-thirds students of color, as well as schools where over 40% of students qualify for free-or-reduced-price lunch.

### ***Academic achievement***

In the Title II program data, programs report the median GPAs of an enrolled cohort of candidates at entry and at exit. I use the reported median GPA as a summary measure of the relative demonstrated achievement of candidates in the program. In the NTPS, I measure demonstrated achievement based on the college selectivity rankings. I

merge the Barron's selectivity ratings using IPEDs institutional codes with the undergraduate, degree granting universities. Barron's selectivity rankings categorically rank institutions from "Most Competitive" to "Least Competitive." Additionally, for schools that admit any candidate or special schools, an institution may receive a ranking of "special" or "unranked." I collapse these rankings from eight categories into four.

These measures of academic achievement are not necessarily the same as academic ability. In fact, measures such as GPA and baccalaureate programs likely also capture personality or character traits that are non-academic in nature, such as self-control or persistence. Therefore, I specifically refer to demonstrated academic achievement rather than academic ability.

### ***Content area preparation***

In the NTPS, teachers self-report on all prior terminal academic degrees, including their major and minors for their baccalaureate degrees and the fields of study in any post-graduate master's degrees or doctoral work. Using these self-reports, I assess whether teachers have any degrees in the subject area of their main teaching assignment. I call this measure the subject-area BA match. Similarly, I construct a measure of whether a teacher holds a state certification in their main teaching area and call this the certification-area match. I can then compare teachers who entered teaching from alternative versus traditional pathways in terms of their certification to teaching subject match and their content knowledge to teaching subject match.

## **4. Findings**

***Finding #1. Alternative programs, particularly post-baccalaureate alternative programs, enroll proportionally more racially diverse candidates than traditional***



***IHE-based teacher preparation programs, even after controlling for median cohort GPA.***

Previous researchers have documented that ARTs enroll more racially diverse candidates relative to traditional preparation programs. In **Figures 3.1 and 3.2**, using data on enrolled teacher preparation candidates from the 2017-18 school year, I show evidence that confirms these documented trends. In **Figure 3.1**, I show the proportion of candidates of each race by whether they are enrolled in alternative or traditional preparation programs (APPs versus TPPs). While just 19% of White candidates are enrolled in APPs, 45% of Black candidates and 34% of LatinX candidates are enrolled in them. In **Figure 3.2**, I plot the distribution of candidates by their racial and ethnic identities across models of teacher preparation programs. Traditional nonprofit IHE-based programs, while preparing the most candidates, are the least racially diverse: 71% of their candidates are White, compared to just 57% of candidates in IHE-based alternative programs and 48% of candidates in independent or non-IHE-based alternative programs. For-profit programs, both alternative and traditional, are also very racially diverse, with candidates of color accounting for approximately 45% of enrollment at both types of programs. Evidence from figures 3.1 and 3.2 support the conclusion that at a national level, the make-up of enrolled candidates is more racially diverse among non-IHE-based programs and for-profit programs relative to traditional preparation programs.

Using a simple multivariate regression, I compare average differences in the proportion of candidates of color enrolled in programs by program type, both with and without state fixed effects. The results are shown in **Table 3.1**. In column 1, weighted averages of the proportion of candidates of color confirm that traditional IHE-based programs have proportionally fewer candidates of color relative to IHE-based alternative

programs, for-profit programs, and non-IHE based alternative programs. In column 2, I add controls for program level--whether the program prepares undergraduate students only, graduate students only, or both; doing so is important since most alternative programs are post-baccalaureate.<sup>25</sup> In columns 3 and 4, I add state fixed effects to compare programs within states. From these simple regressions, it appears that at least some of the racial diversity of alternative programs is explained by differences in undergraduate candidates versus graduate candidates. Students of color are more likely to enroll in post-baccalaureate programs.

In columns 5 and 6, I add controls for median cohort GPA. GPA is negatively correlated with the proportion of candidates of color enrolled in a program, and somewhat attenuates the association between program type and the proportion of candidates of color. When comparing programs at a national level, only for-profit programs enroll candidates of color at higher rates than traditional programs. However, when comparing program enrollment within states, alternative, non-IHE-based alternative programs are more racially diverse, while alternative for-profit programs are not necessarily more diverse than traditional programs.

***Finding #2. Teachers who enter the workforce through ARTs are proportionally more racially diverse than teachers who enter through traditional preparation programs.***

Among teachers already in the workforce, teachers of color comprise a proportionally higher share of ART entrants relative to traditional entrants. In **Figure 3.3**,

---

<sup>25</sup> It is difficult to determine whether adding controls for program level is important. It does allow for a comparison among programs that are more similar and is helpful as a mechanism by which to compare non-IHE based programs against traditional programs. On the other hand, the institutional grade levels are difficult to disentangle since programs must pick either undergraduate only, undergraduate and graduate, or graduate only. See the data appendix for this choice and the implications.

the racial and ethnic composition of teachers who enter the classroom through ARTs is compared to that of teachers who enter teaching through traditional routes using the 2017-18 Public School Teacher survey from the NTPS. Among teachers who enter the profession through ARTs, approximately one-third identify as teachers of color. Black teachers comprise 13% of ART entrants, and 15% are LatinX. By comparison, just 18% of traditionally trained teachers are people of color. Just 5% of traditional entrants are Black, and 8% are LatinX.

***Finding #3. States that rely more heavily on ARTs to produce teachers have proportionally more diverse teaching workforces.***

Although ART entrants are more racially diverse, teachers who are trained through ARTs only comprise around 18% of the total workforce. However, this proportion varies substantially from state to state. Theoretically, states who rely more heavily on ARTs for supplying teachers might have more racially diverse teachers entering the workforce, and a more racially diverse teaching workforce. I explore the relationship between a state's reliance on ARTs for supplying teachers and the racial similarity index of teachers to the adult population of a state. In **Figure 3.4**, I plot the distribution of state RSIs to compare states with high proportions of ART completers and low proportions of ART completers. The left figure includes RSIs for all people of color while the right panel limits the RSI to Black and LatinX teachers (and Black and LatinX adults). The distribution among states with higher proportions of potential teachers who complete ARTs has a wider range and is shifted to the right. The mean RSI is considerably higher for states with more ART completers (mean RSI of 0.59 for high-ART states compared to a mean RSI of 0.39 for low-ART states).

In **Figure 3.5**, I examine the racial similarity index of each state relative to the proportion of all teacher preparation program candidates who complete ART programs.

Each scatterplot includes a best fit regression line. Panel A uses a racial similarity index that includes all teachers of color, while Panel B includes only teachers (and adults) who identify as Black or Latinx. In both cases, there is a strong positive association between the proportion of EPP completers from ART programs and the racial similarity index of the state. In sum, these findings suggest that among states who have robust alternative routes teaching, there are proportionally more candidates of color in educator preparation programs, more teachers of color enter the labor market, and the overall teacher workforce is more racially similar to the overall adult population in the state.

***Finding #4. Teachers who enter teaching through ARTs are more likely to teach in shortage areas, particularly science and math teachers.***

In **Table 3.2**, I show the proportion of teachers from either ART routes or traditional entry who teach in any shortage area, STEM, ESL, or special education. Teachers from both pathways are equally likely to teach special education and ESL or bilingual education. However, teachers from ARTs are proportionally more likely to have a main assignment in science or math relative to teachers from traditional entry pathways. Teachers from ARTs are also proportionally more likely to teach in any shortage area relative to traditional entry routes.

***Finding #5. Teachers who enter teaching through ARTs teach in schools that predominately serve students of color at higher rates than teachers who enter through traditional pathways. Teachers of color are very likely to teach in such schools, regardless of entry pathway, although they are slightly more likely to do so if they enter through ARTs.***

Teachers who enter the field through ARTs teach in schools that serve predominately students of color at a higher rate relative to teachers who enter through

traditional routes. In **Figure 3.6**, I show the proportion of teachers by entry route who are teaching in schools that serve mostly students of color. I categorize schools by whether more than half of the students are students of color, and another indicator for schools where students of color comprise at least two-thirds of the student population. Among all teachers who entered through traditional routes, approximately 43% teach at schools where the majority of students are students of color, and just over 30% teach at schools where at least two-thirds of students are students of color. Conversely, among ART entrants, almost 60% teach at schools where students of color comprise the majority of students, and 48% teach at schools where at least 66% of students identify as non-white. From the underlying figures shown in **Table 3.3**, evidence of sorting of teachers from higher-minority schools to lower is evident as teachers gain additional years of experience. Regardless of entry route, novice teachers are more likely to teach in schools serving predominately students of color, and this number declines when compared to the full population of teachers.

Finally, in **Table 3.4**, I examine whether these observations hold when comparing teachers from different routes while controlling for other important teacher characteristics, such as years of experience, gender, and achievement. The results, which are shown as odds ratios, confirm that entry into teaching through an ART increases the odds of teaching at a high-minority school by about 50%.

***Finding #6. Teachers who enter through ARTs exhibit wide variation in academic achievement, comparable to the variation in academic achievement demonstrated by traditionally trained teachers.***

Cohorts enrolled in post-baccalaureate alternative programs have marginally lower median GPAs, on average, relative to cohorts in traditional post-baccalaureate teacher preparation programs. In **Table 3.5**, I examine median cohort GPA among post-

baccalaureate models of teacher preparation. Among non-profit colleges and universities, relative to cohorts enrolling in traditional post-baccalaureate programs, cohorts enrolling in alternative post-baccalaureate programs have lower academic achievement, on average. The weighted mean of cohort median GPA was 3.41 among post-BA cohorts enrolling in traditional programs compared to 3.26 among post-BA cohorts enrolling in alternative programs at nonprofit IHEs. Consistent with prior analyses, academic achievement varies among cohorts of candidates enrolled within various models of preparation. On average, median GPA at entry among cohorts in selective early-entry programs (3.40) was equivalent to median GPA at entry among cohorts in traditional post-baccalaureate programs (3.41). State managed programs and grow-your-own programs seem to, on average, enroll cohorts with lower demonstrated academic achievement, as measured by median GPA at entry. Among state managed programs that reported GPA for incoming cohorts, the median GPA, on average, was 3.01. For GYO programs, on average, it was 3.16.<sup>26</sup>

Next, I examine whether differences in the demonstrated academic achievement of teachers differs based on their preparation route, as measured by the quality of their undergraduate institution. In **Figure 3.7** (and accompanying **Table 3.6**), I compare teachers trained through ARTs and traditional routes using Barron's selectivity ratings. Teachers from ARTs are slightly more likely to have attended the most selective institutions and unranked institutions relative to traditional entrants. Traditionally trained teachers are clustered more in the second tier of institutions that are competitive or very competitive (representing 71% of traditionally trained teachers), with proportionally fewer from unranked institutions (only about 6% of traditionally trained teachers).

---

<sup>26</sup> One caveat is that caution is warranted in interpreting results from state-managed programs. Multiple state programs do not consider or track candidate GPA, and therefore, only half of state-managed post-baccalaureate programs report cohort GPA at entry.

In Panels B and C of **Table 3.6**, I look at whether these distributions differ when limiting the sample to teachers of color, and again to just Black and LatinX teachers. Similar trends are observed. Even among teachers of color, ART entrants are slightly more likely to have attended the most selective institutions but are also more likely to have attended unranked institutions.

***Finding #7. Traditionally trained teachers are more likely to have a BA in their content area, but teachers from ARTs are equally likely to be certified in their main teaching assignment.***

To determine what specific preparation teachers have for their content areas, I examine whether teachers have a BA in their content area and whether they are certified for their primary content area. For this analysis, I limit teachers to those teaching one of the following subjects: ELA, social studies, math, science, foreign languages, special education, and English as a Second Language or bilingual instruction. In **Table 3.7**, I show the results of a multivariate regression to compare the proportion of traditionally trained teachers and alternative-route teachers by whether they have a bachelor's degree in a closely related field to their main teaching assignment, and the proportion holding a state certification in their main teaching assignment.

Among all teaching placements, traditionally trained teachers are more likely to have a BA in their main teaching assignment. Approximately 54% of traditionally-trained teachers hold a bachelor's in a closely related field to their main teaching assignment, while the corresponding proportion among ART entrants is approximately 42% ( $diff=0.12$ ,  $p-val < 0.001$ ). Similarly, traditionally trained teachers are more likely to have a BA in STEM, foreign language, special education, and ESL placements relative to ART entrants. Only in the humanities (ELA and Social Studies) do ART and traditionally-trained teachers have

similar proportions of teachers with bachelor's degrees in a related field. At the same time, traditionally-trained and ART-trained teachers hold state certification for their primary teaching assignments at similar rates, and this finding holds across all content areas examined.

I then limit the sample to only teachers of color to see if these relationships hold. Overall, about 51% of traditionally-trained teachers of color have a BA in a closely related field to their main teaching assignment relative to just about 41% of ART teachers of color ( $diff = -0.10, p\text{-val} < 0.001$ ). Still, among teachers of color, the small differences in the proportion of teachers holding a BA in their field are not statistically different for STEM, humanities, and foreign language teachers (although this may be due to insufficient sample sizes). No detectible differences are observed among certification rates for traditionally-trained versus ART-trained teachers of color, regardless of whether looking at all teachers of color or limiting the sample to Black and LatinX teachers.

Finally, in **Table 3.8**, I limit the sample to teachers who teach in schools that serve high proportions of students of color. Among teachers sorted to high-minority schools, teachers from ARTs are more likely to have demonstrated the highest and lowest prior academic achievement compared to teachers from traditional pathways, and this holds true when limiting the sample to teachers of color. Like the general findings, among teachers sorted to high-minority schools, those from ARTs are less likely to have a BA in their main teaching assignment but are equally likely to be certified in their main assignment.

## 5. Discussion

### 5.1. ARTs, teacher diversity, and sorting

The driving question of this chapter is whether ARTs are a feasible policy mechanism for increasing the diversity of the teaching workforce. Taken together, the



findings in this descriptive paper cannot yet make a definite claim that ARTs *are* a feasible policy mechanism to increase the racial diversity of teachers. What I have shown is that reliance on ARTs as a source of teachers is associated with more representative teaching forces when comparing states that produce larger proportions of teachers from ARTs to states who do not. ARTs attract more racially diverse candidates to the field and ART entrants are now a sizeable share of teachers of color in the labor market. Among all teachers of color in 2017, ARTs supplied 30%, despite only representing about 18% of the total teaching workforce.

In addition to providing evidence about whom ARTs supply, this chapter also examines two possible sorting mechanisms for ARTs: that teachers from ARTs can help fill shortages in specific content areas and schools. In fact, teachers from ARTs seem to be placed in (and trained for) STEM and humanities positions at higher rates, but not necessarily special education and English as a Second language or bilingual instruction. Teachers who enter through ARTs are more likely to sort to schools that serve higher proportions of students of color. This remains true for all teachers, for novice teachers, and among all teachers of color.

Finally, D. Goldhaber, Theobald, and Tien (2015) raise caution about pursuing strategies to attract more racially diverse teachers to the profession at the expense of lowering the teaching efficacy of candidates. Although we know from empirical research that ARTs appear to be equally effective as traditionally-trained (J. Constantine et al., 2009; Glazerman et al., 2006), we have less evidence about teacher characteristics at a national level. My findings suggest that teachers trained through alternative routes have wider variation in demonstrated academic ability relative to teachers from traditional routes. ART entrants are slightly more likely to demonstrate both the highest prior academic achievement

and the lowest relative to teachers from traditional pathways, and this trend holds true when comparing teachers placed at high-minority schools. It important to note that this study does not address the issue of pedagogical preparation. If we believe that pedagogical preparation is important in teacher quality, and that there exist systematic differences between alternative and traditional preparation programs related to pedagogical skill development, then this could impact teacher quality and educational equity.

## 5.2. Policy simulations

To answer the question of whether ARTs are an effective policy mechanism for increasing the racial diversity of the teacher workforce requires an exploration of the extent to which ARTs could feasibly be expanded, as well as whether and the extent to which they could attract more diverse teachers. This study is purely descriptive in nature and does not attempt to make any causal claims. However, using the descriptive findings, I conduct a simple policy simulation to understand whether and how feasibly ARTs could increase the supply of new teachers of color in the United States. Specifically, what effect would an increase in the ART supply, the racial diversity of ART programs, or both have on the proportion of new hires of color?

For the simulation, I use the baseline figures from school year 2017-18 shown in **Table 3.9**. In the baseline, 28% of all new teachers (i.e., in their first year hired and working as a teacher) enter teaching through an alternative route. Among all first-year ART entrants, 36.5% identify as teachers of color. Among all new teachers, 26% of them were teachers of color. To determine in what ways ARTs could feasibly expand, I compare the baseline figures for the entire new teacher population relative to figures produced by states in which at least 25% of program completers are produced through ARTs. I call these “high-reliance” states. As displayed in **Figure 3.9**, on average, 38.5% of new teachers enter teaching through

ARTs in these high-reliance states. Among new teachers from ARTs, 40% identify as teachers of color. I also assume that the total number of new hires remains constant (approximately 235,000), as does the racial composition of new traditionally trained hires (approximately 22% identify as teachers of color).

For the simulations shown in **Table 3.9**, I consider the effect on the proportion of new teachers of color if states increased the proportion of new teachers from ARTs, if they increased the relative racial diversity of candidates produced through ARTs, or if they were able to change both. The effects are captured in **Figure 3.10**. In model 1, an increase of just over 10 percentage-points in the relative share of new hires from ARTs from would yield about 3,000 additional new teachers of color, an increase of about 5.5%. In model 2, increasing the relative average racial composition of the cohort of new ART entrants from 36.5 to 40% would yield a 3.5% increase in the proportion of new teachers of color. Finally, increasing both the proportion of new hires from ARTs and the proportion of teachers of color within those entrants would yield a 10.6% increase in the proportion of new teachers of color, or just over 6,000 new teachers of color.

### **5.3. Future Lines of Exploration**

While this study explores one possible mechanism by which ARTs could positively influence student outcomes, there are multiple related pathways by which ARTs could also influence student outcomes that need to be explored. First, the results above suggest a relationship between ART availability or uptake that the racial similarity indices of states. However, my results cannot conclude whether a causal relationship exists, or the underlying explanation. Future research can examine whether we see demographically more similar teacher workforces in local areas that have greater availability of ARTs

A second important pathway that warrants additional exploration is the relationship of ARTs and teacher retention. Prior research has found mixed results about whether teachers who enter through ARTs are more likely, less likely, or equally likely to be retained in schools (Donaldson & Johnson, 2011; R. Ingersoll et al., 2014; Papay et al., 2012). However, such studies often examine ARTs that are specific models or specific to geographic locales. As ARTs have evolved, and given that ART entrants are also more likely to sort to more economically disadvantaged schools, it is worth continuing to explore how ART entrants compare with traditional entrants as it relates to retention in both the short- and longer-term.

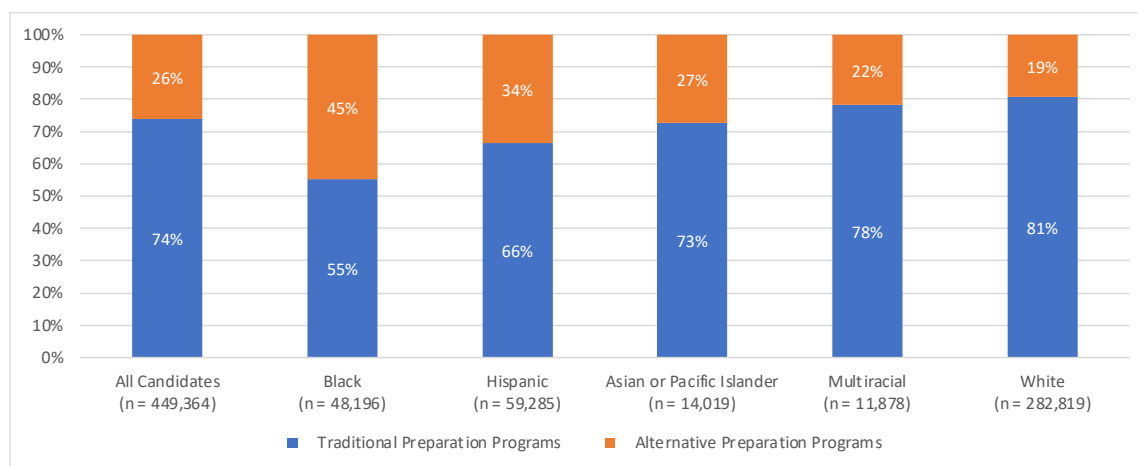
## **6. Conclusion**

In this descriptive paper, I examine an important policy question: can ARTs serve as policy mechanisms to increase the diversity of the teacher workforce without negatively impacting teacher quality? Prior research has documented that alternative routes to teaching enroll proportionally more candidates of color. However, less evidence is available as to whether ARTs can serve as a mechanism for increasing the racial diversity of the teacher workforce, particularly while maintaining teacher quality. The descriptive analyses in this paper suggest that when alternative preparation programs exist and train substantially large proportions of the new teacher workforce, states may benefit with more racially diverse teachers without trade-offs to the overall academic qualifications of teachers.

If we care about the composition of the teaching workforce, then the question of whether ARTs are an effective policy mechanism to influence the composition of the workforce is important to answer, and one that we have not answered at a national level before. Prior studies of alternative preparation pathways suggest that alternative programs do attract candidates who are more racially diverse and prepare proportionally more candidates

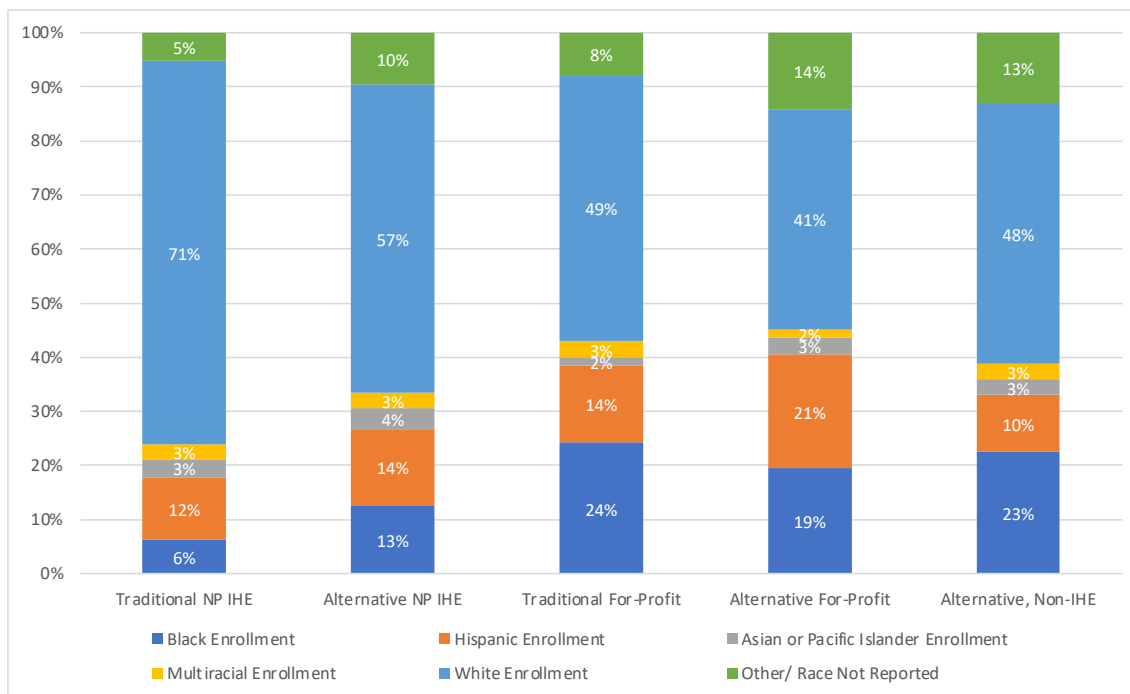
for high-needs fields like math and science. However, in their widely cited paper examining the racial diversity of the teaching workforce, Putman et al. (2016) dismiss ARTs as a viable strategy for substantively improving teacher diversity based on the fact that they only supplied 15% of the teacher workforce<sup>27</sup> and that teacher turnover is higher among alternatively-trained teachers. This study provides some evidence to support a contrary claim that ARTs may help increase the racial diversity of the teacher workforce by feasibly increasing the proportion of teachers who enter the workforce through ARTs.

### Tables & Figures for Chapter 3



**Figure 3.1. Proportional enrollment of teacher preparation program candidates by race and ethnicity, SY 2017-18.** Notes: Read as "Among all Black teacher preparation program candidates, 45% are enrolled in alternative preparation programs." Data are from the 2017-18 academic year Title II Data Collection on all enrolled candidates who self-reported their racial identity.

<sup>27</sup> This figure is based on the most recently available figure at the time of the paper's publication, the 2010-22 Schools and Staffing Survey.

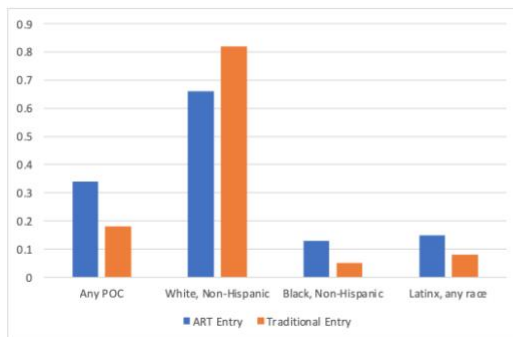


**Figure 3.2. Distribution of enrollment by race and ethnicity within each teacher preparation model, SY 2017-18.** Notes. Data come from all candidates enrolled in educator preparation programs from SY 2017-18, as reported in the Title II Data Collection.

