

ABSTRACT

Title of Dissertation: MUSIC TEACHER LABOR MARKETS:
THREE STUDIES ON MARYLAND EARLY-
CAREER MUSIC TEACHERS

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In these three studies, I analyze data from the Maryland Longitudinal Data System (MLDS) to investigate how labor markets for early-career music teachers are related to the ongoing music teacher shortage in Maryland. In the first study, I explore the transition from postsecondary graduation into the public-school music teacher workforce. In the second study, I examine early-career music teachers' retention and attrition patterns. In the final study, I consider the impacts of the COVID-19 pandemic on these two critical stages of the music teacher pipeline. In the final chapter, I evaluate evidence from these three studies alongside the broader teacher labor market literature to provide policy recommendations that may ameliorate the worsening music teacher shortage in Maryland.

Leveraging data from the MLDS, I used a variety of analytic strategies to describe the workforce transition of individuals who graduated from Maryland institutions of higher education with degrees in music education between 2008 and 2020 ($N = 700$). I used linear probability modeling to examine the individual factors associated with entry into the public-

school music teacher workforce in Maryland. I used descriptive statistics to examine the teaching responsibilities of new teachers and the characteristics of schools in which new teachers worked. Finally, I explored the characteristics of high schools from which the new teachers had graduated and how these characteristics compared to the schools in which new teachers were employed. Results indicated that approximately 60% of new graduates entered Maryland's public-school music teacher workforce. The majority (60%) found employment in elementary schools, and 59% taught general music as part of the instructional responsibilities. Overall, new teachers tended to come from high schools with higher overall socioeconomic status, larger student enrollment counts, and student body demographics with higher proportions of White students compared to state averages. New music teachers in Maryland also taught in schools that were a farther distance from home compared to previous national estimates for all teachers.

In the second study, I examined early-career music teachers' retention and attrition patterns between 2013 and 2020 ($N = 6,430$). On average, 74% of early-career music teachers retained their current position each year, 8% moved to a different school in Maryland, and 18% of left public school music teaching in Maryland. Teachers who moved schools tended to have different teaching responsibilities in their new position. About half of the teachers who moved schools changed the grade levels that they taught, and the vast majority of this change (77%) was to an older student population. On average, teachers tended to move to schools with higher average socioeconomic status and to schools whose demographic composition had a higher proportion of White students. I used discrete-time survival analysis to examine the teacher-, school-, and district-level characteristics associated with whether and when an individual would leave public-school music teaching in Maryland. Kaplan-Meier survivor functions showed that half of all music teachers left public-school music teaching in Maryland within their first five

years of teaching. Attrition risk was greatest in years two and three. Other factors associated with attrition risk included sex, race, ethnicity, school grade level, aspects of school culture, the student body, school and district urbanicity, and the number of teachers employed by the school district.

In the final study, I exploit the exogenous nature of the COVID-19 pandemic to explore its impact on the workforce transition and attrition of early-career music teachers in Maryland. Using an interrupted time series analysis, a quasi-experimental design that can yield causal insights, I demonstrate that attrition of early-career music teachers was likely not impacted by the pandemic. Analyses for the workforce transition were not as conclusive: There was a drop in the workforce entry rate in the first year of the pandemic, but the second year came with a sharp rebound to a much higher rate of workforce entry. Still, the number of provisionally-licensed music teachers, an indicator of shortage severity, has been increasing steadily for nearly a decade. Although media narratives have sounded the alarm on the COVID-19 pandemic's potential impact on the teacher shortage, it would be disingenuous to suggest solving pandemic-related problems would reverse the trend.

I conclude this dissertation with a discussion of policy implications for Maryland local education agencies and music teacher preparation programs. Additionally, I discuss the unique substantive and methodological contributions to the broader music education literature. Substantively, these studies provide a novel framework for examining music teacher labor markets. Methodologically, these studies illustrate a blueprint for music education researchers to leverage the rich data available within the underutilized State Longitudinal Data Systems to explore issues of access, uptake, equity, and pipelines throughout K-12 and postsecondary music education.

MUSIC TEACHER LABOR MARKETS: THREE STUDIES ON MARYLAND
EARLY-CAREER MUSIC TEACHERS

by

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Dedication

To the teachers and mentors who guided me down this path, the students who inspired me to persist, and our tenacious pursuit of a better world.

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Chapter 1. Introduction

1.0 Overview of the Document

For decades, many American schools have been unable to fill available teaching positions with qualified personnel; educational research suggests the shortage of teachers is a complex and multifaceted phenomenon. Early scholarship on the topic began to proliferate in the 1990s (e.g., Ingersoll, 1999; National Commission on Teacher and America's Future, 1997) and continues to be addressed in contemporary research. In 1992, an average of 5.1% of teachers left the profession each year (Carver-Thomas & Darling-Hammond, 2019). Throughout the 1990s, the average rate of teachers leaving the profession did not differ significantly from similar professions, such as nurses and social workers (Harris & Adams, 2007), but high rates of retirement and growing student enrollment numbers accelerated the demand for new teachers (Ingersoll, 1999). By 2008, the rate of teachers leaving the profession each year grew to 8.4%; early-career educators had much higher rates of attrition compared to mid-career, delineating an issue with the retention of newly recruited teachers (Carver-Thomas & Darling-Hammond, 2019). Throughout the 2010s, a combination of comparatively low teacher salaries following the 2009 recession, falling enrollments in teacher preparation programs, and higher rates of teacher turnover/attrition exacerbated the shortage (García & Weiss, 2019). Clearly, the problem of the teacher shortage has grown over the past decades. Presently, concerns regarding how the COVID-19 pandemic and the "Great Resignation" (Parker & Horowitz, 2022) may compound the teacher shortage warrant additional considerations. The causes of a shortage in any given area are numerous but can be conceived of as leaks along the pipeline for teacher preparation. If there are too many leaks along the pipeline, there will not be enough qualified teachers, resulting in a shortage.

Music is one such area in which teacher shortages have been identified; as many as 32 states and the District of Columbia officially designated music as a teacher shortage area between the 2011-2012 and 2020-2021 school years (Hash, 2021b), on par with shortages of qualified teachers in other subject areas. As recently as the 2021-2022 school year, the State of Maryland identified music for all grades PK-12 as a shortage area, underscoring a need for policy-relevant empirical work. Broadly, in this document I leverage data from the Maryland Longitudinal Data System (MLDS) to address the Maryland music teacher shortage by examining two critical stages of the music teacher pipeline: 1) the transition of postsecondary graduates into the teaching profession, and 2) the retention/attrition of early-career music teachers. The MLDS was established with funds from a federal grant initiative authorized under the federal Education Technical Assistance Act of 2002. The MLDS Center has a robust infrastructure for collecting, processing, and organizing census-level data for K-12 students and teachers, postsecondary students and faculty, and workforce.

As this dissertation consists of three distinct, but thematically related, studies, I structure the document as follows: in the remainder of this chapter, I first contextualize the teacher shortage phenomenon as one facet of broader teacher labor markets. Next, I consider how music teachers may experience the labor market differently than non-music teachers and discuss how the music teacher pipeline is uniquely constrained. Then, I outline the purpose of this document, the rationale for addressing this problem with three related studies, and the significance of this work. Following, I list my primary research questions and provide a rationale for using the analysis of state longitudinal data as the basis for my research design. I then discuss the scope and limitations of the current studies. In Chapters 2, 3, and 4, I report three empirical studies, each with novel contributions to the research literature. In Chapter 5, I provide a synopsis of the

three studies and policy implications for their collective significance. In this way, I examine the historical patterns of the music teacher shortage while looking forward to the future. I conclude Chapter 5 by discussing the prospects for continued use of state longitudinal data systems for music education research.

In discussing music education broadly and music teacher labor markets specifically, I consider how my positionality as a White male music educator and researcher in the academy frames my view on music education, social justice, and equity. My understanding is shaped by my experiences teaching in low-income schools and my avid support for public education. I have not personally experienced many of the issues of marginalization and exclusion discussed throughout this document; my perceptions are informed by my engagement with academic scholarship and personal interactions with friends, colleagues, mentors, and students. Thus, all that follows is but one framing that colors my interpretation of background, context, data, and results that are undoubtedly impacted by my positionality.

1.1 Identification of the problem under consideration

1.1.01 Teacher Labor Markets

Four defining attributes of the broader teacher labor market provide an important contextual understanding of the current status of teacher shortages. First and foremost, the nature of the teacher labor market is inherently local (Boyd et al., 2005; Krieg et al., 2016; McHenry-Sorber & Campbell, 2019; Reiningier, 2012). That is to say that more so than other professions, teachers tend to work and live in areas closer to where they grew up. Furthermore, teachers tend to work in schools and school districts similar to the ones they attended. This local nature necessitates that school districts experiencing teacher shortages must consider how to recruit and retain educators from within or near their district. Thus, potential pathways and strategies available to

local education agencies (LEAs) may be unique based on differences in proximity to teacher preparation programs and postsecondary attendance rates. Secondly, the teacher workforce has diversified somewhat, but the demographic composition remains disproportionately White and female (Redding & Baker, 2019; Redding & Nguyen, 2020; Reininger, 2012). Efforts to diversify the teacher workforce that consider the local nature of teacher labor markets have led a number of LEAs to adopt “grow your own” initiatives (Podolsky et al., 2019). In these initiatives, LEAs recruit current students to pursue careers as educators so that they may return to the district to teach upon completion of their teacher preparation program. Still, the homogeneity of the teacher workforce raises questions regarding barriers to equity along the teacher pipeline. Thirdly, the retention rate of teachers in their first five years of teaching is approximately 50%, although estimates from some locales have been slightly higher (Henry et al., 2012; Joiner & Edwards, 2008; Kelley, 2004; Smith & Ingersoll, 2004). Schools and districts have developed mentoring and induction programs to support beginning teachers, but the attrition from teachers in their earliest years persists. Finally, the growing teacher shortage issues have resulted in a multitude of alternative teacher certification pathways in attempts to assuage hiring difficulties and fill vacancies (Podolsky et al., 2016). When schools are unable to fill a vacancy with a qualified teacher, they must hire individuals on provisional credentials (also referred to as conditional licensure, emergency certification, or alternative pathways). The number of teachers hired on such licenses then provides a window into the severity of a shortage in any particular locale or content area (Goldhaber et al., 2021).

1.1.02 Music Teachers Labor Markets

There are several reasons why music teachers may experience labor markets differently than other teachers. Compared to the general teacher population, music teachers tend to have

fewer employment opportunities because LEAs employ a limited number of music teachers in their schools. Some schools may have only one or two music teachers, and others may split a single music teacher among multiple schools, effectively limiting the number of options for employment near a music teacher's home. Compared to non-music teachers, music teachers receive certification in a broader range for age and content areas (May et al., 2017). For example, a new music teacher may be primarily interested in teaching high school band but accept a job teaching elementary general music. It is less common for a teacher certified in secondary math, for example, to teach 3rd grade, as those content areas and grade levels require different certifications. Thus, a music teacher may leave their current position for employment in a new school with opportunities in which they are more interested. At the secondary level, music becomes elective for students. Employment for these music teachers is predicated upon having a sufficiently large enough number of students enrolled in their courses. Otherwise, an LEA may reduce the full-time equivalence of a music teacher or assign the music teacher to multiple schools. Finally, music teachers may experience the market differently because, by the time they complete their teacher preparation program and are ready to transition into the profession, they have persisted through a pipeline with multiple constraints that were not imposed on the broader teacher profession (Grisé, 2019).

1.1.03 A Constrained Music Teacher Pipeline: Leaks and Filters

In the education field, the majority of aspirant teachers formally enter the pipeline for teacher preparation upon enrollment into a four-year teacher preparation program (Barth et al., 2016), but there are several explicit points at which the music teacher preparation pipeline differs. Other content area specializations (e.g., math, science, English, social studies) are mandatory course requirements for high school graduation and college admissions, but music is

almost universally elective at the secondary level. Although students may informally engage with music outside of school in the form of playing in a band, singing-songwriting, etc., admission into a music teacher preparation program is predicated upon passing a formalized audition process, most often within a Western Art Music paradigm (Fitzpatrick et al., 2014; Grisé, 2019; Koza, 2008). The pathway to being a music teacher is then inextricably linked to first being a school music student; it is impossible to separate adolescent access and uptake to school-based ensemble music education and later becoming a qualified school music teacher. The resulting pool of potential teacher candidates for music then consists of a limited subset of individuals compared to other content areas. The pipeline differences between “aspirant music educators” (Grisé, 2019, p. 5) and their non-music counterparts necessitate a critical examination of all points in which a potential music teacher may transition into or out of the teacher preparation pathway.

The pathway toward becoming a music teacher begins long before enrolling in a teacher preparation program, and systemic barriers to access and issues of inequity are entwined with the pipeline the whole way through (Elpus, 2015; Fitzpatrick et al., 2014; Grisé, 2019). The first stage of the music teacher pipeline in the United States begins with enrollment in an ensemble-based music program, often at the elementary or middle school level, and has additional filters along the following stages: 1) application, acceptance, and matriculation into a postsecondary institution, 2) successful audition/placement into a music program, 3) persistence through degree completion, 4) entering the teaching profession, and 5) retention in the profession.

At and between each stage of the pipeline, there are what I refer to as *leaks* and *filters*. Leaks indicate an indiscriminate process resulting in an individual self-selecting out of the pipeline. Filters, on the other hand, represent structural and systemic barriers to equity; some of

these filters are covert, while others are overt. I characterize as “overt” those filters that are readily visible: perhaps a school offers fewer music opportunities for students, students lack the financial resources to participate in school music programs, or students are denied admission to a postsecondary institution based on academics, musical audition, or financial strain. Conversely, “covert” filters are more subtle to the external observer, despite being readily felt by the students being filtered out of the pipeline. Consider how leaks and filters influence the following two hypothetical students:

Emily participates in school orchestra, works hard, but cannot afford private lessons.

After a trial lesson with a university violin professor, the professor gently lets Emily know they are not yet up to the performance standards for admission and recommends taking lessons, practicing intensely, and acquiring a nicer violin before a formal audition.

Joshua is from a low-income family and spent much of their life learning programming skills to support future career aspirations. In high school, they excelled as a saxophonist and regularly participated in auditioned honors ensembles. When talking with their parents about career aspirations, they floated the idea of music education. Joshua’s parents dismissed the idea outright; they want Joshua to stick to their much more lucrative plan of computer programming and software engineering so Joshua can support them financially.

In Emily’s case, the clearly defined overt filter of failing an audition never transpired because she was covertly filtered before ever registering to audition. For Joshua, the overt filter of financial resources did not prevent them from participating in band, but financial considerations covertly filtered Joshua out of the pipeline because of family support. Discussing issues of the music teacher shortage requires scrupulous examination of these pipeline filters; through

judicious reflection, one may discern the inequitable outcomes these filters may impose upon individuals as one seeks to cultivate more equitable processes.

Potentially aspirant music teachers first enter the music teacher pipeline, or are filtered out, at the point in which music becomes elective. For most students in the United States, this occurs at the secondary level, where the most common courses available are band, choir, or orchestra (Elpus, 2017). In some extreme cases, the time at which music becomes elective may be as early as fourth grade, at which point whether or not a student will continue in ensemble music courses through high school may be determined. One observable result of the elective nature of music education in the upper elementary and secondary grades is a disparity in the representation of students by race and ethnicity (Elpus, 2022b; Elpus & Abril, 2011; 2019; Miller, 202) Consistently, demographic analyses of music students have demonstrated that those who elect music study are systematically different from those who do not elect music study. Broadly speaking, music students tend to be more White and more affluent than their non-music counterparts; these disparities are especially prevalent when comparing band and orchestra students to the general student population. Exacerbating inequity is the “significant racial inequality abyss” (Robinson & Hendricks, 2018, p. 30) of American music education; in addition to disproportionately White music teachers/teacher candidates, music education opportunities, by and large, center the White experience. These demographic analyses demonstrably underscore clear inequitable filtering at the earliest stage of the music teacher pipeline.

The next three stages, matriculation into a postsecondary institution, successful audition into a postsecondary music program, and persistence through degree completion, are potentially the moments where the inequitable filtering is most overt. Marginalized populations face additional challenges in postsecondary attendance and completion in the forms of academic,

social, and economic capital (Fitzpatrick et al., 2014). Within music programs, systematic issues of inequity in the audition process, and consequently the pre-audition lives of aspirant music teachers, are abundant. Audition preparation can be a long and arduous process, sometimes beginning well over a year prior to the audition. Often, K-12 music experiences alone do not adequately prepare students for a successful audition, and students without access to private lessons are disadvantaged in this regard (Koza, 2008). Upon entry into the music education degree program, students enroll in a rigorous academic program consisting of music theory, history, lessons/ensembles and other performance requirements, music education coursework, and general education graduation requirements. Often, many of these courses are sequential in nature with a chain of prerequisites that must be passed before progressing to the next level. Thus, failing to receive an adequate passing grade in one course may set back graduation by an entire year or dissuade one from persisting in the degree entirely.

Upon successfully completing a music education degree and obtaining teaching licensure, the next stage in the pipeline is entrance into the music teaching profession. Although most states license music teachers for all music grades PK-12 (May et al., 2017), new music teachers may have preferences for specific content areas and/or grade levels for their first teaching placement (Hellman, 2008; Kelly, 2003). Currently, the vast majority of music teacher responsibilities fall into one of four categories: general music, band, choir, or orchestra (Elpus, 2017). Even when other music courses, such as guitar, piano, or modern band are offered at a school, the teaching responsibilities for such courses tend to be added to the responsibilities of a teacher who is responsible for one or more of the primary areas. As LEAs employ a limited number of music teachers in their schools, new music teachers may have fewer employment options that match their desired grade level and content area. If there are no positions of interest open to a graduate,

or the graduate is not hired for their top choices, the graduate is faced with two options: seek employment in less desirable positions, or delay/suspend entry into the teacher workforce. Thus, while the music teacher shortage in Maryland and elsewhere indicate the availability of teacher positions, the potential mismatch between the nature of vacant positions and the career goals/interests of new music teachers may leave these vacant positions unfilled. Pipeline filtering at this stage quietly influences if and how graduates enter the workforce.

Sue recently graduated with her music education degree and is interested in teaching high school orchestra. She applied for the few vacancies in the districts around her hometown, but they were ultimately filled by other candidates. There were several other elementary general music vacancies that went unfilled, but Sue decided to delay entry into the teaching profession rather than apply for jobs that she did not find appealing.

Although this filtering may first appear to be an indiscriminate leak along the music teacher pipeline, broader systems of inequity persist absent any individual's decision. Orchestra, for example, is less likely to be offered in smaller schools and schools with a higher proportion of students receiving free/reduced lunch (Elpus, 2022a). In an instance where a student from a small high school with a high proportion of students receiving free/reduced lunch school managed to enroll in a school orchestra program and persist along the music teacher pipeline through this point, they are now faced with fewer opportunities that match their desired position compared to those from large, affluent, suburban schools. At a surface-level examination, Sue may have been characterized as too picky in her job expectations, that she self-selected out of the music teacher pipeline. However, deeper reflection on the broader structural inequities along the music teacher pipeline revealed the otherwise covert filter that prevented her entry.

The final stage of the pipeline, retention of music teachers in the teaching profession, is of paramount importance to mitigate the teacher shortage. One of the largest contributing factors to the rising demand for teachers nationally is the attrition of early-career teachers (Carver-Thomas & Darling-Hammond, 2019), a trend mirrored by music teachers (Hancock, 2008). Retaining early-career music teachers can then have the most immediate impact on the number of music teacher vacancies. A music teacher may leave the profession for a multitude of reasons, such as lack of administrative support or low teacher self-efficacy (Hancock, 2008), but retention can be improved via mentorship and collegial networks (Conway, 2002). Policy levers aimed at keeping current early-career music teachers in the profession can impact the teacher shortage with almost immediate effects.

Potential filters that push early-career music teachers out of the profession can remain covert, their operation obscured behind a web of entangled factors. Teacher gender, race, and ethnicity are generally not related to turnover decisions (Nguyen et al., 2019). Instead, several school-level factors related to job satisfaction, such as overall school climate and administrative support, are more strongly associated with a teacher's decision to leave or remain in a school (Nguyen et al., 2019; Nguyen & Springer, 2021). From an equity perspective, it may first appear that the systems that filter out new teachers are indiscriminate, with individuals varying along gender and racial/ethnic lines no more or less likely to move or leave than others. However, inequitable systems are just that: systems that permeate different structures, often invisibly or implicitly. Teachers of color are more likely to teach in schools with higher turnover rates and to teach in school districts with lower potential salary earnings (Carver-Thomas & Darling-Hammond, 2019). Policy levers to foster retention of early-career teachers should then acknowledge these barriers because “effectively retaining teachers is crucial to make sure there

are enough well-prepared and committed teachers” (Carver-Thomas & Darling-Hammond, 2019, p. 19) for *all* schools and students.

1.1.04 Great Resignation

The pandemic shocked social, economic, and education systems throughout the United States and the rest of the world. Crisis narratives sounding the alarm on teacher shortages have dominated the media (e.g., ABC News, 2022; Natandson, 2022), but emotionally compelling narratives cannot replace empirical evidence when considering policy. With an eye toward the future, the extent to which the teacher shortage has contributed towards or has been shielded from the ‘Great Resignation’ warrants investigation. What has been true regarding the teacher shortages across the country historically needs to be re-examined so that the profession may plan for the coming years.

1.1.05 A gap in the literature: policy-relevant empirical work

To date, there have been no empirical studies examining the individual workforce transition of music education graduates and retention/attrition of early-career music teachers using state-level administrative data. A recent call for such scholarship (Austin, 2022) acknowledged the capacity of such research to advance the current understanding of potential music teacher shortages. An important nuance to the issue of teacher shortages is that shortages are demonstrably localized (Thompson, 2022), and thus examinations of local contexts, such as an individual state, provide the most actionable evidence from a policy perspective. Although the results of the three studies comprising this dissertation may not be wholly generalizable to other states, they provide a methodological blueprint for how such investigations may transpire in other locales.

1.1.06 Maryland Context

Among states currently experiencing a shortage of music teachers, Maryland offers a particularly interesting case in which to examine the final two stages of the music teacher pipeline. Maryland is one of the most educated states in the country (<https://worldpopulationreview.com/state-rankings/most-educated-states>), there is broad support for education, and teacher salaries rank in the top 10 of the country (see <https://worldpopulationreview.com/state-rankings/best-states-for-teachers>). As recently as 2021, the State of Maryland passed landmark legislation to increase education funding by \$3.8 billion each year for the next decade, including opportunities for increased salary earnings among teachers, to strengthen the education system (Blueprint for Maryland's Future, 2021). Despite having in place many of the policies commonly advocated to promote teacher recruitment and retention, Maryland still has experienced a shortage of music teachers. Consequently, an examination of the final two pipeline stages in Maryland would yield pertinent insights into these critical periods within a context that is largely supportive of music teachers, disentangled from some of the factors related to pipeline attrition outside of an aspirant or current teacher's locus of control.

Among music teacher positions particularly, several distinctive characteristics of Maryland contextualize the findings from these studies. First, most LEAs in Maryland are large county-wide systems. In total, there are five large suburban LEAs that serve over 60% of the student population positioned along and around the Baltimore-Washington D.C. corridor, 18 rural county districts, and one large urban district. An important consideration about large county districts compared to smaller independent school districts is that teachers may have greater flexibility to transfer schools within a district without resigning from their current position. Prior research at the high school level has indicated that compared to national averages, Maryland

schools and LEAs offer more diverse music courses at a greater number of schools, particularly in the suburban districts (Miller, 2023). Furthermore, teachers at these high schools frequently teach more than one content area specialization, such as band and orchestra, orchestra and guitar, chorus and piano, etc. Elementary students in many Maryland schools have the option for elective ensemble music enrollment, often taught by itinerant specialists.

Finally, aspects of Maryland's state longitudinal data system, the MLDS, provide several rich analytical opportunities that are not necessarily available in other states' SLDSs. The MLDS data from MSDE contains course rostering information, which is not currently available in every state (Bloom-Weltman et al., 2021). Course rostering data allowed me to identify the exact teaching responsibilities of music teachers for the years from which course data were available (starting in 2013), rather than solely examining the school of employment and licensure area. Consequently, the music teachers examined in these studies were all teachers who actively taught music courses. The longevity of the MLDS provides another reason for which to study Maryland; postsecondary and teacher workforce data are available from as early as 2008. As the federal government first awarded grants for SLDS development beginning in 2005, Maryland has coverage spanning a broader period than many other states.

1.2 Purpose and Research Questions

The purpose of these studies was to explore the workforce transition of Maryland postsecondary music education graduates, the retention/attrition patterns of early-career music teachers, and the extent to which both were impacted by the COVID-19 pandemic. Fully understanding these dimensions of the teacher shortage necessitates understanding the systemic barriers to equity at every point. A shortage of music teachers necessarily indicates that K-12 students may be denied a high-quality music education due to societal inequities far beyond their sphere of agency. As

previously discussed, the music teacher pipeline has a multitude of filtering points, starting with access to music education. The music teacher shortage then can exacerbate inequities through a recursive cycle: the most marginalized school communities are more likely to be impacted by shortages (Gitomer et al., 2019) and denied a quality music education, thus students from these communities are filtered out of the pipeline at the earliest stages. Because teachers prefer to work close to their hometown (Boyd et al., 2005; Reininger, 2012), it can be difficult for these school communities to recruit new teachers; the recursive cycle thus continues. By examining the final two stages of the music teacher pipeline historically and with an eye toward the future, I illuminate points of equity and inequity at the stages where policy can impact the most immediate change. The following research questions guided these inquiries.

1.2.1 Chapter 2: The workforce transition of music education graduates in Maryland

RQ1: What proportion of music education graduates from Maryland postsecondary institutions enter the teacher workforce?

RQ1a: What teacher-level characteristics are associated with entry into the teaching profession?

RQ1b: What are the teaching responsibilities (i.e., band, choir, orchestra, guitar, general music, and the number of students enrolled) and characteristics of schools/LEAs (i.e., size, grade level, school demographics, urbanicity, etc.) in which new music teacher graduates obtain their first teaching assignment?

RQ1c: To what extent are the schools of new music teachers' first teaching assignments similar to their attended high school?

1.2.2 Chapter 3: Retention and attrition of early-career music teachers in Maryland: A survival analysis

RQ2: What are the retention and attrition patterns of early-career music teachers in Maryland public schools?

RQ2a: For those who move schools, what are the characteristics of the schools they leave and the schools to which they move?

RQ2b: What teacher-, school-, and LEA-level factors are associated with whether and when an early-career music teacher leaves teaching in Maryland?

1.2.3 Chapter 4: Has the COVID-19 pandemic exacerbated the Maryland music teacher shortage? Evidence from a statewide longitudinal data system

RQ3: How has the COVID-19 pandemic impacted the music teacher shortage in Maryland?

RQ3a: How has the COVID-19 pandemic impacted the workforce transition of new music education graduates in Maryland?

RQ3b: How has the COVID-19 pandemic impacted the retention and attrition patterns of early-career music teachers in Maryland?

RQ3c: How has the number of music teachers who are not certified in music changed since the start of the pandemic?

1.3 Research Design: Analysis of State Longitudinal Data Systems

To answer these questions, I leveraged data from the Maryland Longitudinal Data System (MLDS). Large government data sources, such as SLDS, are underutilized in music education research, but “analyses of large-scale government datasets can have many benefits” for music education research (Miksza, 2022, p. 363). I limited analyses to data within a singular state because broad national data obscure the variation within states, national-scale data have limited generalizability for substantive policy at the state level (Goldhaber & Holden, 2020), and the

nature of teacher labor markets are inherently local (McHenry-Sorber & Campbell, 2019; Reininger, 2012). As such, the data collected under the auspices of an SLDS are a rich source of information that can yield policy-relevant results of particular value to the state from which the data were collected.

Although exact regulations and requirements may vary by state, researchers may gain access to SLDS data by submitting a formal data/research request. SLDSs contain sensitive data, and access to data may require researchers to submit to background checks and complete security training. In some instances, an SLDS may provide a qualified researcher access to the raw data themselves, provided that the researcher satisfies all background and training requirements. If researchers have plans to engage regularly with the SLDS for ongoing research projects, the organization may establish a staff researcher position. Data and research requests must usually fit within an organization's research agenda, legislative mandate, or other sets of requirements. In many cases, obligations to an SLDS must be completed prior to work on further developed projects, such as manuscripts for publication or conference presentations.

For my ongoing work with several MLDS research projects, I have an established relationship as an MLDS staff researcher, which required a federal background check, fingerprinting, and ongoing data security training. In this capacity, I collaborate with researchers and stakeholders across the education field in the State of Maryland, leveraging MLDS data for a variety of research projects. As part of my ongoing engagement, I have a secure virtual machine through which I pull data tables from the operational data store (ODS), write coding scripts to clean and analyze data, and prepare all work for suppression review (the MLDS Center's processes of reviewing all analytical results to ensure compliance with data confidentiality to limit deductive disclosure risk). Still, all new research projects must 1) go through the formal

proposal process, and 2) comply with MLDS Center’s legislative mandate requiring that research proposals be cross-sector and cross-agency. Written research proposals to the MLDS are first submitted to the internal research team for review, followed by a formal presentation and feedback. Next, project proposals are presented to the whole research and policy advisory board, after which the board may approve or reject a research proposal. Cross-sector research constitutes research that uses data spanning across major transitions, such as K-12 to postsecondary or postsecondary to workforce. Cross-agency research constitutes research that uses data collected and reported under the responsibilities of different agencies, such as the Maryland State Department of Education, the Maryland Higher Education Commission, or the Department of Labor. At the completion of each project, I submit the MLDS Center Product, which may be a research presentation, research report, policy brief, or another artifact beneficial to the State of Maryland. All further developed work must be reviewed prior to public dissemination.

1.4 Significance

The results of these studies yielded substantive policy implications for music teacher education in the State of Maryland and unique substantive and methodological contributions to the broader music education research field. First, understanding the workforce transition of recent music education graduates provides insight into the other most immediately impactful tool to address the music teacher shortage. By addressing how many graduates find employment, the factors associated with employment, and the characteristics of schools in which they find employment, teacher preparation programs and schools/LEAs can work towards equitable placement outcomes. Secondly, understanding the labor mobility patterns of early-career music teachers provides schools, LEAs, and teacher preparation programs with invaluable insight into whether

and when a new teacher may move schools or leave public school teaching in the state. By identifying teacher-, K-12 school-, and LEA-level factors associated with such decisions, targeted policy interventions to address these factors can be explored to improve retention. Finally, the COVID-19 pandemic has pervaded nearly every aspect of life and spurred an unprecedented level of labor market movement known as the *Great Resignation* (Parker & Horowitz, 2022). Although narratives of teacher flight have dominated sensational news media (Thompson, 2022), the evidence from the present studies suggests that early-career music teachers have yet to contribute to such movement. Importantly, the present studies are limited in scope to early-career music teachers; more empirical research is needed to quantify the extent to which the teacher shortage and other aspects of music education have or have not been impacted by the pandemic.

Methodologically, this dissertation contributes to the music education scholarship field in several ways. Researchers have previously studied these issues using a variety of methods, such as survey, qualitative inquiry, and secondary analysis. Although these approaches have distinct benefits, they generally come with the tradeoff of limited capacity to inform policy. The use of SLDSs, while inherently limited based on data available within, provide an additional methodological approach with which to probe a variety of questions of broad interest to the music education research community. Currently, music education researchers have not taken advantage of the prolific data available within an SLDS. Earlier, I detailed an overview of the generalized process for gaining access to SLDS data. In each study, I document the processes for working with the data for analytic research, providing a blueprint for future research. The analytical techniques used within this document provide salient and timely contributions to the music education scholarship literature as well. Linear probability modeling provides an intuitive

interpretation for analyses with binary outcomes. Survival analysis techniques and the interrupted time series design are underutilized in music education research but may be employed in future research studies, particularly when leveraging an SLDS as the data source. In Chapter 5, I discuss how music education researchers may leverage SLDS data for future research.

1.5 Scope and limitations of the study

This study is delimited to the context and years for which relevant data are available, the State of Maryland between 2008 and 2021. General trends from previous years or other locales may be similar to those found in the current study. Although the results from this study may inform future practices and policy in Maryland and elsewhere, readers should consider how other contexts may be systematically different from Maryland. Two key limitations also must be considered. First, analyses are limited to the data observable in the MLDS. The quantitative nature of large-scale data analyses obscures the nuance and lived experiences of individuals on their pathway towards and away from music teaching. Secondly, the analyses of the music teacher pipeline within this document are limited to just the final stages of the pathway, after many potentially aspirant music teachers have been filtered out. As such, several systemic barriers along the music teacher pathway remain unexamined. To fully excavate the music teacher pipeline and remove the filters requires monumental work by all those in the music education field: researchers, teachers, teacher educators, and policymakers alike. Cultivating a truly equitable system of music education requires tenacity, perseverance, inward reflection, outward action, and coming to terms with the colonizing past and present of music education so that the profession may decolonize practices into the future. This dissertation is but one link in a long chain of scholarship past and future towards this end, one that I hope invites other scholars

to leverage the ideas and techniques contained within to pursue a more equitable music education for all students.

Chapter 2. The workforce transition of music education graduates in Maryland

2.0 Introduction

Policy briefs, media reports, and lived experiences of those in K-12 education all point toward the same issue: school districts have increasing difficulty in hiring enough qualified teachers to fill their vacant positions (García & Weiss, 2019; Sutch et al., 2016). Generally referred to as a teacher shortage, much of the empirical work on this topic has historically focused on labor market patterns of teachers currently employed (i.e., whether teachers stay in the same school, move schools but stay in the profession, or leave the profession entirely). In the past decade, however, an increased amount of scholarship on the role of teacher preparation programs has illuminated a multitude of factors that are related to decisions to pursue education degrees and enter the teacher workforce, including teacher candidate demographics, academic achievement, hometown geography, student teaching experiences specifically and teacher preparation programs broadly, as well as barriers to entry for the teaching profession, highlighting issues of equity among potential teachers.

Although there has been a growing body of evidence regarding the teacher workforce generally, there is little empirical work regarding music education graduates' entry into the teacher workforce. There are several potential reasons why music teachers may experience the teacher job market in systematically different ways compared to the general education workforce, such as the elective nature of music courses and the comparatively few number of music teachers employed by any particular school or district. These potential differences underscore the need for empirical research focusing on the transition of music education graduates into the teacher workforce (Austin, 2022). Furthermore, the labor market for teachers is local (Reininger, 2012), and thus the use of national data has substantive limitations for

informing policy at the state level (Goldhaber & Holden, 2020). Thus, the purpose of this study was to investigate factors associated with post-graduation employment in K-12 settings of those graduating with music education degrees from teacher preparation programs in the state of Maryland.

2.1 Literature Review

In this literature review, I first provide an overview of the extant literature regarding the transition into the teaching profession in the general education literature. Specifically, I summarize the literature on demographic characteristics of those who pursue careers in teaching, the impact of hometown and student teaching experiences on entry into the profession, and issues of equity for aspiring professional educators. Then, I discuss music education research related to the characteristics of music education majors and licensure candidates, including demographics, motivations for teaching, and where they want to teach. Finally, I discuss music teacher preparation programs, state licensure practices, and issues of equity in music education regarding barriers to entry for undergraduate programs and barriers to licensure/transition into the workforce.

2.1.00 General Education

2.1.01 Demographic characteristics of those pursuing careers in teaching

Redding and Nguyen (2020) analyzed data from seven waves of the National Center for Education Statistics (NCES) School and Staffing Survey (SASS) between the 1988-1989 and 2012-2013 academic years, as well as each available Teacher Follow-Up Survey (TFS), to examine changes in demographics of beginning teachers. Descriptive statistics showed the gender composition of beginning teachers changed slightly between 1988 and 2012 with a slight decrease from 26% male teachers in 1988 to 23% male teachers in 2012. Additionally, the

proportion of new teachers identifying as White was down to 80% in 2012 compared to 87% in 1988, but trends in racial/ethnic changes had stagnated since 2000. Moreover, the increase in representation of teachers of color was largely driven by increases in the number of Hispanic teachers. Finally, the academic background of new teachers has also changed. A larger portion of new teachers had a graduate degree (22% in 2012 compared to 9% in 1988), more were fully certified (96% in 2012 compared to 80% in 2000), and more attended highly selective colleges (35% in 2012 compared to 12% in 1988). Regarding the schools in which first-year teachers worked, the authors found that in recent years, new teachers were more likely to be placed in schools with higher proportions of students receiving free/reduced-price lunch (FRL) and high proportions of students of color. However, after considering broader demographic shifts within the K-12 student population, differences within student populations between new and experienced teachers were diminished in 2012 after about a decade of observed differences between 2000 and 2008.

Redding and Baker (2019) analyzed data from the 2008-2012 cohort of the Baccalaureate and Beyond Longitudinal Study to examine racial and ethnic differences in those who pursue degrees in education. This nationally representative survey was administered by the NCES to those who graduated with an undergraduate degree within the 2007-2008 academic year in three waves: the first wave was during the final undergraduate year, the second wave was in the year immediately following, and the final wave surveyed participants four years after graduation. Their dependent variables of interest were whether a graduate majored in education and whether a graduate had ever worked as a teacher, either in a full-time, supportive, itinerant, or substitute capacity. Results of their analysis indicated that White college graduates were nearly twice as likely to have majored in education compared to Black, Latinx, and other persons of color when

controlling for individual demographic, academic, socioeconomic, and institutional differences. Furthermore, even when controlling for state-level heterogeneity through fixed effects, racial/ethnic gaps in entry to the teaching field persisted: those identifying as Black had a 6.4 percentage point lower probability of entering teaching than those identifying as White, and Latinx graduates had a 2.9 percentage point lower probability of entering teaching than those identifying as White. However, when controlling for degrees in education, substantive differences between racial/ethnic groups were mostly diminished, suggesting that some of the barriers to equity within the education field begin prior to college graduation, such as matriculation into college or major selection within an institution. In line with expectations, holding a degree in education was the strongest predictor of entry into the teaching field, with education graduates 65.6 percentage points more likely to join the teacher workforce than those without education degrees.

2.1.02 Student teachers: demographics and career plans

In an analysis of prospective teachers in a large urban district, Ronfeldt et al. (2013) surveyed candidates' pre- and post-student teaching to examine how student teaching preparation and teacher characteristics impacted student teachers' career plans and self-perceptions of instructional quality ($N = 1,002$). The authors examined four student teacher cohorts from Fall 2008 to Spring 2010 and linked survey responses to district-level administrative data for each school. A large majority (81%) of candidates identified as female, 67% were White, and their average age was about 31 years old. The higher average age was possibly due to a large minority (40%) seeking a graduate degree. Overall, teacher characteristics were most closely related to career plans. For example, those identifying as White expressed lower preferences to work with underserved populations compared to Hispanic/Latinx candidates. Candidates identifying as

Black were about one-third as likely to plan on teaching for their whole career compared to White candidates. Candidates who attended high school in the same district as their student teaching placement had odds three times higher for planning to stay in that district for their whole career compared to those who attended high school in a different district. Finally, higher measures of GPA were associated with lower total planned years for teaching. Overall, school characteristics of student teaching placement did “not predict perceptions of preparedness, teacher efficacy, or career plans” (p. 328). A notable exception, however, was that candidates who student taught in schools with higher proportions of limited English proficiency students “predicted stronger preferences to teach underserved students” (p. 331). Finally, candidates with better perceptions of cooperating teacher quality and more autonomy in their teaching experiences had stronger measures of teaching efficacy at the end of their student teaching.

In additional analyses of the same data, Shirrell and Reininger (2017) examined the extent to which student teachers’ planned persistence in teaching changed throughout their internship as a function of school working conditions. Overall, 61% of student teachers did not change their planned length of teaching throughout their internship experience. When using teacher stability rates as an indicator of working conditions, student teaching in a school with the highest rates of teacher turnover predicted a lower total number of years for which an intern planned to teach. Furthermore, approximately 10% of student teachers in this sample had initially planned to teach in the same district upon graduation but, upon finishing student teaching in schools with challenging working conditions, indicated they would never plan on teaching in that district.

2.1.03 Geographic preferences of teachers: local labor markets

In a seminal study, Boyd et al. (2005) linked data for every new teacher hired in a New York State public school between 1998-2002 to information about the hometown, academic qualifications, and preparing institutions ($N = 33,465$). Using descriptive statistics and logistic regression, the authors found that teachers demonstrated a strong preference for teaching close to their hometown and locales most similar to their hometown. Based on zip code centroid distance, teachers were twice as likely to teach within five miles of their hometown compared to 20 miles away from their hometown. They were three times as likely to teach within 25 miles of their hometown compared to 80 miles away. Distance from preparing institutions was also a factor, but it was not nearly as strong a predictor as the distance from hometown. Even when controlling for distance (as well as other characteristics), teachers also had a strong preference to teach in locales most similar to their hometown. This effect was strongest for those who grew up in suburban areas: a teacher who grew up in a suburb was nearly five times as likely to work in that suburb compared to the urban portion closer to the city center, and they were about three times as likely to work in their home suburban region compared to a suburb from a different metro area.

The preference for working close to home was not a unique characteristic of teachers in New York state, but across all college graduates pursuing a career in teaching nationally (Reininger, 2012). Using the National Education Longitudinal Study of 1988 (NELS:88/00, a nationally representative two-stage stratified cluster sample of the 1988 8th grade cohort), Reininger (2012) analyzed the geographic mobility of new teachers as compared with college graduates pursuing workforce employment elsewhere. Additionally, Reininger linked data from the CCD, a public-use repository of school- and district-level data, to provide additional information about the schools that respondents attended between 1988 and 1992. Among college graduates, teachers moved substantially less far away from home compared to non-teachers: the

median distance moved by teachers was 13 miles compared to the 54-mile median distance of non-teachers. This relationship held across all urbanities; the median distance moved for teachers was consistently less than the median distance for non-teachers. Furthermore, 60% of teachers were living local to their hometown (defined as within a 20-mile radius), whereas only 42% of non-teachers were local. With respect to issues of teacher shortages, particularly in hard-to-staff schools, perhaps the most salient consequence of this study is that when conditioning on the number of high school students who earn a bachelor's degree, high schools with a higher percentage of FRL and students of color would produce as many teachers as schools with more affluent and White students. Given teachers' preference to work close to home, and the smaller portion of high school students from these areas obtaining undergraduate degrees, "the lack of local supply [of teachers] may be perpetuating the cycle in these disadvantaged schools" (Reininger, 2012, p. 141).

Whereas previous geographic studies limited analyses to hometown geography and first teaching placement, Krieg et al. (2016) also considered the geographic proximity of student teaching as a factor. Analyzing the teaching placements of 8,527 student teachers from six teacher preparation institutions in the state of Washington, Krieg and colleagues found that while proximity to hometown was a factor in first teaching placement, proximity to student teaching placement was a more powerful predictor of first teaching placement. Whereas 54.3% of newly hired teachers taught within 25 miles of their home district, about 75% of all hired student teachers taught within 25 miles of their student teaching placement. Further, interns with higher levels of academic qualifications, as measured by college GPA, were more likely to be placed in more advantaged schools/school districts. Although the relationships discussed are only associative as the analysis was descriptive in nature, the pattern of "student teaching placements"

may ostensibly “contribute to inequitable distribution of teacher” (Krieg et al., 2016, p. 365) quality across various schools or districts.

In an extension of this line of inquiry, Goldhaber et al. (2021) connected district-level teacher shortages to the geographic proximity of student teachers from 15 teacher education preparation programs in the state of Washington. To construct their analytic data set, Goldhaber and colleagues linked newly hired teacher data from the Washington State’s Office of Superintendent of Public Instruction to student teacher data from the above-mentioned preparing institutions from 2009-2017 ($N = 38,948$). First, they used the portion of new hires made on emergency credentials as a proxy for staffing shortages. Then, they specified a naive logistic regression model of the bivariate relationship between the probability of staffing a position with emergency credentials to the proportion of district teachers who hosted a student teacher the prior year. However, this model was potentially biased by spillover effects: districts adjacent to or nearby others that hosted a higher proportion of student teachers would potentially benefit from their proximity. Thus, they defined spatial-weighting matrices to account for weighted proximity to nearby districts based on the number of student teachers and the reciprocal of the distance between districts. Results indicated that for each one-percentage-point increase in the proportion of teachers who hosted a student teacher *within* that district, there was a .22 percentage-point decrease in the percentage of teachers newly hired on emergency credentials, equivalent to a marginal effect of approximately 20%. When accounting for geospatial distances, a one-percentage-point increase in the proportion of teachers hosting a student teacher *near* a district was associated with a .45 percentage-point decrease in the percentage of teachers newly hired on emergency credentials. Importantly, the within-district effect of student teachers was attenuated when accounting for district proximity, suggesting that student teaching placements

within and nearby are predictive of future staffing shortages. These results were robust to controls for proximity to teacher education programs.

National aggregate data on characteristics of the aspirant/first-year teacher workforce provide an important window into the past and present status of the teaching profession at large. Taken together, these nationally representative samples of new teachers (Redding & Nguyen, 2020) and recent college graduates (Redding & Baker, 2019; Reininger, 2012), underscored by a local examination of teacher workforce entry (Boyd et al., 2005; Goldhaber et al., 2021; Krieg et al., 2016) have revealed two critical factors. First, while the demographic composition of the teacher workforce is diversifying, it is not keeping pace with changes in student populations. Secondly, prospective teachers' hometown geography and urbanicity, their geographical preferences, and other personal/school characteristics that are unique to the career decisions of teachers pose a specific set of challenges: across the country, these amount to systemic issues nationwide regarding equity within the teacher pipeline prior to any decision to major in education, which I discuss in more detail in section 2.1.5. Importantly, student teacher intentions do not necessarily translate into actual workforce entry for a variety of reasons. To better understand the future of the teaching profession, I now examine the transition between student teaching and workforce entry. As the aggregate data may obscure trends within states and given the local nature of the teacher labor market (McHenry-Sorber & Campbell, 2019; Reininger, 2012), it is important to understand the numerous factors associated with the if and how teacher candidates may enter the profession at the district and state levels.

2.1.04 Student teachers' entry into the teaching profession

Goldhaber et al. (2014) analyzed a unique longitudinal data set from six teacher preparation programs in the state of Washington, following 8,080 teacher candidates who

completed student teaching between 1998 and 2009. Of teacher candidates in their analytic sample, 5,674 were observed as teachers in public schools, teachers in private schools, or otherwise employed in non-teacher roles in public school settings by 2011, the final observed year in the data set. Their results suggested that almost 30% of student teachers did not find employment in Washington Schools, consistent with national estimates. Because observations were right-censored, there is a chance that some student teachers delayed entry into the teaching profession for several reasons, such as family or graduate school, but would eventually return. Student teachers may also have taken positions out of state, which would not be observable in the authors' data. Goldhaber et al. used split-population models to estimate the unique impact of measured covariates on both the timing and probability of entry into the profession. Regarding characteristics of teacher candidates, younger candidates were more likely to be observed in a public-school teaching job (10-year increase associated with a 2.5 percentage point decrease in the probability of hire after 1 year, 4.0 percentage point decrease of hiring after 5 years), teacher candidates of color were less likely to be observed in a public-school teaching job (72.5% probability for White candidates, 70% probability for candidates of color, although differences were not statistically significant), and candidates endorsed in STEM fields and special education were also more likely to be hired compared to elementary teachers and secondary teachers in other fields. Characteristics of cooperating teachers were generally not predictive of entry into the profession, but characteristics of the schools in which candidates completed their student teaching were. Completing student teaching in a suburban school or a school with higher turnover rates (particularly for those candidates with higher academic credentials) led to an increased probability of hiring. In fact, 15% of all observed hires were in the school where

student teachers completed their internship, particularly in cases of high academic credentials and high turnover rates.

In a later analysis of the same data, Goldhaber et al. (2017b) found that student teaching placements may impact not only entry into the workforce but also teacher effectiveness upon entry. Specifically, they found that teachers who had completed their student teaching in a school with similar characteristics to the school of their first teaching placement were, on average, more effective (as measured by Valued-added models) than teachers who had completed their student teaching internship in a school with vastly different characteristics. Although one explanation for this result is that being prepared in a similar context provides an easier pathway to transfer the skills developed in their internship into their teaching, the endogenous nature of student teaching assignments and entry into the teacher workforce requires an abundance of caution. For example, it is also possible that teachers who perceived themselves as ineffective during their student teaching actively sought different contexts upon workforce entry. Similarly, those who perceived themselves as highly effective actively sought similar contexts. In this case, measures of teacher effectiveness would be potentially independent of the degree to which school placements matched. However, if the advantage of teaching in a school with matched characteristics holds, there would be “important ramifications in terms of equity” (Goldhaber et al., 2017b, p. 353) within student teaching placements. The authors found that teachers were much more likely to complete their internships in schools with lower proportions of FRL and underrepresented minority students, necessitating that schools with higher proportions of such students would be less able to hire teachers with internship experiences in such schools.

2.1.05 Issues of Equity - Barriers to Entry

Diversity and representation in the teacher workforce should not just be lofty ideals, but issues of deep reflection, critical thought, and a call to action. When students of color comprise about 52% of the student body, but teachers of color comprise only 20% of the workforce (MacFarland et al., 2018), those within the educational system must work to rectify current practices and policies that have disenfranchised others. Indeed, there are multiple “structural, institutional, and environmental mechanisms that uphold colonial, white supremacist ideals and work against efforts to recruit and retain [teachers of color]” (Carter Andrews et al., 2019, p. 7). One final barrier to entry for those pursuing careers in teaching prior to workforce entry is a licensure performance exam, such as the educative Teacher Performance Assessment (edTPA), which has been adopted in at least some capacity in 41 states and the District of Columbia (see https://www.edtpa.org/policy_and_accreditation). A growing body of evidence suggests that these performance exams may disproportionately impact prospective teachers of color, serving as an exclusionary gatekeeping barrier for entry into the profession (Carter Andrews et al., 2019).

The edTPA portfolio consists of video-recorded classroom teaching, artifacts of planning, instruction, and assessment, and reflective writing, often completed during the student teaching internship. The student teacher then submits the portfolio for evaluation. In an examination of the edTPA technical documentation, Gitomer et al. (2021) assessed the extent to which the assessment, rubric, and scoring practices/policies met a robust threshold of validity and reliability necessary for its high-stakes function. The authors found that despite consisting of 27 unique subject-area assessments, the technical documentation only reported aggregate information regarding validation tests. Further, much of the validation work took place in controlled lab settings “that differ substantially from operational conditions that currently exist in the field” (Gitomer et al., 2021, p. 10). This runs counter to the tenet of validity “that evidence

does not automatically generalize beyond the kinds of contexts and conditions within which the validating evidence was collected” (p. 10). Summarily, the psychometric validity of clinical lab results does not translate to real educational settings, and the validity of one subject domain does not translate to validity amongst all 27 unique assessments. Gitomer and colleagues reported issues of reliability as well: most portfolios are assessed by only a single rater, and the documentation subsequently reports misuses of *kappa* and *alpha* indices of reliability because reliability calculations did not consider the correlation of measures from a single rater. There was also a large degree of variation between subject areas, raising issues of uniform cut-scores for passing. Perhaps the most pressing issue of equity, however, comes from scoring disparities between demographic groups: on average, Black/African American candidates scored lower and closer to the pass/fail cut-score threshold compared to White candidates, with the difference amounting to .39 standard deviations. Gitomer and colleagues concluded that the use of edTPA is ill-suited for high-stakes, pass/fail demarcations for assessments of teaching readiness due to a host of technical and empirical issues.