**Table 3.1. Fixed effects regression of proportion of candidates of color enrolled in a program controlling for state, program level, and median cohort GPA, SY 2017-18**

	(1)	(2)	(3)	(4)	(5)	(6)
Traditional IHE (Constant)	0.257*** (0.0100)	0.214*** (0.0202)	0.154*** (0.0212)	0.153*** (0.0212)	0.718*** (0.1875)	0.445*** (0.0930)
Alternative IHE-based	0.119*** (0.0205)	-0.0117 (0.0301)	0.0603*** (0.0176)	0.0329 (0.0229)	-0.0192 (0.0317)	0.0246 (0.0241)
Traditional For-Profit	0.214*** (0.0103)	0.210*** (0.0120)	0.105*** (0.0172)	0.107*** (0.0176)	0.186*** (0.0180)	0.0945*** (0.0202)
Alternative For-Profit	0.271*** (0.0159)	0.130*** (0.0302)	0.0431 (0.0303)	0.0125 (0.0361)	0.104** (0.0327)	-0.00274 (0.0369)
Alternative, Not IHE-based	0.197*** (0.0279)	0.0574 (0.0374)	0.145*** (0.0279)	0.116*** (0.0329)	0.0408 (0.0416)	0.104** (0.0358)
Median Cohort GPA					-0.148** (0.0545)	-0.0857** (0.0265)
<i>N</i> of Programs	1,751	1,751	1,751	1,751	1,737	1,737
R-squared	0.247	0.270	0.593	0.594	0.304	0.605
State FE	No	No	Yes	Yes	No	Yes
Program Level Controls	No	Yes	No	Yes	Yes	Yes

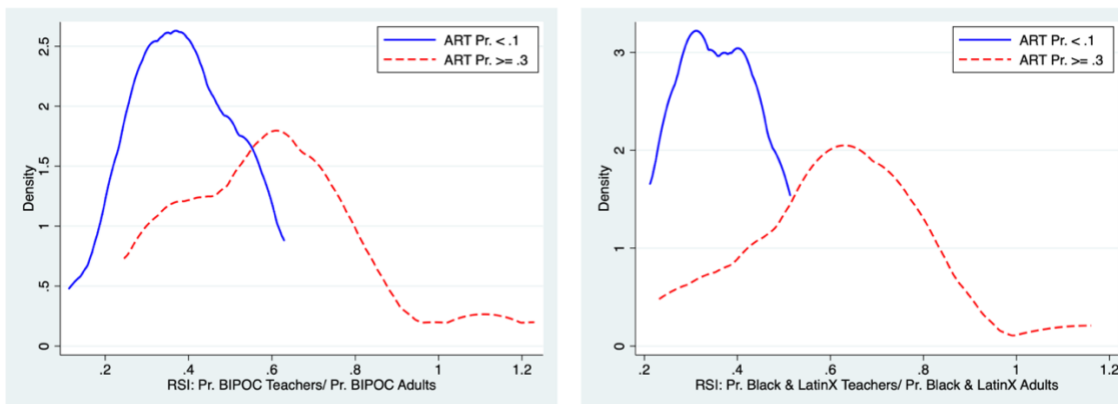
Notes: \*\*\*  $p < 0.001$ , \*\*  $p < 0.01$ , \*  $p < 0.05$ , +  $p < 0.1$ . Results are shown from OLS regression of the proportion of persons of color enrolled in a program on program type. The outcome is calculated as the sum of enrolled candidates from each mutually exclusive racial/ethnic identity category divided by the total number of enrolled candidates who reported their race/ ethnicity in the SY 2017-18 Title II Data Collection. Program level controls include whether the program serves undergraduate students only, graduate students only, or a combination. Weights are used to account for differences in the size of programs. Robust standard errors are included in parentheses.

**Data for Figure 3. Race/ Ethnicity of all teachers and new teachers in SY 2017-18**

	ART Entry		Traditional Entry	
	Mean	SE	Mean	SE
<b>All Teachers N (3,437,700)</b>				
Any POC	0.34	0.008	0.18	0.003
White, Non-Hispanic	0.66	0.008	0.82	0.003
Black, Non-Hispanic	0.13	0.006	0.05	0.001
Latinx, any race	0.15	0.006	0.08	0.002
<b>Novice Teachers N (566,200)</b>				
Any POC	0.37	0.0153	0.22	0.0079
White, Non-Hispanic	0.63	0.01525	0.78	0.0079
Black, Non-Hispanic	0.13	0.0086	0.06	0.0049
Latinx, any race	0.18	0.0129	0.102	0.0062

Notes: Data are from the national public school teacher survey administered as part of the NTPS in 2017-18. Standard errors are calculated using the jackknife replication weights in the NTPS.

**Figure 3.3. Proportion of candidates by race and ethnicity for each certification pathway, SY 2017-18**  
*Note: Categories White, Black, and LatinX are mutually exclusive, such that a teacher of any race that identifies as LatinX is included and not included as White, Black, or another race.*



	BIPOC			States				
	BIPOC Teachers	Adults in State	RSI					
<b>At least 25% of Prog. Completers from ART Routes</b>	0.27 (0.03 - 0.75)	0.4 (0.07 - .76)	0.59 (.24 - 1.2)	Alabama	DC	Indiana	Nevada	Tennessee
				Arkansas	Florida	Kentucky	New Mexico	Texas
				California	Hawaii	Louisiana	North Carolina	Vermont
				Colorado	Idaho	Mississippi		
<b>10% or Fewer ART Completers</b>	0.09 (0.02 - 0.24)	0.23 (0.07 - 0.44)	0.39 (0.11 - 0.63)	Alaska	Masachusetts	New Hampshire	Oklahoma	Virginia
				Arizona	Michigan	Hampshire	Oregon	West Virginia
				Illinois	Minnesota	North Dakota	Pennsylvania	Virginia
				Iowa	Montana	Dakota	Rhode Island	Wisconsin
				Kansas	Nebraska	Ohio	South Dakota	Wyoming

Figure 3.4. Density plots of racial similarity indices, by whether states have low or high proportions of educator preparation program completers from ARTs, SY 2017-18. The table shows the mean and range for each set of variables for the group of states. For instance, the mean RSI for each group of states, as well as the lower and upper RSI bounds (range) of RSI values are shown in column 3.

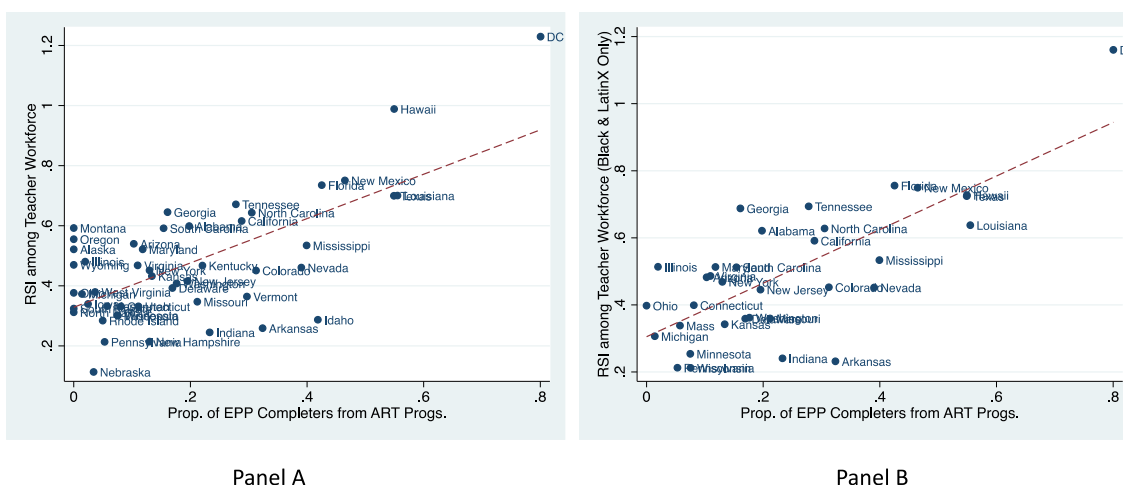
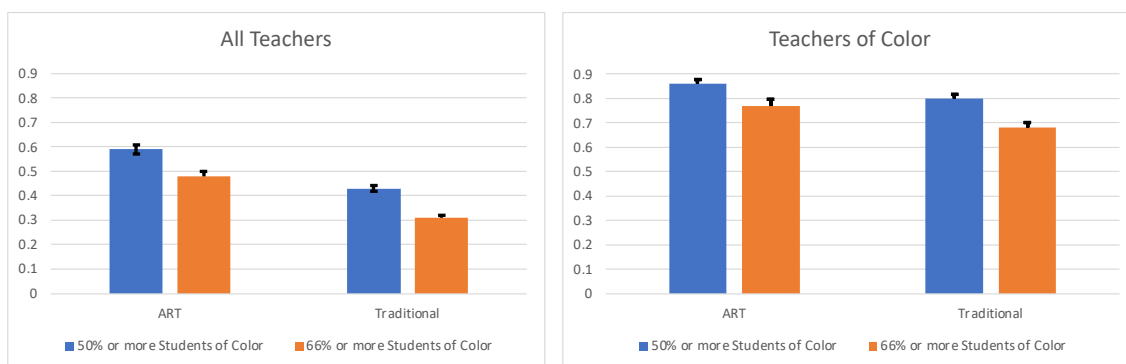


Figure 3.5. Racial similarity index for each state by the proportion of educator preparation program completers from alternative preparation programs. Data on the total number of teachers and number of teachers of color come from the 2017-18 NTPS, while the proportion of adults aged 22-to-68 come from the 2018 American Community Survey. The proportion of EPP completers from ART programs comes from the publicly available Title II Data Collection. The bivariate regression line is equally weighted among states. For Panel B, states are only shown if at least 5% of their population is Black and/or LatinX.



**Table 3.2. Primary teaching assignment by whether teachers enter through ARTs or traditional routes**

Teaching Assignment & School Type	ART Entry		Traditional Entry	
	Mean	SE	Mean	SE
Main Assignment in Shortage Area - Any	0.37	0.008	0.28	0.003
Main Assignment in Stem	0.22	0.006	0.14	0.003
Main Assignment in ESL or Bilingual	0.03	0.003	0.02	0.001
Main Assignment in SPED	0.12	0.005	0.12	0.002



**Figure 3.6. Proportion of teachers who work at schools serving predominately students of color, by entry pathway, SY 2017-18.**

**Table 3.3. Sorting of teachers to schools by entry pathway, SY 2017-18**

	ART Entry				Traditional Entry			
	Mean	SE	95% Confidence		Mean	SE	95% Confidence	
			Interval	Interval			Interval	Interval
<b>ALL TEACHERS</b>								
50% or more Students of Color	0.59	0.0087	0.576	0.61	0.43	0.0061	0.421	0.445
66% or more Students of Color	0.48	0.0095	0.456	0.494	0.31	0.0056	0.297	0.319
<b>NOVICE TEACHERS</b>								
50% or more Students of Color	0.67	0.0135	0.647	0.7	0.5	0.0108	0.48	0.522
66% or more Students of Color	0.53	0.0157	0.502	0.564	0.37	0.0109	0.35	0.393
<b>TEACHERS OF COLOR</b>								
50% or more Students of Color	0.86	0.0093	0.842	0.879	0.8	0.0082	0.785	0.817
66% or more Students of Color	0.77	0.0127	0.747	0.796	0.68	0.0101	0.662	0.702

Notes: Figures are calculated using the 2017-18 public school teacher survey from the NTPS. The first panel includes all teachers, the second panel includes only novice teachers, defined as teachers with three years of experience or less. The third panel includes all teachers of color.

**Table 3.4. Likelihood of teaching in a school where at least two-thirds of students are students of color, expressed in odds ratios, NTPS SY 2017-18**

	M1 <i>No Covariates</i>	M2 <i>Covariates</i>
<b>Alternative Route Entrant</b>	2.07***	1.55***
<b>Teacher of Color</b>		6.97***
<b>Number of Observations</b>	42,000	42,000

Notes. Data are from 2017-18 restricted use NTPS public school teacher survey. The first column of estimates shares the results of a logistic regression model of the whether a teacher entered teaching through an ART on the likelihood of teaching at a high-minority school. The second column adds additional teacher characteristics as controls, including whether the teacher is male, the teacher's years of experience, and binary indicators for quality of the undergraduate institution.

**Table 3.5. Mean entry GPA for cohorts enrolled in various preparation program models: SY 2017-18**

	Postgraduate Median GPA at Entry		
	N of Programs (D)	Unweighted	Weighted
		Mean (E)	Mean (F)
<b>Teacher Prep Model*</b>			
Traditional nonprof. IHEs: Post-BA Insts.	844	3.42	3.41
Traditional forprof. IHEs	13	3.17	3.01
Alternative nonprof. IHEs	387	3.32	3.26
Selective Early-Entry Programs	24	3.44	3.40
Grow-your-Own Programs	101	3.16	3.16
Independent Teacher Prep. Programs	28	3.25	3.28
State Managed and Nonprofit Accelerated or Flexible	9	3.13	3.01
Alternative For-Profit Programs	37	3.15	3.10
<b>Total</b>			
Traditional Preparation Programs	857	3.42	3.21
Alternative Preparation Programs	586	3.28	3.20

*Note: Data come from the Title II Data Collection and author's own research of publicly available information on Educator Preparation Routes. These programs are characterized by the type of program they would be considered in SY 2017-18. N represents the number of programs that reported median GPA at entry for the cohort enrolled in SY 2017-18, if they had a respective undergraduate or postgraduate cohort. The unweighted mean equally weights each program, while the weighted mean weights cohort GPA proportionally based on total enrollment. Some programs report having a cohort, but do not report median GPA for the cohort; these data are missing, and not included in the means. See the appendix for tables that report the proportion of missing data for this table.*

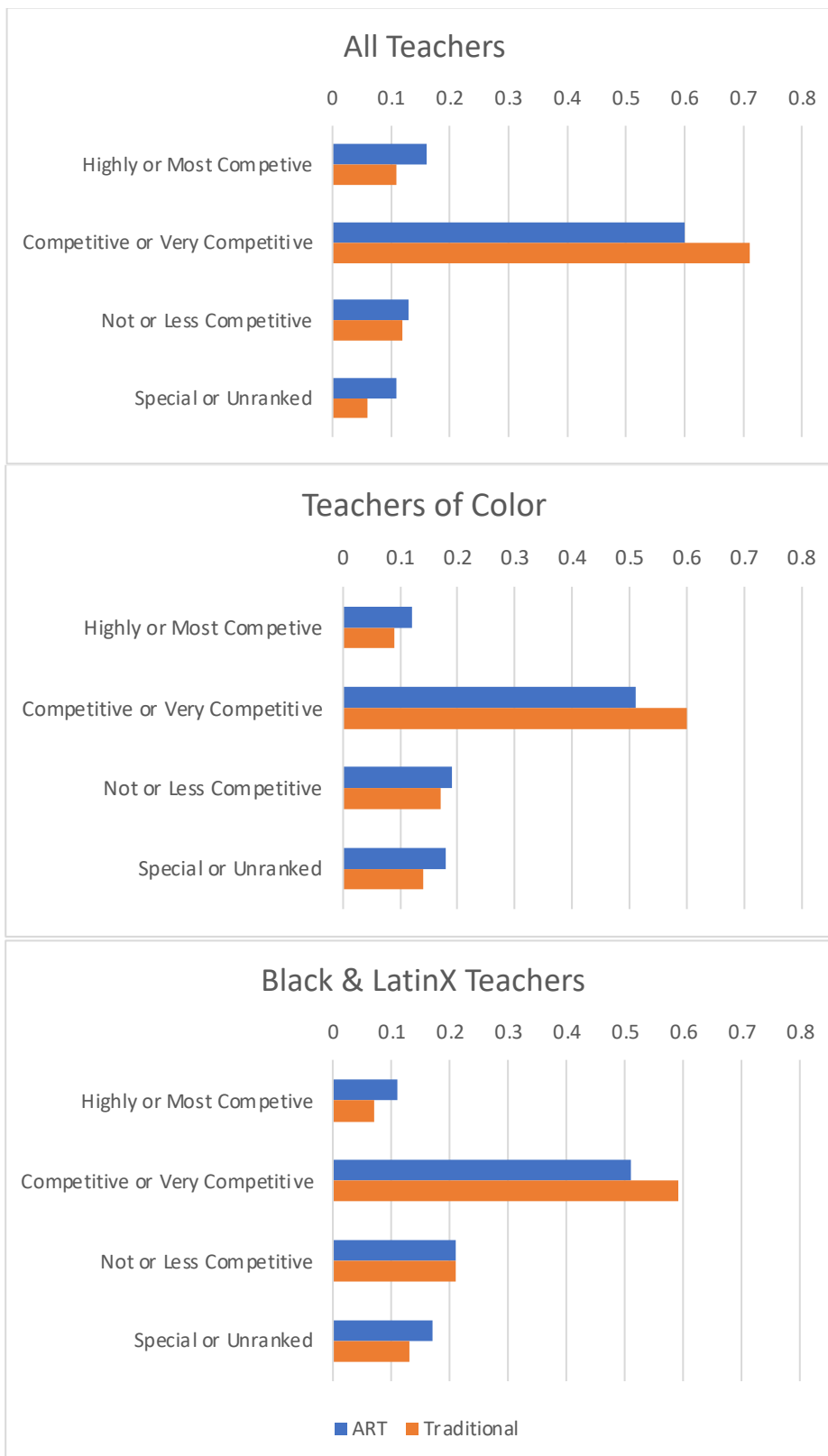
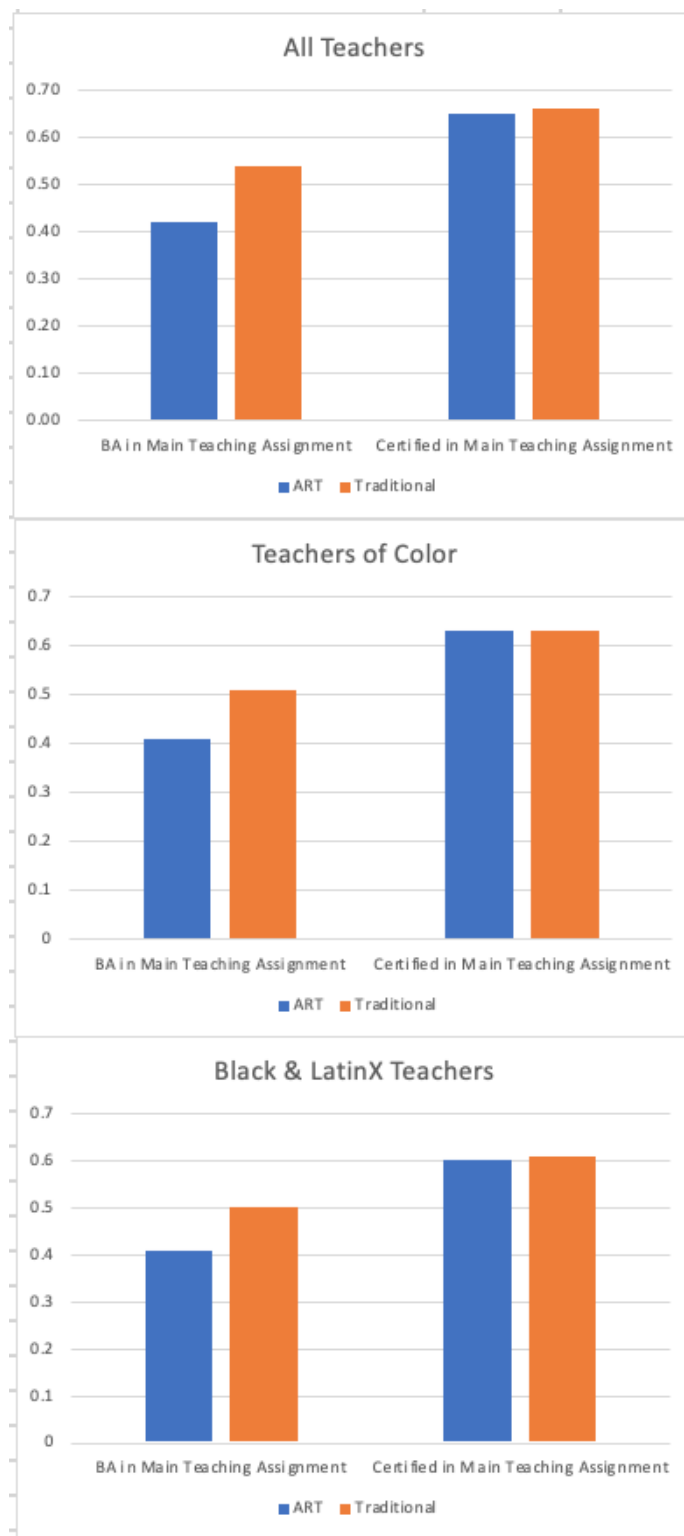


Figure 3.7. Proportion of teachers who attended each category of baccalaureate institution, by ART or traditional entry to teaching

**Table 3.6. Demonstrated academic achievement of teachers trained through traditional versus ART pathways , as measured by the Barron's selectivity rankings of the teacher's undergraduate institution**

	ART Entry				Traditional Entry			
	Mean	SE	95% Confidence Interval		Mean	SE	95% Confidence Interval	
<b>Panel A: ALL TEACHERS</b>								
<b><u>Barron's Selectivity Ratings</u></b>								
Highly or Most Competitive	0.16	0.006	0.149	0.171	0.11	0.003	0.104	0.114
Competitive or Very Competitive	0.6	0.007	0.587	0.615	0.71	0.004	0.7	0.713
Not or Least Competitive	0.13	0.006	0.118	0.14	0.12	0.003	0.116	0.127
Special or Unranked	0.11	0.005	0.1	0.12	0.06	0.002	0.061	0.068
<b>Panel B: TEACHERS OF COLOR</b>								
<b><u>Barron's Selectivity Ratings</u></b>								
Highly or Most Competitive	0.12	0.008	0.1	0.135	0.09	0.005	0.079	0.098
Competitive or Very Competitive	0.51	0.0135	0.483	0.536	0.6	0.009	0.581	0.618
Not or Least Competitive	0.19	0.012	0.171	0.217	0.17	0.007	0.157	0.187
Special or Unranked	0.18	0.0106	0.156	0.198	0.14	0.007	0.126	0.153
<b>Panel C: BLACK &amp; LATINX TEACHERS</b>								
<b><u>Barron's Selectivity Ratings</u></b>								
Highly or Most Competitive	0.11	0.009	0.093	0.127	0.07	0.005	0.063	0.082
Competitive or Very Competitive	0.51	0.0155	0.476	0.537	0.59	0.0109	0.565	0.608
Not or Least Competitive	0.21	0.013	0.185	0.237	0.21	0.01	0.188	0.226
Special or Unranked	0.17	0.012	0.148	0.197	0.13	0.0078	0.118	0.149

Notes: Figures are calculated using the 2017-18 public school teacher survey from the NTPS. The first panel includes all teachers, the second panel includes only teachers of color. The proportion of teachers who attended each selectivity level are included in the estimates. The eight Barron's selectivity rankings have been collapsed into four rankings.



**Figure 3.8. Proportion of teachers who have a bachelor's and who are certified in their main teaching assignment or a closely related field, by whether they entered teaching through a traditional pathway or an alternative route to teaching, SY 2017-18**

**Table 3.7. Comparison of content knowledge qualifications of traditionally-trained versus ART-trained teachers, SY 2017-18**

	ALL TEACHERS						TEACHERS OF COLOR						BLACK & LATINX TEACHERS					
	BA in Main Teaching Assignment		Certified in Main Teaching Assignment		BA in Main Teaching Assignment		Certified in Main Teaching Assignment		BA in Main Teaching Assignment		Certified in Main Teaching Assignment		BA in Main Teaching Assignment		Certified in Main Teaching Assignment			
	Traditional Mean (1)	ART Difference (2)	Traditional Mean (3)	ART Difference (4)	Traditional Mean (5)	ART Difference (6)	Traditional Mean (7)	ART Difference (8)	Traditional Mean (9)	ART Difference (10)	Traditional Mean (11)	ART Difference (12)						
Any Priority Subject Area	0.54 (0.0055)	-0.12*** (0.0112)	0.66 (0.0053)	0.008 (0.0097)	0.51 (0.0130)	-0.10*** (0.0218)	0.63 (0.0120)	-0.0002 (0.0196)	0.50 (0.0159)	-0.09*** (0.0256)	0.61 (0.0139)	0.01 (0.0229)						
STEM	0.55 (0.0100)	-0.07*** (0.0184)	0.66 (0.0097)	0.029 (0.0162)	0.52 (0.0226)	-0.04 (0.0350)	0.63 (0.0203)	0.016 (0.0310)	0.48 (0.0286)	-0.003 (0.0411)	0.56 (0.0265)	0.06 (0.0366)						
ELA or Social Studies	0.59 (0.0086)	-0.03 (0.0189)	0.62 (0.0080)	0.0131 (0.0174)	0.54 (0.0223)	0.04 (0.0373)	0.57 (0.0194)	0.001 (0.0325)	0.52 (0.0258)	0.047 (0.0437)	0.54 (0.0213)	0.006 (0.0391)						
Foreign Language	0.61 (0.0208)	-0.17*** (0.0414)	0.75 (0.0180)	-0.007 (0.040)	0.52 (0.0346)	-0.10 (0.062)	0.70 (0.0325)	0.008 (0.064)	0.56 (0.0356)	-0.13 (0.066)	0.71 (0.0375)	-0.0001 (0.0728)						
Special Education	0.51 (0.0107)	-0.30*** (0.0212)	0.72 (0.0087)	-0.024 (0.0215)	0.46 (0.0241)	-0.31*** (0.0385)	0.73 (0.0205)	-0.02 (0.0388)	0.48 (0.0303)	-0.32*** (0.0461)	0.73 (0.0244)	-0.02 (0.0467)						
English as a Second Language or Bilingual Ed.	0.28 (0.0247)	-0.17*** (0.0409)	0.59 (0.0303)	-0.0642 (0.0648)	0.43 (0.0519)	-0.30*** (0.0754)	0.52 (0.0516)	-0.09 (0.0996)	0.44 (0.0559)	-0.30*** (0.0559)	0.50 (0.0599)	-0.05 (0.109)						

Notes: \*\*\* p<0.001, \*\* p<0.01, \* p<0.05, + p<0.1. Results are shown from a multivariate regression where the outcome is either a binary indicator that the teacher has a BA in their main teaching assignment or is certified in their main teaching assignment. Priority subjects include math, science, ELA, social studies, foreign languages, special education, and ESL. Survey weights from the NTPS account for the complex sampling design. Standard errors are included in parentheses, and generated using jackknife replications as described in the NTPS survey methodology report. Columns displaying the mean among traditionally trained teachers show the estimated mean using sampling weights from NTPS among all traditionally trained teachers of the given category (all, teachers of color, or Black & LatinX teachers). The ART columns show the estimated difference in means between traditionally-trained and ART-trained teachers.