Issues of equity in the edTPA transcend its development and documentation: Goldhaber et al. (2017a) analyzed the extent to which edTPA scores were predictive of employment and teacher effectiveness (as measured by value-added measures) using data from Washington State’s Professional Educator Standards Board and administrative data from the Office of the Superintendent of Public Instruction. The primary analytic sample consisted of candidates who took the edTPA in the 2013-2014 school year ($N = 2,362$). When using edTPA as a standardized continuous measure, a one standard deviation increase in edTPA score was associated with a 5.9 percentage point increase in the probability of employment. Results for employment probability were likely strong because passing the edTPA was consequential for licensure. That is, failing to

receive a high enough score necessarily precluded a candidate from obtaining a teaching license. Strikingly, however, was the difference in pass rates between Hispanic and non-Hispanic White candidates: while only 3.7% of non-Hispanic candidates failed after January 2014, 13.7% of Hispanic candidates failed to pass. Further, when used as a pass/fail screener, edTPA was not predictive of student math outcomes, but it was predictive of student reading outcomes. One potential explanation is that as an assessment, edTPA scores are largely predicated on a candidate's ability to write a clear narrative for the evaluator. When considered alongside issues of validity and reliability (Gitomer et al., 2021), edTPA outcomes are potentially an indicator of one's reading/writing ability in academic English more so than a measure of teacher readiness, raising further doubt about its equitable use as a screening measure for teacher readiness.

2.1.06 Summary of education literature

A plethora of empirical work has demonstrated that entry into the teaching profession is impacted by personal, geographical, and institutional factors. The demographic composition of the teacher workforce has diversified slightly, but it is not yet representative of the student population (MacFarland et al., 2018; Redding & Nguyen, 2020). Transitions from postsecondary institutions into the teaching profession are greatly impacted by the student teaching experience, both in terms of geographic location and characteristics of their host school (Goldhaber et al., 2014; Krieg et al., 2016; Shirrell & Reininger, 2017). Furthermore, individuals from marginalized populations also face potentially inequitable gatekeeping in the form of licensure examinations (Carter Andrews et al., 2019; Gitomer et al., 2021).

2.1.10 Music Education

While several similarities between educators broadly and music teachers specifically may exist, the music teacher pathway is distinct in the manner in which one enters the profession. In

this section, I examine the literature on recent licensure practices in the United States and the characteristics of music teacher licensure candidates. Then, I discuss research on issues of equity to contextualize some of the reasons why the population of music teacher candidates differs from the general teaching population. Finally, I review the literature on music education students' motivations and aspirations for teaching music. Altogether, this literature provides a contextual framework to understand how the pathway for music teachers may be unique and warrant further empirical research.

2.1.11 Motivation, Preparation, and Aspiration for Music Teaching

Although the pathway to becoming a music teacher begins long before entry into a music education program, the first formal entry point is the audition into the music/music education program. Rickels et al. (2013) surveyed prospective music education majors about their career influences ($N = 328$). Participants completed a survey on their audition day at one of eight participating institutions varying in geographic location, size, and structure. Survey items consisted of six-point Likert-type responses ranging from zero (not at all influential) to five (extremely influential) regarding experiences and individuals that influenced their interest in music education programs. The highest rated experiences were performances with a school music group ($M = 4.42$, $SD = .78$), membership in honor performance ensembles ($M = 4.37$, $SD = 1.01$), and leadership positions in their school music program ($M = 4.35$, $SD = .85$). The highest rated individuals were their high school music teacher ($M = 4.5$, $SD = 1.08$) and private lessons instructor ($M = 3.97$, $SD = 1.66$). Clearly, participants perceived their high school music experiences as highly influential.

One of the central goals for music education curricular and fieldwork experiences is to prepare preservice music teachers for their potential entry into the teaching profession. Schmidt

(2013) reviewed the literature regarding the relationship between such experiences and PMTs' beliefs on how it would impact their entry into the profession. Importantly, many of PMTs' beliefs about teaching and the type of teacher they want to be are grounded in their years of experience as a student. However, their beliefs may also be shaped by preservice preparation. Still, disparities between undergraduate coursework, observations, and student teaching experiences in the teaching methods, beliefs, and theories of teaching may be sources of frustration for these aspiring educators. This vexation is especially salient when considering that many undergraduate students were motivated to pursue careers in music because of their experiences with school music programs, particularly at the high school level (Rickels et al., 2013).

Bartolome (2017) followed a cohort of music education students from their sophomore year through their entry into the profession immediately after graduation. Using a collective case study design, Bartolome conducted in-depth interviews about the value of coursework and field experience practicums as they entered the teaching profession. Of the 18 students that initially participated in the study during their sophomore year, nine entered the teaching workforce immediately after graduation, three pursued graduate work, two delayed their graduation, one transferred out of the program, three left the profession altogether, and one worked for a regional symphony orchestra. Although all remarked that fieldwork experiences broadly were invaluable sources of learning, their student teaching experience provided the most directly transferable skills that prepared them for their first job (for those who began teaching after graduation).

Similarly, Roulston et al. (2005) examined nine new music teachers' perceptions of and experiences with their transition from student teaching to full-time educator. The new teachers most valued their practicum teaching experiences but had "mixed views as to the usefulness and

applicability of some of the course work in their teacher preparation program” (p. 73). Some had difficulty connecting their theoretical discussions with the reality of being in a classroom.

Though they had some struggles as new teachers making the transition, they were guided by both informal and formal mentors that alleviated some of the administrative and emotional difficulties. The most rewarding aspect of their first years was musical performances.

Investigations into music education majors’ motivation for pursuing a career in teaching, their institutional preparation, and their transition (or lack thereof) into the workforce raise salient questions for music teacher educators: do graduates of music education programs intend to teach, and what kinds of jobs do they aspire to hold? Hellman (2008) explored these questions by surveying preservice music teachers ($N = 152$) across six institutions in a northeastern state. Participants spanned different years in their program, with first-year students constituting 25.7% of the sample, sophomores 14.3%, juniors 28.3%, and seniors 28.3%. Participants reported their gender as female (55.9%), male (43.4%), or did not answer (0.7%). Although 94.7% of participants intended to complete their course of study and graduate with a music education degree, only 86.8% intended to “make a career of music teaching” and 63.4% intended to “teach music in schools until retirement” (p. 67). The vast majority of participants indicated they preferred to teach a musical ensemble (84.2%). Further, chi-squared tests revealed significant differences in desired teaching level across gender ($\chi^2 = 30.93, p < .01$): 68.2% of male preservice teachers indicated a preference for high school compared to 30.6% of female preservice teachers, and 4.5% of male preservice teachers indicated a preference for elementary school compared to 32.9% of female preservice teachers.

Kelly (2003) surveyed 406 undergraduate music education majors from four institutions about their personal backgrounds and preferences for job placement. Participants included eight

first-year students, 110 sophomores, 166 juniors, and 122 seniors. The majority were White ($n = 340$). Most music education majors came from large, suburban schools and rated their experience in high school highly. When asked about preferences for their first teaching assignment, there were striking similarities to the schools that participants attended: participants overwhelmingly wished to work in large ($n = 232$), suburban ($n = 190$) high schools ($n = 266$). Considerations for cultural matches between attended school and desired teaching positions must include all aspects of a prospective teacher's background, including size, location, and aspects of their musical experiences themselves.

Bruenger (2010) examined why new music teachers graduating from a Hispanic-serving institution may or may not apply to teach in an urban district as part of an action research project. The 11 most-qualified recent choral music education graduates at the institution completed a demographic questionnaire and participated in open-ended interviews. Of the 11 participants, only three applied for a teaching position within an urban district, and only one accepted a position there. Participants cited proximity to home and perceived administrative support as among the most important aspects of choosing potential districts for application. Perceived administrative support was particularly important due to a desire for high ratings at adjudicated performance, with one participant stating that her "future depends on UIL ratings and, well, I've heard nothing good from friends who are urban teachers" (p. 36). Interestingly, only half of the participants had their first job match the SES of their hometown high school, but the vast majority chose jobs that they perceived as able to match the competitive culture of their hometown high school. This underscores one way in which job preferences for music teachers may be systematically different from the general teaching population, as aspects of their school

music cultural background appear to permeate through their broader cultural background and preferences.

How do prospective music teachers weigh which factors are more important in their decision-making process? Robinson (2012) used adaptive conjoint analysis to investigate the relative importance of various factors on preservice music teachers' ($N = 187$) perceptions of characteristics they preferred in a future teaching position. Adaptive conjoint analysis is a market research technique that investigates preferences with the assumption that all decisions come with tradeoffs; a 'perfect' opportunity likely does not exist. In this method, participants first respond to a section of a survey, and their responses are used to subsequently populate a series of ratings and comparative hypothetical choices. Through these forced dichotomous decisions, preferences and factors are decomposed to construct a scale of the relative importance of each factor. Results from Robinson's study indicated that administrative support, parental/community involvement, and program sustainability were the most salient factors for preservice music teachers. In fact, administrative support was rated as significantly more important than any other factor. Participants rated student SES and demographic composition as least important on their own. However, structural inequalities within school systems have created situations such that SES and demographic composition of student bodies tend to be related to the factors preservice teachers indicated as most important.

2.1.12 Licensure Practices and Candidate Demographics

The final formal hurdle for preservice music teachers prior to transitioning into the music teacher workforce is acquiring a teaching license. The most recent examination of music teacher licensure practices across the country comes from May and colleagues (2017), where the authors conducted a comprehensive examination of licensure areas and requirements for 50 states and

the District of Columbia. As of January 2016, 32 states required the Praxis II music teacher licensure test, and 21 states used other national exams, state exams, or some combination of these. Only two states did not require some form of testing to meet licensure requirements. Upon receiving initial licensure, new teachers in 47 states receive an initial or provisional license, which would then be advanced into a standard-level certification. Advanced certification from graduate studies was offered in 32 states. Over time, age levels and content specializations for music licensure areas have broadened, and at the time of the study, 49 states offered K-12 grade level certification and 39 states offered broadly defined music as content area certification.

The first comprehensive picture of future music teachers nationally comes from an examination of music teacher licensure candidates who took the Praxis II music teacher licensure test (Elpus, 2015). Analyzing test data from 20,521 candidates who took the exam between 2007 and 2012, Elpus found that even among teachers, music teacher candidates represented only a select subset of the population. White people were significantly overrepresented among music teacher candidates (comprising 86.02% of the sample) when compared to the reported population for music teachers in the 2011-2012 NCES SASS. Additional racial/ethnic demographic percentages were as follows: 7.07% Black, 1.94% Hispanic, 1.79% Asian, .30% Native American/Alaska Native, .32% Pacific Islander, .82% Multiracial, and 1.74% Other. Additionally, 56.03% of candidates identified as female, and 43.97% identified as male. Additionally, Elpus conducted an analysis of covariance (ANCOVA) and found a statistically significant relationship between race/ethnicity and test scores, as well as a significant interaction between race/ethnicity and sex. Post hoc contrasts and predictive margins indicated that the highest average predicted score by White candidates across all attempts was 168, while the same for Black/African American candidates was 157. Overall, the highest scores were earned by

White male candidates, followed by White female candidates, Black/African American male candidates, and finally Black/African American female candidates. These results indicate a trend consistent with edTPA scores examined by Gitomer and colleagues (2021) and Goldhaber and colleagues (2017a): licensure examination practices disproportionately screen out candidates of certain demographic backgrounds, exacerbating issues of marginalization and exclusion as the trend towards more licensure examinations in music education continues (May et al., 2017).

Recently, DeAngelis (2022) analyzed data from the Integrated Postsecondary Education Data System (IPEDS) to examine the demographic characteristics of those who received a degree in music education between the 2010-2011 and 2017-2018 academic years. DeAngelis constructed a data report from IPEDS by race/ethnicity of those with degree CIP code 13.1312, the designated code for music teacher education. In total, the IPEDS report had data from 565 institutions for 26,919 graduates. After following up with 175 Title IV institutions listed on the College Music Society's directory that were absent from the IPEDS data report, DeAngelis received additional data from 40 institutions, yielding a final sample of 29,869 graduates. As with Elpus (2015), DeAngelis found that the vast majority of music education graduates (81.01%) were White. People identifying as Hispanic/Latinx constituted 6.66% of music education graduates, and people identifying as Black/African-American constituted 4.37% of graduates. Other racial demographics were as follows: Asian (2.35%), American Indian/Alaskan Native (0.46%), Native Hawaiian/Pacific Islander (0.09%), two or more races (2.11%), and unknown (2.96%). Historically Black Colleges/Universities comprised only 5% of schools in the data set, but nearly 30% of Black music education graduates were from such institutions.

2.1.13 Issues of Equity in Music Teacher Education

There are several potential reasons why the population of music teacher candidates may vary systematically compared to the general teacher population and the United States adult population. In a philosophical inquiry, Koza (2008) considered how systemic issues in the process to audition into a school of music marginalize prospective students of color. With increasingly rigorous standards of excellence for demonstrated performance in the audition screening, Koza lamented that “the school music offered in K-12 settings does not, in itself, sufficiently prepare students who aspire to attend this university” (p. 147). Despite no references being made to race regarding acceptable genre and repertoire, the acceptable canon and de facto requirement of private study mean “the possibility of becoming a public-school vocal music teacher...hinges on early access to privilege and affluence” (p. 147). Although Koza was referring to experiences with vocal students, similar notions can be extended to instrumental tracks as well.

Empirically, Grisé (2019) examined the career pathways of teachers, musicians, and music teachers using data from the High School Longitudinal Study of 2009 (HSLs). By examining whether a person was on or off a career pathway at various determinant points, Grisé illustrated systemic differences between those who were on the music teacher pathway and not, and those who persisted and attrited. At every determinant point, the proportion of White people identified on the music education pathway was higher than in the HSLs sample, although differences were not statistically significant. Additionally, the proportion of people in the highest quintile of socioeconomic status identified on the music education pathway was higher than in the HSLs cohort, with statistical significance at 11th grade and the third year of college. Ultimately, those most likely to persist on the pathway were those with “an abundance of advantageous traits, resources, and characteristics” (p. 200). Demographic and environmental

forces greatly contributed to persistence and attrition along the pathways, underscoring issues of equity in pursuit and persistence of aspirant music educators.

So, what then are the experiences of those from marginalized populations as they prepare for and enter music education degree programs? Fitzpatrick et al. (2014) conducted a collective instrumental case study with six undergraduate students to examine and reflect upon their experiences with preparation, admission, and retention within one of three music education programs at large public universities. Researchers conducted semi-structured interviews with participants, as well as a mentor from high school and university identified by each undergraduate student. Barriers for the undergraduate students included audition preparation, as well as the process of applying to and auditioning for the school. For example, the cost of private lessons to aid in preparation was prohibitive for most of the participants. However, participants were able to overcome such barriers by taking personal initiative, working hard, and dedicating themselves to their goals. Finally, the authors determined that the faculty and institution need better lines of communication and mentorship to support aspiring music educators because there is a long pipeline of compounding inequities that contribute to the systemic marginalization of certain populations.

2.1.14 Summary of music education literature

The motivations, preparation, and aspirations of prospective music teachers provide an important context to understand who pursues careers in teaching and why. Notably, these constructs may also elucidate barriers that exclude or hinder certain populations from the music teaching profession. The body of evidence discussed indicates that preservice music teachers tend to come from large, suburban schools with high levels of performance and a majority White student body, and their path was greatly influenced by their high school music teacher. They

overwhelmingly want to then teach in the same types of schools. Thus, inequitable filters exist starting from even before the point one enrolls, or does not enroll, in their first elective music course and persist along every transitional point on the music teacher pipeline.

Pipeline filters invariably contribute to a reduction in the number of aspirant music teachers seeking to enter the teacher workforce. Music education graduates represent a highly selective subset of individuals, those who persisted through the pipeline filters from elective music enrollment through postsecondary completion. The teacher shortage, however, indicates that too many aspirant music teachers are filtered out before workforce entry relative to the number and types of vacant teaching positions. The transition between postsecondary graduation and workforce entry provides a clearly defined path to examine how filters at this stage of the pipeline may or may not contribute to the music teacher shortage in Maryland.

2.1.2 Summary

Developing policy to address the current teacher shortage will necessitate understanding the transition from preservice teacher to inservice teacher. Teaching shortages and staffing difficulties are experienced inequitably depending on the locale, demographic, and socioeconomic status of any individual school or district. Teaching is a local market, but the nature of potential music teacher shortages has not been adequately addressed using comprehensive empirical methods. While a growing body of research has examined relationships between new teachers' employment preferences and their hometown/cultural background, how potential differences between teachers broadly and music teachers specifically manifest remains unclear. This paper seeks to begin addressing that gap with respect to the transition between music education degree programs and workforce entry. The research questions guiding this inquiry were as follows:

RQ1: What teacher-level characteristics are associated with entry into the music teaching profession in Maryland public schools?

RQ2: What are the teaching responsibilities and characteristics of Maryland public schools and districts in which new music teacher graduates obtain their first teaching assignment?

RQ2a: To what extent are the schools of new music teachers' first teaching assignments similar to their attended high school?

2.2 Method

I analyzed data from the Maryland Longitudinal Data System, a statewide administrative data system containing data from the Maryland Higher Education Commission, Maryland State Department of Education, and the Department of Labor. Access to data is restricted and all reported results must undergo deductive disclosure risk review (MLDS Center refers to this as “Suppression Review”). At the minimum, sample sizes must be rounded to the nearest 10, any reported percentages must be rounded to the nearest whole number, and any observed cell with fewer than 10 observations must be omitted or combined with other categories. I used data on postsecondary education from the Maryland Higher Education Commission to identify individuals who graduated with a degree in music education, college GPA, and hometown ZIP code. I used data from the Maryland State Department of Education for school- and district-level characteristics, including grade level, student enrollment, student demographic characteristics, and geographic location. I used workforce data from the Department of Labor to determine if newly credentialed teachers were observed teaching after graduation. Using these data sources, I linked music education graduates to the schools in which they were employed upon graduation (or if they were not observed teaching in Maryland public schools). Additionally, I supplemented

data from MLDS with the Common Core of Data (CCD) and the Integrated Postsecondary Education Data System (IPEDS) for additional information to aid in analyses.

Decisions made during data cleaning, such as identification of the target population, resolving duplicates, and dealing with missing data impact analytic results. As such, I document all decision rules that guided data cleaning processes. I identified individuals graduating with a degree in music education using CIP code for music education associated with the degree earned (13.1312) and codes for Maryland Approved Program Completers (MAPC, for state-approved teacher preparation programs) associated with music teaching licensure. The vast majority of music teacher candidates graduated from one of six state-approved programs: Frostburg University, Peabody Conservatory of the John Hopkins University, Salisbury University, Towson University, University of Maryland Baltimore County, and the University of Maryland (listed alphabetically). Some individuals who graduated with a music education degree pursued dual degree programs and were awarded degrees in different years or semesters. For this study, I considered their final degree conferral as their date of graduation.

The key outcome of interest for this study was entry into the music teacher workforce. I determined which music education graduates entered the teacher workforce by examining K12 staff records and K12 course enrollments. Importantly, the MLDS only contains data from public K-12 institutions. Public school systems in Maryland are comprised of five large suburban county school systems, 18 smaller county school systems, and one large urban city school system. Prior research has shown systemic differences in the number and diversity of music courses offered at the high school level between these district urbanicity groups (Miller, 2023), so I will use the same grouping system to discuss results where appropriate. Additionally, I crosschecked wage data from the Department of Labor to see if any music education graduates

received wages for employment as a teacher in a private or religious school: while there were some graduates observable teaching in private or religious schools, results are not reported due to small sample sizes, in accordance with suppression requirements in my data confidentiality agreement. I determined teaching responsibilities for all those observed teaching in public schools by screening SCED codes and lea-provided course names using regular expressions. The list of strings searched is included in *Appendix A*.

2.2.00 Empirical Strategy

2.2.01 Research Question 1: Entry into the profession

First, I conducted descriptive statistics on all those observed as new music education graduates and disaggregated by whether or not the individual was observed teaching post-graduation. I used linear probability modeling to examine what individual characteristics and characteristics of their degree-granting institution were associated with the probability of being observed teaching in public schools post-graduation. Although binary outcomes are traditionally modeled using a logit function, linear probability modeling using OLS produces regression estimates that are far more intuitive to interpret: a one-unit change in the predictor is equal to the percentage-point change in probability for that outcome. This approach is common in the economics field and was used by Nguyen (2021) to examine teacher attrition. To alleviate any reservations about OLS for binary outcomes, I include logistic regression results for the final model in *Appendix B*, demonstrating consistency between the two estimates.

Music education graduates completed their coursework clustered within their respective institutions, raising an important analytical consideration. Attendance at an institution is endogenous; that is to say, individuals non-randomly selected what institution to attend. As such, there are likely systemic differences between individuals who attended one institution as opposed

to another. Because these potential differences are not accounted for in descriptive statistics, I used a multivariate framework to examine differences in workforce entry along racial/ethnic and gender lines while accounting for this endogeneity using fixed effects. Fixed effects account for *all* variation among observed *and unobserved* characteristics at the level of the fixed effect; regression coefficient estimates are unbiased from variables at the level of the fixed effect. I examined individual characteristics, including race/ethnicity, birth-assigned sex (due to limitations in state-wide administrative data), collegiate grade point average (GPA), and whether an individual's home state was not Maryland (referred to as an out-of-state student from here on). The first theoretical model I used with institution-level fixed effects is shown in (2.1):

$$P(Teaching)_{ij} = \alpha_j + \beta_1 GPA_{ij} + \beta_2 Female_{ij} + \beta_3 \mathbf{RaceEthnicity}_{ij} + \beta_4 OutOfState_{ij} + \delta Institution_j + \varepsilon_{ij} \quad (2.1)$$

This equation models the relationship of the *i*th individual from the *j*th institution's probability of workforce entry with the above-mentioned characteristics. Cumulative GPA was observable only for academic years 2014-2020 and was not a significant predictor for being observed teaching in Maryland public schools ($\beta = -.02, p = .50$). Eliminating GPA from the model did not meaningfully change any model estimates. To maximize sample size and improve model parsimony, I removed GPA as a predictor in all subsequent models. Graduation years with subsequent workforce data observable in the MLDS range from 2008 - 2021. There is likely to be a degree of variation due to time-variant trends, such as the number of graduates belonging to any institution, the racial/ethnic composition of graduates, or the number of job openings, all of which may potentially impact results from the equation modeled in (2.1). Adding a cohort-level fixed effect allowed me to control for all observed and unobserved time-variant factors that may have biased estimates from the first model, shown in (2.2):

$$P(\text{Teaching})_{ijt} = \alpha_{jt} + \beta_1 \text{Female}_{ijt} + \beta_2 \text{RaceEthnicity}_{ijt} + \beta_3 \text{OutOfState}_{ijt} + \gamma \text{Cohort}_t + \delta \text{Institution}_j + \varepsilon_{ijt} \quad (2.2)$$

Fixed-effects regression analyses examine variation within observations clustered within groups for the fixed effect. Reported regression estimates were thus unbiased as a result of institutional and cohort year differences. For variance estimation, I clustered standard errors at the institution-by-year level.

2.2.02 Research Question 2: Characteristics of Employment

To answer research question two, I first conducted descriptive statistics on the characteristics of schools and districts in which graduates were observed teaching, including grade level, student enrollment, demographic characteristics of students, socioeconomic status, school urbanicity, job responsibilities (i.e., the music courses that the new teacher taught in their first year), distance from postsecondary institution, and distance from hometown. To improve interpretability and account for general differences in school size, demographics, and socioeconomic status due to school level/grade ranges, I computed z-scores within school level. Statewide means and standard deviations by grade level for these characteristics are included in Panel A of Table 2.3. The proportion of students receiving free/reduced lunch served as a proxy for schoolwide socioeconomic status. Distance was calculated between latitude and longitude coordinates using the `geodist` program in Stata; this program calculates geographical distance based on direct point-to-point geographical location using the haversine formula (Picard, 2010). When the latitude and longitude coordinates were unavailable, I geocoded the ZIP code centroid (following Boyd et al., 2005 and Reininger, 2012) using the `openagegeo` program in Stata to determine the coordinates (Zeigermann, 2016). To measure the distance from hometown, I first used the ZIP code associated with their application to postsecondary institution, available for 320

graduates observed teaching. I imputed a proxy measurement for 20 additional teachers using the ZIP code of the school from which they graduated, resulting in a final analytic sample for distance calculations of $n = 340$. As Reininger (2012) suggested, I first examined the distribution for distance in miles as a continuous variable, and then I constructed a binary variable set to one if the participant taught within 20 miles of their attended school and set to zero otherwise.

2.2.03 Research Question 2a: Congruence of Teaching Assignment and Home School

To answer research question 2a, I first examined the characteristics of the high school attended by music education graduates. MLDS data collection for high school began in 2007-2008, thus the attended high school was only observable for those who graduated from postsecondary starting in 2013; the analytic sample for these analyses was reduced. Additionally, graduates who did not graduate from Maryland public high schools were not observable, leaving a final sample size of $n = 280$, limited to those who entered the teaching profession and whose hometown high school was identifiable. Because not all graduates took jobs at the high school level, I computed z -scores within school-level for the following characteristics for all schools in Maryland from MLDS data: proportion of students receiving Free/Reduced Price Lunch (FRL), the proportion of chronically absent students (defined by MSDE as more than 18 absences in a given school year), school size, and the proportion of students of color. Additionally, I merged school urbanicity from the CCD. I then compared characteristics individually using the difference of the z -scores for that characteristic. I also constructed a composite measure of difference by summing the absolute values of the differences for individual characteristics. For school urbanicity, I used a dummy variable for whether the individual's employed school matched their attended high school.

2.3 Results

Due to data confidentiality restrictions, reported sample sizes in all cells are rounded to the nearest 10 and percentage points are rounded to the nearest whole number. Cells with fewer than 10 observations were combined with other categories or omitted. Results are organized by research question.

2.3.01 Research Question 1: Entry into the Profession

Descriptive statistics for the workforce entry of music education educators are shown in Table 2.1, disaggregated by year (Panel A) and by demographics (Panel B).

Table 2.1

Workforce entry of Music Education Graduates

Panel A: Workforce Entry by Year

Year	Total	Never Taught	Entered Teaching	Entered Teaching
2008	40	10	30	75%
2009	40	10	30	75%
2010	30	10	20	67%
2011	50	20	30	60%
2012	50	20	30	60%
2013	40	20	30	75%
2014	80	30	50	63%
2015	60	20	40	67%
2016	60	30	30	50%
2017	50	20	30	60%
2018	50	20	40	80%
2019	40	20	30	75%
2020	50	30	30	60%

Panel B: Workforce Entry by Demographics

Demographics	Total	Total	Never Taught	Entered Teaching	Entered Teaching
All	700	100%	300	410	59%
Sex					
<i>Male</i>	310	44%	150	160	52%
<i>Female</i>	390	56%	150	250	64%
Race/ Ethnicity					

<i>White</i>	510	73%	180	320	63%
<i>Black</i>	60	9%	20	40	67%
<i>Hispanic</i>	20	3%	10	10	50%
<i>Asian</i>	50	7%	30	20	40%
<i>Other/</i>	60	9%	50	20	33%
<i>Unknown</i>					

Note: Race/Ethnicity categories were combined to comply with suppression requirements. Hispanic refers to individuals from all racial groups that were Hispanic; other racial designations refer to non-Hispanic individuals within each group.

Across all observed years, about 59% of graduates of Maryland institutions of higher education with a degree in music education entered the teacher workforce in Maryland public schools. The number of music education graduates each year ranged between 30 and 80, and the rate of workforce transition of music education graduates varied between 50% and 80%. Importantly, some of the observed variation is due to rounding in compliance with confidentiality restrictions. Graduates identified as female entered the teacher workforce at a higher rate compared to graduates identified as male. Graduates identified as White or Black entered the teacher workforce at a higher rate than graduates identified as members of Hispanic, Asian, or other racial/ethnic groups.

Regression results for both models are shown in Table 2.2. Compared to White individuals, Asian individuals were 14 percentage points less likely to enter the teacher workforce ($p = .016$). Those belonging to other racial categories (combined to comply with suppression requirements) were 17 percentage points less likely to enter the teacher workforce compared to White music education graduates ($p = .027$). Black individuals were about 12 percentage points more likely to enter the workforce compared to White individuals, but this difference was not statistically significant ($p = .073$). Additional pairwise tests indicated that Black individuals were significantly more likely to enter the workforce compared to Asian individuals ($p < .001$). Differences between male individuals and female individuals were not

statistically significant ($p = .12$), but female individuals were more likely to enter the teacher workforce ($\beta = .05$).

Table 2.2

<i>Linear probability models for workforce entry</i>		
Characteristic	Model 1	Model 2
Female	0.06 (0.036)	0.05 (0.035)
<i>Race/Ethnicity</i>		
Black	0.11 (0.063)	0.12 (0.065)
Hispanic	0.03 (0.098)	0.01 (0.095)
Asian	-0.20*** (0.059)	-0.14* (0.058)
Other/Unknown	-0.19* (0.082)	-0.17* (0.077)
Out-of-State	-0.07 (0.057)	-0.07 (0.058)
<i>Institution Fixed Effects</i>	YES	YES
<i>Year Fixed Effects</i>		YES
Constant	0.62***	0.76***
R ²	0.167	.279

Note: Regression coefficients for LPM are shown with standard errors in parentheses.

Standard errors were clustered at the institution-by-year level. Race/Ethnicity categories were combined to comply with suppression requirements. Hispanic refers to individuals from all racial groups that were Hispanic; other racial designations refer to non-Hispanic individuals within each group. Reference group for race/ethnicity was White.

* $p < .05$; ** $p < .01$; *** $p < .001$

2.3.02 Research Question 2: Characteristics of Employment

For all individuals observed teaching in the Maryland public schools ($n = 410$), I examined the characteristics of the schools in which new music teachers were employed, shown in Panel B of Table 2.3. In Panel A, I report statewide means and standard deviations for school characteristics disaggregated by grade level.

Table 2.3*School Characteristics of newly employed music teachers*

Panel A. Statewide means and standard deviations for all schools

School Characteristics	Elementary		Middle		High	
	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>
Student Enrollment	480.27	173.65	662.01	284.80	971.05	697.64
Free/Reduced Lunch	46%	27%	49%	28%	40%	26%
Students of Color Demographic	58%	32%	63%	32%	59%	32%

Panel B: Characteristics of schools in which new teachers were employed

Characteristic	Mean
Average number of schools	1.661
<i>School level</i> [^]	
Elementary	60%
Middle	30%
High	16%
<i>School Characteristic (z-score)</i>	
School size	0.529
Proportion of students of color	0.100
Proportion of students receiving FRL standardized score	-0.032
<i>School Urbanicity</i>	
Rural/Town	13%
Suburb	73%
City/Urban	14%
<i>LEA Urbanicity</i>	
Rural/Town	45%
Suburb	53%
City/Urban	3%

Note: Statewide means and standard deviations are reported in Panel A to provide context to the z-scores in Panel B. Percentage estimates are rounded to the nearest whole number in compliance with data suppression requirements to limit deductive disclosure risk.

[^] Some teachers taught multiple school levels, so percentages do not sum to 100.

About 39% of new music teachers had teaching responsibilities in more than one school. The average number of buildings in which a new music teacher taught was 1.66 school buildings. Of new music teachers who taught in multiple schools, teachers were employed in an average of 2.85 buildings. The majority (60%) of new music teachers were employed in elementary schools, 30% were employed in middle schools, and 16% were employed in high schools (percentages exceeded 100% because of new music teachers employed at multiple schools of different levels).

When examining school level by gender, χ^2 analyses indicated that female individuals were underrepresented among new music teachers employed at the high school level ($p = .035$). The gender composition of new music teachers employed at the elementary and middle school levels was not significantly different from the composition of all new music teachers. New music teachers taught in schools with .529 standard deviations higher student enrollment than the state average for their grade level. For demographic composition, new music teachers taught in schools with a .1 standard deviation higher proportion of students of color. New music teachers taught in schools with the proportion of students receiving free/reduced-price lunch very close to the state average, approximately .03 standard deviations lower. In Panel B of Table 2.3, I report the urbanicity of schools and LEAs in which new music teachers were employed. A large majority of new teachers (73%) taught in schools defined by the CCD as “suburban.” The remainder of the new music teachers taught in schools characterized by the CCD as “Rural/Town” (13%) and “City” (14%). Examination of the district groupings identified by Miller (2023) indicated that over half (53%) of new music teachers taught in one of the five large suburban districts, 45% taught in one of the 19 rural districts, and 3% taught in the Baltimore City school district.

I report the teaching responsibilities for new music teachers in Table 2.4. The most common music course taught was general music, with 59% of all new music teachers teaching general music as part of their course load. The next most common music course taught was chorus, taught by 29% of new music teachers, followed by band (26%) and orchestra (22%). About 6% of new music teachers taught piano and guitar, and 7% of new music teachers taught non-music courses as part of their course load. In total, 43% of new music teachers taught courses in more than one content area. When comparing teaching responsibilities by gender,

female teachers were less likely to have band as part of their teaching responsibilities compared to male teachers ($\chi^2(2,1) = 8.279, p = .004$). There were no other significant differences in teacher responsibilities by gender.

Table 2.4

Teaching Responsibilities for new music teachers

Course Type	Percentage
Band	26%
Orchestra	22%
Chorus	29%
General Music	59%
Piano	6%
Guitar	6%
non-music courses	7%

Note: Percentage estimates are rounded to the nearest whole number in compliance with data suppression requirements to limit deductive disclosure risk.

Table 2.5

Distance Analyses

Distance Measure	Average
Average distance between employed school and PS Institution	26.68 mi
Average distance between employed school and home	35.20 mi
Proportion of teachers employed within 20 miles of home	13%
Proportion of teachers employed within 10 miles of home	3%

Finally, I examined the distance from postsecondary institution and hometown to new music teachers' primary school of employment, shown in Table 2.5. New music teachers ($n = 340$) were closer to their postsecondary institution ($M = 26.68$ miles) compared to their hometown ($M = 35.2$). Furthermore, only 13% of new music teachers were employed within 20 miles of their hometown. Figure 2.1 shows the distribution of distance between employment and hometown for music teachers compared to the median distance reported by Reininger (2012).

New music teachers in Maryland were employed much farther away from home compared to all new teachers nationally.

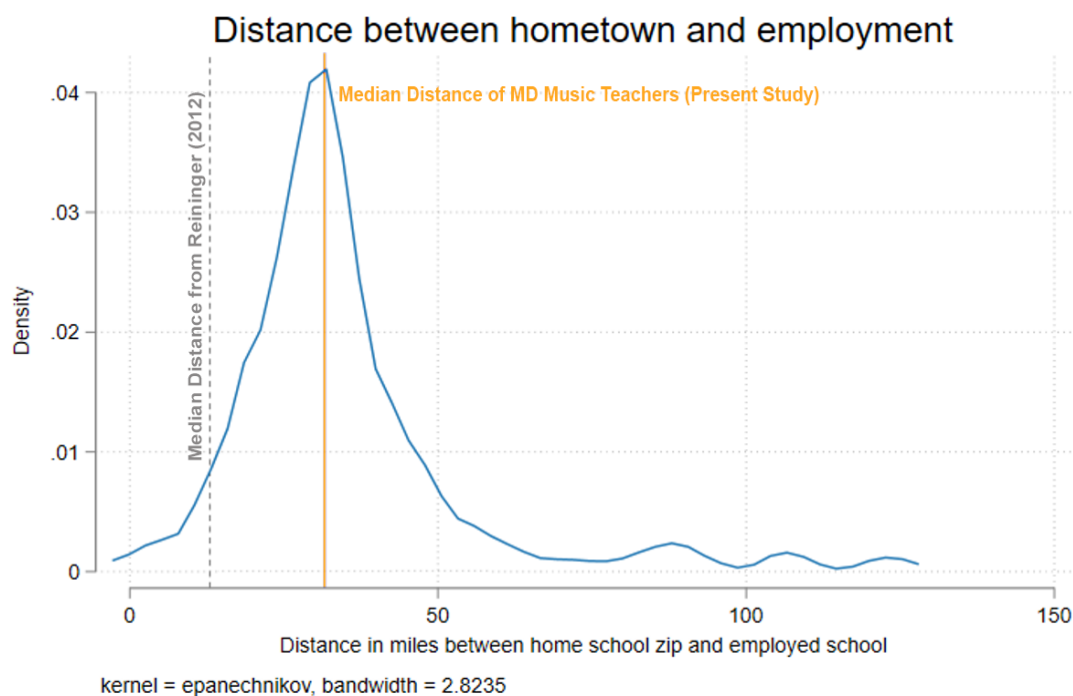


Figure 2.1 Kernel Density plot of distance between hometown and employment school compared to national median for all new teachers (Reininger, 2012)

2.3.03 Research Question 2a: Congruence of Teaching Assignment and Home School

For all new music teachers whose home school was observable ($n = 280$), I report the congruence of the high school from which they graduated with the primary school in which they were employed in Table 2.6. About two-thirds of new music teachers taught in a school with a different level of urbanicity. Compared to their hometown high school, new music teachers taught in schools with a higher proportion of students receiving free/reduced-price lunch (difference = .497 SD), a higher proportion of students who were chronically absent (difference = .423 SD), and a higher proportion of students of color enrolled (difference = .602 SD).

Furthermore, new graduates taught in schools with slightly lower enrollments (difference = -.077 SD). The composite measure of difference (calculated by summing the absolute values of individual z-score differences) was 3.308 standard deviations, indicating the new music teachers were employed in schools with characteristics substantively different than the high school they attended.

Table 2.6

<i>Standardized Mean Differences between employed School and Home School (n = 280)</i>				
School Characteristic	Mean	SD	Min	Max
Proportion of Students Receiving Free/Reduced Lunch	0.497	1.01	-1.904	3.261
Proportion of Students Chronically Absent	0.423	0.741	-1.307	3.201
Number of students enrolled	-0.077	1.074	-3.449	3.602
Proportion of students of color enrolled	0.602	1.062	-1.566	2.968
Composite measure of difference	3.308	1.735	0	8.886
Proportion of teachers employed in a school with different urbanicity	0.67	0.471	0	1

Note: z-scores were calculated using data on all schools in Maryland. Composite measure of difference was calculated by summing the absolute values of individual z-score differences.

2.4 Discussion

2.4.01 Workforce Entry

The overall observed proportion of graduates who entered public school teaching in the present study (59%) is largely consistent with national (58%, Ingersoll, 2003) and other state (64.5%, Goldhaber et al., 2014) estimates, but there were several distinct differences among characteristics associated with workforce entry among new music teachers in Maryland. For example, collegiate GPA was not significantly associated with workforce entry in the present study, nor did placement characteristics vary with GPA in any systematic way. This contrasts with prior research in Washington that found those with higher collegiate GPAs found employment in more advantaged schools compared to those with lower collegiate GPAs (Krieg et al., 2016).

Observed differences in workforce entry rates across gender and race/ethnicity raise important considerations for music teacher educators, school/LEA administrators, and researchers. Female graduates entered the workforce at a higher rate compared to male graduates, although this difference was not statistically significant in regression models. The lack of statistical significance is likely indicative of low statistical power due to sample size and the number of characteristics measured rather than the absence of any difference. In contrast to previous research (Goldhaber et al., 2014), there was no difference in workforce entry between White teachers and teachers of color generally, but there were differences between specific groups: music education graduates who were Black were more likely to enter the teacher workforce compared to music education graduates who were Asian; music education graduates who were Asian or belonged to other racial/ethnic categories (these categories were combined to comply with suppression requires under the data confidentiality agreement) were the least likely to enter the teacher workforce. Whether the observed differences were due to employment opportunities in public schools, the pursuit of other careers, continued education, or other life decisions is unknown, and the small sample size of graduates belonging to these racial/ethnic groups warrants caution in generalizing outcomes.

2.4.02 Characteristics of Employment

The new music teachers observed in the present study demonstrated vast differences regarding geographic distance from home compared to other studies (Boyd et al., 2005; Reininger, 2012). The average distance from home for new music teachers was 35.2 miles, and only 13% of new music teachers were employed within 20 miles of their hometown. These findings are in stark contrast to those by Reininger (2012), who found that 60% of new teachers nationally were employed within 20 miles of their hometown. When considering the high-

density population centers and traffic congestion throughout much of Maryland, the increased distance is likely more impactful than in other parts of the country. When considered alongside Maryland's relatively small geographic size, these two factors offer a potential clue that explains the contrasting findings: these two factors contribute to a plethora of teaching opportunities along major commuter paths. If a teacher plans to remain close to home but did not find employment in the districts nearest to them, they may accept a teaching position further away from home with the intention to move to a position in a geographically closer location. Unfortunately, this postulation was not directly testable because current residence is not observable in the MLDS. As distance between current residence and school of employment is an important predictor of a teacher's workplace satisfaction and consequently attrition risk (Nguyen & Springer, 2021), researchers examining labor markets for music teachers and the broader teacher profession in Maryland should consider this prospect.

The extent to which this phenomenon is indicative of Maryland labor markets, Maryland teacher labor markets, music teacher labor markets nationally, or a peculiarity of Maryland music teacher labor markets specifically requires further examination. Replicating the present study with an expanded sample to include graduates with education degrees in all content/grade area specializations would be particularly illustrative. Furthermore, it is also possible that broader societal shifts in recent decades have augmented workforce mobility patterns. In other words, *everyone* might be more mobile in recent years compared to the years from which data analyzed by Reininger (2012) were collected: a replication using recent national studies, such as the newest waves of the Baccalaureate and Beyond or the Beginning Postsecondary Students Longitudinal Study, could provide more context to broader mobility trends of educators and others in the national workforce.

New music teachers were employed in a school that was an average of 10 miles closer to their postsecondary institution compared to their hometown. Maryland has a high concentration of schools in suburban districts between Washington, D.C. and Baltimore city. Over 60% of Maryland public school students attend school in one of the five suburban districts along this corridor (Miller, 2023), and 52% of new music teachers taught in one of these five districts. The two institutions with the largest number of music education graduates are situated at either end of the corridor, with less than 50 miles between them. The concentration of potential employment opportunities and music education graduates within this radius may explain the average proximity to postsecondary institution. Another possible explanation could be student teaching placement. Krieg et al. (2016) demonstrated that student teaching placement was a more powerful predictor of one's first teaching assignment than one's hometown. Although student teaching placement was not observable in the MLDS data, it is conceivable that student teaching placements are likely to be more concentrated around the postsecondary institution that one is attending compared to other postsecondary institutions. These five large districts also employ the most teachers and consequently have the most opportunities to host student teachers.

The majority of new music teachers (60%) were employed at the elementary school level, and the majority of new music teachers' (59%) course load included general music. Compared to employment preferences of music education majors (Hellman, 2008; Kelly, 2003), new music teachers in Maryland were less likely to teach ensembles and less likely to teach at the high school level. Although music education degree programs may provide curricular study focused on teaching at the elementary level and teaching general music, the vast majority of academic and performance experiences within the broader music education degree program tend to be more aligned with the large-ensemble tradition, raising questions regarding the ideal balance for

a music education degree program. Importantly, a new music teacher's first job is not necessarily representative of the teaching responsibilities throughout their career. In Chapter Three, I examine mobility patterns of early-career music teachers and further discuss changes in grade level and content area specializations.

New music teachers must also be prepared to teach multiple content area specializations: about 43% of new music teachers had multiple areas of music as part of their teaching responsibility. Of new music teachers who taught more than one area of music, they taught an average of 2.4 different areas of specialization. Broadly, music teacher educators must ensure that curricula and internship experiences provide sufficiently diverse opportunities to prepare music teachers for their multitude of responsibilities. One limitation of the present study was the inability to determine a new music teacher's primary area of specialization and examine the extent to which it was related to aspects of their workforce transition. For example, if a music education graduate considered their primary background to be band but was not offered a job with band as the primary responsibility, did the graduate accept a less desirable position, accept a desirable position in another state, or delay their workforce entry? Although primary background may not be directly observable, examination of course enrollments from high school and postsecondary studies may provide a reasonable proxy, given a sufficiently long enough data collection period. As of the time of writing, course-level data in the MLDS lacks sufficient coverage for this analysis, but future replications in the MLDS or replications in states with broader coverage of course data could incorporate this information into analyses.

When comparing differences between employment characteristics by gender, there were two distinct areas in which female teachers were underrepresented, high school and band. Miller (2023) found that in Maryland, female teachers were underrepresented at the high school level,

consisting of only 42% of the high school music teacher population. In the present study, female teachers constituted 60% of all new music teachers, but only 45% of teachers placed at the high school level, consistent with previous findings. This finding indicates that inequitable gender representation at the high school level for Maryland music teachers is present from at least as early as the transition into the workforce. As the majority of high school music teachers are male, and the high school music teacher is one of the most prominent individuals in one's decision to become a music teacher (Rickels et al., 2013), lack of representation for female high school music teachers could influence the career goals of aspirant music teachers.

The employment level and teaching responsibilities of new music teachers observed in the present study are potentially indicative of the grade level and content area that experience the most turnover and thus have the most positions available for employment. If there were a comparable number of positions open for other grade level and content areas, this pattern may also be indicative of hiring preferences of building- and district-level administrators. For example, if there is an opening for a high school chorus position, the administrators might be more inclined to hire someone with teaching experience compared to a new graduate. The administrators then hire someone with experience at the elementary level, creating an open position that is then filled by the new music teacher. In this sense, the grade level change is in effect upward mobility; elementary music teachers get a so-called promotion to teach at higher grades. This finding raised an interesting question that partially motivated the study that constitutes Chapter 3 of this dissertation. I consider the results of both studies concurrently when discussing this issue further in Chapter 5.

2.4.03 Congruence of Teaching Assignment and Home School

Results indicated that the schools in which new music teachers were employed had characteristics substantively different than the high schools from which they graduated. Overall, new music teachers were employed in schools with characteristics that broadly matched the characteristics of all schools along student demographic and school urbanicity dimensions. In fact, the only dimension in which the average characteristic of a new music teacher's school varied substantively was school size, yet that difference was only about .5 standard deviations. Thus, the incongruence observed between home school and employment school characteristics is more indicative of the high schools from which new music teachers come. On average, new music teachers came from high schools with lower proportions of students receiving free/reduced-price lunch, lower proportions of students who were chronically absent, and lower proportions of students of color. These findings are consistent with prior research that found music education majors largely came from suburban, affluent, majority-White schools (Kelly, 2003). In other words, those mostly to persist on the music teacher pathway were those "with an abundance of advantageous traits, resources, and characteristics" (Grisé, 2019). Implications these findings have on the recruitment of music education majors in Maryland for both music teacher education and policy are discussed in Chapter 5.

Importantly, the present study only examined the congruence of attended high school and the school of employment, necessarily omitting music education graduates that did not enter the teacher workforce. Prior research (Rickels et al., 2013) has demonstrated how high school attributes influence the decision to major in music. Future research could examine the extent to which characteristics of one's high school, including music teacher characteristics and program size, may be associated with persistence to degree completion and entry into the teacher workforce. This research would be particularly informative to help identify and address barriers

those from underrepresented populations face in music teacher education (Fitzpatrick et al., 2014).

2.4.04 Conclusion

This study is the first to my knowledge to leverage a state longitudinal data system to examine this critical juncture of the music teacher pipeline. The music education research community would benefit from continued examination using robust quantitative methods and data sources as there are still many unknown factors that influence one's decision to enter the teacher workforce. Still, the nuance in that decision-making process cannot be ignored. Qualitative inquiry into those who do and do not enter the profession may build upon prior work (Bartolome, 2017; Roulston et al., 2006). Results from both modes of inquiry are needed to empower music teacher educators to better facilitate workforce entry of new music education graduates.

Better understanding the nuance of teacher labor markets as they relate to the workforce transition of new music teachers provides critical insight into addressing the music teacher shortage. An estimated 60% of graduates were observed entering the teacher workforce: although increasing the rate of workforce entry for graduates with music education degrees could address the teacher shortage, the consistency with other estimates spanning time and geographic locales indicates a common pipeline leak that may not be so easily addressed. Music teacher preparation programs and researchers would benefit from additional examinations into the degree completion rates of admitted music education majors, the rates of those who enter the workforce upon degree completion, and the reasons one may not enter the teacher workforce upon degree completion.

The results of this study demonstrated that several aspects of music education graduates' workforce entry were consistent with national estimates for new teachers, but also highlighted several key areas in which music teachers experience the labor market in systematically different ways. When considering solutions to address the music teacher shortage in Maryland, policymakers, LEA officials, and music teacher educators must consider these differences. In Chapter Five, I consider these results alongside findings from the following two chapters to discuss ways in which stakeholders may work together to mitigate the music teacher shortage equitably.

Chapter 3. Retention and attrition of early-career music teachers in Maryland:

A survival analysis

3.0 Introduction

Retention and attrition of new teachers is one of the most pressing matters for the national teacher shortage. Although there is some variation between states, several studies have estimated that as many as half of all new teachers leave the profession within the first five years of teaching (Smith & Ingersoll, 2004; Joiner & Edwards, 2008; Kelley, 2004). Broadly speaking, teacher turnover negatively impacts school climate, student learning outcomes, and places financial burdens on the school district (Carver-Thomas & Darling-Hammond, 2019; National Commission on Teacher and America's Future, 2017). Teacher turnover can be classified into two distinct categories: movers and leavers. Movers are teachers who stay in the profession but relocate to a different school, and leavers are those who decide to stop teaching, either temporarily or permanently.

The distinction between movers and leavers is particularly important for music teachers. Music teachers may leave the profession because of school difficulties, overall job satisfaction, or a host of other personal reasons common within the broader teaching profession. Given the broad range of age and content areas within which music teachers are typically certified (May et al., 2017), music teachers may experience teaching opportunities differently than other teachers. For example, a new music teacher may have been primarily interested in teaching high school band but accepted a job teaching elementary general music with intentions to accept a high school position if/when one is offered. It is less common for one certified to teach high school math, for example, to accept a third-grade teaching position, as those content areas and grade levels require different certifications. Thus, a music teacher may contribute to turnover because

they are moving to a new school with opportunities in which they are more interested.

Additionally, a new teacher may experience a high degree of success at a lower-profile school and seek opportunities at a school with more robust performance history and opportunities.

This paper contributes to the current empirical literature by modeling the hazard and survivor functions of early-career music teachers, providing a framework for understanding whether and when an early-career music teacher leaves the profession and the characteristics of the individual, school of employment, and teacher preparation program associated with leaving. Additionally, I explored systemic differences between stayers, movers, and leavers.

3.1 Literature review

3.1.00 General Education

The retention and attrition of early-career teachers is a complex, multifaceted issue that cannot be explained by any singularly identifiable variable (Boe et al., 1997). Still, researchers have identified three broad categories of factors that contribute to a teacher's decision to leave: teacher characteristics, their preservice preparation, and characteristics of the schools where they are employed. In this section, I first review the most salient literature on how various facets of each are related to teacher attrition in the general teacher workforce. Then, I discuss the literature on improving teacher retention. Finally, I conclude with a discussion of two papers that delve into the lived experiences of those who left the teaching profession.