**Table 3.8. Comparison of content knowledge qualifications among teachers working in schools comprised of predominately students of color by whether they are traditionally-trained versus ART-trained teachers, SY 2017-18**

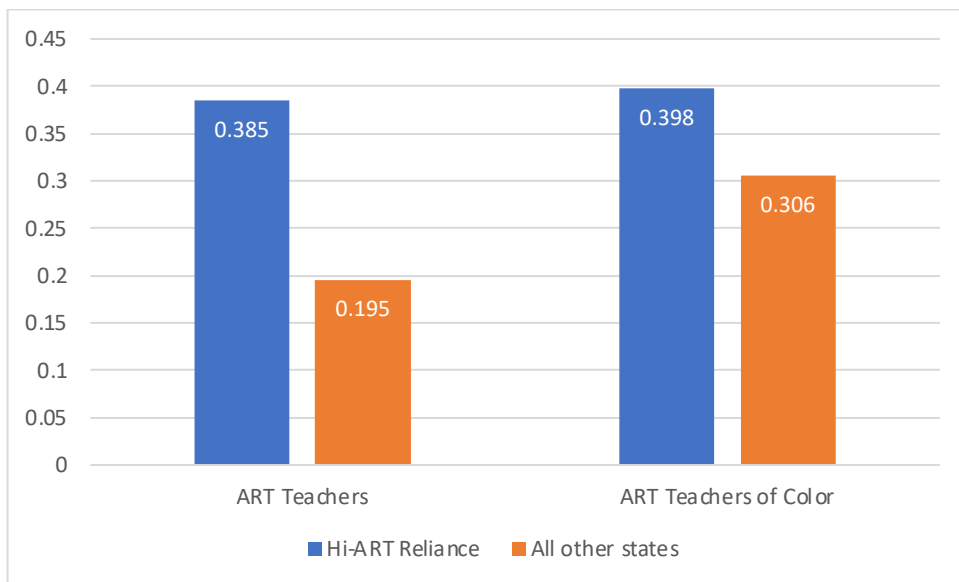
	ALL TEACHERS			TEACHERS OF COLOR		
	2/3rds or more Students of Color			2/3rds or more Students of Color		
	ART (4)	Traditional (5)	Difference (6)	ART (10)	Traditional (11)	Difference (12)
<b><u>Barron's Selectivity Ratings</u></b>						
Highly or Most Competitive	0.15	0.10	0.05*** (0.0091)	0.12	0.08	0.04** (0.0108)
Competitive or Very Competitive	0.54	0.66	-0.12*** (0.0066)	0.48	0.59	-0.11*** (0.0193)
Not or Least Competitive	0.16	0.14	0.02* (0.006)	0.21	0.19	0.02 (0.0145)
Special or Unranked	0.15	0.09	0.06*** (0.0093)	0.19	0.14	0.05** (0.0155)
<b><u>Content Area Qualifications</u></b>						
BA in Main Teaching Assignment	0.40	0.51	-0.11*** (0.0183)	0.42	0.49	-0.07** (0.0252)
Certification in Main Teaching Assignment	0.65	0.64	0.05 (0.0161)	0.64	0.62	0.02 (0.0227)

Notes: \*\*\* p<0.001, \*\* p<0.01, \* p<0.05, + p<0.1. For comparisons of teachers by a BA in their content area and certification in their content area, only teachers who teach priority subjects are included. Priority subjects include math, science, ELA, social studies, foreign languages, special education, and ESL. Survey weights from the NTPS account for the complex sampling design. Standard errors are included in parentheses, and generated using jackknife replications as described in the NTPS survey methodology report.

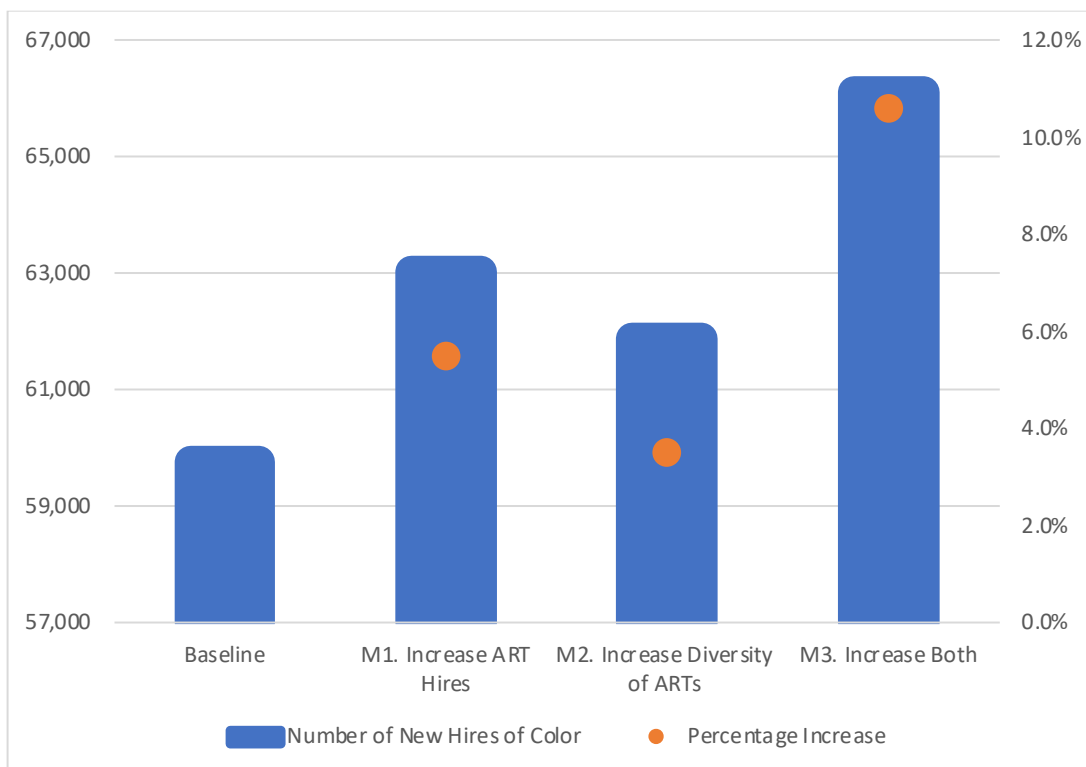
**Table 3.9. Policy simulations to examine the possibility of increasing the number of new teachers of color**

Model	Policy Simulations/ Scenarios	Proportion of all new teachers from ARTs	Prop. Of New Teachers from ARTs who are BIPOC	Total New Hires of Color	Percentage Increase
Model #1	Increase proportion of new hires from ARTs	0.39	0.37	0.27	5.5%
Model #2	Increase proportion of new hires of color from ARTs	0.28	0.40	0.27	3.5%
Model #3	Increase both prop. Of new hires of color from ARTs, and overall prop. Of new hires from ARTs	0.39	0.40	0.29	10.6%
<b>BASELINE</b>		0.284	0.365	0.26	





**Figure 3.9. Proportion of teachers who are hired through ARTs and the proportion of ART entrants who are teachers of color by whether states rely heavily on ARTs to produce program completers**  
*Note: “Hi-ART Reliance states” are defined as those in which at least 25% of all educator preparation program completers are produced by ARTs.*



**Figure 3.10. Results of the policy simulations outlined in Table 9, in which states would increase either the proportion of new teachers from ARTs, the relative racial diversity of ART entrants, or both**

## Appendix for Chapter 3

### Appendix A. Title II Data & Methodology

One of the primary sources of data for this analysis is the annual Title II Data Collection administered by the Office of Postsecondary Education and mandated by the Higher Education Act. Since 2000, OPE has collected information about program completers, and since 2008, programs have been required to report information about basic demographic characteristics of candidates enrolled in and completing their programs. Below, I discuss some of the methodological issues specific to the use of the Title II Data, and decisions I made around how to use these data.

#### Program Completers

In each reporting year, institutions report the number of program completers for the current year, as well as the two years prior to the current year. A “program completer” is defined as “a person who has met all the requirements of a state-approved teacher preparation program” and for whom the program has documentation, such as a transcript or credential that shows the candidate has met these requirements.

#### Teachers Prepared by Subject Area

For reporting purposes, program providers are required to report the academic major and the subject area for which program completers are prepared to teach. According to the Title II data documentation manual, “subject area” refers to the content area in which a completer is prepared to teach, or the area in which the candidate’s certification would be granted. Programs can report a prepared candidate in more than one subject area. For instance, if a candidate is prepared in both Biology and Physics, they would be reported in both subject areas. This method for reporting content area is important because it recognizes that candidates may prepare for more than one content area, and in fact, in some places, dual certification is required for some specializations like special education and/or bilingual education, although requirements vary by program and state. Additionally, many programs reported both secondary content areas of specialization as well as general secondary (or general education or general elementary). Therefore, one candidate may be reported across multiple areas of preparedness, and reporting varies by program and state.

To ensure validity of the figures reported in the tables in this chapter, I matched the figures reported by the Office of Postsecondary Education in their publicly available Title II reports, most notably, their policy brief *Alternative Teacher Preparation Programs* (U.S. Dept. of U.S. Department of Education, 2015). I was able to match these figures. However, the calculations contained in the tables for this chapter differ from this policy brief in a few ways. First, I use more recently available data. From 2015 to 2017, the average proportion of completers prepared for each subject do not change very much, although the overall number of completers declines slightly. Second, I exclude 13 program providers who report vastly different figures for the number of completers overall for the year relative to the number prepared by content and grade level. As discussed in the paragraph above, it is not unusual for the number of completers prepared by subject area to be larger than the total completers. However, based on typical certification rules, it is unlikely that each candidate would be counted more than three to five times. For instance, in North Carolina, an alternative route program allowed regional assistance licensing centers (RALCs) to facilitate and manage alternative certification. In the report, this program provider reported just over

600 completers for the school year, but over 11,000 program completers by content area, a magnitude that seems large enough to be due to reporting error. Based on this logic, I exclude outliers where the total completers are a magnitude of size larger than the reported completers. I posit that in these cases, it is possible that the program provider reported those currently in the preparation pipeline rather than the number of completers for the given year. In any case, removing these outliers changes the figures only slightly.

Finally, some program providers report far fewer total prepared candidates by subject area relative to current completers. This could be due to the fact that candidates could complete a program, but not be qualified or complete the requirements for a specific content area. Alternately, it could also be a data reporting issue. Approximately 3.7% (77) of programs reported more completers in a given year than the sum of candidates prepared for specific content areas. Of these, 31 have a difference of more than 10 completers. Overall, I leave these figures as they are. The discrepancies are generally not large enough or widespread enough to influence any mean statistics.

### **Enrollment by Race/ Ethnicity**

Title II reporting requires programs to report the total number of enrolled students in a program that self-identify their ethnicity as Hispanic or Latino, or self-identify their race as black or African American, Asian, Hawaiian Native or Pacific Islander, American Indian or Alaska Native, White, or two or more races. These racial and ethnic categories are mutually exclusive in the Title II reporting. Students who identify as Hispanic or Latino will be coded as such, regardless of their racial identity. For example, if a student identifies as Latino, and identifies their race as African American, the student will be coded as Hispanic. Self-reporting of racial and ethnic identification is optional. Therefore, for some programs, the sum of enrollment figures by race and ethnicity may not add up to the total enrollment. See the Higher Education Act Title II Institution and Program Report Card (IPRC) Reporting System User Manual for report year 2019 for more information.

### **Median GPA**

Programs report whether they have an undergraduate program and/or postgraduate program, and for each, the minimum GPA entry requirements and median GPA of the cohort of enrolled candidates. Many traditional programs have both undergraduate and graduate programs, while most alternative programs have only postgraduate programs. To calculate mean median GPA of entry, I first needed to clean the data. Some program report having a minimum GPA, but do not report (and may not collect) information on the median GPA of candidates enrolled in their program. Unsurprisingly, the proportion of missing data is higher among alternative programs relative to traditional programs (see Appendix Table A4). For post-graduate programs, median GPA calculations are harder, since a cumulative GPA includes all undergraduate and any prior postgraduate work completed, often requiring calculations across multiple institutions

Table A3.1.

**Data for Figure 3. Race/ Ethnicity of all teachers and new teachers in SY 2017-18**

	ART Entry		Traditional Entry	
	Mean	SE	Mean	SE
<b>All Teachers N (3,437,700)</b>				
Any POC	0.34	0.008	0.18	0.003
White, Non-Hispanic	0.66	0.008	0.82	0.003
Black, Non-Hispanic	0.13	0.006	0.05	0.001
Latinx, any race	0.15	0.006	0.08	0.002
<b>Novice Teachers N (566,200)</b>				
Any POC	0.37	0.0153	0.22	0.0079
White, Non-Hispanic	0.63	0.01525	0.78	0.0079
Black, Non-Hispanic	0.13	0.0086	0.06	0.0049
Latinx, any race	0.18	0.0129	0.102	0.0062

Notes: Data are from the national public school teacher survey administered as part of the NTPS in 2017-18. Standard errors are calculated using the jackknife replication weights in the NTPS.

## **Chapter 4. Expansion of alternative routes to teaching and the effect on teacher supply and hiring**

While many studies have examined the efficacy of teachers trained through various models of teacher preparation, fewer have examined an oft-cited outcome made by proponents of alternative teacher preparation: that such programs expand the pool of teachers, with the effect of alleviating teacher shortages. Concerns about teacher shortages have grown over the past decade as both enrollment in teacher preparation programs has declined (García & Weiss, 2019; L Partelow, 2019; Sutchter et al., 2016), and as demand for teachers is projected to rise (Sutchter et al., 2016). Proponents of alternative preparation models cite widespread teacher shortages, particularly in high-needs subject areas, as a primary motivation for the expansion of alternative routes to certification (Cross, 2017). They claim that alternative preparation programs (APPs), which lower barriers to entry to teaching, can more easily recruit candidates into the teacher labor market to fill positions in high-need subjects and schools. If true, the implication would be that hiring for hard-to-staff positions would be less burdensome. However, little research has explored the actual contribution of APPs on teacher supply and hiring.

In this chapter, using a difference-in-differences with staggered policy implementation, I exploit variation in the timing of policies that implement or expand early-entry policies to examine whether such policies increase teacher supply and ease teacher hiring in the years following implementation. I define early-entry policies as those state approved policies that allow candidates to serve as the teacher-of-record in a classroom while concurrently working toward meeting the requirements for initial certification. I compile a state-by-year panel from 1990 – 2018, using two primary sources of data, the publicly available Title II Data Collection and the restricted-use Schools and Staffing Survey.

I find evidence that while implementation of early-entry policies yields an increase in the number of educator preparation program completers, there is a decline in the number of initial teaching licenses issued. I share evidence from an estimation strategy that the true effect is likely a decline in the long-term trend in initial licensures. I posit that this can be explained by early-entry routes replacing short-duration temporary and emergency licenses, which are typically included in the count of initial licenses.

## **1. Teacher Supply & Alternative Routes to Teaching**

### **1.1. Teacher production & teacher shortages**

Teacher shortages refer to the insufficient production of certified new teachers in the subject areas and schools which have openings, and they have long plagued K-12 schools (Behrstock-Sherratt, 2016; Labaree, 2008). Teacher shortages are influenced by several factors, including the production of newly trained teachers, teacher retirement, turnover, sorting among schools and locations, and changes in student-teacher ratios that influence demand for teachers (Sutcher et al., 2016). Despite substantial public attention directed at teacher shortages, measuring shortages and identifying them remains fraught with challenges, in large part due to inconsistent and incomplete data collected about teaching vacancies and the source and supply of newly licensed teachers. As a result, researchers have put forth considerable effort to simply understanding the scope of teacher shortages and teacher production.

Teacher shortages cannot be calculated solely on the national production of teachers. From the 1980s to 2007, the number of degrees awarded in education increased (Cowan et al., 2016), despite high numbers of states reporting difficulties in finding qualified teachers. At least one estimate suggests that only 70 – 90% of educator preparation program completers ever enter teaching, with completers being much more likely to teach if they

graduate from a graduate program compared to a traditional undergraduate program (Darling-Hammond, 2000). However, this estimate is two decades old, and teacher preparation has evolved quite significantly. It is difficult to calculate exactly how many program completers do enter the classroom due to lack of longitudinal data from both baccalaureate and post-baccalaureate programs. Teacher shortages are not equally distributed across states or even within states. Rather, schools and states are much more likely to report shortages in science and math fields, special education, and bilingual education, as are schools that serve predominately low-income students and students of color (Cowan et al., 2016; Cross, 2017; Thomas S Dee & Goldhaber, 2017a; D. Goldhaber, Krieg, et al., 2015). Finally, shortages are unequally experienced across states. Some states have the human capital to produce sufficient teachers to meet state demand, while others end up “importing” candidates trained in other states (Sutcher et al., 2016). As an example, in 2013-14, New York “exported” teachers while Alaska, North Dakota, and Wyoming issued the majority of their new teaching licenses to candidates prepared out-of-state.

New teacher production is one of the most important factors that contributes to teacher shortages. While aggregate production increased from 1990 – 2007, since then it has declined, likely driven by the Great Recession. In **Figure 4.1**, I plot two measures of new teachers from 2000 – 2018: the total number of teacher preparation program completers and the number of newly licensed teachers. During this time, the number of educator preparation program completers fell drastically, from a peak of 242,376 completers in 2006 to 146,805 completers in 2018, a 39% decline.<sup>28</sup> The number of newly licensed teachers has

---

<sup>28</sup> Here, I define the number of new teachers using two measures. The first is the number of newly licensed teachers, as reported by state departments of education. The second measure is the number of educator preparation program completers. This number will vary from those reported by sources that define new teachers using other measures, such as the number of students majoring in Education. Using the number of program completers is a better measure, because the completers reported through Title II are all programs

followed a similar decline of 33% during the same period. While these declines were likely exacerbated by the Great Recession, the persistence and magnitude of the decline has persisted, only appearing to possibly slow within the past few years.<sup>29</sup> Declines in new teacher production have been experienced across nearly every state: all but five states saw declines in educator preparation completers since 2010 (L Partelow, 2019). The persistent and steady decline in the production of new teachers has exacerbated concerns that teacher shortages will expand in the coming years (L Partelow, 2019; Partelow & Baumgardner, 2016).

In addition to considering the production of qualified candidates for teaching, it is important to consider reported vacancies and school leader reports of difficulties in filling vacant positions as a measure of demand. From 1999 - 2015, schools consistently reported fewer vacancies, and fewer difficulties in filling teaching positions, and this holds true across all types of subject areas and types of schools (i.e. higher-poverty, higher-minority schools) (Malkus et al., 2015). Despite the improvement, certain subject areas and schools consistently have relatively higher rates of vacancies and difficult-to-fill positions (Cowan et al., 2016; Thomas S Dee & Goldhaber, 2017b; D. Goldhaber, Krieg, et al., 2015), including those schools serving predominately students from lower-income communities, and teaching subjects such as special education, ESL or bilingual, early-childhood, and science, technology, engineering, and math (STEM).

## **1.2. Alternative routes to teaching & teacher production**

---

that allow candidates to meet the requirements for an initial teacher certification. Conversely, some programs that produce a Bachelor's in Education or a Master's in Education may not actually prepare candidates for meeting licensure requirements.

<sup>29</sup> The most recently available enrollment and completion data are for academic year 2017-18.



Alternative routes to teaching (ARTs) are teacher preparation pathways that lower the barriers to entry into teaching relative to traditional pathways, usually in terms of the institutional management of a program, the time to teaching relative to being fully certified, or the programmatic and coursework requirements to complete the program. Since their inception, alternative routes to teaching have been touted as one policy mechanism for alleviating teacher shortages and easing hiring, especially in difficult-to-staff subjects and high-needs schools (M. Clark et al., 2013; E. Feistritzer, 1994; Paige, 2002). ART policies were originally implemented to ease hiring of qualified candidates, while improving teacher quality relative to uncertified or emergency-certified candidates. When the earliest states adopted ARTs in the late 1980s and early 1990s, most did so to alleviate pervasive teacher shortages. Their goal, according to Emily Feistritzer, who extensively documented the rise and expansion of ARTs, was to lower regulatory barriers to teaching to attract qualified second career entrants into teaching. Prior to ARTs, states relied on emergency or temporary teaching authorizations. The requirements for ARTs, which often including demonstrated content knowledge through a standardized test, sought to raise the quality of new teachers relative to those teaching under temporary licenses (C Emily Feistritzer, 1984; E. Feistritzer, 1994; Neumann, 1994).

Since 2012, ARTs have steadily increased production of potential teachers, from just over 28,000 completers to nearly 34,000 completers in 2018 (see **Figure 4.2**). During the same period, the number of program completers from traditional preparation programs declined by 29%. Even so, ARTs still produce less than a quarter of educator preparation program completers, causing some to doubt whether they can significantly impact teacher labor markets at the necessary scale (Putman et al., 2016). Teacher labor markets vary substantially, and in some states, ARTs comprise a much larger proportion of enrolled

preparation candidates and completers. For instance, in 2017, ARTs produced more than half of all program candidates in DC, Texas, Louisiana, and Hawaii. With such a large market share, it seems possible that ARTs can affect the supply and composition of new teachers in those states.

At least half of all ARTs were originally designed to alleviate shortage areas, and many continue to be restricted to candidates who can fill shortage-subject areas.<sup>30</sup> As reported by the Office of Postsecondary Education, ARTs, particularly those *not* based at institutions of higher education, produce a disproportionate share of teachers in high-needs areas of science, math, and special education (OPE, 2016). Proponents of alternative routes to teaching suggest that lowering regulatory barriers allows alternative programs to attract career changes from STEM fields. APPs may also fill shortages in high-needs schools given that APPs are often designed to be responsive to state and local labor market needs.

In this study, I focus on one primary feature of ARTs, the timing of teacher preparation relative to serving as a teacher-of-record. Grossman and Loeb (2008) define early-entry routes as those pathways to teaching that allow candidates to serve as lead-teachers prior to obtaining initial state certification. In early-entry programs, the timing of teacher preparation happens concurrently to the candidate serving as a full-time teacher of record. Conversely, in traditional teacher preparation, candidates finish their training and obtain an initial licensure prior to serving as the teacher-of-record. Most states make the decision to allow for early-entry as a state-level policy decision. Typical early-entry policies grant teacher candidates a one-, two-, or three-year provisional certificate<sup>31</sup> while they are

---

<sup>30</sup> Based on author's own analysis of Title II Data Collection alternative route data from SY 2016-17.

<sup>31</sup> "Provisional" is the most common term for these certificates, but some states have special certificates for candidates in early-entry routes, such as intern certificates, certificates of eligibility, residency certificates, and temporary certificates.

concurrently enrolled in a state-approved teacher certification program. In this way, candidates lead-teach while working toward state certification. Early-entry policies may or may not exist alongside other alternative route mechanisms. For instance, in some states, a candidate on a provisional license may be required to still participate in a traditional educator preparation program. In other states, candidates may have alternative routes that alter the traditional requirements, such that they engage in wholly different requirements for certification. Early-entry is a dominant feature of ARTs. In fact, over 90% of all existing alternative routes allow for early-entry, and over 70% include early-entry as a key component.<sup>32</sup>

## **2. Conceptual Framework**

In this study, I explore the effect of implementing or expanding early-entry policies on the supply of new teachers and potential teachers (in the form of educator preparation program completers) and on ease of hiring teachers for school vacancies. Early-entry policies are state approved policies that allow candidates to serve as the teacher-of-record in a classroom while concurrently working toward meeting the requirements for initial certification.

Theoretically, early-entry could have both expansion and substitution effects on teacher supply. Early-entry might expand the pool of candidates by attracting individuals that would not otherwise enter teaching or would not participate in a traditional preparation program. This may be more likely if the ART route lowers the cost, time, or other barriers for candidates, particularly candidates who may not be able to take time out of the labor market to complete a traditional program, or who need to continue earning an income while

---

<sup>32</sup> Based on the author's own analysis of the Title II Data Collection from SY 2016-17.

attending school. Expansion is particularly likely to occur among second-career entrants or non-traditional post-baccalaureate candidates, at least some of whom may already be working in schools as paraprofessionals, aides, or long-term substitutes. ARTs likely also cause some candidates who would choose a traditional route to instead choose an alternative route (substitution), or to delay entry into any preparation route. For instance, a candidate who may have chosen education as an undergraduate major may choose not to pursue that field if they believe they can easily enter teaching through an alternative route later in their professional career regardless of their undergraduate major. If ARTs primarily yield a substitution effect, then it is possible that alternative certification will have little effect on the overall supply of teachers.

How will these effects impact observed teacher supply and ease of hiring? If ARTs have a large expansion effect, then implementing the policy should yield an increase in the number of educator program completers, who would be eligible for initial licensure. The expansion effects of ARTs or early-entry policies on the number of initial licensures granted in a state is less straightforward because of the role of temporary and emergency licensure. In many states, prior to the use of early-entry and other ARTs, shortage areas and schools with vacancies are filled by uncertified teachers who obtain short-term emergency or temporary licenses. These licenses typically have fewer requirements relative to standard licenses—for instance, they may not require enrollment in an educator preparation program or passage of a licensure tests. They are often still considered initial licenses. In fact, when a state implements an early-entry alternative route, the requirements for obtaining a provisional or alternative teaching license to teach while concurrently completing a program, these provisional requirements are more stringent than temporary license requirements, and the provisional license also typically lasts longer. Because alternative route licenses have

longer durations and are more stringent relative to temporary certification, it is possible that implementation of early-entry as the primary mechanism for addressing teacher shortages could yield a *decrease* in the number of initial teaching licenses granted in a state.

Implementation of ARTs, and early-entry in particular, may also influence the ease of hiring qualified candidates to fill teaching vacancies. Assuming demand stays constant, if ARTs attract candidates who are qualified to teach in shortage areas or areas that match the teaching vacancies that are most difficult to staff, then school leaders should report having an easier time filling vacant positions. If the expansion includes newly licensed teachers in areas that are already filled with traditionally licensed teachers (for instance, in elementary education in high-income schools) or in any areas that are not shortage areas, then there will be no substantive effect on hard-to-fill positions. The effect of early-entry on hiring will also be based on the extent to which candidates currently teaching on temporary licenses take advantage of early-entry. If they choose to participate in early-entry, it is possible that they simply substitute alternative certification for temporary. Another option is that they are displaced by new early-entry candidates. In either of these cases, it is probable that the number of difficult-to-staff positions or vacancies would be unaffected by the implementation of early-entry alternative routes. If, however, states are relying on long-term substitutes or other non-certified staff to fill positions, then implementation of early-entry should increase ease-of-hiring in the short-term. In the longer term, early-entry should alleviate hiring difficulties, assuming that new candidates enter the field and that they are certified in shortage areas.

A final consideration is how implementation of early-entry routes impacts the flexibility that school leaders have to fill positions. As discussed, early-entry often represents a way to move from relying on temporary certification to a route for permanent certification.

If the use of temporary certification is limited in the wake of passing early-entry policies, then school leaders may have a harder time filling vacancies in the short-term after passage of early entry.

### **3. Data & Key Measures**

#### **3.1. Data & Sample**

To examine these questions, I compile a state-by-year dataset from school year 1990-91 through 2018-19. Most data are compiled from three primary sources. First, information about state certification policies come from the Title II Data Collection, publicly available and administered by the Office of Postsecondary Education in the U.S. Department of Education. Under the Higher Education Act, all educator preparation programs (EPPs) are federally mandated to report characteristics of their programs, characteristics of candidates enrolled in and completing their programs, and state policies regarding certification licensure types and requirements. The federal government first began collecting these data in 2000-01 and expanded the data collection in 2008-09. Therefore, some variables are only available beginning in 2000.

The second primary data source is the *Schools and Staffing Survey (SASS)*, a nationally representative survey administered by the National Center for Education Statistics (NCES) that collects information on characteristics of schools, current teaching vacancies and placements, and characteristics of teachers, their school placements, and their students. The SASS has been administered on a four-year cycle, beginning in 1987-88, through the 2011-12 school year. In 2015-16, NCES redesigned the SASS by adjusting many of the questions and ensuring that the survey would be integrated with other NCES surveys, renaming the survey the *National Teacher and Principal Survey (NTPS)*, which is the third primary data source in the study. For these analyses, I use the 1990, 1993, 1999, 2003, 2007, and 2011 SASS and the

2015-16 NTPS. I exclude the 1987 *SASS* survey because it differs from later versions in terms of how it collects information about teacher vacancies and hiring. When fitting models using the SASS and NTPS, I use the appropriate population weights to ensure nationally representative parameter estimates.