3.1.01 Teacher Characteristics

In a meta-analysis, Borman and Dowling (2008) examined the results of 34 separate studies on a total of 63 attrition moderators. One of the most important findings was the U-shaped distribution of attrition along years of experience. Consistently, research has shown that the majority of teacher attrition occurs early in one's career, with a second uptick late in a career

as one approaches retirement. With criteria for vestment in retirement pensions varying across states, the curved distribution observed is more in-line with expectations compared to a discontinuity at a uniform retirement age. Further results from this meta-analysis are reported with the characteristic, odds ratio, p -value, and the number of studies that contributed to the result. Male teachers were less likely to attrit than female teachers ($OR = .77, p < .01, n = 19$). White teachers were more likely to attrit than teachers of color ($OR = 1.36, p < .01, n = 13$). Married teachers were more likely to attrit than non-married teachers ($OR = 1.40, p < .05, n = 4$). Having a new child was greatly associated with attrition ($OR = 6.69, p < .01, n = 1$). Higher academic achievement as measured by ACT (binary measure of high/low) was associated with attrition ($OR = 1.02, p < .01, n = 1$). Finally, several studies demonstrated various differences in attrition by certification area and grade level, with secondary teachers generally ($OR = 1.02, p < .01, n = 6$), and secondary science teachers in particular ($OR = 1.42, p < .01, n = 1$), significantly more likely to attrit.

A decade later, Nguyen et al. (2019) examined findings from 120 studies in an updated meta-analysis. The increase in the number of teacher attrition studies within that decade demonstrates the raising concern about attrition within the education workforce. Leveraging the proliferation of studies using longitudinal data systems, more clearly documented search protocols and inclusion/exclusion criteria, and advancements in meta-analysis methods and best practices, these results offer a more comprehensive view of the extant literature. Studies measuring the age of teachers affirmed that younger teachers were more likely to leave than older teachers, although findings were not statistically significant. When examining time in career, beginning teachers had increased odds for leaving the profession compared to veteran teachers ($OR = 1.542, p < .001, n = 13$). In contrast to Borman and Dowling (2008), there were

no differences in attrition due to gender. Nguyen and colleagues speculated that gender differences may have been true historically, but sociological changes in recent years may have mitigated such differences. Regarding race and ethnicity, results showed that Hispanic ($OR = .473, p < .001, n = 11$) and teachers of color generally ($OR = .842, p = .048, n = 12$) were less likely to attrit than White teachers, but there were no significant differences between White teachers and Black teachers. Unsurprisingly, higher career satisfaction was associated with decreased odds for attrition ($OR = .847, p = .003, n = 7$). Traditionally certified teachers were less likely to attrit than alternatively certified teachers ($OR = .526, p = .005, n = 16$).

Beyond demographics and qualifications, the relationship between retention/attrition and teacher personality is an emerging area of interest. Bastian et al. (2017) surveyed first-year teachers in North Carolina during the 2013-2014 school year ($N = 1,790$, survey response rate = 27.88%) to examine the relationship between personality type, teacher effectiveness, and retention intention. They set an alpha threshold for significance testing at $p < .10$, which, when combined with the relatively large sample size, requires a level of caution when interpreting how meaningful/substantive any results may be. The domain of conscientiousness was significantly associated with retention intentions ($OR = 1.249, p < .10$). In terms of predicted probability of return, those with the mean level of conscientiousness had an 86% probability of intending to return to North Carolina public school teaching, other factors in the model held constant. A two-standard deviation increase raised the predicted probability of intending to return by five percentage points, up to 91%. Although they suggested using a personality assessment as a component of hiring decisions to improve retention, there were several limitations to this study that warrant caution with the conclusion put forth. First, they stated this study was exploratory in nature and set a higher-than-typical alpha threshold. Secondly, one's experience while teaching

may affect both conscientiousness and retention intention, introducing a potentially spurious association between the two factors. Finally, the effect size for retention was quite small - the difference between the predicted probability for retention for those with conscientiousness measures two standard deviations above the mean (91%) was only 11 percentage points higher than those two standard deviations below the mean (80%). Given that 95% of all people will fall into this range, the authors failed to supply compelling reasons for this policy recommendation.

While the teacher market as a whole has been invariably local (Boyd et al., 2005; Reininger, 2012), understanding the geographic mobility and career retention of teachers who cross state borders is of particular importance to schools making hiring decisions, policymakers considering licensure reciprocity agreements, and teacher preparing institutions. Bastian and Henry (2015) examined the effectiveness and retention of elementary school teachers in North Carolina with less than five years of teaching experience between the 2005-2006 and 2009-2010 school years. To measure attrition, they used logistic regression with leaving as the binary outcome variable, teacher preparation as the key predictor of interest, class- and school-level covariates, and clustered standard errors. Results showed that in-state prepared teachers were significantly less likely to leave North Carolina public schools compared to their out-of-state counterparts ($OR = .464, p < .01$). One possible explanation put forth by Bastian and Henry used social capital theory: teachers initially had to move out-of-state because they were viewed as less competitive applicants in their home state (out-of-state teachers had lower value-added score than in-state, but that could be due to curricula familiarity), but return to their home-state once they have improved their experience skill set. A limitation of this study was that the destination of leavers was not observable. If out-of-state leavers consistently returned to teaching in their home state, that may support the authors' postulation.

Redding and Henry (2019) analyzed retention patterns using payroll data from North Carolina teachers with less than three years of experience between the 2009-2010 and 2011-2012 school years ($N = 13,665$). Payroll data had the distinct advantage of monthly observations, permitting the researchers to differentiate between within-year teacher turnover and between-year teacher turnover. They used a combination of discrete-time survival analysis, Kaplan-Meier survival analysis, and multinomial logistic regression to examine the impact of teacher and school characteristics on teacher turnover while considering differential patterns between the type and timing of turnover. Differentiating between movers and leavers, 40% of early-career teachers moved schools within the first three years of teaching, and 33% of early-career teachers left teaching in North Carolina. When disaggregating between in-state and out-of-state, 7% of in-state traditionally prepared teachers moved/left each year, while 9% of out-of-state prepared teachers moved/left each year. When comparing pathways, 4% of Teach for America (TFA) teachers left after their first year, the lowest attrition rate of any pathway. Teachers on other alternative certification pathways had similar retention/attrition rates to out-of-state traditionally prepared teachers. A huge caveat, however, is that by the end of two years, TFA teachers had the highest attrition rate of any pathway. Since TFA is initially a two-year commitment, this attrition pattern makes sense. It also suggests that as a policy lever to recruit high-achieving people into the teaching profession, TFA completely fails to garner positive effects on any long-term outcomes to address the teacher shortage. When coupled with the negative impacts of teacher turnover on student learning outcomes, TFA may exacerbate the problems it initially sought to address. Although most turnover occurred between school years, approximately 8% of all first-year teachers left without finishing a complete year. Female teachers were more likely to temporarily leave a school mid-year and return compared to male teachers, likely due to

maternity leave. Teachers identifying as Black were less likely to leave midyear than teachers identifying as White.

The manifestations of a teacher shortage and teacher labor market mobility are perhaps experienced most acutely at the school-district/LEA level, as geographic region, availability of resources, and school characteristics can vary drastically and impact the ability of a district to recruit and retain teachers. McHenry-Sorber and Campbell (2019) interviewed seven district personnel from five different districts in West Virginia to make sense of the ways in which districts experience and respond to staffing challenges. One of the most salient findings of this study was the different perceptions of teacher shortages between metropolitan and rural school districts. Rural leaders felt shortages were outside of local locus of control, whereas metropolitan leaders felt they possessed several policy levers to address issues as they arose, such as recruitment bonuses and salary increases to recruit/retain extra teachers. This study underscored the need to consider “the ways shortages manifest in local contexts, beyond generalized comments based on student demographics, geographic placement, and socioeconomic realities” (p. 24). Although alternative certification pathways are an increasingly prevalent tool to address staffing challenges, they are “ineffective for the neediest districts because of their distance from higher education partners and the barriers related to their geographic isolation” (p. 24). Summarily, any empirical work on recruitment, retention, and attrition of teachers with respect to staffing shortages should be coupled with a strong contextual understanding of the nuance within a state and between school districts to provide meaningful policy evaluations or recommendations.

3.1.02 Preservice Teacher Preparation

Preservice teacher preparation is traditionally the most common pathway to becoming an educator. To help address teacher shortages, a growing body of empirical work has focused on the extent to which aspects of preservice preparation programs and the post-secondary institutions themselves may be related to the retention and attrition of beginning teachers. In addition to differentiating between in-state and out-of-state traditional preparation, empirical work has also examined differences in retention due to alternative preparation programs. By identifying the most effective components of preservice preparation and certification pathways, researchers hope to expand the current framework of understanding to improve teacher retention, particularly among early-career teachers.

In a national study of beginning teachers, Meister and Melnick (2003) examined the concerns of new teachers as a way to understand the strengths and weaknesses of preservice preparation programs. This study was a follow-up to a pilot study by Meister and Jenks (2000), a qualitative inquiry examining the concerns of beginning teachers that served as the basis for questionnaire development. To recruit participants, Meister and Melnick began by mailing letters to 1,000 principals, asking them to forward an enclosed flier with the survey web link to first- or second-year teachers in their building. They conducted a second recruitment round with an additional 500 principals. Teachers ($N = 273$) represented 41 states and a variety of urbanities and school levels. Results indicated that nearly half of respondents did not feel well-prepared for administrative tasks, 84% indicated they were sometimes overwhelmed by their workload, and 64% reported difficulty handling the workload. Still, three-quarters of respondents felt their student teaching experience made them well-prepared and confident to succeed. However, it is important to note that the sample is not nationally representative. Further, the exact response rate was not able to be calculated, but 273 teachers from 1,500 schools indicates a scant sampling

frame. Finally, results may have been biased from two sources of non-response, principal and teacher. Likely, principals who forwarded the survey work with a population of teachers that are systematically different than principals who did not, and teachers who responded to the survey are likely systematically different than teachers who did not. Despite the shortcomings of this study, a window into the concerns of beginning teachers potentially indicates areas of focus for preservice teacher preparation programs and early career support/professional development.

DeAngelis et al. (2013) matched survey data from completers at 12 undergraduate teacher preparation programs ($N = 4,974$) to state administrative data to analyze the impact of teacher preparation programs and early career support on retention and attrition, examining both teacher intentions and decisions. The authors used multinomial logistic regression to differentiate between stayers, movers, and leavers while estimating the unique impact of individual variables while holding others in the model constant. To account for potential similarities across students at the institution level, all analyses estimated variance with standard errors adjusted to account for clustering at the level of the postsecondary institution attended. With staying in the same school as the base category for comparison, satisfaction with preservice preparation quality was not a significant predictor for movers, but it was a significant predictor for leavers: those with greater preservice satisfaction were less likely to leave the profession (relative risk ratio [rrr] = .53, $p < .01$). Additionally, significant predictors of lower likelihood of changing school districts included early career support in the form of mentor in the same subject area (rrr = .72, $p < .05$) and high perception of comprehensive mentorship and career induction activities (rrr = .85, $p < .001$). A comprehensive mentorship and induction program was also associated with a lower risk of leaving the profession (rrr = .80, $p < .01$).

In perhaps the most comprehensive analysis of teacher attrition by type of certification pathways, Mitani et al. (2022) delineated 13 discrete types of preparation pathways, including combinations of traditional undergraduate programs, private/public university, emergency credentials, alternative pathways (district-, school-, university-, or private organization-based), for-profit/not-for-profit status, and out-of-state preparation. In total, they examined 163 preparation programs. Leveraging statewide administrative data from Texas between 2004 and 2011, they analyzed turnover (movers) and attrition (leavers) of 141,706 beginning teachers. Kaplan-Meier survivor functions by program type indicated that traditional certification programs by public postsecondary institutions had the lowest attrition rate of any pathway. While there was variation in survivor functions between different alternative pathway types, survivor functions essentially converged after four years of teaching experience, regardless of preparation pathway. This finding emphasizes the importance of retention of early-career teachers by providing the appropriate supports to address their concerns.

3.1.03 School Characteristics

Characteristics of the schools in which a teacher works may also significantly impact retention decisions. Returning to the meta-analysis by Borman and Dowling (2008), school attributes moderated individual teachers' attrition probability. Teachers were more likely to attrit if they taught in schools with higher enrollments of low socioeconomic status students ($OR = 1.05, p < .01, n = 6$). A one-percentage-point increase in students on FRL was associated with an increase of one percent in odds for attrition ($OR = 1.01, p < .01, n = 8$). Teachers were more likely to leave if they taught in schools with a higher enrollment of students of color; a one-percentage-point increase in students of color was associated with an increase of three percent in odds for attrition ($OR = 1.03, p < .01, n = 7$). In the meta-analysis by Nguyen et al. (2019), better

teacher working conditions were associated with greatly reduced odds for attrition ($OR = .557, p = .031, n = 5$), as were higher levels of administrative support ($OR = .796, p < .001, n = 13$). Finally, induction and mentoring for beginning teachers substantively reduced attrition ($OR = .767, p < .001, n = 11$).

Weiss (1999) used data from the 1987-1988 and 1993-1994 waves of the Schools and Staffing Survey (SASS), a nationally representative survey from the United States Department of Education, to analyze the relationships between planned retention for first-year teachers and workplace conditions. Sample respondents for the first wave were 2,676 first-year teachers, and sample respondents for the second wave were 2,412 first-year teachers. To measure planned retention, the author used the survey item asking, “How long do you plan to remain in teaching?” (p. 864). Independent variables included survey items for teacher demographics, academic background, and school characteristics. Perceptions of school leadership and school culture, as well as teacher autonomy, were positively associated with planned retention.

More recently, Kim (2019) analyzed the relationship between principal leadership and teacher turnover using the Beginning Teacher Longitudinal Survey (BTLS), which followed beginning teachers from the 2007-2008 SASS study for five years ($N = 1,990$). The BTLS is nationally representative when including survey weights in analyses. Kim constructed a measure of perceived principal leadership by averaging and standardizing Likert-type survey responses from data collection waves one, three, four, and five. The survey in wave two did not include aspects of principal leadership, so lagged values from the first wave were imputed as a proxy. The primary dependent measures were changing schools or leaving the profession. Plots for the Kaplan-Meier survivor curve and Nelson-Aalen cumulative hazard functions provided insight into the magnitude and timing of attrition: only 69% of beginning teachers worked at their

original school by the end of year one. By the end of the fifth year, only 35% of the cohort remained at their school. Estimates for remaining in the profession were higher; about 92% of teachers stayed in teaching as a second-year teacher, and 78% persisted through the fifth year. Using discrete-time survival analysis, Kim analyzed relationships between each measure of attrition, principal leadership, and a vector of control variables for teacher and school characteristics. Perceptions of higher quality principal leadership were associated with lower odds of attrition. The most salient aspect of principal leadership was student behavior management, and principal leadership overall mediated impacts of school culture, such as discipline and attendance.

The relationship between aspects of school leadership/administrative support and teacher retention has been consistently found within different teacher cohorts. Nguyen (2021) used data from four waves of the SASS (1999-2000, 2003-2004, 2007-2008, 2011-2012) with corresponding Teacher Follow-Up Survey (TFS) the next year. Additionally, analyses were supplemented with the Common Core of Data (CCD). For these analyses, Nguyen differentiated between those who stayed in the profession but changed schools (switchers), those who left teaching (leavers), and a composite measure of those who contribute to turnover (movers) as three discrete outcomes. It is important to clarify that Nguyen's conception of movers differs from other literature previously discussed, instead using the term switchers. Further, Nguyen used linear probability modeling with ordinary least squares (OLS) regression even though the outcome was binary (Nguyen provided logistic and multinomial models as a robustness check). While binary outcomes are traditionally modeled with logistic regression, the use of OLS on binary outcomes is quite common in some economic fields and carries a distinct advantage of ease of interpretation for regression coefficients: a one-unit change in the predictor variable is

associated with a percentage-point change in probability equal to the regression coefficient. As odds ratios can obscure interpretation and are often converted to marginal probabilities, the use of OLS here greatly simplified this process. All analyses employed sample weights, standard errors were robust to heteroskedasticity, and predictors were converted into standardized z -scores. Results showed that perceived administrator support ($\beta = -.013, p < .01$), degree of teacher cooperation in the school ($\beta = -.009, p < .01$), and principal effectiveness ($\beta = -.008, p < .01$) were all strong predictors of teacher mobility. From a school principal's standpoint, the effect of a teacher leaving the profession or switching schools is the same; the principal has lost a teacher and must replace them, even though the teacher's reason for mobility may be vastly different. However, findings in the aggregated 'movers' measure of turnover were largely consistent with the disaggregated analyses of switchers and leavers. Results were robust to additional cohort and state fixed-effects specifications and models with charter schools.

Turning to a state-level analysis, Loeb et al. (2005) examined the relationship between teaching conditions and teacher turnover in the state of California. California teachers from 370 school districts were surveyed in January 2002 ($N = 1,071$). They linked survey responses to district-level salary data, including the minimum salary offered, the entry salary for most credentialed teachers, and an advanced salary level for those with 60 credits beyond bachelor's degree coursework. Then, they adjusted salary measures for cost-of-living at the county level and included measures of average county income for analyses. Other measures of workplace conditions were developed from survey responses using factor analysis to develop two predictor variables: perceptions of teaching conditions and optimism for school future. Attrition was not directly observable, so the proportion of teachers in a school that was in their first year of teaching served as a proxy indicator. Student demographics were a key predictor of turnover;

high proportions of students of color were associated with an increased proportion of first-year teachers. Affluent, majority-White schools tended to hire teachers with experience, while less privileged schools tended to hire first-year teachers. However, working conditions and salary were also substantial predictors of turnover, and together, they mitigated the impact of student demographics. Schools with more students of color also tended to be schools with fewer resources and lower relative salaries. Loeb and colleagues concluded that improving retention of first-year teachers “may require improvements in both salaries and working conditions and that these improvements have the potential to overcome differences in schools’ abilities to hire and retain teachers that have been associated with their students’ characteristics” (p. 67).

Within a singular district as a model of local teacher labor markets, Boyd et al. (2011) also found a strong relationship between working conditions and teacher retention patterns. In Spring 2005, they administered a survey to all first-year teachers in New York City and received a 70% response rate ($N = 4,360$). They followed up with the same teachers one year later and matched survey responses to administrative data to link additional school characteristics for analyses. Boyd and colleagues used multinomial logistic regression to compare three outcomes: stayers (those who remained in the same school), movers (those who transferred to another school in New York City), and leavers (those who left New York City Schools, although they potentially remained in the teaching profession). Overall working conditions were predictive of teacher attrition, particularly the indicators of administrative support for both moving within the district ($rrr = .552, p < .001$) and leaving the district ($rrr = .691, p < .01$).

3.1.04 Improving Retention

The continually developing body of empirical research on early-career teacher attrition implores policymakers, school districts, and teacher education programs to consider how to

improve teacher retention. Much of the empirical work has focused on developing a robust program of induction and mentoring for beginning teachers (Joiner & Edwards, 2008). In their review of the literature on induction/mentoring programs, Joiner and Edwards concluded that induction and mentoring programs should support beginning teachers' social, emotional, and curricular needs. Although many induction programs they reviewed addressed the first two, curricular mentorship was often overlooked in favor of socialization. It is important to understand the local context of individual schools and districts; there is no silver bullet or panacea of mentorship programs that would uniformly work for all settings. As such, "induction programs need to be tailored to meet the needs of individual [school districts]," and schools must also have "a positive climate and culture that will support the induction of new teachers" (p. 49).

Professional development programs can be one way to address the curricular support component of induction programs. Ado (2013) examined how action research projects impacted early-career teachers' perceptions of support and learning in a new urban high school. Out of 34 early-career teachers in the high school, 26 participated in a qualitative research study as they engaged in school-wide action research for professional development. Importantly, the majority of teachers at this school were early-career teachers. Data collection consisted of classroom observations and informal interviews throughout two cycles of action research projects. Positive outcomes of action research were the development of a supportive professional culture, context-specific support, and feelings of empowerment. Teachers collaborated to support each other with curricular and administrative needs that they felt were most important to them. Some teachers also felt overwhelmed by the action research project, burdening themselves with added responsibilities while already feeling overextended. Although not directly observable in the current study due to research design and timeline, the joint efforts for "solving classroom or

school-specific challenges can result in meaningful professional relationships that help retain early-career teachers” (p. 144). In this sense, the professional network available to early-career teachers may warrant further attention in empirical work.

In a survey study by Miller and Youngs (2021), school culture was also the driving force in retention/attrition of first-year teachers. Miller and Youngs used person-organization fit as a framework to investigate issues related to teacher retention and attrition. As part of a longer, four-year longitudinal mixed-methods study, 159 teachers completed a teacher retention survey. Participants were program completers from one of five teacher-preparing institutions across three states. Regression analyses for quantitative survey responses using cohort and institution fixed effects revealed that beginning teachers’ perception of their fit with other colleagues was the strongest predictor of teacher retention. A teacher’s sense of belonging and the congruence of their values with those of the school and their colleagues were more important than other teacher- and school-level characteristics commonly examined in the extant empirical literature.

In a study of novice teachers’ experiences, Fantilli and McDougall (2009) examined the challenges and supports perceived by graduates of a two-year teacher preparation program. They used a sequential explanatory mixed methods design. In the first quantitative strand, they surveyed 54 program completers. In a nested sample, they selected five teachers for participation in the second qualitative strand. Survey responses indicated that the new teachers found many aspects of the job challenging, including meeting the needs of students with special needs, lack of classroom resources, classroom management, curricular planning, and communication with parents and administrators. Sixteen of the survey participants indicated they were assigned formal mentors, and 24 participants reported having an informal mentor. Participants with mentors (formal or informal) reported a much lower degree of challenge due to

parental/administrative communication. Major findings from the case studies revealed the full extent to which mentorship support mattered; mentors assisted the new teachers with navigating the complexities of their social, administrative, and curricular responsibilities. Mentorship effectiveness was predicated upon district support and professional development, particularly regarding the mentor-mentee relationship.

Outside of the school building, teacher salaries are a potential policy lever to promote the retention of early-career teachers. In a policy brief, Dee and Goldhaber (2017) provided a set of complementary policy proposals that could work together to address teacher shortages in hard-to-staff subject areas and hard-to-staff schools. They discussed several studies involving the use of teacher salary as a mechanism for teacher recruitment and retention. As “the local, segmented nature of teacher labor markets is important to consider when addressing shortages” (p. 11), and most teachers who change schools stay within state boundaries, increasing wages in less affluent areas to create parity with higher-paying districts can mitigate the desire to move schools.

Interestingly, they found that higher salaries are more effective for the retention of teachers, but less effective as far as recruiting new teachers. Although they use this evidence to suggest that broad salary raises for all teachers would be an ineffective use of resources, I would argue that any policy lever aimed at new-teacher salary for recruitment would not yield observable outcomes for a lag period of at least four years. The decision to major in education and pursue a career in teaching necessarily precedes one’s entry into the teaching profession, often by a number of years to account for the 4-year traditional degree program for teacher preparation. Thus, most people on the pathway toward teaching would not be immediately affected by a policy change for entry, but those in their earliest years of the profession could be enticed to stay.

3.1.05 Those who left

Qualitative inquiries of those who left the teaching profession provide an invaluable narrative context to supplement quantitative analyses. Gallant and Riley (2014) conducted a phenomenological inquiry to investigate attrition of early-career teachers ($N = 9$). Semi-structured interviews and unprompted, written ‘leaving narratives’ from teachers who left the classroom within five years elucidated pertinent issues that influenced attrition decisions. Participants cited aspects of school culture as primary factors, particularly regarding administration. Lack of emotional support and trust from administrators contributed to a negative and toxic school climate. Frequent administrator migration made developing lasting relationships between teachers and administrators challenging. Although these teachers entered the profession with “a desire to make a better future through education” (p. 569), the difficulties they experienced, and lack of growth/direction led to a “protracted and cumulative” (p. 574) decision to leave. Teachers may not have one singular moment that serves as an impetus to leave, but rather face enduring hardships without requisite help and support that gradually build to their exit.

3.1.06 General Education Summary

Early-career teacher attrition poses a substantive challenge in addressing the growing teacher shortage. Beyond the economic costs of training, recruiting, and developing new teachers, high levels of turnover negatively impact school culture and student learning. Although the number of factors that contribute to teacher attrition complicates empirical study and limit researchers’ ability to draw causal inferences, the sheer volume of descriptive quantitative work colored by the narratives of teachers who have left provide important insights into the issue. Particularly, teachers need the physical, social, and emotional resources to acclimate to their new job. Supportive administration teams and collegial relationships contribute to a positive school

climate, while mentoring and induction programs offer new teachers the necessary outlets to connect with others, expanding their professional network and providing pathways for professional development and personal growth.

3.1.10 Music Teachers

3.1.11 Music Teacher Mobility and Burnout

Although the general education literature on early-career teacher attrition is more extensive than music teachers specifically, music education researchers have completed several national-scale investigations using SASS and TFS data. For example, Hancock (2008) analyzed the 1999-2000 wave of SASS in the first nationally representative empirical study of music teacher retention/attrition. In total, 1,931 music teachers completed the survey, and the key outcome of interest was risk for attrition, a dichotomous variable Hancock developed based on their stated intentions for returning to the school, long-term career plans, etc. Hancock employed logistic regression adjusted for complex sample features, including survey weights and variance estimation. Importantly, teachers younger than 30 years old (i.e., early-career) had odds 2.69 times higher for attrition compared to teachers older than 40 years old. A one-unit increase in positive perceptions of school culture was associated with lower risk for attrition ($OR = .77, p < .01$). A one-unit increase in dissatisfaction with administrative support was associated with higher risk of attrition ($OR = 1.38, p < .01$). Consistent with the general education literature, attrition risk for music teachers was greater for early-career teachers and those with less satisfaction with their administrators, and those with higher measures of self-perceived teacher efficacy were less likely to be an attrition risk. In contrast to the general education literature, Hancock found that mentorship was not a significant predictor of mobility patterns. Importantly,

however, the measure of attrition risk was not necessarily equivalent to actual retention/attrition decisions.

Using data from the 1999-2000 SASS wave and its 2000-2001 TFS, Gardner (2010) analyzed observed retention, turnover, and attrition of music teachers ($N = 1,903$). Gardner examined the relationship between teacher mobility patterns (stayers, movers, and leavers) and teacher characteristics, aspects of school responsibilities, and workplace climate using a combination of descriptive statistics, factor analysis, logistic regression, and structural equation modeling (SEM). The final SEM indicated that teachers' opinions and perceptions of their workplace (including administrative/parental support and their instructional autonomy) and their personal characteristics (age, experience, and education) were significant predictors of their mobility decisions. Salary was not a significant predictor of job satisfaction or mobility decision. Movers were more likely to change schools due to workplace conditions and for self-described 'better' teaching assignments, such as schools with higher music enrollments. Results broadly indicated that the factors examined influenced "both turnover and attrition as separate phenomena" (p. 119). Teacher attributes were more strongly related to moving, but workplace perceptions were stronger predictors of leaving the profession. The results of this study underscore the need to conceptualize music teacher turnover with clear delineations between changing schools and leaving the profession.

Hancock (2009) analyzed the 1988-1989, 1991-1992, 1993-1994, and 2000-2001 waves of the TFS to examine trends in teacher mobility patterns over time, including a comparison of music teachers ($n = 881$) and non-music teachers ($n = 17,376$). As the TFS uses a subsample of the previous years' SASS, Hancock matched sample responses for the TFS to their prior SASS responses. Overall, proportion estimates for retention (stayers), migration (movers), and attrition

(leavers) were comparable between music teachers and non-music teachers. On average, approximately 84% of music teachers remained in their school, 10% moved schools, and 6% left teaching. However, about one-third of music teachers who left teaching planned to return within five years. This was likely due to the number of teachers who left to raise their children during infancy. When teachers moved schools, they most often transferred school districts but remained within the same state.

In a study delimited to secondary music teachers in Southwestern United States, Russell (2012) examined factors associated with teachers' short-term and long-term career plans. Russell administered a survey to 1,000 secondary music teachers who were members of the National Association for Music Education southwestern division; the response was completed by 321 participants (response rate = 32.1%). Russell used a stratified (by state) sampling frame to randomly select 1,000 teachers for participation, out of the population of 4,890. Adopting the stayers, movers, and leavers descriptors for workplace employment intentions, Russell administered the Music Educator Career Questionnaire to collect data on teachers, job responsibilities, the schools in which they work, and career intentions. The majority of teachers (72.2%) planned on staying in the same school the following year. About 9% planned on moving schools but remaining in the teaching profession, and about 9% of teachers planned on leaving teaching (either temporarily or permanently) for reasons other than retirement. School environment, student body characteristics, mentorship, and undergraduate GPA were all associated with career intentions.

Robison and Russell (2022) administered the same Music Educator Career Questionnaire from the previous study to elementary general music teachers. Drawing from the National Association of Music Education membership listserv, Robison and Russell sent survey

invitations to all 12,150 teachers who indicated elementary general music as one of their instructional areas of interest, and they received 972 responses (response rate = 8%). Despite poor response rate, the authors proceeded with analyses because their sample population matched similar populations examined in other studies. In total, about 84% of elementary general music teachers intended to stay in the same position in the following year, but more than half of respondents intended to leave their position within five years.

McLain (2005) measured a proxy for attrition risk, burnout, in music teachers across the country. McLain administered a survey to a non-random sample of 896 music teachers from 42 states and received 514 responses (response rate = 57%). McLain measured burnout levels using the Maslach *Burnout Inventory for Educators Survey*, a survey tool that measures burnout along three dimensions: emotional exhaustion, depersonalization, and personal accomplishment. On average, music teachers indicated moderate burnout levels of emotional exhaustion and low burnout levels of depersonalization and personal accomplishment. Positive levels of school climate (administrative support, parental support, teacher relationships, etc.) were associated with lower levels of emotional exhaustion. These findings are congruent with attrition studies and illustrate a possible mechanism through which administrative support and school culture impact teacher mobility decisions.

Killian and Baker (2006) surveyed early-career music teachers who were members of Texas Music Education Association (TMEA) to examine the personal and situational factors related to teachers' retention intention. The survey had a response rate of 37.35% and was completed by a total of 223 K-12 music teachers in Texas. Overall, about 20% of teachers indicated they were planning to leave the profession, citing concerns about lack of administrative support, particularly regarding student behavior. Limitations of this study include the sampling

frame, sample size, and response rate. As the sampling frame was limited to members of TMEA who self-reported as a first-year teacher, there is a high potential for the sample to not be representative of all early-career music teachers in Texas. Relatedly, the small sample size limited statistical power for potential multivariate analyses given the large number of covariates measured, and the bivariate analyses used could not account for other factors. There may also be bias resulting from survey non-response, as those who completed the survey could be systematically different from those who did not complete the survey. Finally, the intention to leave teaching does not necessarily translate into actual attrition. Still, the factors measured provide a useful framework to investigate how teacher turnover may be related to individual or environmental concerns and should be considered for future research on music teacher attrition.

Madsen and Hancock (2002) surveyed recent program graduates from a large university in Southeastern United States in Spring 1995, and again six years later in the 2001-2002 school year. Surveys were mailed to 225 certified teachers randomly sampled from a list of program graduates, and surveys were completed by 137 respondents in the first wave and 122 respondents in the second wave. In the first year of survey administration, about 17.5% of respondents were not currently teaching. Six years later, 34.4% were not currently teaching, indicating that about 17% of teachers left classroom teaching during those six years, a lower attrition rate compared to estimates for other subject areas. However, it is important to note that Madsen and Hancock combined college teaching with K-12 settings in both administrations when considering attrition, which may not have been a factor when considering other subject areas' rates of teacher attrition. Open-ended comments indicated that teachers left primarily due to dissatisfaction with the degree of administrative support they received.

3.1.12 Professional Networks and Collegial Support

As with broader general education efforts to reduce early-career teacher attrition, music education researchers have also investigated mentorship and induction. Mentorship and induction programs ostensibly provide early-career music teachers with the support to be successful in their careers (Conway et al., 2002). At the time of writing, Conway and colleagues located reports identifying 38 states with mentorship/induction programs specifically for novice teachers, but only 19 states mandated district-level support for all beginning teachers. Mentorship programs for music teachers are difficult because “music teachers usually work as specialists in their schools [and] and are often without experienced music resource experts” (p. 13) to provide regular guidance and discourse. State and national music organizations have since offered an expanded role in offering mentorship experiences to connect young music teachers with more experienced mentors; understanding the early context of mentoring for music teachers illustrates the unique challenges that the profession continues to face.

Krueger (2000) conducted semi-structured interviews with 30 early-career music teachers in Washington regarding if and why they would consider leaving the profession. Most teachers who planned to stay in the profession described positive administrative support, which shaped a school-wide culture of support for music teachers. Teachers who planned to leave, as well as some who planned to stay, viewed lack of support from administrative colleagues as a primary problem. Instead, they relied on a network of more experienced music teachers. Teachers described the ability to collaborate with other music teachers “as an effective means for professional growth and as a rewarding aspect of teaching” (p. 25). Although participants represented only one state, their experiences were consistent with the range of literature on the importance of mentorship and professional networks. For music teachers in particular, they are often the only teacher in their school for their specific content area; working with other teachers

in the district or as part of one of many national organizations' mentoring programs may be an invaluable experience. However, participants in this study demonstrated that early-career teachers may be too overwhelmed to seek out these mentors and networks themselves.

DeLorenzo (1992) developed a 55-item survey consisting primarily of 5-point Likert-type responses and administered the survey to beginning teachers in Pennsylvania ($n = 288$) and New Jersey ($n = 219$). The survey was completed and returned by a total of 221 teachers for a response rate of 44%. Survey responses indicated that beginning teachers felt that mentor teachers and other more experienced music teacher colleagues were the most helpful factors in being successful. This was largely due to the number of music-specific challenges compared to non-music colleagues. For example, recruitment for ensemble classes, scheduling performances, and managing inventory are tasks that are both time-consuming and consequential for a music teacher's experience; non-music teachers do not face such challenges.

More recently, Gallo (2018) compared the perceived mentorship quality and induction support between music teachers and non-music teachers using data from the 2011-2012 SASS administration. Gallo used survey weights and clustered standard errors to account for the complex sampling features of the SASS. Gallo also limited analyses to the subsample of first-year educators. Additionally, state-level fixed effects were used in regression analyses to account for unobserved heterogeneity in mentorship levels between states. Descriptive statistics revealed that 67.54% of music educators had a mentor teacher compared to 70.57% of the full sample, and they received fewer mentorship supports ($M = 1.90$) compared to average ($M = 2.38$). Additionally, 35% fewer music teachers had common planning time with their mentor compared to the full sample, and only 53% of music teachers met with their mentor on a regular basis. Results affirmed assertions by Conway et al. (2002) that music teachers face unique challenges

regarding mentorship and induction programs and demonstrate a need for more attention to providing adequate support for novice music teachers.

The presence of a mentor teacher does not guarantee positive outcomes. Negative mentoring relationships can have a detrimental impact on first-year music teachers, as illustrated by Stringham and Snell (2019). Using narrative inquiry to share experiences of Elise, they demonstrated problems with workplace incivility faced by Elise because of her mentor. Initially, Elise had positive experiences in her first few weeks of teaching, working with a more experienced band director that was also her school-assigned mentor. However, their relationship deteriorated as her mentor teacher took advantage of her and treated her as an inferior. Her mentor regularly would use Elise as a way to avoid work, reschedule events without consulting, and make negative statements about her in front of students and colleagues. This study necessarily indicates that schools, districts, and the music teacher profession must carefully consider the quality and qualifications of a potential mentor. While Elise persevered and persisted in the teaching profession, hardships such as these could exacerbate the early-career attrition frequently observed among teachers.

3.1.13 Music Teacher Summary

Although the body of empirical work on early-career attrition for music teachers is less developed than the broader education field, researchers have found many similarities. Early-career music teachers are more likely to leave teaching than mid-career teachers, often due to a lack of administrative support and issues with school climate generally. Mentorship and professional networks may assist novice teachers with some of the challenges with starting their careers, but music teachers lack parity in this regard compared to their non-music teacher counterparts.

3.1.2 Summary

Early-career music teacher attrition poses a complex challenge for alleviating the teacher shortage. However, the music education literature has not comprehensively investigated retention and attrition of early-career music teachers in a way that addresses the local nature of the teacher labor market, models observed patterns of retention and attrition, and has broad coverage over time to limit potential sampling and non-response bias. Finally, the empirical methods used previously in music education were limited due to either their descriptive nature or issues of censored data. This paper is the first to address these limitations to better understand the retention and attrition patterns of early-career music teachers. The following research questions guided this inquiry:

RQ1: What are the mobility patterns of early-career music teachers in Maryland public schools?

RQ1a: For those who move schools, what are the characteristics of the schools they leave and the schools to which they move?

RQ2: What teacher-, school-, and district-level factors are associated with whether and when an early-career music teacher leaves teaching in Maryland?

3.1.3 Conceptual Framework

For the present study, I utilized the conceptual framework for teacher turnover developed by Nguyen and Springer (2021, p. 8), shown in Figure 3.1. I used this framework to select and organize potential factors for analysis and to contextualize results for coherent interpretation.

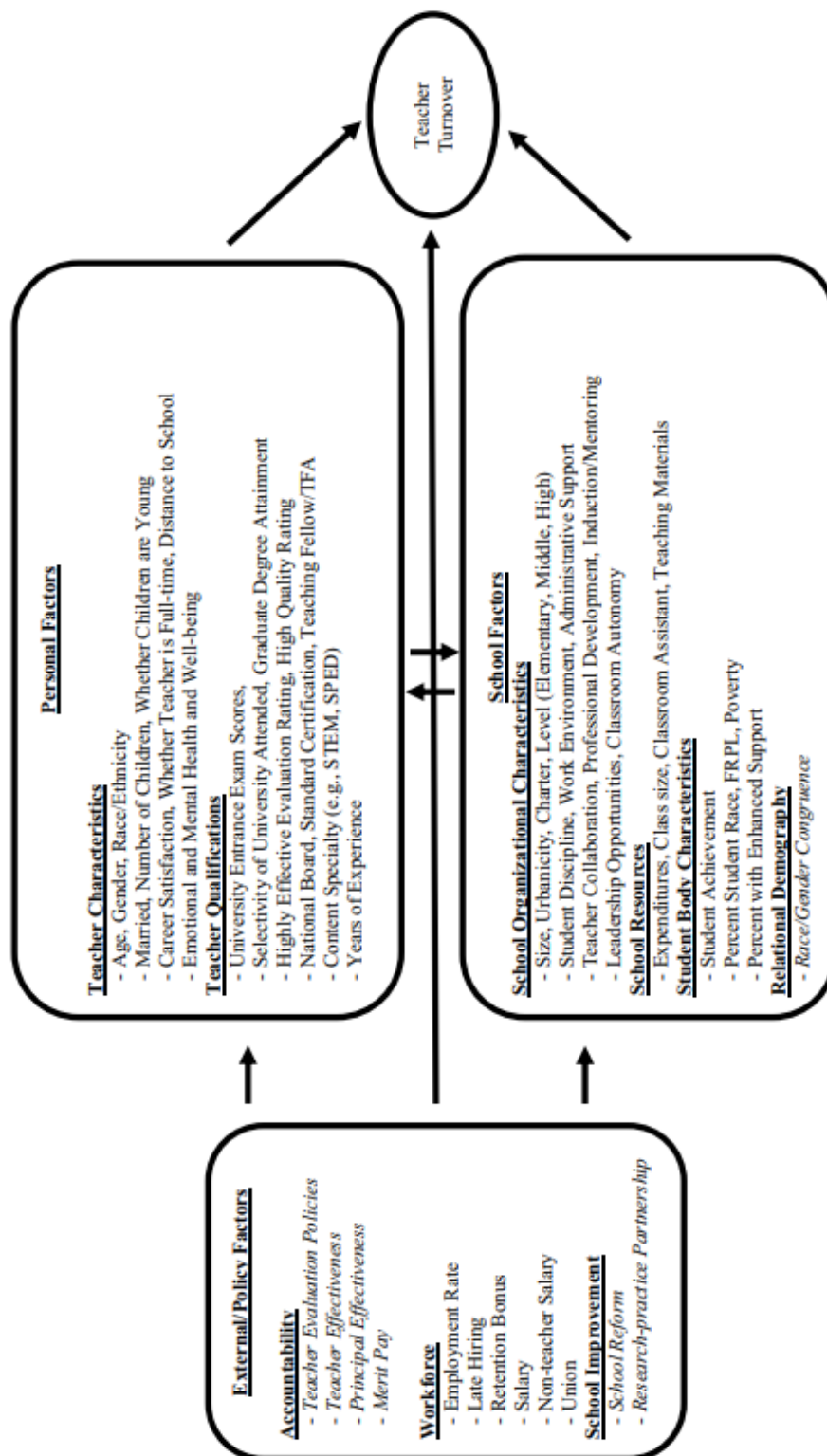


Figure 3.1. Conceptual framework for teacher turnover (Nguyen & Springer, 2021, p. 8)

3.2 Method

I analyzed data from the Maryland Longitudinal Data System, a statewide administrative data system containing data from the Maryland Higher Education Commission, Maryland State Department of Education, and the Department of Labor. The analysis of state administrative data to investigate music teacher mobility has several distinct advantages over national surveys and researcher-administered surveys employed previously by music education researchers. First, state-level data provides pertinent policy relevance to the state from which data were drawn. Second, administrative data is not susceptible to bias resulting from sampling frame issues and non-response. Finally, and perhaps most importantly, state administrative data contain observable retention/attrition decisions, rather than stated intentions.

Access to data is restricted and all reported results must undergo suppression review to limit deductive disclosure risk. At the minimum, sample sizes must be rounded to the nearest 10, any reported percentages must be rounded to the nearest whole number, and any observed cell with fewer than 10 observations must be omitted or combined with other categories. I used data from the Maryland State Department of Education for school- and district-level characteristics, including grade level, student enrollments, demographic characteristics, and geographic location. I used workforce data from the Department of Labor to identify early-career music teachers. Coverage ranged from the 2013 academic year to the 2022 academic year. For this study, I considered teachers with less than five complete years of teaching experience as early-career teachers. Additionally, I supplemented data from MLDS with Common Core of Data (CCD) to aid in analyses, linking schools through the unique NCES ID.

During data cleaning, I made several decisions when identifying members of the analytic population that may potentially impact analyses. First, I identified as music teachers individuals

who were linked as the instructor of record to a number of music courses. I identified such music courses using a combination of SCED codes and LEA-provided course names with regular expressions. All strings used to identify music courses, and thus music teachers, are included in *Appendix A*. When a teacher was assigned to multiple schools, I designated as the primary school the location of employment in their staff employment record. In analyses involving school characteristics, only characteristics from their primary school were included in the models. I then retained early-career teachers based on the number of years of experience reported. Teacher experience was reported by LEAs, and some LEAs did not report experience from other school districts. That is, a record may have indicated a teacher with 1 year of experience, but they had 5 years of experience in a different LEA. When prior observations for experience were available, I used the earliest record to determine years of experience to identify early-career teachers.

The key outcome of interest for this study was end-of-year mobility patterns. I identified teachers as stayers, movers, or leavers at the end of the school year based on their observed employment the following school year. For example, if a teacher were observed in the same school in 2014 and 2015, they would be identified as a stayer at the conclusion of the 2014 school year. If that teacher were instead observed in school A in 2014 and school B in 2015, they would be identified as a mover at the conclusion of the 2014 school year. If they were not observed in the data set, they would be identified as a leaver. There is a possibility that some of those identified as leavers stayed in the profession but moved to a private school or migrated to another state; I examined cause of separation data within MLDS to verify leaver status and made adjustments when possible. I examined individual characteristics, including race/ethnicity, birth-assigned sex (state-wide administrative data pulls official state records, and persons are unable to observe/change their gender identity in the data system), class assignment(s) (band, choir,

orchestra, piano, guitar, general music) and teacher preparation program (in-state/out-of-state preparation, alternative entry). I examined school- and district-level characteristics including school level, school size, student population demographics, and school urbanicity.

3.2.00 Empirical Strategy

3.2.01 Research Question 1: Mobility patterns of early-career teachers

I determined the proportion of teachers who stayed, moved schools, or left public school teaching using descriptive statistics. I disaggregated mobility patterns by year. Additionally, I compared the demographic characteristics of these teachers using descriptive statistics.

3.2.02 Research Question 1a: School characteristics of movers

For all teachers identified as movers, I conducted descriptive statistics at the school and district levels to examine potential trends in mobility patterns. As music teachers may move positions for a number of reasons, such as perceived program quality, school size, grade level, etc., this analysis provides important insight into general trends. I examined the proportion who switched to a new LEA, the proportion who switched teaching assignments (i.e., general music to choir, multiple assignments to band), and average changes in school size, proportion of students eligible for free/reduced-price lunch, proportion of students of color, and district size (as measured by the number of schools).

3.2.03 Research Question 2: Survival Analysis

To address research question 2, I used discrete-time survival analysis to examine teacher-, school-, and district-level characteristics associated with whether and when a teacher left public school teaching in Maryland. I am aware of only two music education studies (i.e., Hancock, 2015; Hancock & Price, 2016) that employed survival analysis frameworks, and they were in the context of bibliometrics. However, survival analysis has been used to examine teacher attrition in

other disciplines (e.g., Redding & Henry, 2019; Singer, 1993; Vagi et al., 2019). This methodological approach has several key advantages over logistic regression. First, although teacher attrition can be modeled as a binary outcome (i.e., 1 if a teacher left, 0 if a teacher did not), logistic regression approaches are unable to account for the fact that although an event has not happened yet, it still may happen in the future. For example, if an observation ends for a teacher in their third year of teaching, they could leave after their fourth, but this outcome would be unobserved, and consequently, unaccounted for in logistic regression. Secondly, logistic regression assumes that risk of attrition in each year would be equal and independent of other years, a strong assumption unlikely to hold in real-world conditions. Another key advantage of survival analysis is the ability to precisely model change in risk for event occurrence over time (Singer & Willett, 2003).

There are three key methodological facets for survival analysis: “a well-defined ‘event’ whose occurrence is being explored, a clearly identified ‘beginning of time,’ and a substantively meaningful metric for clocking time” (Singer & Willet, 2003, p. 306). For early-career teachers, their entry into the workforce marks the beginning of time for this analysis. The event of interest is leaving the profession. Although there are models of survival analysis that can be used to model multiple potential outcomes, the primary goal of this study was to understand those who are leaving the profession. As such, the outcome, teacher attrition, was dichotomous, mutually exclusive, and exhaustive. All teachers either returned to teaching or did not return to teaching; there was no third outcome of movers in this analysis. The vast majority of teacher turnover occurs between school years, so the meaningful metric for clocking time in this analysis was a singular academic year. Because the decision to leave could occur at many different points in the

year, and the precision to which day a teacher decided to leave was unobservable in this data set, yearly time measurements are said to be discrete, rather than continuous.

Censored data occur when the observation period for the data set ends before event occurrence (right-censored) or when the observation period for the data set begins after entry (left-truncated). Censoring can pose several statistical and conceptual problems with survival analysis. For example, means and standard deviations for average time-to-event are biased when limited to non-censored data, as those computations cannot account for the possibility of an event happening later. One method for handling censored data is to simply throw out all cases that do not fit within the observation window. However, this approach is usually not advisable, as these cases “are not a random subset of the sample, they are the ones *least likely* to experience the event” (Singer & Willet, p. 316). In the present study, right-censored cases of early-career music teachers are those who have completed fewer than five years observable in the data set. It is quite possible that they left or will leave the profession before advancing into their sixth year, but exclusion in the analysis or assuming they left at the end of the observation period would both bias results. This situation is one of the key benefits of survival analysis; these censored observations contribute to the overall hazard function in a meaningful and informative way. Left-censored data are not as easily dealt with; left-censored observations in the present study are teachers who entered teaching prior to the observable data set. Fortunately, the start of their career can be imputed because their years of experience are directly observable, although the schools in which they previously taught are not.

I therefore conducted two analyses: In the first analysis, I eliminated left-censored observations, so I only observed music teachers who began their career starting in the 2012-2013 academic year. In the second analysis, I imputed the left-censored observations as a sensitivity

test to examine the extent to which results from the primary analysis were biased as a result of censoring. School characteristics were a key factor of interest, so rather than disregard school characteristics from the analysis, I assumed that teachers began their career in their first observable school. Importantly, this is a strong assumption that, based on mobility patterns of early-career teachers found in research question 1, likely holds for many, but not all, teachers. However, any dramatic change in coefficient estimates between analyses 1 and 2 would be an indication of bias from left censoring.

The discrete-time hazard function (Singer & Willet, 2003, p. 330) is modeled by (3.1):

$$h(t_{ij}) = Pr[T_i = j | T_i \geq j] \quad (3.1)$$

Where: T represents a random discrete variable, and T_i indicates time period j when an individual i experiences the event of interest. The hazard h of an event occurring for an individual i experiencing an event in time period j is equal to the conditional probability density function, given that the individual has not experienced the event prior to time period j . In other words, the individual may only experience leaving the teaching profession if they have not already left the teaching profession. The conditionality function allowed me to assess the unique risk of an individual for experiencing the event in that time period because it necessarily eliminates those not part of the risk set. Discrete-time hazard models use a logit function to link predictors to outcomes. For the present study, the time period for which the attrition event can occur is bounded to the first five years of teaching, and thus the statistical model for survival analysis is shown in (3.2):

$$\begin{aligned} \text{logit } h(t_{ij}) = & [\alpha_1 D_{1ijsd} + \alpha_2 D_{2ijsd} + \dots + \alpha_5 D_{5ijsd}] + [\mathbf{X}\boldsymbol{\beta}_{isd} + \mathbf{X}\boldsymbol{\gamma}_{jsd} \\ & + \mathbf{X}\boldsymbol{\lambda}_{jd}] \end{aligned} \quad (3.2)$$

The first set of alpha predictors in the left set of brackets represents the baseline hazard for their respective time periods, akin to one intercept per time period, for the i^{th} individual in the j^{th} time period teaching in the s^{th} school in the d^{th} district, equal to the hazard when all predictors are set to zero. The right side of brackets represents vectors of covariates: $X\beta$ is the vector of time-invariant teacher characteristics, $X\gamma$ is the vector time variant school characteristics, and $X\lambda$ is the vector of time-variant district characteristics. Below, I identify factors from the conceptual framework included in the analysis, then I define and operationalize each factor.

- **Personal Factors**

- *Teacher Characteristics*

- Race: Categorical variable indicating White, Black, Hispanic, Asian, or Other/Multiracial (categories were combined to supply with suppression requires in compliance with data confidentiality agreement)
 - Gender: Binary indicator set to one if the teacher is male, zero otherwise
 - Part-time Employment: Binary indicator set to one if the teacher FTE is less than one, zero otherwise

- *Teacher Qualifications*

- Certification Pathway: Binary indicator for all individuals who did not receive initial certification through a traditional teacher preparation program
 - Content Specialty: all teachers are music teachers
 - Years of Experience: the meaningful unit of clocking time in discrete-time survival analysis framework

- **School Factors**

- *School Organizational Characteristics*

- School Level: Elementary, Middle, or High school level defined by the highest grade offered
- Non-traditional/Charter School: Binary indicator that the school of employment was a non-traditional or charter school
- School Size: Number of students enrolled, standardized within school level with mean of zero and standard deviation of one
- School Urbanicity: Urbanicity as defined in the CCD, with rural/town combined
- Teacher Collaboration/Professional Development/Mentoring: Although not directly observable in the dataset, LEA urbanicity and number of full-time equivalent teachers (scaled in 200s of teachers) served as proxy measures for the potential professional network available to the early-career music teacher.