### **3.2. Availability of early-entry routes to teaching**

This study focuses on understanding how vacancies and hiring shortages were or were not alleviated by the passage and expansion of *early-entry routes* to teaching. Both theoretical and pragmatic reasons support the use of early-entry as the independent variable of interest. First, early-entry routes are the most common feature distinguishing alternative routes to teaching. By 2016, 82% of states allowed for some form of early-entry. Of the 117 alternative state pathways to certification, 73% of them were designed as early-entry routes.<sup>33</sup> Second, the use of early-entry as a policy mechanism has expanded throughout the period of study. By 1990, 9 states already had early-entry policies in place. Between 1990 – 2018, nearly every other state implemented early-entry policies. By 2019, only four states did not have early-entry programs: Wyoming, Vermont, Maine, and Indiana. Among those, only Wyoming has no form of alternative route to teaching. Finally, early-entry lowers the barriers to entry for teaching to benefit both teacher candidates and schools that have difficult-to-fill vacancies. For candidates, it lowers the time and cost barriers since candidates can earn a full-time teaching salary without the opportunity cost of lost wages from taking time away from the labor market to pursue a teaching certificate. For schools, it theoretically increases the pool of teacher candidates. If schools have difficult-to-staff positions or

---

<sup>33</sup> Figures are based on the author's own calculations of the publicly available data on alternative routes to teaching from the 2016-17 Title II Data Collection.

vacancies, if early-entry operates as proponents suggest, it should help alleviate these vacancies.

In this study, states are indicated as having an early-entry route in place if they have a state-approved alternative route to teaching in which early entry is a key component. This definition excludes states in which provisional licensure is available, but not formally implemented as a key component of educator preparation programs (for instance, as is the case in Vermont). I also do not include states that have alternative routes to education but do not include early-entry as a component. For instance, Maine has a robust alternative route to teaching in the form of licensure via transcript review. However, this route does not include early-entry, and therefore, Maine would be considered as never having early-entry.

In my analytic dataset, I use a binary indicator to measure whether a state has an approved early-entry route in each year. The primary treatment indicator is based on the year of policy passage, and all observations in the state prior to that year are coded as 0, while all subsequent years are coded as 1. Policy passage indicates the year in which a state first approved the alternative route to teaching in which early entry was a key component. In addition to defining the treatment based on initial policy passage, I also document changes in early-entry policies that *expanded* the use of early-entry to make it substantially easier for candidates to obtain teaching licenses. In many cases, states that were early adopters of early-entry iterate upon alternative route policies, often beginning programs as pilots, and later expanding them. For instance, although California implemented its early-entry route in 1986, in 2001 it revised the policy to substantially increase the use of provisional certification for early-entry, allowing more candidates to be licensed as lead-teachers prior to completing their educator preparation programs. Expansion of early-entry also includes states like Hawaii, that allowed early-entry only once it allowed for national certification pathways like



Teach For America to operate. In many cases, the year of early-entry passage and expansion are the same. This occurs in cases when the state adopts an early-entry route that immediately becomes available to candidates across the state. Using the year of expansion may more accurately capture the effect of early-entry, as it allows for early-entry to be a viable pathway to teaching for most or many teacher candidates. On the other hand, the measure can be difficult to interpret in the sense that for states for whom the year of passage and expansion is the same, there may likely be other certification policies that change simultaneously, such as restrictions on the use of temporary or emergency certification. For states in which expansion is later than the original year of implementation, then the timing may indicate a truer effect of implementing early-entry absent other certification policy changes.

To determine whether and when each state's first early-entry policy was passed, implemented, and expanded, I examine information collected in the Title II Data Collection by state certification managers. Not only do states report whether alternative pathways exist each year, but they also report the year in which the pathway was approved and implemented. Most state program officers also provide descriptions of the route requirements and possible changes in the policy over time. These reports allowed me to find information very conclusively for states that implemented alternative certification routes after SY 2008-09. For states that implemented early-entry policies prior to that year, most were also reported in Title II, since many of the original pathways still existed, despite potential changes to the route requirements. I use additional sources to validate the year of implementation or expansion of ARTs. Most often, I find the year of implementation in one of two sources. I use descriptive studies published by Emily Feistritz and her private research organization the National Center for Education Information to clarify the

characteristics and timeline of early-entry among many states who implemented their routes in the 1980s and 1990s (C Emily Feistritzer, 1993; C Emily Feistritzer & Chester, 2003). I also supplement these sources with case studies written by a variety of researchers throughout the 1990s to understand how early-entry policies and programs were structured (Bliss, 1990; Carroll, Hayes, Mercer, Neuenswander, & Drake, 2006; Cornett, 1992; Lohman, 2000; McDermott, 2005).

In **Table 4.1**, I summarize the year in which an early-entry route was first approved, and the year in which it was expanded. In some cases, the year of expansion is the same as the year it was passed, but in most cases, the policy is expanded a few years to many years after passage. The empirical sample for this study includes states that were treated throughout the entire time period (as in the case of New Jersey), states that were never treated (Wyoming, North Dakota, etc.) and states that were treated at some point during the time period of the study. For states that implemented early-entry policies prior to 2000 (when the outcome is teacher supply) or prior to 1990 (when the outcome is hiring), the indicator is always equal to 1. In states that never implemented early-entry policies, the indicator is always equal to 0. For all other states, the indicator is equal to 0 in years leading up to the policy passage or expansion and is equal to 1 in all other years. I refer to groups of states as treated or untreated, rather than as control, because all states that are untreated at some point contribute to the control group.

### **3.3. Teacher supply**

In **Table 4.2**, I provide an overview of the key variables used in this study. The primary outcome of interest is a measure of new teacher supply, or the change in new teacher supply following the approval or expansion of early-entry routes. Unfortunately, we do not have a national, annual source of data measuring the number of teachers in their first

year of teaching. Instead, to measure new teacher supply, I use the number of initial licenses issued in a state as reported through Title II by each state department of education. Initial licenses include those teaching on any type of initial license for whom the license was issued in that academic year. These licenses may include temporary, provisional, and professional licenses, regardless of whether the candidate has completed a traditional or alternative preparation program or is still enrolled. Thus, the measure serves as a strong proxy for the actual number of new teachers eligible for hire in public schools each year, although it may not be suggestive of the permanent teacher supply in a state, given that temporary and provisional licenses often need to be renewed every 1 -to-3 years, and have strict guidelines for eligibility.

### **3.4. Potential Teacher Supply**

As another measure of new teacher supply, I examine the potential supply of teachers measured by the number of educator preparation program completers in a state, also reported through the Title II Data Collection. Program completers are defined as candidates who successfully meet all requirements of a teacher preparation program in a given academic year. When the program's requirements include or are more stringent than the requirements for licensure in a state, the number of program completers serves as an accurate proxy of candidates available for licensure in a state. In some cases, program completion requirements may be less stringent than the requirements for licensure, in which case the actual supply of available licensed teachers may be slightly lower. An example would be when a candidate meets all program requirements but fails to pass a required content licensure test. Moreover, not all program completers enter the teacher workforce. Nevertheless, the number of program completers is a strong proxy for potential teacher supply and represents candidates who could easily transition to the teaching workforce. For

this measure, I use the number of total program completers, not just the number of completers from alternative preparation programs. Delineations between alternative and traditional programs are not always straightforward. For instance, in many states, early-entry candidates in alternative routes still typically complete traditional post-baccalaureate preparation programs. Therefore, distinguishing between alternative and traditional program completers is not always easy to do.

### **3.5. Teacher Hiring**

The third outcome of interest is a measure of school hiring, or ease of filling vacant teaching positions. On the SASS/ NTPS school questionnaire, school administrators report a binary indicator of whether any teaching vacancies exist for the school year. If vacancies exist, principals report in which subject area the vacancy exists, whether they were able to fill the vacancy, and the ease or difficulty in filling the vacancy on a four-point scale: *Easy*, *Somewhat Difficult*, *Very Difficult*, or *Could not fill the Vacancy*. Using these reports, I create a binary indicator of whether the school had at least one vacancy, and whether the school had a vacancy in any STEM fields. Following a measure analyzed by the Office of Postsecondary Education (Malkus et al., 2015), I create the primary outcome of interest, a binary measure of whether a school had any “difficult-to-staff” (DTS) positions of the nine content areas, which I define as a position that was “very difficult” to fill or which a school leader “could not fill.” For the vacancy and DTS positions, because the reported teaching subject areas vary slightly over time, I focus on the nine content areas that remain stable across the SASS/NTPS: elementary education, special education (SPED), English Language-Arts, Math, Biology, Physical Science, English as a Second Language (ESL), foreign languages, and vocational/ technical. I also examine whether schools had any difficult-to-staff STEM

positions and any DTS shortage areas, defined as positions in STEM, ESL or bilingual instruction, SPED, or foreign languages.

### **3.6. High Flexibility/ Low-Barrier States**

Operationalizing the treatment variable using timing as the key dimension represents a very broad way to define the treatment. Early-entry routes vary considerably from state-to-state in terms of how they lower barriers to entry into teaching relative to traditional program requirements. For instance, in Oregon, although provisional licensure<sup>34</sup> was introduced in 2004, teachers utilizing a provisional are required to be enrolled in a traditional teacher preparation program. By comparison, candidates in Louisiana have multiple program models from which to choose from, including non-IHE based alternative early-entry programs and online options. Additionally, some states have only one pathway by which candidates can participate in an early-entry program (as was the case in Alaska, and is the case in Montana), while other states have multiple options for early-entry programs and make programs widely available across the state. Therefore, a possible alternative way to define the treatment would be to identify which early-entry routes truly lower barriers to entry to teaching relative to traditional programs. Peterson and Nadler (2009) identify these states as “true” alternatives to traditional certification and make the case that we might only expect alternative routes to teaching to have a noticeable impact in these states.

In this study, I might only expect to see an impact of early-entry policy changes in states that also have routes which serve to lower barriers relative to traditional certification. I would observe that states with fewer restrictions on their early-entry programs would experience the expected outcome of increased numbers of initial licenses in the years

---

<sup>34</sup> The provisional teaching license in Oregon is known as a restricted teaching license and requires a candidate to have demonstrated content knowledge in the subject area.

following passage of the policy. To determine which states created policies that were more likely to induce new candidates to teaching, I define a set of low-barrier/ high-flexibility states. States included in this set, identified in **Table 4.3**, are those states in which: (1) the early-entry policy applies broadly across the state or broadly across grade levels and subjects rather than to only one program or subset of shortage subjects, and for which (2) the early-entry route reduces timing through reduction in credit hour requirements or methods used to achieve coursework hours relative to traditional certification requirements.

### **3.7. State-, Policy-, and School-level controls:**

In the final models examining the effect of early-entry on teacher supply, I include a vector of state-level covariates to control for time-varying measures of economic and population characteristics that may influence both teacher supply and school hiring. In specifications examining state-level outcomes related to teacher supply, I include annual state unemployment rates, whether a state received a Race-to-the-Top award, per-pupil expenditure in a state, the average teacher salary, log of total student K-12 enrollment, the proportion of Black, Hispanic and/or Latinx, and White K-12 students, and the proportion of students in K-12 living at or below the poverty level. I also include key policy variables related to certification that operate independently of alternative certification policies, including whether the state requires standardized content exams for licensure, whether the state has a minimum GPA requirement, and whether the state requires that candidates hold a bachelor's degree in their content area for secondary subjects.

In the final models examining the effect on teacher hiring, I include a vector of school controls that may account for variation in the schools included in the SASS/NTPS, and to control for possible factors correlated with ease of hiring at a school. These controls include the percent of students at a school that are Black or Hispanic, the percent of

students eligible for Free or Reduced-Price Lunch, the total student enrollment, the urbanicity of a school (city, suburb, town, or rural), and the focus of the school (regular, special education, CTE, alternative, or a special program focus). To control for a measure of teacher demand, I include the student-teacher ratio for each school, which vary across schools and over time.

## 4. Methodology

### 4.1. Non-parametric analysis

In this study, I explore whether the passage and expansion of early-entry routes to teaching increased teacher supply and the ease of filling vacancies, particularly for difficult-to-staff schools and subject areas. I first examine the trends in the key outcomes using a non-parametric analysis to illustrate the results that might be anticipated from a quasi-experimental analysis. I use a flexible event-study specification with time-varying treatment effects using equation 1:

$$Y_{st} = \alpha + \sum_{TtEE=-7}^5 \mathbf{1}(t = TtEE + t_s^*) \beta_{TtEE} + \lambda X_{st} + \pi_s + \gamma_t + \epsilon_{st} \quad [\text{eq. 1}]$$

$Y_{st}$  represents an outcome of interest for state  $s$  in year  $t$ . In analyses where the outcome of interest is defined at the school level, such as the proportion of teacher vacancies or difficult-to-staff teaching positions, this outcome is defined at the school by state by year level. I include a set of indicator variables for each year pre- and post-ART policy implementation,  $\sum_{TtEE=-10}^5 \mathbf{1}(TtEE = t - t_s^*) \beta_{TtEE}$ , where  $t_s^*$  represents the year in which an early-entry route was approved for a state. This strategy centers the event study such that the year of policy passage is equal to 0. I include state-level control variables that are time-varying, as described in the previous section,  $X_{st}$ . Finally, I include state ( $\pi_s$ ) and year fixed effects ( $\gamma_{rt}$ )

that control for time-invariant factors in teacher labor markets within states and factors that influence all states in each time period. The final term,  $\epsilon_{st}$  is a random error term.

Of primary interest are the coefficients on the timing-to-treatment indicators, the  $\beta_{TtEE}$ 's, which represent the mean of the outcome in each year prior to and post-ART policy implementation. To anticipate an effect, I would expect to see that the coefficient estimates on the indicator variables would be statistically different in the post-treatment time periods relative to the pre-treatment time periods. If approval of early-entry routes increases the supply of teachers, then the post-policy coefficients would be statistically different and positive relative to the pre-policy coefficients. Because a simple event study only includes observations in the timing window and does not model pre- or post-trends outside of the window, it is possible that my sample will be too small to detect statistical significance. Therefore, while the event study results are helpful in anticipating the findings of the difference-in-differences models, I do not expect them to perfectly predict the findings of the parametric models.

#### 4.2. Difference-in-differences with variation in timing

After the anticipatory non-parametric event-study, I turn to a simple difference-in-differences (DiD) analysis, aggregating the effect of the early-entry policy implementation across post-policy years (eq. 2).

$$Y_{st} = \alpha + \beta_1 EEPolicy_{st} + \lambda X_{st} + \pi_s + \gamma_{st} + \mu_{st} \quad [\text{eq. 2}]$$

$Y_{st}$  represents outcomes for state  $s$  in year  $t$ . The treatment variable,  $EEPoly_{st}$ , is an indicator of whether a state has an approved early-entry route in year  $t$ . The indicator variable is 0 for states that never have an approved route, and 1 for states that always have an approved route. It changes across years for states that implement early-entry routes



during the time period of interest (between 2000 – 2018 for teacher supply outcomes, and between 1990 – 2016 for teacher hiring). The coefficient of interest,  $\beta$ , provides the average treatment effect across all years in which the early-entry policy was in place. The random disturbance term is given by  $\mu_{st}$  and all other variables are defined as in Eq. 1.

For any specifications that use teacher supply as an outcome (either with the number of newly licensed teachers or the number of educator preparation program completers), I account for differences in the size of state labor markets by scaling the number of newly licensed teachers or educator preparation program completers by the number of individuals of working age in a given state and year, which I define as individuals between the ages of 22 – 68 years old. I generate the number of working aged individuals in a state using data from the American Community Survey from 2000 - 2018. The outcome measure is therefore the number of newly licensed teachers per 10,000 working aged individuals (or the number of program completers per 10,000 working aged individuals). In specifications with these scaled outcomes, I also weight observations by the number of working aged individuals per 10,000 people.<sup>35</sup> For any specifications that examine the outcome of teacher hiring using the SASS/ NTPS, I use the propensity weights included in the SASS/ NTPS to generate nationally representative estimates and improve the precision of the estimates.

### 4.3. Differential trends and time-varying effects

It is very possible that the effect of early-entry policy implementation yields heterogeneity in treatment effects over time. For instance, implementation of a policy could yield an immediate effect that either increases or attenuates over time as markets adjust to

---

<sup>35</sup> I weight by the number of working aged individuals per 10,000 people because the number of initial licenses varies considerably over time within states. Kraft, et. al, (2020) suggest weighting to increase the precision of the estimates. I fit models both ways, and the results do not vary substantially.

the policy. Therefore, I extend the basic difference-in-differences model to allow for different pre-treatment trends and time-varying treatment effects by including a linear trend and interaction of the treatment and linear trend. This model takes the form in Eq. 3 below:

$$Y_{st} = \alpha + \beta_1 \text{YearstoPolicy}_{st} + \beta_2 \text{EEP}_{st} + \beta_3 (\text{YearstoPolicy}_{st} * \text{EEP}_{st}) + \lambda X_{st} + \pi_s + \gamma_{st} + u_{st} \quad [\text{eq. 3}]$$

In this final model, I include a linear time trend centered at zero of the year in which an ART was approved in a state,<sup>36</sup> the term  $u_{st}$  is the random error term, and all other terms are defined similar to Equations 1 and 2. The coefficient  $\beta_2$  gives the immediate change in the outcome in the year following the policy implementation, and  $\beta_3$  gives the change in the post-implementation slope for the outcome, allowing the trends to differ in the pre- and post-time periods. Thus, the model allows for both an intercept shift and a change in slope as possible consequences of implementing ARTs. The effect estimate of interest would be given by  $\beta_2 + \beta_3$ , indicating the effect of the expansion of early-entry routes on the outcome of interest.

#### 4.4. Differential effects by school population and flexibility of state policies

Using a binary measure of whether a state has an ART policy represents the simplest possible way to measure the treatment variable and is standard in a typical difference-in-differences approach. Drawbacks exist in using this simple treatment measure, however. Most importantly, as discussed above, early-entry routes and policies can differ in terms of the extent to which the route lowers barriers to entry into teaching relative to traditional

---

<sup>36</sup> Because some ARTs should impact the teacher workforce as soon as they become available, it is possible that I should center the time trend at the year before an ART is approved to check for an immediate effect. I do check for this empirically and find little difference but prefer a specification that uses the trend centered on the year of passage.

preparation programs. The variation in the policies themselves can therefore influence the effects of the policy change on teacher supply and hiring. A binary indicator treats all early-entry routes equally in thinking about their potential effect. Using the states coded as having “highly flexible/ low-barrier” early-entry policies, I interact the indicator for this group by the early-entry timing variables, and re-fit equations 2 and 3 to look for differential effects by policy flexibility.

Finally, in specifications that use the SASS/ NTPS, I also look for differential effects by school characteristics. Specifically, new teachers and alternatively certified teachers are more likely to teach in schools that serve higher proportions of students from low-income neighborhoods and schools that serve predominately students of color.<sup>37</sup> These same characteristics correlate with higher vacancies and higher teacher turnover. I look for differential effects in ease of hiring, defining “high-needs” schools as those in which at least half of the students qualify for free or reduced-price lunch.

#### **4.5. Potential Bias in the Two-way Fixed Effects estimator**

The canonical DiD estimator with two time periods and two groups is straightforward to calculate. However, as many contemporaries have demonstrated, the two-way fixed effects estimator (TWFE) with staggered treatment timing, such as the one used here, can be problematic (Baker, Larcker, & Wang, 2021; De Chaisemartin & d'Haultfoeuille, 2020; Goodman-Bacon, 2021). In Eq. 2, because of the variation in treatment timing, the resulting coefficient of interest is a weighted average of all possible 2x2 DD estimators. If the panel is perfectly balanced and the treatment effect does not vary over time, then the estimator will give an unbiased estimate of the treatment effect. However, most often in the

---

<sup>37</sup> For instance, see the author’s evidence from analyzing sorting of teachers from alternative routes in Chapter 3 of this dissertation.

case of staggered treatment timing, heterogeneous treatment effects are present, and bias is introduced into the estimator.

The TWFE estimator will be biased under two primary conditions. First, the estimator could be biased if the *treatment effect varies across states*. In the TWFE estimator, individual 2x2 estimates are given proportionally more weight when they use a larger share of the sample, and when there is wider variance of the treatment indicators. Thus, the 2x2 estimates from the middle of the panel tend to be weighted more heavily. If the treatment effect for states in the middle of the panel have treatment effects that are substantially greater or less than other states, this could bias the coefficient on the treatment measure. The DD estimator could also be biased if the *treatment effect varies over time within states*. This condition seems theoretically likely in the case of ART implementation. For instance, an ART policy may have an initial short-term effect, but the magnitude and possibly even direction may change over time. In a TWFE estimator, heterogeneity in treatment effects over time is problematic because earlier-treated units later serve as controls, and later-treated units become the treated units. The always-treated units or already-treated units may be negatively weighted, biasing the true estimate.

Given the possible bias of the DiD estimator with staggered timing, I include additional steps and specifications to ensure validity of the estimates. First, because heterogeneity of treatment effects seems likely, I extend the simple DiD to model the pre- and post-policy trends. Doing so can help capture common treatment effects that vary over time. Additionally, to understand the source of variation in the TWFE estimator from Eq. 2, I conduct a Bacon decomposition of the estimator as prescribed by Goodman-Bacon (2021), which I describe in the next section. Doing so provides information about how the state groups and timing comparisons influences the weighted pooled estimate. Finally, I also use

an estimator proposed by Callaway and Sant’Anna (2021). Their approach to ensure validity is to eliminate the bias that may be introduced by using always treated states as comparison groups. In their strategy, treated states are compared to either never treated states or not-yet-treated states. I discuss the results of each of these strategies in the results below.

## 5. Results

### 5.1. Effects on supply of new teachers

In **Figure 4.3**, I share the results from the simple event study model without controls given by Eq. 1. I plot the point estimates and associated 95% confidence intervals for years leading up to the policy change, and just after the state passes an ART policy, along with a simple trend reference line. In Panel A, policy passage is the treatment, while in Panel B, widespread expansion of early-entry is used. In Panel A, the plot shows a slight upward trend in the number of newly licensed teachers in the years preceding ART policies being passed. Passage of early-entry routes appears to have a negative effect on this trend, leading to a downward trend in the post-passage period. The event study is unable to detect statistically significant results but is helpful in anticipating possible pre-treatment trends and possible treatment effect heterogeneity.

In columns 1 – 4 of **Table 4.4**, I share the results from the TWFE estimator from Eq. 2 and the DiD with linear time trends from Eq. 3 to assess the short-term and time-varying effects of early-entry policy passage and policy expansion on the number of initial teaching licenses. The coefficient from the simple pooled difference-in-difference (Table 4.4, column 2) suggests that initial passage of ART policies led to a decline of 3.5 initial licenses per 10,000 22-to-68-year-olds, on average, when controlling for state and policy covariates. For context, the effect suggests an approximately 18% decline in initial licenses after passage of an early-entry policy relative to the pre-policy mean. In Columns 3 and 4, I model the pre-

policy trend in newly licensed teachers. However, as suggested by the event study, the pre-policy slope does not appear to be statistically different from zero, nor can I statistically detect a post-policy change in slope that is different from zero. The negative effect resulting from the policy passage persists, and the coefficient remains stable.

The effects of expanding early-entry are shown in columns 5 – 8 of **Table 4.4**. Compared with initial early-entry policy passage, the effect is still negative, but attenuated. On average, expanding ART policies led to approximately 2.2 fewer newly licensed teachers in a state per 10,000 22-to-68-year-olds, or a decline of about 14% from the pre-expansion mean.

## 5.2. Effects on supply of potential teachers

Next, I examine how the results change by defining teacher supply as the supply of *potential* teachers, measured by the number of program completers from any state educator preparation programs, again fitting eqs. 1 – 3. The plot of the results from the event study without covariates, shown in **Figure 4.4**, suggests a stable, or slightly downward trending, production of educator preparation program completers prior to the passage of ART policies. After policy passage, there is suggestive evidence of an increase in program completers in the few years following the policy change.

In **Table 4.5**, I share the results of the parametric DiD estimates examining the impact of early-entry policies on program completers. The direction of the coefficient of interest is both positive and statistically different from zero in most specifications, providing evidence of a small positive increase in program completers. Substantively, passage of early-entry policies yields an approximately 7% increase in the number of program completers. When considering the effect of early-entry policy expansion, the effect again remains positive. When modeling the pre- and post-policy expansion trends, the positive effect

appears as a positive change in the production of program completers rather than a short-term intercept change.

### 5.3. Effects on Teacher Hiring

Finally, I examine the possibility that passing or expanding early-entry policies helps address the most tangible aspects of teacher shortages for school leaders, filling difficult-to-staff teaching positions. In **Table 4.6**, I share the results of parametric specifications from Eqs. 2 and 3. In column 1, I show the results from the simple pooled DiD. On average, passage of an initial early-entry policy led to a 3.2 percentage-point increase in the likelihood that a school reported a difficult-to-staff position, or a 15% change from the pre-policy mean. This increase in hiring difficulty persists when examining STEM positions or all shortage areas. For instance, passage of ART policies yielded a 20% increase in the likelihood that a school leader would report a difficult-to-staff STEM position and a 13% increase in the likelihood of having a difficult-to-staff shortage area position, on average.

I also explore whether these effects are mediated by whether schools serve high proportions of students from low-income families or a majority of students of color. The results are shown in **Table 4.7**. In column 1 and 5, I display the results of the effect of early-entry passage on likelihood of having a difficult-to-staff position. On average among schools that serve less than half students of color, early-entry passage led to an increase of 4.2 percentage points in the likelihood of having a difficult-to-staff position. However, this affect is attenuated to just about one percentage point for schools that serve predominately students who are economically disadvantaged. Moreover, while early entry expansion seems to have no effect on most states, it yields a decrease of 3.5 percentage points in the likelihood of having a difficult-to-staff position among schools where more than half of students qualify for free-or-reduced price lunch.

#### 5.4. Low-Barrier/ High-Flexibility States

Finally, I explore whether the effects of policy passage and expansion differ by the amount of flexibility provided by each state's early-entry policy relative to traditional routes to teaching. In **Table 4.8**, I share the results of fitting Eq. 2 using initial early-entry passage and expansion as the treatment on the three primary outcomes of the scaled number of newly licensed teachers, program completers, and likelihood of reporting any DTS teaching positions. I add a binary indicator for the high-flexibility/ low-barrier states, as well as an interaction term with the post-early-entry policy. In columns 1 and 2, I share the results of the differential effects of passing and expanding early-entry policies on the number of initial teaching licenses granted. The simple pooled DiD estimates are consistent with the main results, and without differentiated trends by state policy flexibility.