- *Student Body Characteristics*

- Student Chronic Absenteeism: the proportion of students chronically absent, a proxy measure for school climate
- Student Suspensions: the proportion of students who received an out-of-school suspension, a proxy measure for school climate
- School FRL proportion: the proportion of students receiving free/reduced-price lunch, standardized within school level with mean zero and standard deviation of one

- School demographics: the proportion of students of color, standardized within school level with mean zero and standard deviation of one
- **External/Policy Factors**
 - *Workforce*
 - Salary: the total earned salary by a teacher, scaled in 1,000s of dollars

3.3 Results

3.3.01 RQ1: Mobility Patterns of Early Career Music Teachers

Mobility patterns are disaggregated by academic year (Panel A) and by demographics (Panel B) in Table 3.1. Observations are unique at the teacher-year level, meaning that early-career teachers were counted in the sample for each year they were observed teaching in Maryland public schools. On average, 74% of all early-career teachers remained teaching in the same school each following school year. Rates for moving schools ranged between 6% and 9%, depending on the year. Rates for leaving public school music teaching in Maryland varied considerably, with as few as 11% of early career teachers leaving the profession at the end of the 2018 academic year and as many as 25% leaving the profession at the end of the 2015 academic year. Female teachers left the profession at a higher rate (21%) compared to male teachers (13%). Hispanic teachers moved schools at a higher rate (12%) compared to other racial/ethnic groups, and Asian teachers left public school teaching in Maryland at a higher rate (24%) compared to other racial/ethnic groups.

Table 3.1

Retention/Attrition of Early-Career Music Teachers

Panel A: Stayers, Movers, Leavers Disaggregated by Year

Year	Teachers (<i>N</i>)	Stayers		Movers		Leavers	
		<i>n</i>		<i>n</i>		<i>n</i>	
2013	900	670	74%	50	6%	180	20%
2014	860	600	70%	70	8%	190	22%

2015	840	570	68%	60	7%	210	25%
2016	770	600	78%	60	8%	110	14%
2017	800	620	78%	70	9%	110	14%
2018	790	630	80%	70	9%	90	11%
2019	820	570	70%	50	6%	200	24%
2020	650	520	80%	40	6%	90	14%

Panel B: Stayers, Movers, Leavers Disaggregated by Demographics							
Demographic	Observations (<i>N</i>)	Stayers		Movers		Leavers	
		<i>n</i>		<i>n</i>		<i>n</i>	
Total	6430	4770	74%	490	8%	1170	18%
Sex							
Male	2160	1700	79%	180	8%	270	13%
Female	4270	3070	72%	300	7%	900	21%
Race/Ethnicity							
White	4800	3550	74%	380	8%	870	18%
Black	980	720	73%	70	7%	190	19%
Hispanic	170	130	76%	20	12%	30	18%
Asian	170	120	71%	10	6%	40	24%
Other/ Unknown	310	260	84%	10	3%	40	13%

Note: Race/Ethnicity categories were combined, sample sizes were rounded to the nearest 10, and percentage estimates were rounded to the nearest whole combined to comply with suppression requirements. Observations refer to each unique teacher-year observation.

3.3.02 RQ1a: School Characteristics of Movers

I report descriptive statistics on the school- and LEA-level characteristics of school movers in Table 3.2. About one-third of all movers switched LEAs, and about two-thirds of movers transferred schools while remaining in the same LEA. Approximately half of all movers changed grade levels. Of those who changed grade levels, the vast majority of teachers (77%) moved from a school serving younger students to a school serving older students (i.e., elementary to middle/high, or middle to high). Teachers moved from schools with higher proportions of students receiving Free/Reduced lunch to schools with lower proportions of students receiving Free/Reduced lunch, with the difference amounting to approximately .14 standard deviations. Teachers moved to schools with a lower proportion of students of color

(about .11 SD). There were no consistent trends among movers regarding changes in school size (as measured by student enrollment, difference = .03 SD) or LEA size (as measured by the number of schools reported by CCD, difference = -.06 schools). Finally, about 42% of movers had different teaching responsibilities at their new school.

Table 3.2

Descriptive statistics for school characteristics of Movers (n = 490)

Panel A: Proportion estimates for movers				
Characteristic	Percentage			
Changed LEA	35			
Changed Teaching Assignment	42			
Changed School Level	50			
<i>Moved to an older grade level^</i>	77			
Panel B: Average difference in school characteristics				
School characteristics	<i>Mean</i>	<i>Std. Dev.</i>	<i>Min</i>	<i>Max</i>
FRL (z-score)	-0.14	1.10	-3.22	2.78
Student Enrollment (z-score)	0.03	1.282	-3.23	3.56
Students of color demographic proportion (z-score)	-0.11	0.93	-2.77	2.73
Change in LEA Size (number of schools)	-0.06	40.78	-184.00	193.00

[^] This percentage was calculated using only the subsample of Movers who changed school level

3.3.03 RQ2: Survival Analysis

First, I constructed Kaplan-Meier survivor functions to visually examine differences in attrition among early-career music teachers. Survivor functions for the primary analysis and the sensitivity analysis were consistent, thus I only include graphs for the primary analysis. Figure 3.2 shows the overall survivor function for early-career music teachers, and Figures 3.3-3.6 show the survivor functions disaggregated by gender, race/ethnicity, school level, and certification pathways. Results indicated that half of all music teachers left public school teaching in Maryland within the first five years of their teaching career. Female teachers left at a higher rate than male teachers at every year, and the difference was greatest in years four and five.

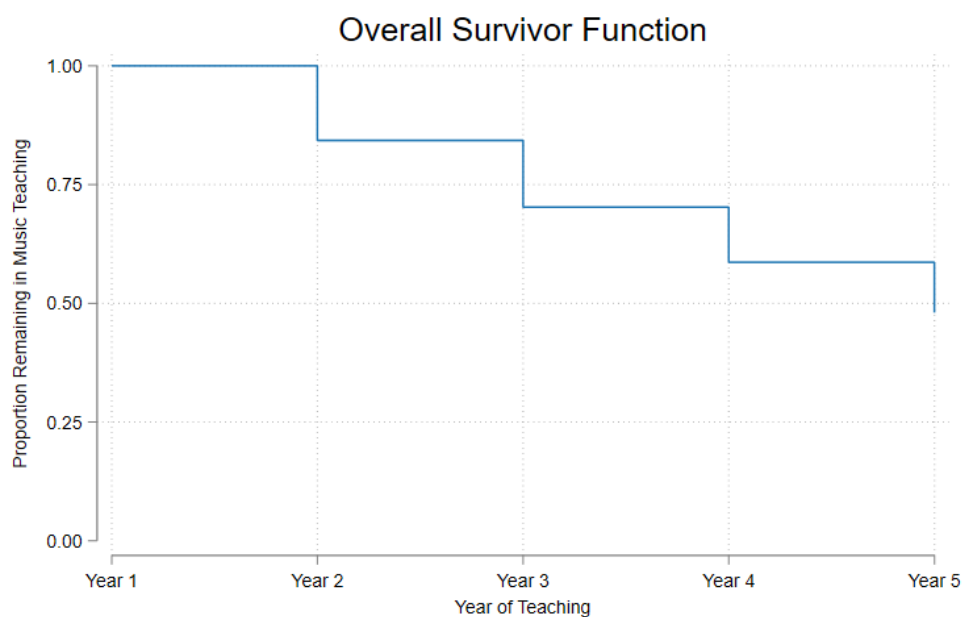


Figure 3.2 Survivor Function

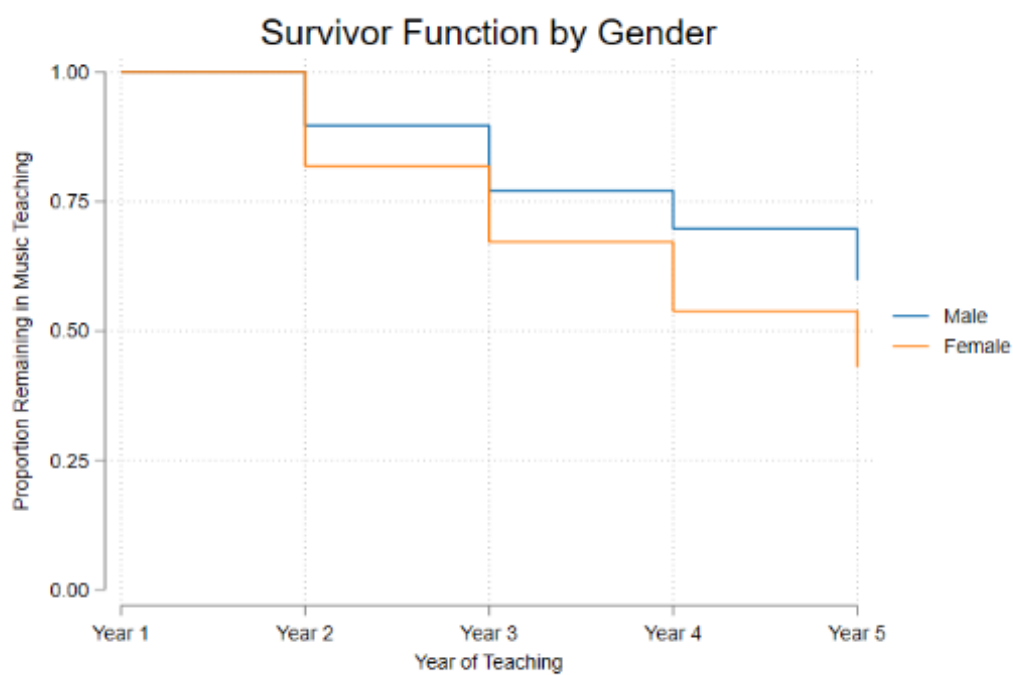


Figure 3.3 SF by Gender

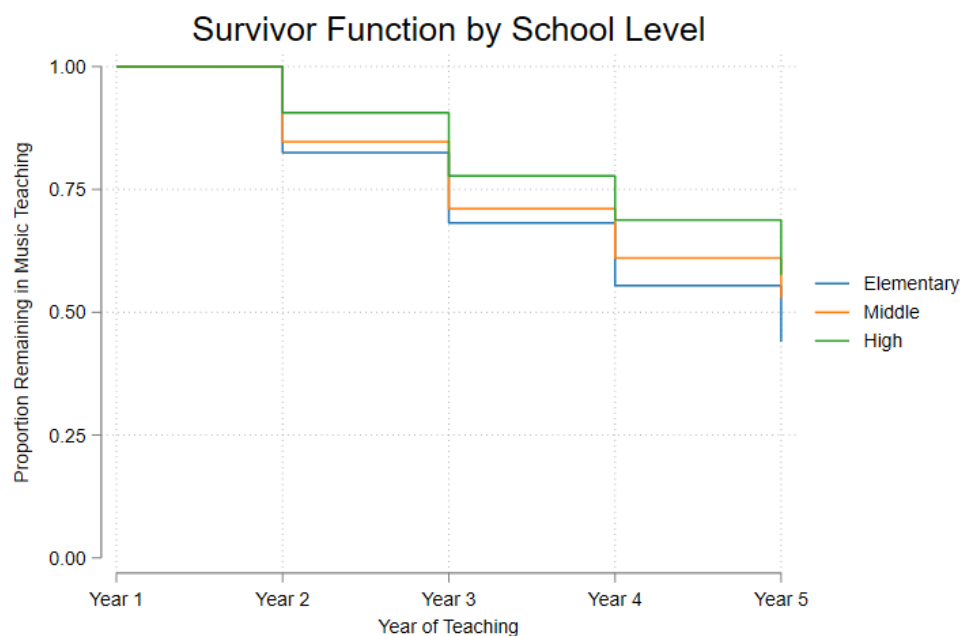


Figure 3.4 SF by School Level

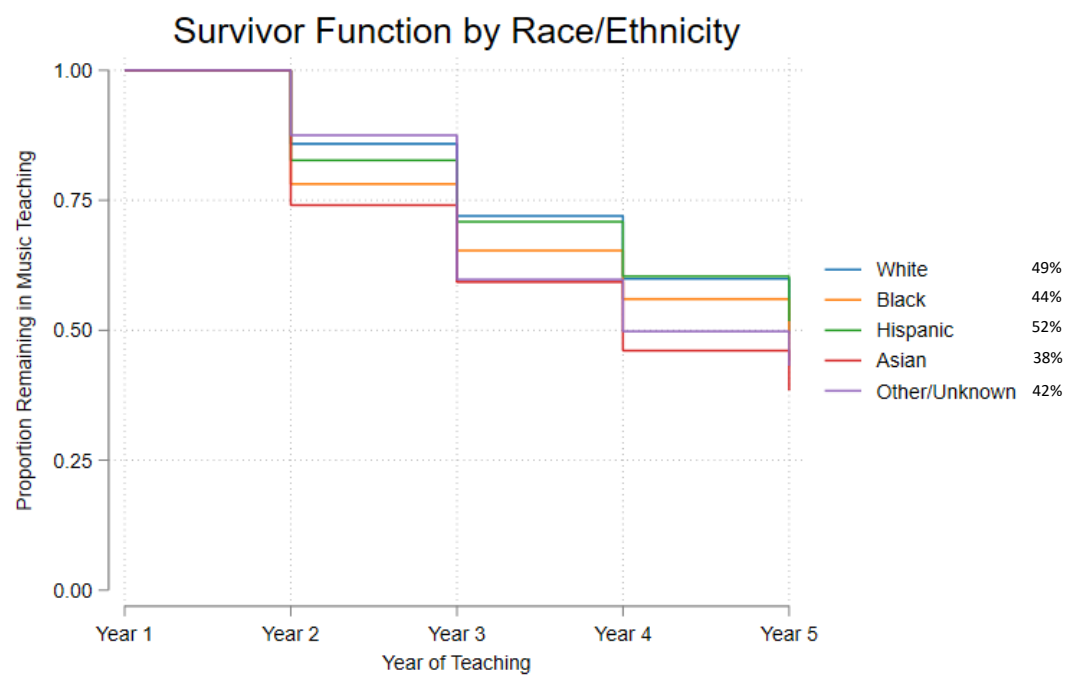


Figure 3.5 SF by Race/Ethnicity

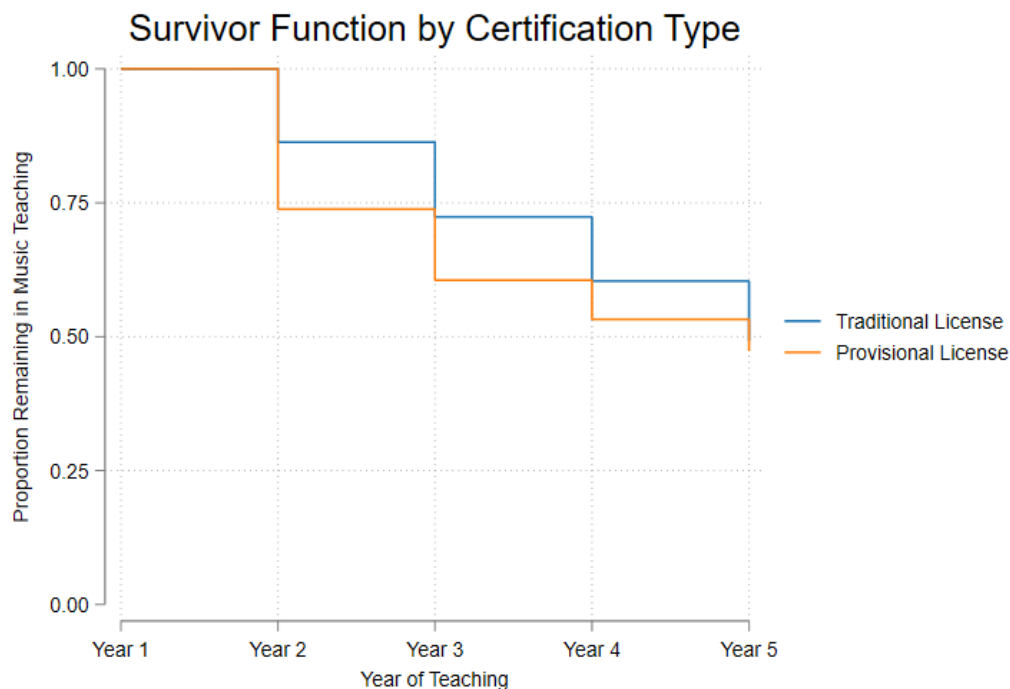


Figure 3.6 SF by Certification Type

Survivor function curve revealed pertinent trends across different subgroups of music teachers. The survivor function by race/ethnicity revealed that Asian teachers left teaching at the highest rate in the earliest years. Individuals belonging to the four other categories of racial/ethnic groups had smaller differences in their earliest years and converged toward similar rates as years of experience progressed. Survivor function was strongly related to school level; early-career music teachers at the elementary level left at a higher rate than those at the middle school level. High school teachers had the lowest rate of attrition across all five years. Traditionally certified teachers had lower attrition rates compared to provisionally certified teachers. The largest difference in attrition rate occurred after the first year of teaching: about 25% of all provisionally licensed music teachers left after the first year, whereas about 14% of traditionally licensed teachers left after the first year. The difference between licensure pathways converged over the five years of teaching experience.

I report the results of the discrete-time survival analysis in Table 3.3. Coefficients are reported as odds ratios with standard errors in parentheses. To facilitate interpretation, continuous measured predictors were either standardized as *z*-scores or mean-centered and scaled into meaningful increments. The first model contains results from the restricted analysis, in which left-censored observations (those whose first year of teaching was unobservable) were omitted. The second model contains results from the sensitivity analysis, in which I imputed missing observations based on observable experience. In reporting the results that follow, I primarily address the restricted analysis, referring to the sensitivity analysis only when meaningful differences were found. The final analytic sample consisted of unique teacher-year observations (restricted model: $N = 5,100$; imputed model: $N = 7,570$).

Table 3.3*Discrete-Time Survival Analysis*

Predictors	Model 1 $N = 5100$	Model 2 $N = 7570$
Year 1	0.26*** (0.032)	0.11*** (0.011)
Year 2	0.39*** (0.041)	0.19*** (0.018)
Year 3	0.39*** (0.043)	0.22*** (0.022)
Year 4	0.33*** (0.038)	0.22*** (0.023)
Year 5	0.28*** (0.034)	0.27*** (0.03)
Race/Ethnicity (Reference: White)		
<i>Black</i>	1.33* (0.169)	1.17 (0.127)
<i>Hispanic</i>	0.94 (0.236)	1.18 (0.272)
<i>Asian</i>	1.60* (0.36)	1.36 (0.281)
<i>Other</i>	0.97 (0.213)	0.93 (0.185)

Male	0.51*** (0.048)	0.60*** (0.051)
Part-Time	1.07 (0.176)	1.15 (0.177)
Provisional Licensure	0.90 (0.131)	1.24 (0.169)
School Level (Reference: Elementary)		
<i>Middle</i>	0.69** (0.085)	0.81* (0.086)
<i>High</i>	0.64** (0.089)	0.67** (0.086)
Nontraditional School	2.33*** (0.466)	1.45* (0.227)
Proportion of students chronically absent	2.34 (1.441)	3.54* (1.936)
Proportion of students suspended	1.54 (1.764)	0.20 (0.203)
School Urbanicity (Reference: Suburban)		
<i>Rural/Town</i>	0.59*** (0.091)	0.67** (0.088)
<i>Urban/City</i>	1.17 (0.152)	1.02 (0.114)
School Enrollment (<i>standardized</i>)	0.95 (0.04)	1 (0.039)
Free/reduced-price lunch proportion (<i>standardized</i>)	1.23** (0.08)	1.18** (0.066)
Students of color demographic proportion (<i>standardized</i>)	0.89 (0.065)	0.99 (0.062)
LEA Urbanicity (Reference: Suburban)		
<i>Rural</i>	0.45*** (0.087)	0.57*** (0.097)
<i>Urban</i>	0.77 (0.148)	0.76 (0.116)
Lea FTE teachers (200s)	0.98*** (0.003)	0.98*** (0.003)
Salary (\$1000s)	1 (0.005)	1 (0.005)

Note: Coefficients are reported as odds ratios with standard errors in parentheses. Standard errors were clustered at the person level. Race/Ethnicity categories were combined to comply with suppression requirements. Hispanic refers to individuals from all racial groups that were Hispanic; other racial designations refer to non-Hispanic individuals within each group.

Reference group for race/ethnicity was White.

* $p < .05$; ** $p < .01$; *** $p < .001$

Time predictor coefficients indicate the baseline odds for leaving when all other values for predictors are equal to zero. In these models, the baseline comparison is a White female elementary music teacher employed full-time in a traditional public school in a suburban area. The teacher was licensed through a traditional certification program and taught in a school that had an average number of students, average proportion of students receiving free/reduced lunch, average rates of absences and suspension, and average proportion of students of color. The school was in a suburban LEA with an average number of full-time teachers. There was a noticeable increase in the baseline odds for attrition in years two and three (.39), up from the odds of .26 in the first year. Odds of an event can be converted to the probability of an event by dividing the odds by one plus the odds. Thus, the probability of attrition in year one was 20.6%, and the probability of attrition in either years two or three was 28.1%. By the end of years four and five, the risk for attrition began to drop, with the probability of attrition in each year equal to 24.8% and 21.9%, respectively. Here, the advantage of survival analysis over logistic regression is clear: the risk for attrition is clearly different depending on years of experience, and this difference would be unobservable in the alternative analytic strategy. In the sensitivity analysis, the coefficients for time predictors differ because imputing prior years exclusively added observations that did not experience attrition to the risk set, artificially reducing the baseline risk for attrition in the earliest years.

I included the following teacher-level characteristics in the survival analysis model: race/ethnicity, sex, part-time employment, and licensure pathway. Whereas the Kaplan-Meier survivor functions delineated bivariate relationships between these characteristics and attrition,

the discrete-time survival analysis model examines such factors in a multivariate context.

Compared to female teachers, male teachers had lower risk for attrition ($OR = .51, p < .001$), holding constant all other factors in the model. Compared to White teachers, Black teachers had higher risk for attrition ($OR = 1.33, p < .05$), and Asian teachers had higher risk for attrition ($OR = 1.60, p < .05$). There was no significant difference between White and Hispanic teachers ($OR = .94, p > .05$) or White teachers and teachers belonging to other/multiple race categories ($OR = .97, p > .05$). There was no significant difference in attrition risk due to licensure pathway ($OR = .90, p > .05$). Finally, part-time employment status was not significantly associated with attrition risk ($OR = 1.07, p > .05$).

Characteristics of the schools in which one taught were associated with early-career music teacher attrition risk. Compared to teachers whose primary assignment was at an elementary school, teachers whose primary assignment was at a middle school ($OR = .69, p < .01$) or high school ($OR = .64, p < .01$) were less likely to leave public school teaching in Maryland, statistically controlling for all other factors in the model. Teachers in a nontraditional school, such as a charter school, were significantly more likely to leave teaching ($OR = 2.33, p < .001$) compared to teachers at traditional public schools, all else held constant. Teaching at a school in a rural locale was associated with decreased risk for attrition compared to schools in suburban locales ($OR = .59, p < .001$), but there was no difference in attrition risk between urban and suburban locales.

Several student body attributes were associated with teacher attrition risk. I used the proportion of students receiving free/reduced lunch as a proxy measure for school-wide socioeconomic status, measured as a standardized z -score. A one-standard-deviation increase in the proportion of students receiving free/reduced-price lunch was significantly associated with

1.23 times higher odds for teacher attrition, all else held constant ($p < .01$). School demographic proportions and school size (measured by the number of students enrolled) were not significantly associated with teacher attrition risk ($p > .05$). The two indicators of school climate in the model, chronic absenteeism and school suspensions, were not significant predictors of attrition in the restricted analysis ($p > .05$).

Finally, I included two LEA-level characteristics in the survival analysis models, urbanicity and the number of full-time equivalent (FTE) teachers employed by the LEA. I used CCD-designated urbanicity indicators. Similarly, I used the number of FTE teachers indicated by the CCD, scaled in 200s of teachers and centered at the mean. Centering was required to have meaningful interpretations for the time coefficients, otherwise baseline odds would have indicated attrition risk for teachers working in LEAs with zero teachers – not a particularly informative measure. Teachers in rural LEAs had odds for attrition less than half of teachers in suburban LEAs ($OR = .45, p < .001$), and there was no difference between teachers in suburban LEAs and urban LEAs. For every increase in 200 FTE teachers employed by the LEA, the odds for attrition decreased by a factor of .98 ($p < .001$).

3.4 Discussion

3.4.01 RQ1: Mobility Patterns of Early Career Teachers

Approximately three-quarters of early-career music teachers retained their position, although there was variation in mobility patterns across the observed years. Of the 26% of music teachers who left their teaching position, 8% of music teachers left to move to another school, and 18% left public school teaching in Maryland. As private school employment and employment out of state were not observable in MLDS data and may have been excluded from cause of separation data, it is possible that some “leavers” in the present study left the state of Maryland while

remaining in the profession. Regardless, the impact of teacher turnover on the music teacher shortage is the same: the vacancy created by the teacher who left must still be filled.

Results from the present study diverge from several previous estimates of music teacher mobility. When compared to a national analysis of music teachers by Hancock (2008), early-career music teachers in Maryland stayed in their position at a lower rate (74% compared to 86%) and left the profession at a higher rate (18% compared to 6%). Rates for moving schools were similar: 8% of teachers moved schools in the present study compared to 10% of all music teachers nationally. As with previous studies examining more specific subgroups of music teachers by geography and content area (e.g., Robison & Russell, 2022; Russell, 2012), the unique variation within each context underscores that as with the general teacher population, music teacher labor markets are locally situated (Boyd et al., 2005; Reininger, 2012).

In any year, fewer than 10% of early-career teachers moved schools. As the analytic sample consisted of only teachers with less than five years of teaching experience, additional research is needed to examine the extent to which these patterns hold with more experienced teachers. It is possible that a teacher may keep their initial job for a period of at least five years prior to moving, maintaining their current employment until receiving an employment offer for their “ideal” job. If this were true, there may be a jump in the proportion of teachers moving positions in the middle years of their career. In future examinations of music teacher labor markets, researchers should consider the distribution of experience along each of the three categories (i.e., stayer, mover, leaver) to provide a more nuanced understanding of movers.