#### 5.5. Bacon Decomposition

To more deeply understand how timing of policy passage and subgroups of states influence the overall difference-in-differences estimates, I conduct a Bacon decomposition for Eq. 2, decomposing the effect of early-entry passage and expansion on the scaled number of initial licenses granted and the number of program completers. In **Table 4.9**, I share the DiD estimates from each of the timing group comparisons, as well as each comparison's share of total weight in the overall estimate. In **Figure 4.5**, I obtain a scatterplot of all 2x2 estimates that contribute to the weighted final parameter from the simple pooled DiD estimate of the effect of early-entry policy passage (panel a) and policy expansion (panel b) on the scaled number of initial teacher licenses.<sup>38</sup> The red horizontal line

---

<sup>38</sup> Currently, the Bacon decomposition does not support propensity weighted difference-in-difference estimates. Therefore, the overall DD estimate shown in the decomposition is slightly larger in magnitude than the overall DD estimate shared in Table 3. However, the 2x2 DD estimates contributing to the overall estimate are the same, just weighted differently due to the weighting scheme I describe in the methods section.



shows the weighted overall estimate of the effect, and the markers are the individual 2x2 estimates by the weight they are given.

From the table and figure, a few conclusions are worth noting to contextualize the primary results of this study. First, when examining the effect of policy passage, the majority of the individual 2x2 estimates are negative. In aggregate, the estimate from comparing the timing groups to one another (i.e., the states that first implement early-entry during the study period) is positive, with a magnitude of 0.68. The estimate of the never-treated states relative to the “switchers” is also negative, and larger in magnitude than the weighted overall estimate. In examining the individual estimates from the policy expansion, all timing group averaged estimates are negative (Table 4.9, column 3). In both treatment specifications, the most heavily weighted group estimate comes from comparisons of the always treated states versus the switchers, since these represent the largest share of comparisons.

In the staggered DiD estimate, the always treated states provide a problematic comparison, since it is unclear which portion of the comparison trend is due to the treatment. To address this problem, researchers have suggested trying to only utilize the comparisons involving the timing groups (those states that implement the policy during the time period) and those states that do not implement policies. Intuitively from the Bacon decomposition, it appears that removing these comparisons may attenuate the magnitude of the effect of policy implementation, although it is not clear that it will reverse the negative effect on the number of licensures.

The results of the Bacon decomposition of early-entry passage on the number of program completers is included in the appendix. Similar to the main results, all timing group DiD estimates are positive, on average. Again, based on the weights allocated to each of the timing group estimates, it appears that removing the comparisons involving the always-

treated groups will attenuate the magnitude of the effect size, but that it will remain positive. I do not perform a Bacon decomposition of the effect of early-entry passage on the likelihood of having a DTS position, as the sample is unbalanced due to the SASS occurring only every three to four years.

### 5.6. Callaway & Sant’Anna Approach

To remove the comparisons of the timing groups, I use an estimation strategy proposed by Callaway and Sant’Anna (2021) to generate all possible two-way comparisons of timing groups and states, using only the never-treated states as a comparison or comparing not-yet-treated states as a comparison. The results of a weighted average, the average treatment on the treated, is given in **Table 4.10**. The results of early-entry passage on the number of initial teacher licenses are shown in columns 1 – 4. The direction and magnitude of the effect sizes are similar to those from the two-way fixed effects estimates. The results of early-entry expansion on the number of program completers. The results are positive and consistent with the TWFE estimates, although somewhat attenuated in magnitude relative to the results from the staggered DiD.<sup>39</sup>

Finally, using the CS approach, I generate event studies in which I use only the comparisons of the treated states to not-yet-treated states. I show the results for the effect of policy passage on the number of initial licensures (**Figure 4.6**) and the number of program completers (**Figure 4.7**). In Figure 4.6, a flat trend exists prior to policy passage, after which the trend declines steadily over time. In Figure 4.7, which plots the event study of program completers relative to treatment, the trend breaks from flat in the pre-policy period to an increase in the post-policy period. It may suggest a true positive effect on program completers.

---

<sup>39</sup> The results from the CS estimator are shown from models fitted without the inclusion of covariates.

## 6. Discussion

In this study, I explore the effect of passing and expanding early-entry routes to teaching on teacher supply and hiring. Implementation of early-entry policies yields an increase in the number of educator preparation program completers of about 5 – 7% relative to the pre-policy production, or about 1 additional completer per 10,000 adults. Among states with more flexible early-entry routes in which the barriers to certification are lower, passing early-entry routes increased the number of program completers by about 5 additional completers per 10,000 working aged adults. Passage of early-entry led to a decline in the number of initial licenses issued. In the pooled estimates, passage of early-entry decreased the number of initial licenses by about 18%. However, in the event study comparing only treated to not-yet-treated states, the effect of the passage may be more accurately summarized as a change in the long-term trend, from a flat trend to a declining trend in the number of initial licenses issued.

In terms of hiring, early-entry policy implementation makes it more challenging, on average, to fill difficult-to-staff positions in schools in the short-term, but this effect declines over time. Widespread expansion had no substantive effect. However, among schools that serve a majority of students of color or a majority of students who qualify for free-or-reduced price lunch, expansion of early-entry yields a decline in the probability of having a difficult-to-staff position, suggesting that expansion may ease hiring for the schools most likely to benefit from early-entry expansion.

Because multiple researchers have raised concerns about potential bias in the DiD estimator with staggered treatment timing, it is necessary to ensure that the results from these models are validly capturing the “true” effects of the policy changes. The TWFE estimator, as discussed earlier in the paper, is a weighted average of all possible 2x2 group

and time comparisons. The 2x2 estimates are weighted more heavily when they represent a larger sample share, and when they have the greatest variance in treatment. As shown in the Bacon decompositions, in the case of this study, the estimates that compare always-treated states to states that implement the policy during the study period are the most heavily weighted, and so it is prudent to remove these and compare the results. Using the estimation strategy recommended by Callaway and Sant'Anna (2021), I generate all 2x2 estimates comparing just the never-treated states and the states that implement treatment, as well as a separate comparison that just compares states that implement the policy during the time period of the study. This strategy removes the potentially problematic negative weights produced by always treated states entering the TWFE estimate. The CS results produce estimated effects that are consistent with the TWFE, and the resulting event study plots shed light on the heterogenous treatment effects. Taken together, the alternate CS ATT estimates reinforce the key findings summarized above.

If the results are to be believed, how can they be explained conceptually in terms of the labor market incentives introduced by the passage or expansion of early-entry policies? The increase in program completers, though substantively small, provides evidence of expansion effects of early-entry implementation. Early-entry routes attract candidates to the field of teaching who would not otherwise enter through traditional routes. The immediate increase in program completers is substantively quite small. However, during the period under study, educator preparation programs saw large declines in production of potential teachers (see Figures 4.1 & 4.2), and even more so because of the Great Recession. Therefore, even a small increase in program completers counteracts these trends. More importantly, the results from looking at differential effects in states with more flexible early-entry routes, or the “true” alternatives to traditional preparation, suggest that the increase in

program completers is largely due to expansion effects that occur in states with these more flexible early-entry programs. Thus, programs that explicitly make it easier for candidates to get certified seem to drive expansion effects.

The finding that implementation of early-entry policies negatively impacts the number of initial licenses issued seems initially perplexing. However, there are two related factors that can explain the finding. First, for many states, implementing ARTs is a strategy for reducing reliance on emergency licensure. Emergency licenses tend to have short duration periods and few requirements. Implementing EE would increase the use of provisional licenses which have more stringent requirements relative to emergency licensure. Absent an early-entry policy, a state might issue more initial licenses due to reliance on temporary or emergency licensure, as they are easier to obtain. Passing an early-entry policy would shift the state toward an increased use of provisional or alternative licenses. With more stringent requirements, fewer candidates would qualify for these licenses, and with a longer license duration, the effect would be a decline in the number of initial licenses issued annually. Thus, at least during the period under study, when states approved early-entry, they simultaneously restricted emergency or temporary certificates, and inadvertently restricted the number of candidates utilizing or qualifying for certification. The effect would be a decline in the number of initial licenses issued annually.

Second, the time period of observation for this study occurs in the wake of No Child Left Behind (NCLB), the 2001 reauthorization of the Elementary and Secondary Education Act. It is possible (and probable) that some of these policies were passed as part of a package to increase restrictions on teacher certification given the focus on improving teacher quality in NCLB. It is likely that schools may not have had as much freedom to hire candidates using temporary licenses as prior to the policy.

These explanations may also account for the increased difficulty in hiring after early-entry passage. In the short-term, school leaders may have experienced a temporary restriction in supply due to tighter restrictions on the use of emergency licensure. However, over time, the use of provisional likely eases hiring if turnover decreases. Moreover, expansion of early-entry may more accurately capture expansion effects without the changes in policy. With expansion, hiring does ease for the schools that are most likely to benefit from alternative routes to teaching, those schools serving economically disadvantaged students.

## **7. Conclusion**

Teachers continue to be one of the most important factors influencing both short-term and longer-term outcomes of students. This empirical analysis contributes to a growing body of literature seeking to understand the effects of alternative routes to teaching and certification policies on the production of new teachers. I find that, on average, implementing early-entry policies between 2000 and 2018 seems to have expanded the pool of potential teachers, and the effect is larger for states with early-entry policies that had lower barriers to entry or wider availability across the states. The policy also led to a short-term decrease in the supply of initial licenses and made filling difficult-to-staff positions even harder, although the latter effect disappears for schools that predominately serve students of color. Additionally, expansion of early-entry policies seems to ease hiring for high-needs schools that would most benefit from the policy.

Overall, the results of this study call into question the common narrative that alternative routes to certification represent a lowering of standards for potential teachers. In fact, early-entry routes that passed in the decade following NCLB seemed to tighten the number of licenses issued, likely due to a shift from the use of emergency licensure to

provisional licensure for filling teacher vacancies. Teacher labor markets are complex, as are state licensure policies. In future lines of research, it will be important to disentangle the effects of changes to ARTs on the types of licensures, to see if the decrease in supply was due to a decline in initial licensure or a shift from emergency to provisional licensures.

## Tables & Figures for Chapter 4

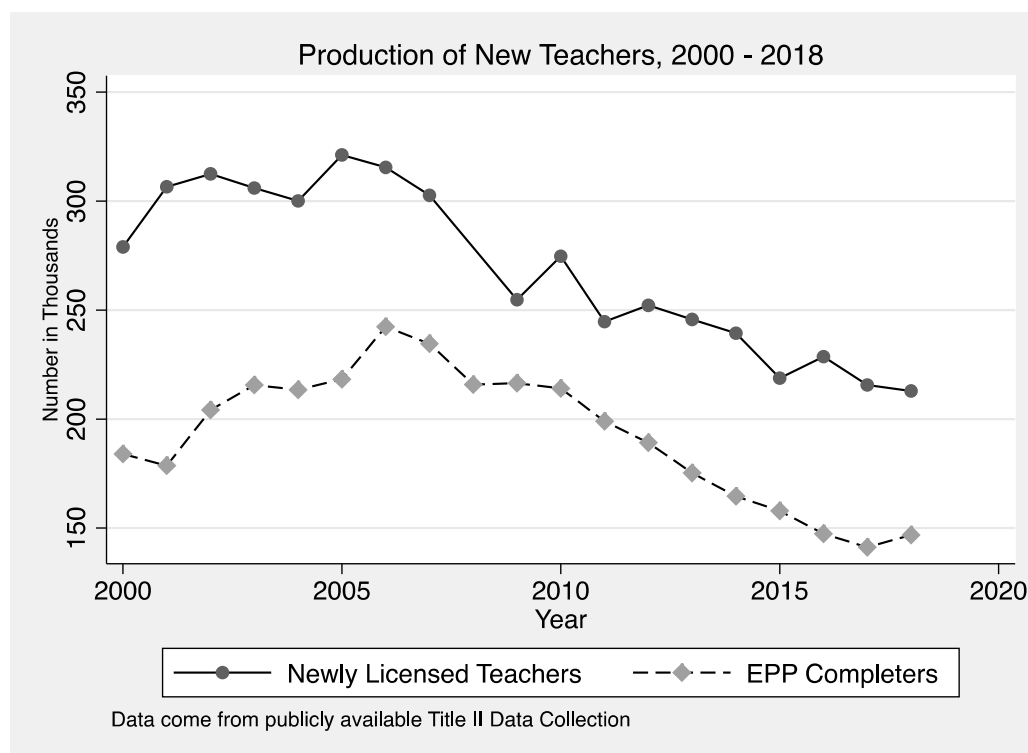


Figure 4.1. Production of new teachers in thousands, 2000 – 2018

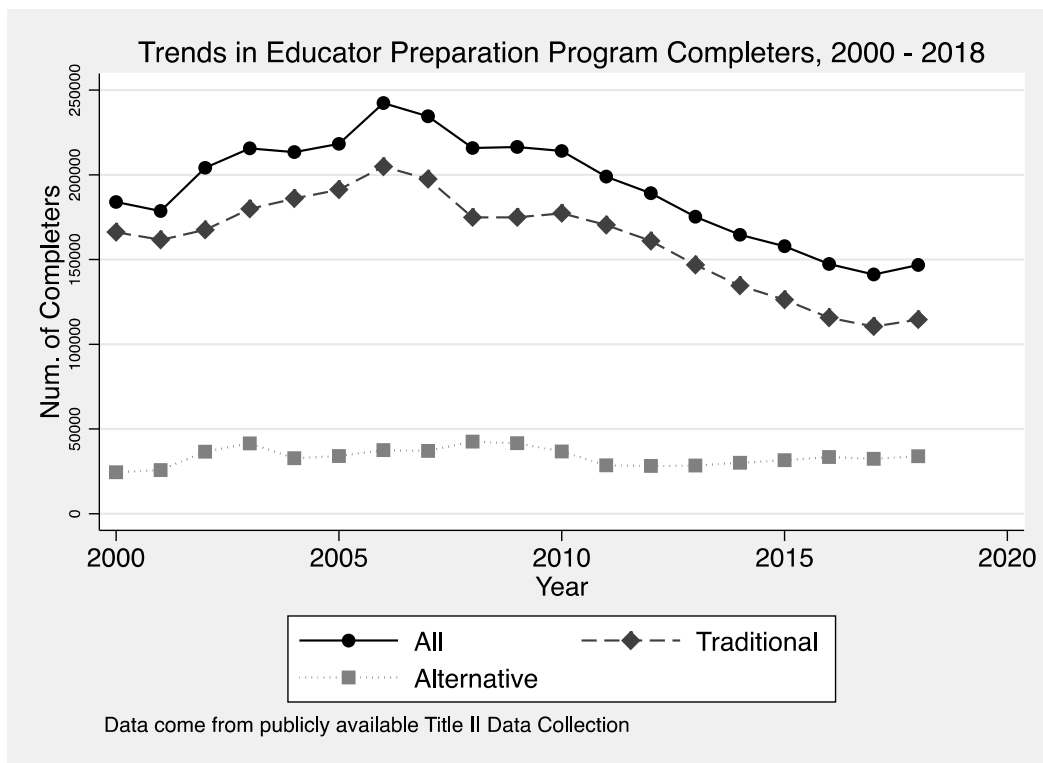


Figure 4.2. Educator preparation program completers from 2000 - 2018



**Table 4.1.**  
**Year in which EE policy was approved or expanded, 1982 - 2019**

Year	EE Approved		EE Widespread Expansion	
<b>Never Treated</b>	Indiana Maine North Dakota	Vermont Wyoming	Indiana Maine North Dakota	Vermont Wyoming Ohio
<b>Pre-1990</b>	California South Carolina New Jersey Virginia North Carolina	Arkansas Texas Alabama Connecticut	South Carolina Arkansas	New Jersey
<b>1990</b>	Maryland Oklahoma	Pennsylvania	Oklahoma	
<b>1991</b>	Colorado		Alabama	Maryland
<b>1992</b>	Illinois			
<b>1993</b>			California	Illinois
<b>1994</b>	Delaware		Delaware	
<b>1995</b>	Mississippi			
<b>1996</b>	Kentucky	Wisconsin	Texas	
<b>1997</b>	Florida	Nevada		
<b>1998</b>	Massachusetts	Tennessee	Nevada	
<b>1999</b>	Hawaii	Missouri	Missouri	Tennessee
<b>2000</b>	Kansas Georgia	New York	New York	Virginia
<b>2001</b>	Louisiana Montana	Washington	Colorado Mississippi Kentucky Massachusetts	Georgia Louisiana Washington
<b>2002</b>	Arizona Nebraska	South Dakota	North Carolina Connecticut Wisconsin	Kansas Nebraska
<b>2003</b>	New Mexico		Montana	South Dakota
<b>2004</b>	Iowa New Hampshire	Oregon Idaho	Pennsylvania Arizona New Mexico	New Hampshire Oregon
<b>2005</b>	Utah	West Virginia	Florida Utah	West Virginia
<b>2007</b>	Alaska		Idaho	
<b>2008</b>	DC			
<b>2009</b>	Rhode Island		Iowa	DC
<b>2010</b>	Michigan		Michigan	Rhode Island
<b>2011</b>	Minnesota			
<b>2012</b>			Hawaii	
<b>2017</b>			Minnesota	
<b>2018</b>	Ohio			

Table 4.2. Descriptive statistics on key measures

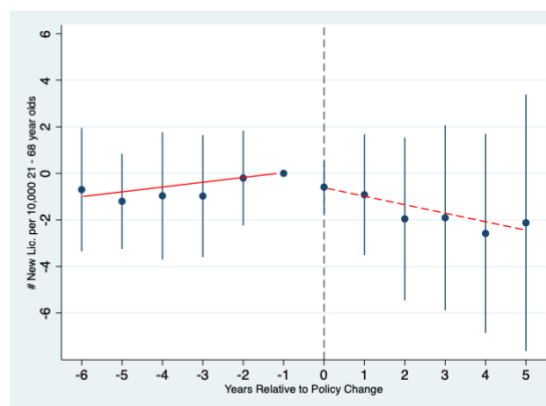
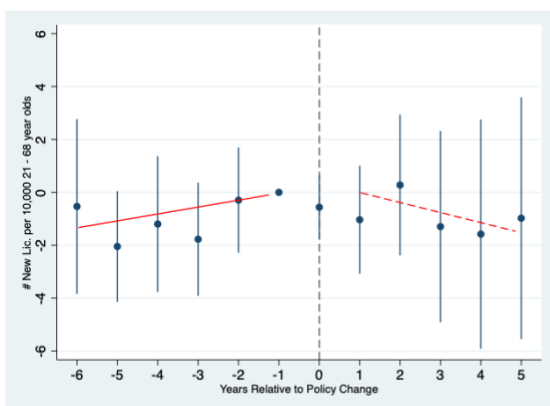
Measure	Description	Years (Fall of Academic Year)	Data Source	Observations	Mean	SD
<b><u>Key Outcome Measures</u></b>						
Initial teacher licenses (state)	Num. of newly issued teaching licenses per 10,000 working-aged adults (ages 22 - 68)	2000 - 2018	Title II	918	15.7	6.52
Program Completers (state)	Num. of program completers from any type of EPP per 10,000 working-aged adults (ages 22 - 68)	2000 - 2018	Title II	933	10.9	4.44
At least one unfilled vacancy (school)	School-reported at least one position that needed to be filled for the academic year	1990, 1993, 1999, 2003, 2007, 2011, 2015	SASS/ NTPS	55,800	0.80	
At least one difficult-to-staff teaching position (school)	School reported having at least one "very difficult" or "unfilled" teaching position	1990, 1993, 1999, 2003, 2007, 2011, 2015	SASS/ NTPS	55,800	0.28	
<b><u>State Covariates</u></b>						
Licensure Assessments	Required content specific or pedagogical content knowledge licensure tests for initial licensure	2000 - 2017	Title II	908	0.90	0.31
BA in Content Area	Required BA in content area for secondary certification	2000 - 2017	Title II	908	0.52	0.5
GPA Minimum	State has a GPA minimum threshold as a certification requirement	2000 - 2017	Title II	908	0.45	0.5
Race-to-the-top grant	Whether a state received/ was receiving funds from a Race-to-the-Top grant in a given year	2010-2015	US. Dept. of Ed.			
Annual unemployment rate	Annual unadjusted unemployment rate based on place of residence	1990, 1993, 1999, 2000 - 2018	BLS LAUS	56,920	5.66	1.8
Real average earnings in state	Average earnings per job by state in constant 2015 dollars	1990, 1993, 1999, 2000 - 2016	CPS	56,820	\$49,598	\$9,671
% of Black students	Percent of 5 - 17 year olds that identify as Black	1990, 1993, 1999, 2000 - 2018	ACS and CPS*	54,690	13.9	12.6
% of Hispanic or LatinX students	Percent of 5 - 17 year olds that identify as Hispanic/ LatinX	1990, 1993, 1999, 2000 - 2018	ACS and CPS*	55,460	12.9	14.1
% of White students	Percent of 5 - 17 year olds that identify as White	1990, 1993, 1999, 2000 - 2018	ACS and CPS*	56,920	67.0	18.3
% of students living in poverty	Percent of 5 - 17 year olds whose family incomes	1990, 1993, 1999, 2000 - 2018	ACS and CPS	55,250	40.8	29.3
Log total school enrollment	Log of total students enrolled in K-12th grades and ungraded	1990, 1993, 1999 - 2018	ACS and CPS	56,920		
Per-pupil public school expenditure	Public per-pupil expenditure, adjusted for size of the student population	1992 - 2016	NCES			
Average pupil-teacher ratio	Average pupil-teacher ratio as reported by state from the Common Core of Data	1999 - 2017	NCES			
Average public teacher salary	Average salary of all full-time public school teachers	1990 - 2018	NEA			
<b><u>School Covariates</u></b>						
School level	Elementary, Secondary, or combined	1990, 1993, 1999, 2003, 2007, 2011, 2015	SASS/ NTPS	56,920		
% of students of color	% of student enrollment who identify as students of color	1990, 1993, 1999, 2003, 2007, 2011, 2015	SASS/ NTPS	55,370	33	32.2
% of students eligible for FRPL	% of students who participate in the FRPL program	1990, 1993, 1999, 2003, 2007, 2011, 2015	SASS/ NTPS	55,250	40.8	29.3
Total student enrollment (school)	Total K-12 student enrollment + ungraded students	1990, 1993, 1999, 2003, 2007, 2011, 2015	SASS/ NTPS	55,800	622.2	531.8
Urbanicity of school	Location of school: city, suburb, town, rural	1990, 1993, 1999, 2003, 2007, 2011, 2015	SASS/ NTPS	55,800		
Type of school program	Regular, special program, SPED, career tech, alternative	1990, 1993, 1999, 2003, 2007, 2011, 2015	SASS/ NTPS	55,800		
Student-Teacher Ratio	Number of students per FTE teacher	1990, 1993, 1999, 2003, 2007, 2011, 2015	SASS/ NTPS	55,800	15.4	9.7

Notes: Observations from SASS and NTPS are rounded to the nearest tens, per Institute for Education Sciences disclosure guidance.

\*ACS is used to calculate population statistics for any models related to teacher supply. The CPS is used to calculate population statistics for any model related to teacher vacancies.

**Table 4.3. States that substantively lower barriers to teacher licensure**

State	Policy Passage	Widespread Implementation
Arizona	2002	2004
Arkansas	1987	1987
California	1983	1993
Colorado	1991	2001
Connecticut	1986	2002
Delaware	1994	1994
District of Columbia	2008	2009
Florida	1997	2005
Georgia	2000	2001
Hawaii	1999	2012
Idaho	2004	2007
Kentucky	1996	2001
Louisiana	2001	2001
Massachusetts	1998	2001
Mississippi	1995	2001
South Carolina	1984	1985
North Carolina	1985	2002
Texas	1989	1996
Utah	2005	2005

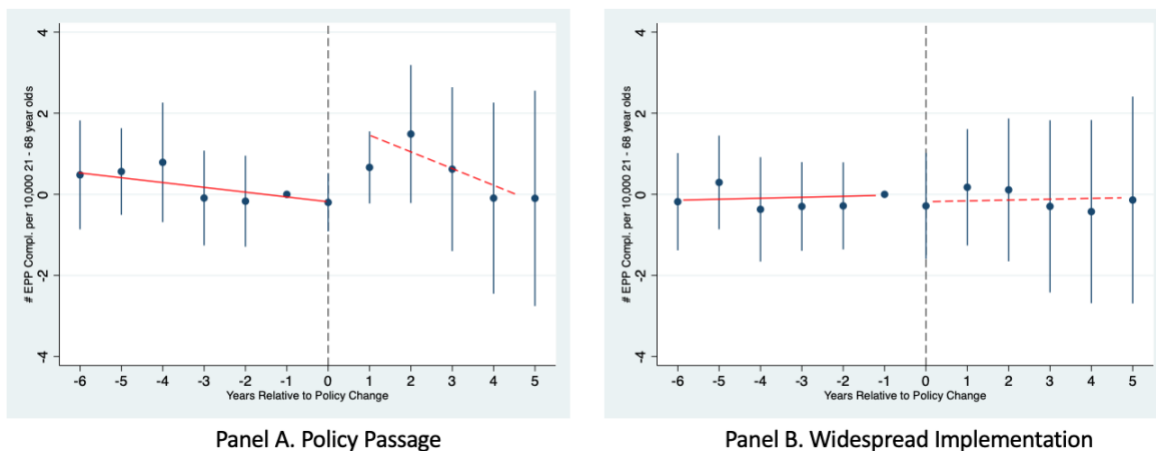


**Figure 4.3. Event study of effect of early-entry policy passage (Panel A) and policy expansion (Panel B) on the number of initial teaching licenses issued per 10,000 working aged adults, 2001-2017**

**Table 4.4.**  
**Effect of passing early-entry policy, and widespread implementation of early-entry policy on the number of initial teaching licenses issued in a state**

Outcome: Initial Licenses Issued	Treatment: EE Policy Passage				Treatment: EE Widespread Implementation			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Post-ART Policy Passage	-2.440*** (0.6920)	-3.464*** (0.7556)	-2.484*** (0.7004)	-3.239*** (0.7321)				
Post Policy * Year Trend			-0.0219 (0.0836)	0.136 (0.0941)				
Year Trend			-0.0746 (0.0882)	0.244 (0.3055)			-0.149 (0.0946)	0.132 (0.3816)
Post-ART Policy Expansion					-1.336* (0.6328)	-1.497* (0.6824)	-1.276* (0.6502)	-1.336* (0.6989)
Post Expansion * Year Trend							0.00467 (0.0874)	0.109 (0.1044)
% Change Relative to Mean	-12%	-18%			-8%	-9%		
State & Policy Controls	No	Yes	No	Yes	No	Yes	No	Yes
Observations	918	805	918	805	918	805	900	789

Notes: \*\*\* p<0.001, \*\* p<0.01, \* p<0.05, + p<0.1. Results are shown from difference-in-differences models, first pooling effects in columns 1-2, and 5-6. Columns 3 - 4 and 7-8 include time-varying effects of the policy implementation. All specifications include both state and year fixed effects. Outcome measure is scaled per 10,000 working-aged adults in a state, and each observation is weighted using population figures as described in the methodology section. Robust standard errors are shown in parentheses. Covariates include: state unemployment rate, Race-to-the-Top awards, state per-pupil expenditure, average teacher salary, log of total K-12 student enrollment, the proportion of children in a state who are Black, Hispanic, or White, the proportion of children living in households with income at or below 125% of the poverty line, and whether states require the following certification requirements: a GPA minimum, standardized tests, and a Bachelor's degree in the content area for secondary certifications. For source of each measure, see Table 2. Mean in year prior to policy passage is 19.7 initial licenses per 10,000 adults, and mean in year prior to widespread implementation is 17.6 licenses per 10,000 adults.



**Figure 4.4. Event study of the effect of early-entry policy passage (Panel A) and policy expansion (Panel B) on the number of educator preparation program completers per 10,000 22-to-68-year-olds**

**Table 4.5.**  
**Effect of passing early-entry policy, and widespread implementation of early-entry policy on the number of educator preparation program completers in a state**

Outcome: Program Completers	Treatment: EE Policy Passage				Treatment: EE Widespread Implementation			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Post-ART Policy Passage	0.511 (0.3800)	0.881** (0.3275)	0.597 (0.3727)	0.935** (0.3081)				
Post Policy * Year Trend			0.0412 (0.0308)	0.0321 (0.0437)				
Year Trend			0.155** (0.0541)	-0.192 (0.1512)			0.213*** (0.0611)	-0.160 (0.1814)
Post-ART Policy Expansion					0.643* (0.3276)	0.716* (0.2969)	0.652* (0.3250)	0.689* (0.2970)
Post Expansion * Year Trend							-0.00202 (0.0306)	-0.0227 (0.0473)
% Change relative to State Mean	4.3%	7.4%			5.4%	6.0%		
State Policy Controls	No	Yes	No	Yes	No	Yes	No	Yes
Observations	933	823	933	823	933	823	914	806

Notes: \*\*\* p<0.001, \*\* p<0.01, \* p<0.05, + p<0.1. Results are shown from difference-in-differences models, first pooling effects in columns 1-2, and 5-6. Columns 3 - 4 and 7-8 include time-varying effects of the policy implementation. All specifications include both state and year fixed effects. Outcome measure is scaled per 10,000 working-aged adults in a state, and each observation is weighted using population figures as described in the methodology section. Robust standard errors are shown in parentheses. Covariates include: state unemployment rate, Race-to-the-Top awards, state per-pupil expenditure, average teacher salary, log of total K-12 student enrollment, the proportion of children in a state who are Black, Hispanic, or White, the proportion of children living in households with income at or below 125% of the poverty line, and whether states require the following certification requirements: a GPA minimum, standardized tests, and a Bachelor's degree in the content area for secondary certifications. For source of each measure, see Table 2. Mean of the outcome in year prior to policy passage is 11.9 program completers per 10,000 adults, and mean of the outcome in the year prior to policy expansion is 12 program completers per 10,000 adults.

**Table 4.6.**  
**Effect of alternative routes to teaching policy passage and widespread expansion on teacher hiring for difficult-to-staff positions, 1990 - 2015**

	(1)	(2)	(3)	(4)	(5)	(6)
					DTS Shortage Areas	DTS Shortage Areas
<b>Policy Passage</b>	<b>Any DTS</b>	<b>Any DTS</b>	<b>DTS Stem</b>	<b>DTS Stem</b>		
Post-EE Policy Passage	0.0323*** (0.0081)	0.0235** (0.0082)	0.0138** (0.0046)	0.0140*** (0.0046)	0.0296*** (0.0077)	0.0216** (0.0084)
Post Policy * Year Trend		-0.0031*** (0.0007)		0.0001 (0.0004)		-0.0028*** (0.0007)
Year Trend		-0.003*** (0.0008)		-0.0017*** (0.0005)		-0.0029*** (0.0007)
% Change Relative to Mean	15%		20%		13%	
Observations	54,100	54,100	54,100	54,100	54,100	54,100

	(1)	(2)	(3)	(4)	(5)	(6)
					DTS Shortage Areas	DTS Shortage Areas
<b>Widespread Expansion</b>	<b>Any DTS</b>	<b>Any DTS</b>	<b>DTS Stem</b>	<b>DTS Stem</b>		
Post-EE Policy Expansion	-0.0093*** (0.0081)	-0.0078 (0.0082)	0.0058 (0.0047)	0.006 (0.0047)	-.0035 (0.0078)	-0.0022 (0.0079)
Post Expansion * Year Trend		-0.0046*** (0.0008)		-0.0004 (0.0005)		-0.004*** (0.0008)
Year Trend		0.0023** (0.0008)		-0.0015** (0.0005)		-0.0025*** (0.0008)
% Change Relative to Mean	-3%		6%		-1%	
Observations	54,100	54,100	54,100	54,100	54,100	54,100

Notes: \*\*\* p<0.001, \*\* p<0.01, \* p<0.05, + p<0.1. Results are shown from difference-in-differences models, first pooling effects, then allowing pre- and post- time-varying trends. Panel A shows the effect on DTS positions and vacancies relative to states passing early-entry policies for the first time, and Panel B shows the effect relative to states expanding early-entry, or making it widely available for the first time. All specifications include state and year fixed effects as well as school, state, and policy controls. Robust standard errors are shown in parentheses. Observations are weighted using weights provided in SASS/ NTPS. For source of each measure, see Table 2. Sample sizes are rounded to the nearest tens place per IES disclosure guidelines. Shortage areas include Special education, foreign languages, STEM, and ESL or bilingual.

**Table 4.7.**  
**Effect of early-entry policy passage on difficult-to-staff positions, modified by schools serving high proportions of students from families who are economically disadvantaged or students of color**

Treatment	50% or more students qualify for FRPL				50% or more students of color			
	EE Passage		EE Expansion		EE Passage		EE Expansion	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Post-ART Policy	0.042*** (0.0085)	0.019 (0.0096)	0.004 (0.006)	-0.002 (0.0097)	0.040*** (0.0083)	0.026** (0.0087)	0.001 (0.0084)	-0.001 (0.0089)
High-Needs School	0.019 (0.0110)	-0.009 (0.0152)	0.018 (0.0105)	0.002 (0.0150)	0.031* (0.0157)	0.036 (0.0213)	0.026 (0.0140)	0.027 (0.0185)
High-Needs * Post-ART Policy	-0.0295** (0.01)	0.017 (0.0169)	-0.035*** (0.0098)	-0.012 (0.0172)	-0.036** (0.0130)	-0.021 (0.0218)	-0.037** (0.0116)	-0.025 (0.0199)
Year Trend		-0.003** (0.0008)		-0.002* (0.0008)		-0.0032*** (0.0008)		-0.003** (0.0008)
High-Needs * Year Trend		-0.003* (0.0011)		-0.002 (0.0011)		0.004 (0.0017)		0.002 (0.0014)
Year Trend * Post-ART Policy		-0.003*** (0.0008)		-0.005*** (0.009)		-0.002*** (0.0007)		-0.004*** (0.0008)
High-Needs * Year Trend * Post-ART Policy		0.001 (0.0013)		0.001 (0.0014)		-0.002 (0.0019)		-0.001 (0.0017)
School & State Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: \*\*\* p<0.001, \*\* p<0.01, \* p<0.05, + p<0.1. Results are shown from difference-in-differences models. Columns 1, 3, 5, and 7 model a simple pooled DD with varying effects for high-needs schools. Columns 2, 4, 6, and 8 model pre- and post-treatment trends interacted with high-needs schools. All specifications include state and year fixed effects as well as school, state, and policy controls. Robust standard errors are shown in parentheses. Observations are weighted using weights provided in SASS/ NTPS. For source of each measure, see Table 2.

**Table 4.8.**  
**Effect of passing early-entry policy, and widespread implementation of early-entry policy, on the number of initial licensures, educator preparation program completers, and likelihood of having difficult-to-staff positions in a state, with differing effects for states with more flexible early-entry programs**

	Passage on # Initial Licensures		Passage on Program Completers		Passage on Likelihood of Having DTS Positions	
	Treatment: Policy Passage	Treatment: Widespread Implementation	Treatment: Policy Passage	Treatment: Widespread Implementation	Treatment: Policy Passage	Treatment: Widespread Implementation
	(1)	(2)	(3)	(4)	(5)	(6)
Post-EE Policy	-3.373*** (0.7385)	-1.513* (0.7321)	-0.0495 (0.3020)	-0.178 (0.2874)	0.041*** (0.0092)	-0.0104 (0.0091)
High-Flexibility * Post-EE Policy	-0.425 (1.8361)	0.0413 (1.2317)	5.437*** (1.1562)	2.325*** (0.6573)	-0.029* (0.0130)	0.0013 (0.0119)
High-Flexibility Policy	-16.59+ (9.1088)	-10.33 (9.3928)	11.39** (4.3660)	6.764 (4.3689)	0.262*** (0.0275)	0.210*** (0.0269)
State & Policy Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	805	805	823	823	54,100	54,100

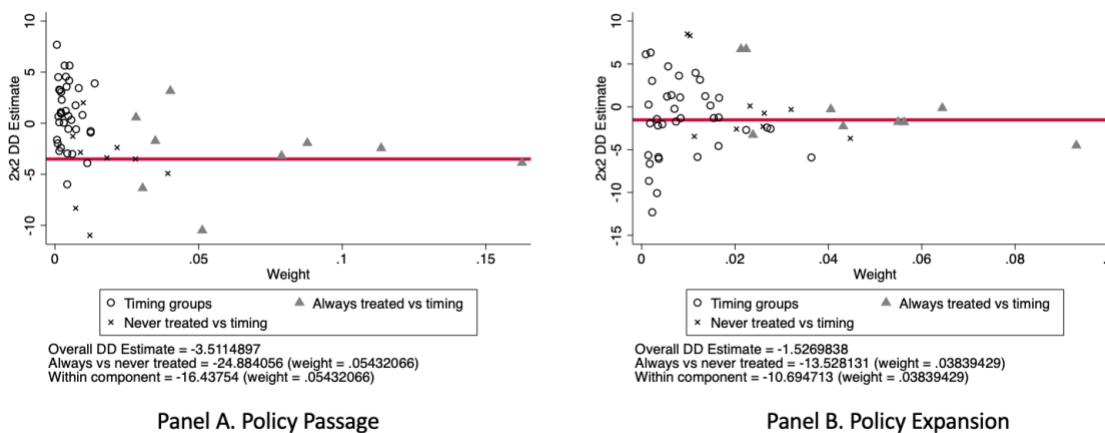
Notes: \*\*\* p<0.001, \*\* p<0.01, \* p<0.05, + p<0.1. Results are shown from simple difference-in-differences models, pooling effects of the policy implementation or widespread policy expansion. All specifications include both state and year fixed effects. Robust standard errors are shown in parentheses. State flexibility in EE policy is indicated for states that allow early-entry, have programs widely available across the state, and reduce the number of coursework or credit hours required for initial licensure. Sample sizes are rounded to the nearest tens place per IES disclosure guidelines for columns 5 and 6.

**Table 4.9.**

**Bacon decomposition of early-entry policy passage & expansion on the number of initial licenses issued and program completers, with covariates**

	EE Passage on Initial Licenses		EE Expansion on Initial Licenses	
	DD Estimate	Total Weight	DD Estimate	Total Weight
<b>Timing Groups</b>	0.678	0.164	-1.663	0.336
<b>Always Treated v. Timing</b>	-3.154	0.628	-1.240	0.420
<b>Never Treated v. Timing</b>	-4.046	0.151	-0.855	0.204
<b>Always v. Never</b>	-24.884	0.003	-13.528	0.001
<b>Within</b>	-16.438	0.054	-10.695	0.038
<b>Weighted Overall Estimate</b>	-3.51*** (1.024)		-1.53 (1.046)	

Notes: Results of a Bacon decomposition of the effect of early-entry policy passage and policy expansion on the number of newly licenced teachers, 2000 - 2018. The weighted overall estimate is the weighted sum of the timing group comparisons shown. The decomposition includes the same covariates included in Eq. 2, but does not include the propensity weights described in the paper. The accompanying scatterplots of each individual 2x2 estimate included in the overall weighted estimates are shown in Figure 5, panels A and B.



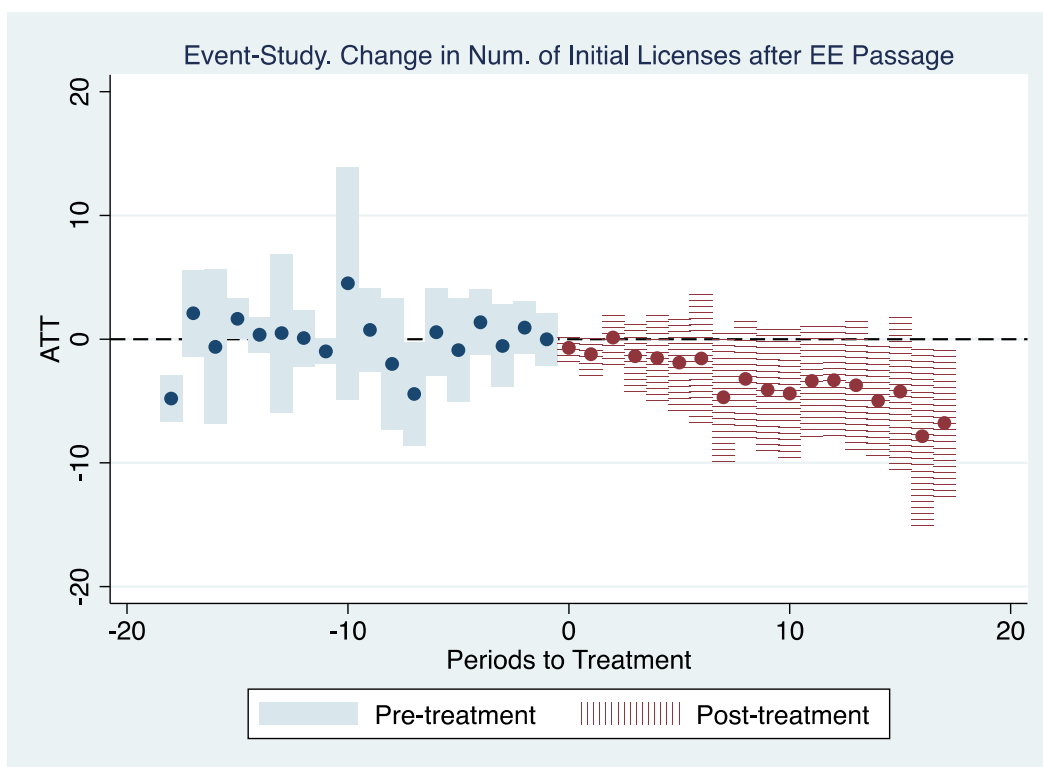
**Figure 4.5. Bacon decomposition scatterplots of all 2x2 estimates by weights, for ART policy passage (panel A) and ART policy expansion (panel B) on the number of newly licensed teachers**



**Table 4.10. Callaway and Sant'Anna DiD ATT estimator**

Outcome Treatment	# Initial Teacher Licenses (per 10,000 adults)				# Ed. Prep. Program Completers (per 10,000 adults)			
	<u>Early-Entry Passage</u>		<u>Widespread Expansion</u>		<u>Early-Entry Passage</u>		<u>Widespread Expansion</u>	
	Never Treated	Not Yet Treated	Never Treated	Not Yet Treated	Never Treated	Not Yet Treated	Never Treated	Not Yet Treated
Control	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
DiD ATT	-2.752 (1.7602)	-2.764+ (1.5667)	-1.554 (1.583)	-0.800 (1.671)	0.681 (0.7294)	0.955 (0.6525)	0.447 (0.7582)	0.499 (0.6670)
Observations	432	432	630	630	406	406	559	562

Notes: \*\*\* p<0.001, \*\* p<0.01, \* p<0.05, + p<0.1. DiD ATT estimator is shown based on weighting estimates from all 2x2 estimates from each timing group using the approach outlined in Callaway and Sant'Anna (2021). States that are always-treated during the period of the study are excluded. Each ATT is calculated for unconditional ATT with no state or policy controls.



**Figure 4.6. Event study of the effect of early-entry policy passage on the number of initial licenses granted, comparing treated states to not-yet-treated states**

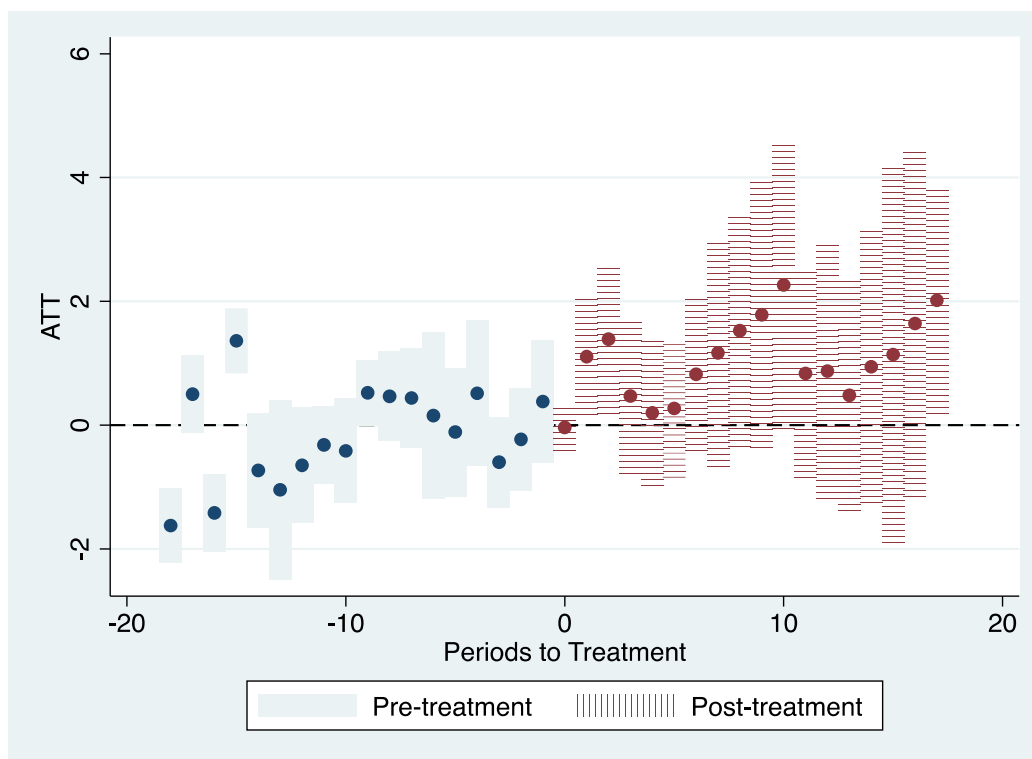


Figure 4.7. Event study of the effect of early-entry policy passage on the number of program completers, comparing treated states to not-yet-treated states

## Appendix for Chapter 4

### Appendix A. Comparing SASS & NTPS

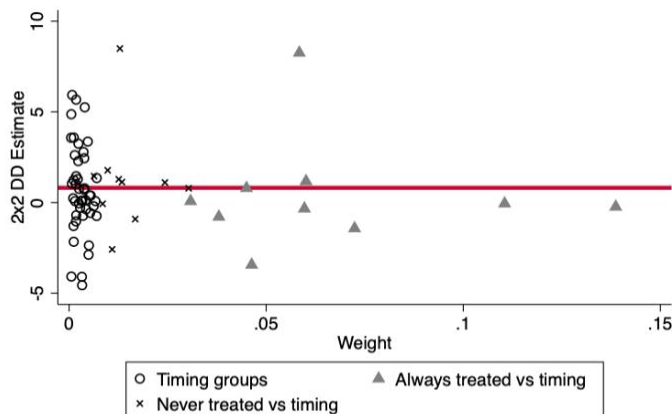
Both the SASS and NTPS sampling frames are based on the Common Core of Data, which reflects the public-school population, including both charter and traditional public schools, and is available for each school year.<sup>40</sup> There are a few major differences in the populations of inference for the SASS and the NTPS. The SASS samples are meant to provide both state-level and nationally representative estimates. The NTPS was not specifically designed to allow for state-level inferences of the public-school population. However, the National Center for Education Statistics (NCES) still publishes state-level estimates from the NTPS, suppressing cells where there is not enough data to make a reliable estimate. Similarly, I choose to drop Wyoming from my SASS/NTPS sample due to inadequate sampling sizes. The remaining 49 states and DC are kept in the sample.

A second major difference between the NTPS and SASS is that the former excludes private schools and schools managed by the Bureau of Indian Affairs. Because of this, I

<sup>40</sup> The earliest version of the SASS (1987-88) bases its sampling frame on the predecessor of the CCD, the Quality Education Data File (QED). All other survey years are based on the CCD.

exclude these schools from my analytic dataset.<sup>41</sup> In some years of the SASS, schools managed by the Department of Defense were included, and in other years, they were excluded. I therefore exclude these schools as well. My final sample includes all traditional and charter public schools in each available survey year serving grades K – 12. For more information on the methods used in the SASS and NTPS, see the Documentation for the 2011-12 Schools and Staffing Survey (Cox, Parmer, Strizek, & Thomas, 2017).

**Appendix B. Results of the Bacon decomposition of the effect of early-entry policy passage on program completers**



Overall DD Estimate = .81295634  
 Always vs never treated = 1.4172232 (weight = .05293011)  
 Within component = 5.4084506 (weight = .05293011)

**Bacon decomposition of early-entry policy passage & expansion on the number of program completers, with covariates**

	<u>DD Estimate</u>	<u>Total Weight</u>
Timing Groups	0.372	0.137
Always Treated v. Timing	0.363	0.660
Never Treated v. Timing	1.193	0.146
Always v. Never	1.417	0.004
Within	5.408	0.053
<b>Weighted Overall Estimate</b>	<b>0.813</b>	
	(0.681)	

Notes: Results of a Bacon decomposition of the effect of early-entry policy passage and policy expansion on the number of program completers, 2000 - 2018. The weighted overall estimate is the weighted sum of the timing group comparisons shown. The decomposition includes the same covariates included in Eq. 2, but does not include the propensity weights described in the paper.

<sup>41</sup> Note: The SASS does not allow for state-level estimates of private schools.

## Conclusion

Alternative routes to teaching have now existed for nearly 40 years and continue to expand rapidly (U.S. Dept. of Education, 2009, 2016). Since their inception, alternative routes to teaching (ARTs) have attempted to both expand the pool of teacher candidates while simultaneously improving upon perceived shortcomings in traditional preparation programs. The decline in production of new teachers within the past decade has heightened debate around whether the increase in alternative preparation programs and enrollment can provide a path forward to attract candidates to the teaching profession while also maintaining the quality of teachers. In this study, I examine available evidence to describe and characterize the landscape of alternative teacher preparation at a national level. I investigate whether ARTs hold promise as a policy mechanism for addressing teacher shortages and improving the racial and ethnic diversity of the teaching workforce.

A few conclusions emerge when considering the results of this study holistically. First, ARTs can serve as a mechanism for innovation in the teacher preparation space. Non-IHE based ARTs and online programs are growing in enrollment relative to traditional and IHE-based ARTs. Because ARTs are increasingly operating outside of traditional IHEs or in partnership with them, they operate in a nimbler fashion. For instance, since the pivotal report on the Boston Teacher Residency (Papay et al., 2012), the program structure has been revised and continues to evolve in response to data on candidate and graduate efficacy. Second, ARTs have expanded rapidly in some states such that they represent a substantial proportion of both teacher preparation candidates and new teachers. Because of this, ARTs increasingly can influence the composition of the teacher workforce. In this empirical work, it appears that ARTs can meaningfully promote racial and ethnic diversity of the teaching workforce in states where they are widely available. Finally, early-entry routes to teaching can

expand the pool of teacher candidates, and this is particularly true in states that lower barriers to entry in their alternative preparation routes. Early-entry expansion particularly benefits high-needs schools, where hiring qualified teaching staff is often most difficult.

I share several recommendations for future lines of related research. First, researchers should more closely examine another claim of ART proponents – that another mechanism by which ARTs help alleviate shortages is through higher relative retention, particularly in high-needs schools. With the NTPS and the teacher follow-up survey, it is possible to examine short-term retention of teachers trained through ARTs. At least some evidence from the 2004 SASS and 2005 Teacher Follow-up Survey suggests that attrition is slightly higher, on average, among candidates from ARTs relative to traditionally trained teachers (R. Ingersoll et al., 2014). It is particularly important to understand if candidates from programs specifically designed to improve retention, such as teacher residencies and grow-your-own models, can realize this outcome. Additionally, future research should explore the relationship between certification requirements and teacher preparation programs. The results of this study suggest that ARTs can effectively induce candidates to teaching even in states with high certification requirements. To help understand these relationships, it will be important to examine program retention and attrition. For instance, enrollment is booming among for-profit online teacher preparation programs. However, whether these enrolled candidates can successfully matriculate into teaching is unknown. Finally, related to the last point, for-profit programs are the quickest growing segment of the teacher preparation space. Both case study research and empirical work on the outcomes of graduates from these programs would be useful in understanding how to interpret these enrollment trends.

Former president of Columbia Teacher's College Arthur Levine wrote in 2006, "The nation is deeply divided about how to prepare a large number of high-quality teachers." These words continue to resonate as practitioners and policymakers debate the balance between restricting versus expanding access to teaching. However, more recent developments in alternative routes to teaching, such as residency models and grow-your-own programs, may serve to bridge ideological divides. This research also suggests that ARTs do not solely operate by lowering or relaxing standards for teacher preparation. In fact, they often operate by increasing standards for certification relative to temporary licensure. Finally, great variation between states means that we can understand and utilize ARTs as a policy mechanism for impacting students through the composition of teachers in addition to just teacher quality.

## Works Cited

- Aaronson, D., Barrow, L., & Sander, W. (2007). Teachers and student achievement in the Chicago public high schools. *Journal of Labor Economics*, 25(1), 95-135.
- Backes, B., & Hansen, M. (2015). Teach for America Impact Estimates on Nontested Student Outcomes. Working Paper 146. *National Center for Analysis of Longitudinal Data in Education Research (CALDER)*.
- Baker, A., Larcker, D. F., & Wang, C. C. (2021). How Much Should We Trust Staggered Difference-In-Differences Estimates? *Available at SSRN 3794018*.
- Ball, D. L., & Forzani, F. M. (2011). Building a common core for learning to teach: And connecting professional learning to practice. *American Educator*, 35(2), 17.
- Ballou, D., & Podgursky, M. J. (1998). The case against teacher certification. *Economics publications (MU)*.
- Bauman, K., & Cranney, S. (2020). *School enrollment in the United States: 2018*. Retrieved from Washington, D.C.: <https://www.census.gov/content/dam/Census/library/publications/2020/demo/p20-584.pdf>
- Behrstock-Sherratt, E. (2016). Creating Coherence in the Teacher Shortage Debate: What Policy Leaders Should Know and Do. *Education Policy Center at American Institutes for Research*.
- Birkeland, S. E., & Peske, H. G. (2004). Literature review of research on alternative certification. *National Education Association*.
- Bliss, T. (1990). Alternate certification in Connecticut: Reshaping the profession. *Peabody Journal of Education*, 67(3), 35-54.
- Boyd, D., Grossman, P., Hammerness, K., Lankford, H., Loeb, S., Ronfeldt, M., & Wyckoff, J. (2010). *Recruiting effective math teachers: How do math immersion teachers compare?: Evidence from New York City*. Retrieved from
- Boyd, D., Grossman, P., Lankford, H., Loeb, S., & Wyckoff, J. (2006). How Changes in Entry Requirements Alter the Teacher Workforce and Affect Student Achievement. *Education Finance and Policy*, 1, 176-216.
- Boyd, D., Grossman, P., Lankford, H., Loeb, S., & Wyckoff, J. (2008). Measuring Effect Sizes: The Effect of Measurement Error. Working Paper 19. *National Center for Analysis of Longitudinal Data in Education Research*.
- Boyd, D. J., Grossman, P. L., Lankford, H., Loeb, S., & Wyckoff, J. (2009). Teacher preparation and student achievement. *Educational Evaluation and Policy Analysis*, 31(4), 416-440.
- Bullough Jr, R. V., Burbank, M., Gess-Newsome, J., Kauchak, D., & Kennedy, C. (1998). 'What Matters Most: Teaching for America's future?' A faculty response to the Report of the National Commission on teaching and America's future1. *Journal of Education for Teaching*, 24(1), 7-32.
- Callaway, B., & Sant'Anna, P. H. (2021). Difference-in-differences with multiple time periods. *Journal of Econometrics*, 225(2), 200-230.
- Carney, M. C. (2021). Designed for the digital age: Teacher preparation at TEACH-NOW Graduate School of Education. *The New Educator*, 17(1), 21-38.
- Carroll, J. A., Hayes, J. L., Mercer, D., Neuenswander, B., & Drake, S. (2006). State-Wide Collaborative Partnerships for Alternative Certification the Kansas Transition to Teaching Program. *Journal of the national association for alternative certification*, 1(2), 4-18.

- Clark, M., McConnell, S., Constantine, J., & Chiang, H. (2013). Addressing Teacher Shortages in Disadvantaged Schools: Lessons from Two Institute of Education Sciences Studies. NCEE Evaluation Brief. NCEE 2013-4018. *National Center for Education Evaluation and Regional Assistance*.
- Clark, M. A., Chiang, H. S., Sonnenfeld, K., Erbe, A., & Puma, M. (2013). The effectiveness of secondary math teachers from Teach For America and the Teaching Fellows programs.
- Cochran-Smith, M., Keefe, E. S., Carney, M. C., Sánchez, J. G., Olivo, M., & Smith, R. J. (2020). Teacher Preparation at New Graduate Schools of Education. *Teacher Education Quarterly*, 47(2), 8-37.
- Cochran-Smith, M., Villegas, A. M., Abrams, L., Chavez Moreno, L., Mills, T., & Stern, R. (2016). Research on teacher preparation: Charting the landscape of a sprawling field. *Handbook of research on teaching*, 5, 439-547.
- Cohen, D. K. (2011). Learning to Teach Nothing in Particular: A Uniquely American Educational Dilemma. *American Educator*, 34(4), 44.
- Constantine, J., Player, D., Silva, T., Hallgreen, K., Grider, M., & Deke, J. (2009). *An evaluation of teachers trained through different routes to certification: Final report*. Retrieved from Washington, D.C.:
- Constantine, J., Player, D., Silva, T., Hallgren, K., Grider, M., Deke, J., & Warner, E. (2009). An evaluation of teachers trained through different routes to certification. *Final Report for National Center for Education and Regional Assistance*, 142.
- Corcoran, S. P., Evans, W. N., & Schwab, R. M. (2004). Changing Labor-Market Opportunities for Women and the Quality of Teachers, 1957-2000. *The American economic review*, 94(2), 230.
- Cornett, L. M. (1992). Alternate Certification: State Policies in the SREB States. In W. D. Hawley (Ed.), *The Alternative Certification of Teachers*. Washington, DC: ERIC Clearinghouse on Teacher Education.
- Cowan, J., Goldhaber, D., Hayes, K., & Theobald, R. (2016). Missing elements in the discussion of teacher shortages. *Educational Researcher*, 45(8), 460-462.
- Cowan, J., Goldhaber, D., Jin, Z., & Theobald, R. (2020). Teacher Licensure Tests: Barrier or Predictive Tool? Working Paper No. 245-1020. *National Center for Analysis of Longitudinal Data in Education Research (CALDER)*.
- Cox, S., Parmer, R., Strizek, G., & Thomas, T. (2017). Documentation for the 2011-12 Schools and Staffing Survey. NCES 2016-817. *National Center for Education Statistics*.
- Cross, F. (2017). *Teacher Shortage Areas Nationwide Listing 1990–1991 through 2017–2018 June 2017*. Retrieved from Washington, DC:  
<https://files.eric.ed.gov/fulltext/ED612088.pdf>
- Darling-Hammond, L. (2000). *Solving the dilemmas of teacher supply, demand, and standards: How we can ensure a competent, caring, and qualified teacher for every child*. ERIC.
- Darling-Hammond, L., & Green, J. (1988). Teacher quality and educational equality. *College Board Review*, 148, 16-23.
- De Chaisemartin, C., & d'Haultfoeuille, X. (2020). Two-way fixed effects estimators with heterogeneous treatment effects. *American Economic Review*, 110(9), 2964-2996.
- Decker, P. T., Mayer, D. P., & Glazerman, S. (2004a). *The effects of Teach for America on students: Findings from a national evaluation*. University of Wisconsin--Madison, Institute for Research on Poverty.
- Decker, P. T., Mayer, D. P., & Glazerman, S. (2004b). The Effects of Teach For America on Students: Findings from a National Evaluation.



- Dee, T. S. (2004). Teachers, Race, and Student Achievement in a Randomized Experiment. *Review of Economics and Statistics*, 86(1), 195-210. doi:10.1162/003465304323023750
- Dee, T. S. (2005). A teacher like me: Does race, ethnicity, or gender matter? *American Economic Review*, 95(2), 158-165.
- Dee, T. S., & Goldhaber, D. (2017a). Understanding and addressing teacher shortages in the United States. *The Hamilton Project*, 5, 1-28.
- Dee, T. S., & Goldhaber, D. (2017b). Understanding and addressing teacher shortages in the United States. *The Hamilton Project*, April.
- Deming, D., Goldin, C., & Katz, L. (2013). For-profit colleges. *The future of children*, 137-163.
- Dickstein Staub, S., & Scott Frank, S. (2015). *Clinically Oriented Teacher Preparation*. Retrieved from <https://nctresidencies.org/wp-content/uploads/2015/07/NCTR-COTP-Final-Single-Pgs.pdf>
- Donaldson, M. L., & Johnson, S. M. (2011). Teach For America teachers: How long do they teach? Why do they leave? *Phi Delta Kappan*, 93(2), 47-51.
- Education, U. S. D. o. (2009). *The Secretary's sixth annual report on teacher quality: a highly qualified teacher in every classroom*. Retrieved from Washington, D.C.: [https://title2.ed.gov/Public/Title\\_II\\_09.pdf](https://title2.ed.gov/Public/Title_II_09.pdf)
- Education, U. S. D. o. (2015). *Alternative teacher preparation programs*. Retrieved from Washington, D.C.: [https://title2.ed.gov/Public/44110\\_Title\\_II\\_Issue\\_Brief\\_Altm\\_TPP.pdf](https://title2.ed.gov/Public/44110_Title_II_Issue_Brief_Altm_TPP.pdf)
- Education, U. S. D. o. (2016). *Preparing and credentialing the nation's teachers: the Secretary's 10th report on teacher quality*. Retrieved from Washington, D.C.: <https://title2.ed.gov/Public/TitleIIReport16.pdf>
- Egalite, A. J., Kisida, B., & Winters, M. A. (2015). Representation in the classroom: The effect of own-race teachers on student achievement. *Economics of Education Review*, 45, 44-52.
- Espinoza, D., Saunders, R., Kini, T., & Darling-Hammond, L. (2018). Taking the Long View: State Efforts to Solve Teacher Shortages by Strengthening the Profession. *Learning Policy Institute*.
- Evans, L. (2011). Job queues, certification status, and the education labor market. *Educational policy*, 25(2), 267-298.
- Feistritzer, C. E. (1984). *The making of a teacher: A report on teacher education and certification*: National Center for Education Information.
- Feistritzer, C. E. (1993). National overview of alternative teacher certification. *Education and Urban Society*, 26(1), 18-28.
- Feistritzer, C. E. (2005). *Profile of alternate route teachers*. Retrieved from Washington, D.C.:
- Feistritzer, C. E. (2006). *Alternative teacher certification: A state-by-state analysis*. Retrieved from Washington, D.C.:
- Feistritzer, C. E., & Chester, D. (2003). *Alternative teacher certification: A state-by-state analysis 2003*: National Center for Education Information.
- Feistritzer, C. E., Griffin, S., & Linnajarvi, A. (2011). *Profile of teachers in the US, 2011*: National Center for Education Information Washington, DC.
- Feistritzer, C. E., & Haar, C. K. (2008). *Alternate routes to teaching*: Prentice Hall.
- Feistritzer, E. (1994). *The evolution of alternative teacher certification*. Paper presented at the The Educational Forum.
- Fenstermacher, G. D. (1990). The place of alternative certification in the education of teachers. *Peabody Journal of Education*, 67(3), 155-185.

- Ferguson, R. F. (1991). Paying for public education: New evidence on how and why money matters. *Harv. J. on Legis.*, 28, 465.
- Finn Jr, C. E., & Madigan, K. (2001). Removing the Barriers for Teacher Candidates. *Educational Leadership*, 58(8), 29.
- Fountain, J. H. (2021). *The Higher Education Act (HEA): A Primer*. Retrieved from Washington, DC: <https://sgp.fas.org/crs/misc/R43351.pdf>
- Fox, L. (2016). Seeing Potential. *AERA Open*, 2(1).
- Fryer, R. G., & Levitt, S. D. (2004). Understanding the black-white test score gap in the first two years of school. *Review of Economics and Statistics*, 86(2), 447-464.
- Future, N. C. o. T. A. s. (1996). *What matters most: teaching for America's future*. New York, NY: National Commission on Teaching and America's Future.
- García, E., & Weiss, E. (2019). US Schools Struggle to Hire and Retain Teachers. The Second Report in "The Perfect Storm in the Teacher Labor Market" Series. *Economic policy institute*.
- Gershenson, S., Holt, S. B., & Papageorge, N. W. (2015). Who believes in me? The effect of student–teacher demographic match on teacher expectations. *Economics of Education Review*, 52, 209-224. doi:10.1016/j.econedurev.2016.03.002
- Gist, C. D. (2019). Grow Your Own Programs and Teachers of Color: Taking Inventory of an Emerging Field. *Teacher Education Quarterly*, 46(1), 5.
- Gitomer, D., Latham, A., & Ziomek, R. (1999). The academic quality of prospective teachers: the impact of admissions and licensure testing. Educational Testing Service, The Teaching and Learning Division Research and Data Analysis Group. In.
- Glazerman, S., Mayer, D., & Decker, P. (2006). Alternative routes to teaching: The impacts of Teach for America on student achievement and other outcomes. *Journal of Policy Analysis and Management: The Journal of the Association for Public Policy Analysis and Management*, 25(1), 75-96.
- Glazerman, S., & Tuttle, C. (2006). An Evaluation of American Board Teacher Certification: Progress and Plans. *Mathematica Policy Research, Inc*.
- Goldhaber, D. (2007). Everyone's doing it, but what does teacher testing tell us about teacher effectiveness? *Journal of Human resources*, 42(4), 765-794.
- Goldhaber, D. (2008). Teachers matter, but effective teacher quality policies are elusive. *Handbook of research in education finance and policy*, 1, 146-165.
- Goldhaber, D., & Hansen, M. (2010). Race, gender, and teacher testing: How informative a tool is teacher licensure testing? *American Educational Research Journal*, 47(1), 218-251.
- Goldhaber, D., Krieg, J., Theobald, R., & Brown, N. (2015). Refueling the STEM and special education teacher pipelines. *Phi Delta Kappan*, 97(4), 56-62.
- Goldhaber, D., Lavery, L., & Theobald, R. (2014). Uneven Playing Field? Assessing the Inequity of Teacher Characteristics and Measured Performance across Students. CEDR Working Paper. WP# 2014-4. *Center for Education Data & Research*.
- Goldhaber, D., Theobald, R., & Tien, C. (2015). The theoretical and empirical arguments for diversifying the teacher workforce: A review of the evidence.
- Goldhaber, D. D., & Brewer, D. J. (1997). Why don't schools and teachers seem to matter? Assessing the impact of unobservables on educational productivity. *Journal of Human resources*, 505-523.
- Goldin, C. (2006). The quiet revolution that transformed women's employment, education, and family. *American Economic Review*, 96(2), 1-21.
- Goodman-Bacon, A. (2021). Difference-in-differences with variation in treatment timing. *Journal of Econometrics*.

- Greenberg, J., Walsh, K., & McKee, A. (2015). *2014 teacher prep review: A review of the nation's teacher preparation programs*. Retrieved from
- Greenwald, R., Hedges, L. V., & Laine, R. D. (1996). The effect of school resources on student achievement. *Review of Educational Research*, *66*(3), 361-396.
- Grissom, J. A., & Redding, C. (2015). Discretion and disproportionality: explaining the underrepresentation of high-achieving students of color in gifted programs. *AERA Open* *2*(1), 2332858415622175.
- Grossman, P., Hammerness, K., & McDonald, M. (2009). Redefining teaching, re-imagining teacher education. *Teachers and Teaching: theory and practice*, *15*(2), 273-289.
- Grossman, P. L., & Loeb, S. (2008). *Alternative routes to teaching: Mapping the new landscape of teacher education*. Harvard Education Press Cambridge, MA.
- Guarino, C. M., Santibanez, L., & Daley, G. A. (2006). Teacher recruitment and retention: A review of the recent empirical literature. *Review of Educational Research*, *76*(2), 173-208.
- Guha, R., Hyler, M. E., & Darling-Hammond, L. (2017). The power and potential of teacher residencies. *Pi Delta Kappan*, *98*(8), 31-37.
- Hammerness, K., & Reininger, M. (2008). Who goes into early-entry programs? In P. Grossman & S. Loeb (Eds.), *Alternative routes to teaching: Mapping the new landscape of teacher education*. Cambridge, Mass.: Harvard Education Press.
- Hanushek, E. (1971). Teacher characteristics and gains in student achievement: Estimation using micro data. *The American economic review*, *61*(2), 280-288.
- Hegji, A. (2021). *The Higher Education Act (HEA): A Primer*. CRS Report R43351. Updated. Retrieved from
- Henry, G. T., Purtell, K. M., Bastian, K. C., Fortner, C. K., Thompson, C. L., Campbell, S. L., & Patterson, K. M. (2014). The effects of teacher entry portals on student achievement. *Journal of Teacher Education*, *65*(1), 7-23.
- Hess, F. M. (2003). *Tear Down this Wall: The case for a radical overhaul of teacher certification*. Paper presented at the White House Conference on Preparing Tomorrow's Teachers, Washington, D.C.
- Hess, F. M. (2005). The predictable, but unpredictably personal, politics of teacher licensure. *Journal of Teacher Education*, *56*(3), 192-198.
- Hill, H. C., Rowan, B., & Ball, D. L. (2005). Effects of teachers' mathematical knowledge for teaching on student achievement. *American Educational Research Journal*, *42*(2), 371-406.
- Holt, S. B., & Gershenson, S. (2015). The Impact of Teacher Demographic Representation on Student Attendance and Suspensions.
- Hui, T. K. (2021, June 8, 2021). Want to teach in a high school? NC may only require 1 semester of teacher prep classes. *The News & Observer*. Retrieved from <https://www.msn.com/en-us/money/careers/want-to-teach-in-a-high-school-nc-may-only-require-1-semester-of-teacher-prep-classes/ar-AAKQaBL>
- Humphrey, D. C., & Wechsler, M. E. (2007). Insights into alternative certification: Initial findings from a national study. *Teachers College Record*, *109*(3), 483-530.
- Ingersoll, R., Merrill, L., & May, H. (2014). What are the effects of teacher education and preparation on beginning teacher attrition?
- Ingersoll, R. M. (2004). Four Myths about America's Teacher Quality Problem. *Yearbook of the National Society for the Study of Education*, *103*(1), 1-33.
- Ingersoll, R. M., & May, H. (2012). The magnitude, destinations, and determinants of mathematics and science teacher turnover. *Educational Evaluation and Policy Analysis*, *34*(4), 435-464.

- Kane, T. J., Rockoff, J. E., & Staiger, D. O. (2008). What does certification tell us about teacher effectiveness? Evidence from New York City. *Economics of Education Review*, 27(6), 615-631.
- Kelly, S., & Northrop, L. (2015). Early career outcomes for the “best and the brightest” selectivity, satisfaction, and attrition in the beginning teacher longitudinal survey. *American Educational Research Journal*, 52(4), 624-656.
- Kennedy, M. M. (1999). The role of preservice teacher education. *Teaching as the learning profession: Handbook of policy and practice*, 54-85.
- Kraft, M. A., Blazar, D., & Hogan, D. (2018). The effect of teacher coaching on instruction and achievement: A meta-analysis of the causal evidence. *Review of Educational Research*, 88(4), 547-588.
- Kutz, G. D. (2010). For-Profit Colleges: Undercover Testing Finds Colleges Encouraged Fraud and Engaged in Deceptive and Questionable Marketing Practices. Testimony before the Committee on Health, Education, Labor, and Pensions, US Senate. GAO-10-948T. *US Government Accountability Office*.
- Labaree, D. F. (2008). An uneasy relationship: the history of teacher education in the university. 290-306.
- Levine, A. (2006). Educating school teachers: Report of the education schools project. In: Washington, DC: The Education Schools Project.
- Lincove, J. A., Osborne, C., Mills, N., & Bellows, L. (2015). Teacher preparation for profit or prestige: Analysis of a diverse market for teacher preparation. *Journal of Teacher Education*, 66(5), 415-434.
- Lohman, J. (2000). *Alternative Route to Teacher Certification*. Retrieved from Connecticut:
- Mac Iver, M. A., & Vaughn III, E. S. (2007). " But How Long Will They Stay?" Alternative Certification and New Teacher Retention in an Urban District. *ERS Spectrum*, 25(2), 33-44.
- Malkus, N., Mulvaney Hoyer, K., & Sparks, D. (2015). *Teaching vacancies and difficult-to-staff teaching positions in public schools*. Retrieved from Washington, D.C.:
- Master, B., Sun, M., & Loeb, S. (2018). Teacher workforce developments: recent changes in academic competitiveness and job satisfaction of new teachers. *Education Finance and Policy*, 13(3), 310-332.
- Mayer, D. P., Decker, P. T., Glazerman, S., & Silva, T. W. (2003). Identifying alternative certification programs for an impact evaluation of teacher preparation. *Cambridge, MA: Mathematica Policy Research*.
- McDermott, K. A. (2005). In MINT condition? The politics of alternative certification and pay incentives for teachers in Massachusetts. *Educational policy*, 19(1), 44-62.
- McDonald, M., Kazemi, E., & Kavanagh, S. S. (2013). Core practices and pedagogies of teacher education: A call for a common language and collective activity. *Journal of Teacher Education*, 64(5), 378-386.
- McGrady, P. B., & Reynolds, J. R. (2013). Racial mismatch in the classroom: Beyond black-white differences. *Sociology of Education*, 86(1), 3-17.
- Monk, D. H. (1994). Subject area preparation of secondary mathematics and science teachers and student achievement. *Economics of Education Review*, 13(2), 125-145.
- Muñiz, J. (2020). Investing in Grow Your Own Teacher Programs: Leveraging State-Level Competitive Grants to Promote Quality. *New America*.
- NCES. (2020). *Racial/Ethnic Enrollment in Public Schools*. Retrieved from [https://nces.ed.gov/programs/coe/indicator\\_cge.asp#:~:text=In%20fall%202017%2C%20of%20the,million%20were%20American%20Indian%2FAlaska](https://nces.ed.gov/programs/coe/indicator_cge.asp#:~:text=In%20fall%202017%2C%20of%20the,million%20were%20American%20Indian%2FAlaska)

- Neumann, R. A. (1994). Reconsidering emergency teaching certificates and alternative certification programs as responses to teacher shortages. *Urban Education*, 29(1), 89-108.
- Ngoma, H. (2015). Understanding recently changed state requirements for alternate route programs. Retrieved from <https://cesp.rutgers.edu/blog/understanding-recently-changed-state-requirements-nj-alternate-route-programs>
- No Child Left Behind Act of 2001, Pub. L. No. 107-110, § 115, 1425 C.F.R. (2002).
- OPE. (2016). *Preparing and Credentialing the Nation's Teachers: The Secretary's 10th Report on Teacher Quality*. Retrieved from Washington, D.C.: <https://title2.ed.gov/Public/TitleIIReport16.pdf>
- OPEPD. (2016). *The State of Racial Diversity in the Educator Workforce*. Retrieved from Washington, D.C.: <https://www2.ed.gov/rschstat/eval/highered/racial-diversity/state-racial-diversity-workforce.pdf>
- OPPI. (2003). *Meeting the Highly Qualified Teachers Challenge: The Secretary's Second Annual Report on Teacher Quality*. Retrieved from Washington, D.C.: <https://www2.ed.gov/about/reports/annual/teachprep/2003title-ii-report.pdf>
- Paige, R. (2002). Meeting the highly qualified teachers challenge: The secretary's annual report on teacher quality. *US Department of Education*.
- Papay, J. P., West, M. R., Fullerton, J. B., & Kane, T. J. (2012). Does an urban teacher residency increase student achievement? Early evidence from Boston. *Educational Evaluation and Policy Analysis*, 34(4), 413-434.
- Partelow, L. (2019). What to make of declining enrollment in teacher preparation programs. *Center for American Progress*. <https://www.americanprogress.org/issue/s/education12/reports/2019/12/03/4773>, 11.
- Partelow, L. (2019). What to make of declining enrollment in teacher preparation programs. *Washington, DC: Center for American Progress*. Retrieved December, 7, 2019.
- Partelow, L., & Baumgardner, C. (2016). Educator Pipeline at Risk: Teacher Labor Markets after the Great Recession. *Center for American Progress*.
- Pascal, A. (1987). The Qualifications of Teachers in American High Schools.
- Peterson, P. E., & Nadler, D. (2009). What happens when states have genuine alternative certification? We get more minority teachers and test scores rise. *Education Next*, 9(1), 70-75.
- Putman, H., Hansen, M., Walsh, K., & Quintero, D. (2016). High hopes and harsh realities. Retrieved from [https://www.brookings.edu/wp-content/uploads/2016/08/browncenter\\_20160818\\_teacherdiversityreportpr\\_hansen.pdf](https://www.brookings.edu/wp-content/uploads/2016/08/browncenter_20160818_teacherdiversityreportpr_hansen.pdf)
- Residencies, N. C. f. T. (2016). *Boettcher Teacher Residency's Rural Expansion*. Retrieved from <https://nctresidencies.org/research/innovations-teacher-preparation-boettcher-teacher-residency-rural-expansion/>
- Robinson, S. (2014). *Statement on NCTQ Teacher prep review from Sharon P. Robinson*. Ed. D., AACTE President and CEO,
- Rowan, B., Chiang, F.-S., & Miller, R. J. (1997). Using research on employees' performance to study the effects of teachers on students' achievement. *Sociology of Education*, 256-284.
- Sass, T. R. (2011). Certification Requirements and Teacher Quality: A Comparison of Alternative Routes to Teaching. Working Paper 64. *National Center for Analysis of Longitudinal Data in Education Research*.

- Sass, T. R. (2015). Licensure and worker quality: A comparison of alternative routes to teaching. *The Journal of Law and Economics*, 58(1), 1-35.
- Shuls, J. V. (2018). Raising the bar on teacher quality: Assessing the impact of increasing licensure exam cut-scores. *Educational policy*, 32(7), 969-992.
- Suell, J. L., & Piotrowski, C. (2007). Alternative teacher education programs: A review of the literature and outcome studies. *Journal of Instructional Psychology*, 34(1), 54.
- Summers, A. A., & Wolfe, B. L. (1977). Do schools make a difference? *The American economic review*, 67(4), 639-652.
- Sutcher, L., Darling-Hammond, L., & Carver-Thomas, D. (2016). A coming crisis in teaching? Teacher supply, demand, and shortages in the US. *Learning Policy Institute. Teacher preparation policies and issues in the Higher Education Act, Report Number R45407*. (2018). Retrieved from
- Tikkanen, A. (2016). normal school. In T. E. o. E. Britannica (Ed.), *Encyclopaedia Britannica*.
- Valenzuela, A. (2017). Grow Your Own Educator Programs: A Review of the Literature with an Emphasis on Equity-Based Approaches. Literature Review. *Equity Assistance Center Region II, Intercultural Development Research Association*.
- Walker, T. (2016). Hiring non-certified teachers no way to address teacher shortage, say experts. *NEA Today: Education Policy, Teacher Recruitment and Retention*.
- Walsh, K., & Jacobs, S. (2007). Alternative Certification Isn't Alternative. *Thomas B. Fordham Institute*.
- Wilson, S. M., Floden, R. E., & Ferrini-Mundy, J. (2001). *Teacher preparation research: Current knowledge, gaps, and recommendations: A research report prepared for the US department of education and the office for educational research and improvement, February 2001*: Center for the Study of Teaching and Policy.
- Xu, Z., Hannaway, J., & Taylor, C. (2011). Making a difference? The effects of Teach For America in high school. *Journal of Policy Analysis and Management*, 30(3), 447-469.
- Zeichner, K. M. (2003). The adequacies and inadequacies of three current strategies to recruit, prepare, and retain the best teachers for all students. *Teachers College Record*, 105(3), 490-519.
- Zeichner, K. M., & Hutchinson, E. A. (2008). The development of alternative certification policies and programs in the United States. In P. Grossman & S. Loeb (Eds.), *Alternative routes to teaching: Mapping the new landscape of teacher education* (pp. 15 - 30). Cambridge, MA: Harvard Education Press.
- Aaronson, D., Barrow, L., & Sander, W. (2007). Teachers and student achievement in the Chicago public high schools. *Journal of Labor Economics*, 25(1), 95-135.
- Backes, B., & Hansen, M. (2015). Teach for America Impact Estimates on Nontested Student Outcomes. Working Paper 146. *National Center for Analysis of Longitudinal Data in Education Research (CALDER)*.
- Baker, A., Larcker, D. F., & Wang, C. C. (2021). How Much Should We Trust Staggered Difference-In-Differences Estimates? *Available at SSRN 3794018*.
- Ball, D. L., & Forzani, F. M. (2011). Building a common core for learning to teach: And connecting professional learning to practice. *American Educator*, 35(2), 17.
- Ballou, D., & Podgursky, M. J. (1998). The case against teacher certification. *Economics publications (MU)*.
- Bauman, K., & Cranney, S. (2020). *School enrollment in the United States: 2018*. Retrieved from Washington, D.C.:

<https://www.census.gov/content/dam/Census/library/publications/2020/demo/p20-584.pdf>

- Behrstock-Sherratt, E. (2016). Creating Coherence in the Teacher Shortage Debate: What Policy Leaders Should Know and Do. *Education Policy Center at American Institutes for Research*.
- Birkeland, S. E., & Peske, H. G. (2004). Literature review of research on alternative certification. *National Education Association*.
- Bliss, T. (1990). Alternate certification in Connecticut: Reshaping the profession. *Peabody Journal of Education*, 67(3), 35-54.
- Boyd, D., Grossman, P., Hammerness, K., Lankford, H., Loeb, S., Ronfeldt, M., & Wyckoff, J. (2010). *Recruiting effective math teachers: How do math immersion teachers compare?: Evidence from New York City*. Retrieved from
- Boyd, D., Grossman, P., Lankford, H., Loeb, S., & Wyckoff, J. (2006). How Changes in Entry Requirements Alter the Teacher Workforce and Affect Student Achievement. *Education Finance and Policy*, 1, 176-216.
- Boyd, D., Grossman, P., Lankford, H., Loeb, S., & Wyckoff, J. (2008). Measuring Effect Sizes: The Effect of Measurement Error. Working Paper 19. *National Center for Analysis of Longitudinal Data in Education Research*.
- Boyd, D. J., Grossman, P. L., Lankford, H., Loeb, S., & Wyckoff, J. (2009). Teacher preparation and student achievement. *Educational Evaluation and Policy Analysis*, 31(4), 416-440.
- Bullough Jr, R. V., Burbank, M., Gess-Newsome, J., Kauchak, D., & Kennedy, C. (1998). 'What Matters Most: Teaching for America's future?' A faculty response to the Report of the National Commission on teaching and America's future1. *Journal of Education for Teaching*, 24(1), 7-32.
- Callaway, B., & Sant'Anna, P. H. (2021). Difference-in-differences with multiple time periods. *Journal of Econometrics*, 225(2), 200-230.
- Carney, M. C. (2021). Designed for the digital age: Teacher preparation at TEACH-NOW Graduate School of Education. *The New Educator*, 17(1), 21-38.
- Carroll, J. A., Hayes, J. L., Mercer, D., Neuenswander, B., & Drake, S. (2006). State-Wide Collaborative Partnerships for Alternative Certification the Kansas Transition to Teaching Program. *Journal of the national association for alternative certification*, 1(2), 4-18.
- Clark, M., McConnell, S., Constantine, J., & Chiang, H. (2013). Addressing Teacher Shortages in Disadvantaged Schools: Lessons from Two Institute of Education Sciences Studies. NCEE Evaluation Brief. NCEE 2013-4018. *National Center for Education Evaluation and Regional Assistance*.
- Clark, M. A., Chiang, H. S., Sonnenfeld, K., Erbe, A., & Puma, M. (2013). The effectiveness of secondary math teachers from Teach For America and the Teaching Fellows programs.
- Cochran-Smith, M., Keefe, E. S., Carney, M. C., Sánchez, J. G., Olivo, M., & Smith, R. J. (2020). Teacher Preparation at New Graduate Schools of Education. *Teacher Education Quarterly*, 47(2), 8-37.
- Cochran-Smith, M., Villegas, A. M., Abrams, L., Chavez Moreno, L., Mills, T., & Stern, R. (2016). Research on teacher preparation: Charting the landscape of a sprawling field. *Handbook of research on teaching*, 5, 439-547.
- Cohen, D. K. (2011). Learning to Teach Nothing in Particular: A Uniquely American Educational Dilemma. *American Educator*, 34(4), 44.

- Constantine, J., Player, D., Silva, T., Hallgreen, K., Grider, M., & Deke, J. (2009). *An evaluation of teachers trained through different routes to certification: Final report*. Retrieved from Washington, D.C.:
- Constantine, J., Player, D., Silva, T., Hallgren, K., Grider, M., Deke, J., & Warner, E. (2009). An evaluation of teachers trained through different routes to certification. *Final Report for National Center for Education and Regional Assistance*, 142.
- Corcoran, S. P., Evans, W. N., & Schwab, R. M. (2004). Changing Labor-Market Opportunities for Women and the Quality of Teachers, 1957-2000. *The American economic review*, 94(2), 230.
- Cornett, L. M. (1992). Alternate Certification: State Policies in the SREB States. In W. D. Hawley (Ed.), *The Alternative Certification of Teachers*. Washington, DC: ERIC Clearinghouse on Teacher Education.
- Cowan, J., Goldhaber, D., Hayes, K., & Theobald, R. (2016). Missing elements in the discussion of teacher shortages. *Educational Researcher*, 45(8), 460-462.
- Cowan, J., Goldhaber, D., Jin, Z., & Theobald, R. (2020). Teacher Licensure Tests: Barrier or Predictive Tool? Working Paper No. 245-1020. *National Center for Analysis of Longitudinal Data in Education Research (CALDER)*.
- Cox, S., Parmer, R., Strizek, G., & Thomas, T. (2017). Documentation for the 2011-12 Schools and Staffing Survey. NCES 2016-817. *National Center for Education Statistics*.
- Cross, F. (2017). *Teacher Shortage Areas Nationwide Listing 1990–1991 through 2017–2018 June 2017*. Retrieved from Washington, DC:  
<https://files.eric.ed.gov/fulltext/ED612088.pdf>
- Darling-Hammond, L. (2000). *Solving the dilemmas of teacher supply, demand, and standards: How we can ensure a competent, caring, and qualified teacher for every child*. ERIC.
- Darling-Hammond, L., & Green, J. (1988). Teacher quality and educational equality. *College Board Review*, 148, 16-23.
- De Chaisemartin, C., & d'Haultfoeuille, X. (2020). Two-way fixed effects estimators with heterogeneous treatment effects. *American Economic Review*, 110(9), 2964-2996.
- Decker, P. T., Mayer, D. P., & Glazerman, S. (2004a). *The effects of Teach for America on students: Findings from a national evaluation*. University of Wisconsin--Madison, Institute for Research on Poverty.
- Decker, P. T., Mayer, D. P., & Glazerman, S. (2004b). The Effects of Teach For America on Students: Findings from a National Evaluation.
- Dee, T. S. (2004). Teachers, Race, and Student Achievement in a Randomized Experiment. *Review of Economics and Statistics*, 86(1), 195-210. doi:10.1162/003465304323023750
- Dee, T. S. (2005). A teacher like me: Does race, ethnicity, or gender matter? *American Economic Review*, 95(2), 158-165.
- Dee, T. S., & Goldhaber, D. (2017a). Understanding and addressing teacher shortages in the United States. *The Hamilton Project*, 5, 1-28.
- Dee, T. S., & Goldhaber, D. (2017b). Understanding and addressing teacher shortages in the United States. *The Hamilton Project*, April.
- Deming, D., Goldin, C., & Katz, L. (2013). For-profit colleges. *The future of children*, 137-163.
- Dickstein Staub, S., & Scott Frank, S. (2015). *Clinically Oriented Teacher Preparation*. Retrieved from <https://nctresidencies.org/wp-content/uploads/2015/07/NCTR-COTP-Final-Single-Pgs.pdf>
- Donaldson, M. L., & Johnson, S. M. (2011). Teach For America teachers: How long do they teach? Why do they leave? *Phi Delta Kappan*, 93(2), 47-51.



- Education, U. S. D. o. (2009). *The Secretary's sixth annual report on teacher quality: a highly qualified teacher in every classroom*. Retrieved from Washington, D.C.:  
[https://title2.ed.gov/Public/Title\\_II\\_09.pdf](https://title2.ed.gov/Public/Title_II_09.pdf)
- Education, U. S. D. o. (2015). *Alternative teacher preparation programs*. Retrieved from Washington, D.C.:  
[https://title2.ed.gov/Public/44110\\_Title\\_II\\_Issue\\_Brief\\_Altm\\_TPP.pdf](https://title2.ed.gov/Public/44110_Title_II_Issue_Brief_Altm_TPP.pdf)
- Education, U. S. D. o. (2016). *Preparing and credentialing the nation's teachers: the Secretary's 10th report on teacher quality*. Retrieved from Washington, D.C.:  
<https://title2.ed.gov/Public/TitleIIReport16.pdf>
- Egalite, A. J., Kisida, B., & Winters, M. A. (2015). Representation in the classroom: The effect of own-race teachers on student achievement. *Economics of Education Review*, 45, 44-52.
- Espinoza, D., Saunders, R., Kini, T., & Darling-Hammond, L. (2018). Taking the Long View: State Efforts to Solve Teacher Shortages by Strengthening the Profession. *Learning Policy Institute*.
- Feistritzer, C. E. (1984). *The making of a teacher: A report on teacher education and certification*: National Center for Education Information.
- Feistritzer, C. E. (1993). National overview of alternative teacher certification. *Education and Urban Society*, 26(1), 18-28.
- Feistritzer, C. E. (2005). *Profile of alternate route teachers*. Retrieved from Washington, D.C.:
- Feistritzer, C. E. (2006). *Alternative teacher certification: A state-by-state analysis*. Retrieved from Washington, D.C.:
- Feistritzer, C. E., & Chester, D. (2003). *Alternative teacher certification: A state-by-state analysis 2003*: National Center for Education Information.
- Feistritzer, C. E., Griffin, S., & Linnajarvi, A. (2011). *Profile of teachers in the US, 2011*: National Center for Education Information Washington, DC.
- Feistritzer, C. E., & Haar, C. K. (2008). *Alternate routes to teaching*: Prentice Hall.
- Feistritzer, E. (1994). *The evolution of alternative teacher certification*. Paper presented at the The Educational Forum.
- Fenstermacher, G. D. (1990). The place of alternative certification in the education of teachers. *Peabody Journal of Education*, 67(3), 155-185.
- Ferguson, R. F. (1991). Paying for public education: New evidence on how and why money matters. *Harv. J. on Legis.*, 28, 465.
- Finn Jr, C. E., & Madigan, K. (2001). Removing the Barriers for Teacher Candidates. *Educational Leadership*, 58(8), 29.
- Fountain, J. H. (2021). *The Higher Education Act (HEA): A Primer*. Retrieved from Washington, DC: <https://sgp.fas.org/crs/misc/R43351.pdf>
- Fox, L. (2016). Seeing Potential. *AERA Open*, 2(1).
- Fryer, R. G., & Levitt, S. D. (2004). Understanding the black-white test score gap in the first two years of school. *Review of Economics and Statistics*, 86(2), 447-464.
- Future, N. C. o. T. A. s. (1996). *What matters most: teaching for America's future*. New York, NY: National Commission on Teaching and America's Future.
- García, E., & Weiss, E. (2019). US Schools Struggle to Hire and Retain Teachers. The Second Report in "The Perfect Storm in the Teacher Labor Market" Series. *Economic policy institute*.
- Gershenson, S., Holt, S. B., & Papageorge, N. W. (2015). Who believes in me? The effect of student-teacher demographic match on teacher expectations. *Economics of Education Review*, 52, 209-224. doi:10.1016/j.econedurev.2016.03.002

- Gist, C. D. (2019). Grow Your Own Programs and Teachers of Color: Taking Inventory of an Emerging Field. *Teacher Education Quarterly*, 46(1), 5.
- Gitomer, D., Latham, A., & Ziomek, R. (1999). The academic quality of prospective teachers: the impact of admissions and licensure testing. Educational Testing Service, The Teaching and Learning Division Research and Data Analysis Group. In.
- Glazerman, S., Mayer, D., & Decker, P. (2006). Alternative routes to teaching: The impacts of Teach for America on student achievement and other outcomes. *Journal of Policy Analysis and Management: The Journal of the Association for Public Policy Analysis and Management*, 25(1), 75-96.
- Glazerman, S., & Tuttle, C. (2006). An Evaluation of American Board Teacher Certification: Progress and Plans. *Mathematica Policy Research, Inc.*
- Goldhaber, D. (2007). Everyone's doing it, but what does teacher testing tell us about teacher effectiveness? *Journal of Human resources*, 42(4), 765-794.
- Goldhaber, D. (2008). Teachers matter, but effective teacher quality policies are elusive. *Handbook of research in education finance and policy*, 1, 146-165.
- Goldhaber, D., & Hansen, M. (2010). Race, gender, and teacher testing: How informative a tool is teacher licensure testing? *American Educational Research Journal*, 47(1), 218-251.
- Goldhaber, D., Krieg, J., Theobald, R., & Brown, N. (2015). Refueling the STEM and special education teacher pipelines. *Phi Delta Kappan*, 97(4), 56-62.
- Goldhaber, D., Lavery, L., & Theobald, R. (2014). Uneven Playing Field? Assessing the Inequity of Teacher Characteristics and Measured Performance across Students. CEDR Working Paper. WP# 2014-4. *Center for Education Data & Research*.
- Goldhaber, D., Theobald, R., & Tien, C. (2015). The theoretical and empirical arguments for diversifying the teacher workforce: A review of the evidence.
- Goldhaber, D. D., & Brewer, D. J. (1997). Why don't schools and teachers seem to matter? Assessing the impact of unobservables on educational productivity. *Journal of Human resources*, 505-523.
- Goldin, C. (2006). The quiet revolution that transformed women's employment, education, and family. *American Economic Review*, 96(2), 1-21.
- Goodman-Bacon, A. (2021). Difference-in-differences with variation in treatment timing. *Journal of Econometrics*.
- Greenberg, J., Walsh, K., & McKee, A. (2015). *2014 teacher prep review: A review of the nation's teacher preparation programs*. Retrieved from
- Greenwald, R., Hedges, L. V., & Laine, R. D. (1996). The effect of school resources on student achievement. *Review of Educational Research*, 66(3), 361-396.
- Grissom, J. A., & Redding, C. (2015). Discretion and disproportionality: explaining the underrepresentation of high-achieving students of color in gifted programs. *AERA Open* 2(1), 2332858415622175.
- Grossman, P., Hammerness, K., & McDonald, M. (2009). Redefining teaching, re-imagining teacher education. *Teachers and Teaching: theory and practice*, 15(2), 273-289.
- Grossman, P. L., & Loeb, S. (2008). *Alternative routes to teaching: Mapping the new landscape of teacher education*. Harvard Education Press Cambridge, MA.
- Guarino, C. M., Santibanez, L., & Daley, G. A. (2006). Teacher recruitment and retention: A review of the recent empirical literature. *Review of Educational Research*, 76(2), 173-208.
- Guha, R., Hyler, M. E., & Darling-Hammond, L. (2017). The power and potential of teacher residencies. *Phi Delta Kappan*, 98(8), 31-37.

- Hammerness, K., & Reiningger, M. (2008). Who goes into early-entry programs? In P. Grossman & S. Loeb (Eds.), *Alternative routes to teaching: Mapping the new landscape of teacher education*. Cambridge, Mass.: Harvard Education Press.
- Hanushek, E. (1971). Teacher characteristics and gains in student achievement: Estimation using micro data. *The American economic review*, 61(2), 280-288.
- Hegji, A. (2021). *The Higher Education Act (HEA): A Primer*. CRS Report R43351. Updated. Retrieved from
- Henry, G. T., Purtell, K. M., Bastian, K. C., Fortner, C. K., Thompson, C. L., Campbell, S. L., & Patterson, K. M. (2014). The effects of teacher entry portals on student achievement. *Journal of Teacher Education*, 65(1), 7-23.
- Hess, F. M. (2003). *Tear Down this Wall: The case for a radical overhaul of teacher certification*. Paper presented at the White House Conference on Preparing Tomorrow's Teachers, Washington, D.C.
- Hess, F. M. (2005). The predictable, but unpredictably personal, politics of teacher licensure. *Journal of Teacher Education*, 56(3), 192-198.
- Hill, H. C., Rowan, B., & Ball, D. L. (2005). Effects of teachers' mathematical knowledge for teaching on student achievement. *American Educational Research Journal*, 42(2), 371-406.
- Holt, S. B., & Gershenson, S. (2015). The Impact of Teacher Demographic Representation on Student Attendance and Suspensions.
- Hui, T. K. (2021, June 8, 2021). Want to teach in a high school? NC may only require 1 semester of teacher prep classes. *The News & Observer*. Retrieved from <https://www.msn.com/en-us/money/careers/want-to-teach-in-a-high-school-nc-may-only-require-1-semester-of-teacher-prep-classes/ar-AAKQaBL>
- Humphrey, D. C., & Wechsler, M. E. (2007). Insights into alternative certification: Initial findings from a national study. *Teachers College Record*, 109(3), 483-530.
- Ingersoll, R., Merrill, L., & May, H. (2014). What are the effects of teacher education and preparation on beginning teacher attrition?
- Ingersoll, R. M. (2004). Four Myths about America's Teacher Quality Problem. *Yearbook of the National Society for the Study of Education*, 103(1), 1-33.
- Ingersoll, R. M., & May, H. (2012). The magnitude, destinations, and determinants of mathematics and science teacher turnover. *Educational Evaluation and Policy Analysis*, 34(4), 435-464.
- Kane, T. J., Rockoff, J. E., & Staiger, D. O. (2008). What does certification tell us about teacher effectiveness? Evidence from New York City. *Economics of Education Review*, 27(6), 615-631.
- Kelly, S., & Northrop, L. (2015). Early career outcomes for the "best and the brightest" selectivity, satisfaction, and attrition in the beginning teacher longitudinal survey. *American Educational Research Journal*, 52(4), 624-656.
- Kennedy, M. M. (1999). The role of preservice teacher education. *Teaching as the learning profession: Handbook of policy and practice*, 54-85.
- Kraft, M. A., Blazar, D., & Hogan, D. (2018). The effect of teacher coaching on instruction and achievement: A meta-analysis of the causal evidence. *Review of Educational Research*, 88(4), 547-588.
- Kutz, G. D. (2010). For-Profit Colleges: Undercover Testing Finds Colleges Encouraged Fraud and Engaged in Deceptive and Questionable Marketing Practices. Testimony before the Committee on Health, Education, Labor, and Pensions, US Senate. GAO-10-948T. *US Government Accountability Office*.

- Labaree, D. F. (2008). An uneasy relationship: the history of teacher education in the university. 290-306.
- Levine, A. (2006). Educating school teachers: Report of the education schools project. In: Washington, DC: The Education Schools Project.
- Lincove, J. A., Osborne, C., Mills, N., & Bellows, L. (2015). Teacher preparation for profit or prestige: Analysis of a diverse market for teacher preparation. *Journal of Teacher Education*, 66(5), 415-434.
- Lohman, J. (2000). *Alternative Route to Teacher Certification*. Retrieved from Connecticut:
- Malkus, N., Mulvaney Hoyer, K., & Sparks, D. (2015). *Teaching vacancies and difficult-to-staff teaching positions in public schools*. Retrieved from Washington, D.C.:
- Master, B., Sun, M., & Loeb, S. (2018). Teacher workforce developments: recent changes in academic competitiveness and job satisfaction of new teachers. *Education Finance and Policy*, 13(3), 310-332.
- Mayer, D. P., Decker, P. T., Glazerman, S., & Silva, T. W. (2003). Identifying alternative certification programs for an impact evaluation of teacher preparation. *Cambridge, MA: Mathematica Policy Research*.
- McDermott, K. A. (2005). In MINT condition? The politics of alternative certification and pay incentives for teachers in Massachusetts. *Educational policy*, 19(1), 44-62.
- McDonald, M., Kazemi, E., & Kavanagh, S. S. (2013). Core practices and pedagogies of teacher education: A call for a common language and collective activity. *Journal of Teacher Education*, 64(5), 378-386.
- McGrady, P. B., & Reynolds, J. R. (2013). Racial mismatch in the classroom: Beyond black-white differences. *Sociology of Education*, 86(1), 3-17.
- Monk, D. H. (1994). Subject area preparation of secondary mathematics and science teachers and student achievement. *Economics of Education Review*, 13(2), 125-145.
- Muñiz, J. (2020). Investing in Grow Your Own Teacher Programs: Leveraging State-Level Competitive Grants to Promote Quality. *New America*.
- NCES. (2020). *Racial/Ethnic Enrollment in Public Schools*. Retrieved from [https://nces.ed.gov/programs/coe/indicator\\_cge.asp#:~:text=In%20fall%202017%2C%20of%20the,million%20were%20American%20Indian%2FAlaska](https://nces.ed.gov/programs/coe/indicator_cge.asp#:~:text=In%20fall%202017%2C%20of%20the,million%20were%20American%20Indian%2FAlaska)
- Neumann, R. A. (1994). Reconsidering emergency teaching certificates and alternative certification programs as responses to teacher shortages. *Urban Education*, 29(1), 89-108.
- Ngoma, H. (2015). Understanding recently changed state requirements for alternate route programs. Retrieved from <https://cesp.rutgers.edu/blog/understanding-recently-changed-state-requirements-nj-alternate-route-programs>
- No Child Left Behind Act of 2001, Pub. L. No. 107-110, § 115, 1425 C.F.R. (2002).
- OPE. (2016). *Preparing and Credentialing the Nation's Teachers: The Secretary's 10th Report on Teacher Quality*. Retrieved from Washington, D.C.: <https://title2.ed.gov/Public/TitleIIReport16.pdf>
- OPEPD. (2016). *The State of Racial Diversity in the Educator Workforce*. Retrieved from Washington, D.C.: <https://www2.ed.gov/rschstat/eval/highered/racial-diversity/state-racial-diversity-workforce.pdf>
- OPPI. (2003). *Meeting the Highly Qualified Teachers Challenge: The Secretary's Second Annual Report on Teacher Quality*. Retrieved from Washington, D.C.: <https://www2.ed.gov/about/reports/annual/teachprep/2003title-ii-report.pdf>
- Paige, R. (2002). Meeting the highly qualified teachers challenge: The secretary's annual report on teacher quality. *US Department of Education*.

- Papay, J. P., West, M. R., Fullerton, J. B., & Kane, T. J. (2012). Does an urban teacher residency increase student achievement? Early evidence from Boston. *Educational Evaluation and Policy Analysis*, 34(4), 413-434.
- Partelow, L. (2019). What to make of declining enrollment in teacher preparation programs. *Washington, DC: Center for American Progress*. Retrieved December, 7, 2019.
- Partelow, L. (2019). What to make of declining enrollment in teacher preparation programs. *Center for American Progress*. <https://www.americanprogress.org/issue/s/education12/reports/2019/12/03/4773>, 11.
- Partelow, L., & Baumgardner, C. (2016). Educator Pipeline at Risk: Teacher Labor Markets after the Great Recession. *Center for American Progress*.
- Pascal, A. (1987). The Qualifications of Teachers in American High Schools.
- Peterson, P. E., & Nadler, D. (2009). What happens when states have genuine alternative certification? We get more minority teachers and test scores rise. *Education Next*, 9(1), 70-75.
- Putman, H., Hansen, M., Walsh, K., & Quintero, D. (2016). High hopes and harsh realities. Retrieved from [https://www.brookings.edu/wp-content/uploads/2016/08/browncenter\\_20160818\\_teacherdiversityreportpr\\_hansen.pdf](https://www.brookings.edu/wp-content/uploads/2016/08/browncenter_20160818_teacherdiversityreportpr_hansen.pdf)
- Residencies, N. C. f. T. (2016). *Boettcher Teacher Residency's Rural Expansion*. Retrieved from <https://nctresidencies.org/research/innovations-teacher-preparation-boettcher-teacher-residency-rural-expansion/>
- Robinson, S. (2014). *Statement on NCTQ Teacher prep review from Sharon P. Robinson*. Ed. D., AACTE President and CEO,
- Rowan, B., Chiang, F.-S., & Miller, R. J. (1997). Using research on employees' performance to study the effects of teachers on students' achievement. *Sociology of Education*, 256-284.
- Sass, T. R. (2015). Licensure and worker quality: A comparison of alternative routes to teaching. *The Journal of Law and Economics*, 58(1), 1-35.
- Shuls, J. V. (2018). Raising the bar on teacher quality: Assessing the impact of increasing licensure exam cut-scores. *Educational policy*, 32(7), 969-992.
- Suell, J. L., & Piotrowski, C. (2007). Alternative teacher education programs: A review of the literature and outcome studies. *Journal of Instructional Psychology*, 34(1), 54.
- Summers, A. A., & Wolfe, B. L. (1977). Do schools make a difference? *The American economic review*, 67(4), 639-652.
- Sutcher, L., Darling-Hammond, L., & Carver-Thomas, D. (2016). A coming crisis in teaching? Teacher supply, demand, and shortages in the US. *Learning Policy Institute. Teacher preparation policies and issues in the Higher Education Act, Report Number R45407*. (2018). Retrieved from
- Tikkanen, A. (2016). normal school. In T. E. o. E. Britannica (Ed.), *Encyclopaedia Britannica*.
- Valenzuela, A. (2017). Grow Your Own Educator Programs: A Review of the Literature with an Emphasis on Equity-Based Approaches. Literature Review. *Equity Assistance Center Region II, Intercultural Development Research Association*.
- Walker, T. (2016). Hiring non-certified teachers no way to address teacher shortage, say experts. *NEA Today: Education Policy, Teacher Recruitment and Retention*.
- Walsh, K., & Jacobs, S. (2007). Alternative Certification Isn't Alternative. *Thomas B. Fordham Institute*.
- Wilson, S. M., Floden, R. E., & Ferrini-Mundy, J. (2001). *Teacher preparation research: Current knowledge, gaps, and recommendations: A research report prepared for the US department of*

*education and the office for educational research and improvement, February 2001*: Center for the Study of Teaching and Policy.

- Xu, Z., Hannaway, J., & Taylor, C. (2011). Making a difference? The effects of Teach For America in high school. *Journal of Policy Analysis and Management*, 30(3), 447-469.
- Zeichner, K. M. (2003). The adequacies and inadequacies of three current strategies to recruit, prepare, and retain the best teachers for all students. *Teachers College Record*, 105(3), 490-519.
- Zeichner, K. M., & Hutchinson, E. A. (2008). The development of alternative certification policies and programs in the United States. In P. Grossman & S. Loeb (Eds.), *Alternative routes to teaching: Mapping the new landscape of teacher education* (pp. 15 - 30). Cambridge, MA: Harvard Education Press.