3.4.03 RQ 2: Survival Analysis

Half of all early-career music teachers in Maryland public high schools left the profession within their first five years of teaching. This estimate is consistent with those from broader

national analyses of teacher attrition (Smith & Ingersoll, 2004; Joiner & Edwards, 2008; Kelley, 2004). The greatest baseline risk for attrition occurred at the end of the second and third years of teaching. There are several plausible explanations for this observed trend. Initially certified teachers in Maryland receive a three-year certification that may or may not be renewed depending on satisfactory teacher evaluations. The uptick in attrition risk potentially rose in these years due to licensure non-renewal. However, official cause of separation indicators within MLDS indicated that involuntary separation and licensure non-renewal were exceedingly rare. An alternative explanation is that a portion of teachers who considered leaving after a difficult first year decided to delay their workforce exit, optimistic that they would have an easier or more enjoyable experience in their second and third years. A third explanation hinges on potential changes in the level of support beginning teachers received as they progressed through their first years. If a teacher received fewer supports/mentorship in their second and third year compared to their first, the lack of support or mentorship may have contributed to their decision to leave. Although mentorship and induction for beginning teachers were not observable in MLDS, the number of FTE teachers employed by the LEA served as a proxy for the potential mentorship network available to a teacher. Teachers employed in LEAs with fewer full-time teachers were more likely to leave. In other words, those with a smaller potential network of support within the LEA left the profession at higher rates. This possibility is consistent with the conceptual framework (Nguyen & Springer, 2021), prior literature that described the importance of mentorship and induction to improve teacher retention (Joiner & Edwards, 2008), and research that found music teachers often face unique challenges regarding mentoring (Conway et al., 2002; Gallo, 2018). Additional investigation into the mentoring and induction practices for novice music teachers in Maryland could provide additional clarity.

Attrition risk varied across several meaningful subgroups, particularly sex. Female music teachers were observed leaving the teacher workforce at higher rates than male music teachers. Whereas this pattern was true among the broader teacher workforce historically (Borman & Dowling 2008), Nguyen et al. (2019) found no substantive difference in teacher attrition along gender lines in more recent times. Historically, female teachers left the profession at higher rates than male teachers partly due to family leave for having and raising children. One possible explanation that reconciles these discrepancies is that female early-career music teachers left the teaching profession at higher rates than male teachers initially but returned after a leave of absence. Extensions of the survival analysis techniques that account for exit and re-entry into the workforce could be employed in future designs to examine this possibility. Another plausible explanation for differences between music teachers and the broader teacher workforce is the after-school commitments often assumed by music teachers. The frequent after-school rehearsals, concerts, performances, etc. may preclude a sense of balance. Several researchers (e.g., Bovin, 2019; Fitzpatrick, 2013; Fitzpatrick & Sweet, 2023) have documented that women working in various music education settings face a multitude of challenges ranging from a search for balance to workplace discrimination. Clearly, school systems and academic institutions must do more to support healthy work-life balance and provide appropriate resources for parents in the workplace, particularly the women who have often assumed the role of primary caregiver. Support for childcare, comprehensive family leave, and cultivating more positive and supportive workplace climates are several courses of actions available to employers to ensure female music teachers may continue to find success in happiness as both parent and teacher.

One more potential explanation draws on evidence from chapter two of this dissertation: female music education graduates were more likely to find employment in elementary schools.

In the present study, teaching in an elementary school was associated with an increased risk for attrition when controlling for sex, among other factors. As female teachers were more likely to find employment at an elementary school, they could then face increased risk for attrition. However, endogeneity in employment selection and incomplete models for teacher attrition limit the ability to draw strong conclusions about specific constructs associated with teaching in elementary schools that lead to increased attrition. To this end, qualitative inquiry regarding employment preferences and attrition reasons from elementary school music teachers could fill this important gap in the literature.

Differences in attrition risk among racial/ethnic groups contrasted previous findings. In the general teacher population, teachers of color had lower attrition risk than White teachers after controlling for school- and district-level characteristics (Borman & Dowling, 2008; Nguyen et al., 2019). In the present study, Black and Asian teachers were significantly more likely to leave the profession compared to White teachers. People of color consistently have been filtered out of the music teacher pipeline: people of color are underrepresented among school music programs (Elpus & Abril, 2019; Miller, 2023), music education teacher graduates/teacher candidates (DeAngelis, 2022; Elpus, 2015), and music teachers (Elpus, 2022c; Miller, 2023). This filtering persists even among those who have reached the final stage of the pipeline and entered the teaching profession. The pipeline filtering occurring at this stage is particularly curious because those who became music teachers are the ones who persisted. Clearly, persistence along the pipeline through workforce entry does not indicate that all barriers were overcome. As analyses controlled for other observable factors associated in the literature with attrition risk, one of two explanations must be true. Either factors unobservable in the data and thus excluded from the model are associated with music teacher race/ethnicity and attrition risk, or the manner in which

early-career music teachers in Maryland experience workforce mobility is systematically different than the broader teacher population.

The relationships between most school-level factors and teacher attrition were consistent with prior research. As with the general teacher population (Nguyen & Springer, 2021), early-career music teachers were more likely to leave schools with lower overall socioeconomic status, and they were more likely to leave non-traditional schools. School climate indicators were not significantly associated with music teacher attrition in the primary analysis, but results were inconsistent in the sensitivity test: the odds ratio for absenteeism increased from 2.34 to 3.54 and was statistically significant ($p < .05$); the odds ratio for suspensions decreased from 1.54 to .2 and remained statistically insignificant. These changes could indicate bias due to censoring, that the left censorship observed in the data was not random. This would be observable if the distribution of these characteristics linked to the teachers with imputed observations was meaningfully different than the distribution of these characteristics linked to teachers without imputed observations. Given that the starting year for MDLS data collection can be assumed independent of any teacher attrition decision, and that descriptive examinations of these characteristics revealed that the distributions were similar, the change in results was not likely due to non-random censorship. Results for chronic absenteeism and suspensions are then inconclusive and warrant further examination.

3.4.04 Conclusion

Altogether, these results support the broader consensus in the literature that the vast majority of teachers who leave the profession do so within their first five years of teaching. To this end, early-career music teachers in Maryland were quite similar to the national teacher workforce. Improving retention of early-career music teachers may be one of the most

immediately impactful strategies to mitigate the music teacher shortage in Maryland, with particular attention to music teachers at the elementary level, music teachers in LEAs with a less expansive professional network, music teachers in non-traditional schools, and schools with lower socioeconomic status. Teachers who entered the profession via pathways that led to provisional licensure initially left the profession at higher rates, but attrition risk at the end of year five for traditionally-certified teachers and alternatively-certified teachers converged. This finding suggests that alternatively-certified teachers may lack the support to develop the necessary skillset initially but develop their skillset throughout their first five years. In Chapter 4, I examine the extent to which the coronavirus pandemic has impacted the number of music teachers hired through alternative certification pathways to better contextualize how Maryland LEAs hire and support these teachers to fill vacancies. In Chapter 5, I discuss several policy interventions informed by these findings that could be used to mitigate the teacher shortage through recruitment and retention efforts.

Beyond the substantive contributions of this paper to the music education field, the methodological contribution to the study of music teacher labor markets is particularly noteworthy. While previous survey methods used to examine music teacher mobility patterns benefited from survey item construction, and thus were not limited by data collected by previously established means, the benefits came with tradeoffs of potential sampling issues and measuring intentions rather than decisions. The music education community would benefit from replications and extensions of this survival analysis framework in various geographic locales by leveraging state longitudinal data systems. For example, time-to-event analyses can account for multiple outcomes, such as leaving and moving. Researchers could also use time-to-event analyses to model workforce exits and re-entrances; these approaches could be used to

investigate if differential rates of attrition between male and female teachers could be explained at least in part by temporary workforce exits.

Chapter 4. Has the COVID-19 pandemic exacerbated the Maryland music teacher shortage?

Evidence from a statewide longitudinal data system

4.0 Introduction

On March 11, 2020, the World Health Organization officially declared the novel coronavirus outbreak a global pandemic (Chappell, 2020). The pandemic shocked the entire education system in the United States as K-12 systems and postsecondary universities shut down, switching to emergency remote learning to slow the spread of the virus and protect students, staff, and families. With the abrupt and sudden closure of in-person activities, K-12 teachers and university faculty alike had to drastically rethink and re-imagine teaching, learning, and negotiating a virtual community amongst an arduous social-emotional burden of social distancing and isolation. Across the country, teachers struggled to engage students, assess learning, and use technology effectively as the pandemic began to take its toll (Huck & Zhang, 2021). Additionally, teachers, school leaders, and policy analysts realized the potential of remote learning to exacerbate educational inequities due to income, disability, or English-language learner status.

In the wake of the ongoing COVID-19 pandemic, many workers have left their current employment because of low pay and other working conditions as part of what is colloquially known as ‘The Great Resignation’ (Parker & Horowitz, 2022). As shifts to emergency remote learning jolted the education system across the country, teachers experienced heightened stress and hardship (Griffith, 2020; Huck & Zhang, 2021; Miksza et al., 2022; Parks et al., 2021). Although personal narratives (e.g., Dixon, 2022) and early speculation (e.g., Griffith, 2020) suggested the teacher shortage would be exacerbated by the pandemic and resulting recession, early empirical work (Choate et al., 2021; Goldhaber & Theobald, 2020) points to less

pessimistic outcomes. However, music teachers were uniquely impacted by the switch to remote learning and the subsequent distance/masking regulations to promote student and teacher safety, and the stress experienced by these changes was severe (Hash, 2021a; Shaw & Mayo, 2022; Thomas et al., 2021). Primarily teaching through ensemble-based instruction, and the two most common music courses (band and chorus) being aerosol-producing activities, current and aspirant music teachers faced an acutely potent challenge. Empirical work has yet to examine the potential impact of COVID-19 on entry into the teaching profession and retention/attrition on early-career music teachers. This paper addresses that gap in the literature by leveraging an Interrupted Time Series design to examine how the pandemic has impacted music education graduates' entry into the teaching profession and the attrition of early-career music teachers.

4.1 Literature Review

4.1.00 COVID-19 and K-12 Teacher Experiences

In the initial stages of the pandemic, policy analysts could only predict the impact that COVID could have on teachers and the K-12 system, and early predictions all pointed to an exacerbation of the teacher shortage. Analyzing the cuts to the teacher labor force resulting from the 2008 Great Recession, Griffith (2020) postulated that similar outcomes would occur as a result of the shutdown's economic cost: teaching positions would be cut, and cuts would disproportionately impact local education agencies and individual schools serving higher proportions of low-income families and students of color. In fact, Griffith estimated that the state of Maryland, on average, would lose 8.2% of teaching positions due to budget cuts. All analyses leading to this projection were kept internal to the Learning Policy Institute, so it is not possible to further scrutinize the veracity of these claims. However, the message from early on in the pandemic was clear: K-12 education was staring down a crisis.

4.1.01 Teacher Burnout

In March 2021, Zamarro and colleagues (2021) surveyed teachers from the RAND American Teacher Panel about their current job and burnout ($N = 1,045$). They then compared data to survey results from just prior to the shutdown to examine any changes. Nearly half (49%) of teachers reported working in a hybrid model for most of the year, 29.8% reported working fully remotely, and 21.2% reported teaching fully in person. The portion of teachers planning on teaching until retirement dropped from 74% before the pandemic to 69% one year into it, and the portion who were uncertain increased from 6% to 22%. Over half (51%) of teachers reported burnout from job stress was a major concern. Predictors of burnout included working in a hybrid instructional model, (average marginal effect (AME) = 9.3%), being female (AME = 17.4%), and experiencing a switch in instructional modalities throughout the year (AME = 6.7%). Multivariate analyses indicated that burnout was also a major factor in considering leaving because of the pandemic; those with burnout as a major concern were nearly 20 percentage points more likely to indicate they were considering leaving their position due to COVID. Although these results signal an alarming trend for teacher turnover, a major caveat is that intentions and considerations when responding to a survey are not necessarily representative of actual decisions.

Ten months later, teachers were again surveyed for burnout and mental health as part of a study by the National Education Association (NEA) (Jotkoff, 2022). Although the sample was nationally representative of membership, it is important to note that the NEA membership is not necessarily wholly representative of the broader education workforce across the country. Further, the NEA did not publish the technical details of survey administration, sample weighting, or variance estimation with its media brief. Still, the overwhelming majority (90%) of teachers

indicated that feeling burned out was a serious problem, and 91% attributed high levels of general stress to the ongoing pandemic. Most members (86%) indicated that they perceived a higher rate of teacher attrition compared to the start of the pandemic. A slight majority (55%) indicated they planned to leave the teaching profession earlier than originally anticipated. This sentiment was particularly strong among Black (62%) and Hispanic/Latinx teachers (59%), raising additional concerns for equity among the music teacher profession.

Clearly, teachers have experienced high rates of burnout and stress during the tumultuous pandemic period; a Gallup poll comparison between teachers and the rest of the workforce underscored the full extent of this trend (Marken, 2022). In a nationally representative probability sample survey of 12,319 working professionals taken during February 2022, K-12 teachers and other school-based staff ($n = 1,263$) reported alarmingly high levels of burnout. Across all industries, about 30% of workers reported often or always feeling burned out at work, but the number soared to 44% among K-12 staff, the highest of any industry. When examining teacher burnout specifically, the rate of burnout increased to 52%. This is in contrast to early pandemic levels where 36% of K-12 workers reported burnout, just eight percentage points higher than the general workforce at 28%. While burnout across the country has risen as the pandemic persists, teachers and other K-12 staff have been disproportionately impacted.

School and district leadership may impact teachers' stress, burnout, and career intentions during crises. Matthews et al. (2022) used latent growth modeling to examine how school and district leadership decisions may be related to teachers' sense of work-life balance and intentions to remain teaching. They administered a survey to K-12 teachers throughout the Fall 2020 semester by partnering with a national teacher association to distribute survey invitations via social media groups. The first survey was accessed by 2,311 and completed by 1,943 individuals;

the final analytic sample consisted of those who completed the initial survey and at least one follow-up survey ($n = 617$). Results indicated that teachers' overall perceptions of work-life balance improved throughout the semester and intentions to leave their current position decreased throughout the semester. School and district leadership behaviors and actions were important factors in shaping teachers' initial crisis responses but did not continue to shape teachers' crisis responses throughout the semester. Rather, teachers responded more directly to the increased availability of resources and safety measures. An increased sense of work-life balance as the semester progressed was pivotal in reducing turnover intentions. Although this study is subject to issues of sampling bias due to the recruitment strategy, one important takeaway is that the timing of survey administration can contextualize research on teacher beliefs, stress, burnout, and retention decisions.

4.1.02 Teacher Attrition in the Pandemic

Burnout is a general predictor of leaving one's job, but surveys on burnout and attrition intentions are not a substitute for empirical investigations on attrition decisions. As the work exploring the potential impact of COVID-19 on the teacher labor market is in its infancy, the number of empirical studies is still limited at this time. An early estimate by Rosenberg and Anderson (2021) found that at the end of the 2019-2020 school year, teacher turnover in the six included school districts actually decreased to 12.6 percent from the previous three-year average of 17.3 percent. Moreover, the decrease in turnover was uniform across all teacher and school subgroups. Perhaps the great uncertainty within the first couple months of the pandemic contributed to a lower-than-typical turnover rate. Another potential reason considers the general state of the labor market; if teachers had more limited employment opportunities, they may have

been more likely to keep their current job, although it is difficult to speculate without details regarding the specific locales.

Goldhaber and Theobald (2022) compared attrition rates for teachers in Washington from the years before the pandemic to the first two years of the pandemic (i.e., attrition between the end of the 2019-2020 and 2020-2021 school years). The attrition rate increased from 6.4% at the end of the 2019-2020 school year to 7.3% at the end of the 2020-2021 school year, below-average changes in turnover rates from the mid-2000s, which saw the highest year of attrition at 7.7% after the 2006-2007 school year. Although the “recent media stories about rising teacher attrition rates [were] accurate in direction,” they were “not [accurate] in magnitude” (p. 3).

Camp and colleagues (2022) examined changes in teacher mobility and attrition in Arkansas between the 2018-2019 and 2021-2022 school years. They used administrative data maintained by the Office of Education Policy and the Department of Education Reform at the University of Arkansas and supplemented analyses with school-level information from the CCD. Additionally, they imputed district-level learning modalities (i.e., in-person, remote, hybrid) from the American Enterprise Institute’s Return to Learn tracker (<https://www.returntolearnteacher.net/>). Descriptively, about 80% of teachers remained in their school in the pre-pandemic period examined. In the first year of the pandemic, the proportion of stayers remained stable, but there was about a two-percentage-point decrease in stayers in the second year of the pandemic. About 10% of teachers exited the public-school teacher workforce in Arkansas prior to and in the first year of the pandemic, but the rate of workforce exits increased to about 11.5% in the second year of the pandemic. The increase in attrition rates in the second year of the pandemic was heterogeneous across regions and depended on teacher- and school-level characteristics. There was a two-percentage-point increase in workforce exits

among those who were near retirement age, but no increase in exits among first-year teachers. However, newly hired teachers had a five percentage-point increase in school movement. Retention among Black teachers diminished throughout the pandemic from 75% in pre-pandemic years to 68% by the second year of the pandemic. Compared to White teachers from the same school, this constituted an average difference of 10 percentage points in retention rates. Turnover (a measure combining movers and leavers) increased more dramatically in schools with higher rates of free and reduced-price lunch. Switching learning modalities throughout the year was associated with a four percentage-point reduction in retention rates. Consistent with Goldhaber et al. (2022), the increase in teacher attrition during the pandemic was modest; empirical evidence did not support sensational media claims.

4.1.03 K-12 Music Teacher Experiences

At the onset of the pandemic and sudden emergency shift to remote learning, music educators across the country were forced to dramatically rethink and reconceptualize many facets of their instructional environments. Hash (2021a) captured the initial thoughts, experiences, and priorities of Illinois band directors in a March 2020 survey at the pandemic's onset. Hash emailed 1,372 elementary and secondary level band directors and received 474 responses (response rate = 34.5%). During the shift to remote learning, nearly all teachers (99.4%) rated student well-being as a high/medium priority, the most uniform priority across all participants. The second highest priority was maintaining motivation for music study, a priority of 95.2% of teachers. The actual preparation of band repertoire was rated as a low or non-priority by 83.3% of teachers. The second highest rated challenge for teachers was instructional planning; given the low priority placed on long-time ensemble repertoire, this suggests the sudden switch in both learning medium and instructional goals provided a great challenge to teachers. The shift to

remote learning inhibited ensemble performance, but it also highlighted further inequities due to poverty. Teachers in higher-poverty schools reported that their schools were less able to provide computers and internet access compared to teachers in lower-poverty schools. Access to quality computer and internet resources is paramount for remote learning instruction. Overall, this study indicated that, at the beginning of the pandemic, these teachers were primarily concerned with the well-being of their students, and the long-time performance goals of band repertoire performance were far less important than cultivating and sustaining motivation for music study in other ways.

Similarly, Shaw and Mayo (2022) surveyed members of the National Association for Music Education (NAfME) during the Spring 2020 shutdown period to capture educators' experiences on a national scale. Survey responses ($n = 1,368$, response rate = 5.4%) indicated that nearly half (44.9%) of music teachers had no synchronous meetings during the remote learning period. Instead, the majority (53.5%) indicated their remote learning was online, asynchronous instruction. Almost 60% of teachers felt that music was not a priority for their school; among elementary teachers, this number rose to 73%. Furthermore, almost half of the respondents disagreed that remote instruction was meaningful. There are several key factors to consider when evaluating the extent to which this study generalizes. First, membership in NAfME is not compulsory for music teachers, and some states have independent music teacher associations. Secondly, although the number of responses yielded a large sample size, the response rate was still quite low. The findings are potentially susceptible to non-response bias; those who responded to the survey may vary systematically from those who did not respond. Finally, as with the survey by Hash (2021a), teachers responded during a particularly tumultuous time, as teachers were overwhelmed with concerns for the health and safety of themselves, their

family and friends, and their students while simultaneously navigating the single most impactful change to education in their career.

After teachers had a few months to finish the school year, Miksza and colleagues (2022) surveyed NAFME membership in July 2021 and asked teachers to reflect on their Spring 2020 shutdown experiences. This survey was completed by 2,023 teachers (response rate = 7%); the authors speculated that the low response rate was another potential indicator of the severity of stress the pandemic placed upon music educators. As part of the survey, participants completed the PERMA Profiler and a portion of the Depression, Anxiety, and Stress Scale (DASS-21). Compared to published norms on the PERMA Profiler, music teachers reported significantly lower overall measures of well-being ($p < .001$), with significantly lower levels on the positive emotions, engagement, accomplishment, and health subscales ($p < .001$). They also reported higher levels of negative emotions ($p < .001$). As positive outcomes, music teachers scored higher ($p < .001$) on relationship and meaning subscales compared to published norms. Results were consistent regardless of school demographics, size, locale, and socio-economic status. Further, respondents reported “serious concerns regarding the impact of the pandemic on their teaching and their students’ learning” (p. 1165).

In a replication during the Fall 2021 school semester, Parks and colleagues (2021) surveyed the NAFME membership once more in November 2021. This administration was completed by 1,325 participants for an overall response rate of 5%. Most concerning, 77% of music teachers reported some level of depression, a quarter of which rated their depression levels as severe or extremely severe. Less experienced teachers also reported lower positive emotions than more experienced teachers. This survey administration revealed even lower levels of overall well-being. Although this could potentially be an indicator of worsening trends as the pandemic

persisted, it could also be a result of differential non-response bias between the two survey administrations. Even though the collection of national surveys discussed was not without limitations, the consistent message across them all was clear: music teachers were experiencing seriously troubling levels of mental well-being and required a great degree of emotional and instructional support.

Amid pandemic-induced high stress, anxiety, and burnout among music teachers, there are also accounts of resilience and possibility for music education. In a co-autoethnographic account of one elementary general music teacher's lived experiences, Beirnes and Randles (2022) delineated the resilience of the teacher in a blended learning environment. Blended learning refers to class environments in which students attend both physically and virtually. Through careful reflection and the use of technology, the elementary teacher was able to construct a blended learning setup that allowed all students to access resources and participate in classroom activities. Although the struggles were numerous throughout the year, the teacher was able to foster an environment that provided student autonomy and creative opportunities. The pandemic created a host of troubles for many teachers, but this story highlights the opportunity to take lessons learned from the pandemic forward to improve music education.

4.1.04 COVID-19 and the early-career music teacher

In a literature review on first-year music teachers, Conway (2015) chronicled the challenges faced by teachers, perceptions of their preservice preparation, and their induction and mentoring experiences. The most well-documented concern among first-year music teachers was classroom management, and additional challenges consistent among the literature included isolation and planning time, among others. Although the literature review examined first-year teachers specifically, many of the challenges persist throughout one's early career, and these

challenges in particular could be exacerbated by the pandemic and shift to remote learning. As discussed previously, music teachers felt that maintaining student engagement during remote learning was a challenge. Preservice preparation was often viewed as a place for teachers to develop stronger classroom management skills. Some early-career teachers who completed all or part of their student teaching online may have missed some skill development important to having successful early years of teaching. Of all challenges faced by early-career music teachers, isolation was possibly most intensified by the pandemic: music teachers struggled with feelings of isolation before the pandemic because they were often the only music teacher, or one of just a few, in their school. Furthermore, mentorship and induction practices are important for “the community created between music teachers” (p. 70), but the extent to which mentorship and induction for beginning music teachers continued throughout the pandemic warrants further examination.

Frey-Clark et al. (2023) conducted a phenomenological investigation of first-year music teaching during the COVID-19 pandemic. Frey-Clark and colleagues interviewed participants ($N = 10$) and collected written responses to a variety of prompts regarding job contexts, schedules, and pandemic policies. Participants represented all K-12 grade levels and four areas of music instruction: band, choir, orchestra, and general music, and their primary teaching modalities included face-to-face, hybrid, and online synchronous/asynchronous instruction. First-year music teachers were overwhelmed by mixed instructional modalities, student attendance issues, safety protocols, and lack of agency over ensemble performance expectations. Distancing requirements and other safety protocols created a sense of distance and disconnect from students and other colleagues. Overall, the essence of the first-year music teaching experience during COVID-19 was largely characterized by “a feeling of being adrift during a largely lost year” (p. 19). While

several participant concerns, such as being overwhelmed or lacking administrative support, were consistent with those from novice teachers prior to the pandemic, participants' concerns over missing out on key experiences and their well-being represented new concerns previously absent from the literature. Additionally, concerns such as classroom management, which Conway (2015) found to be among the greatest of novice teachers, appeared to be reduced among participants in this study, due to smaller in-person class sizes and remote instruction. Frey-Clark and colleagues concluded that these novice teachers may have experienced “acute intensification” (p. 20) of challenges typically present for novice teachers.

4.1.05 Summary

While the prevalent narrative in the media is that the teacher shortage is going to reach a critical breaking point as a result of the pandemic, the early empirical evidence is less dire. Educators across the country are facing a myriad of challenges, including high levels of stress, burnout, and fatigue. Additionally, the documented challenges of early-career music teachers specifically may have been augmented by shifts to remote learning during their early years and internship experiences (Frey-Clark et al., 2023). Consequently, early-career music teachers may be particularly sensitive to the impact of COVID-19 regarding their retention and attrition decisions.

4.1.10 COVID-19 and Preservice Teacher Experiences

4.1.11 General Education

Postsecondary institutions were also impacted by a shift to remote learning. In cases of preservice teachers, many had field experiences in K-12 settings that were affected by the change. Recent findings have begun to illuminate how these field experiences contribute to preservice teachers' development (Goldhaber & Ronfeldt, 2020), raising concerns regarding the

disruption of such experiences on preservice teacher preparation. Hill (2021) elaborated on some of these uncertainties by examining preservice teacher experiences during COVID-19. Data from preservice teacher surveys ($n = 10$), fieldwork supervisor notes, and teaching observations were analyzed to ascertain the extent to which preservice teachers learned in the remote learning classrooms “what the performance expectations say they should” (p. 2) learn in the traditional face-to-face environments. Results indicated that preservice teachers lacked opportunities to demonstrate mastery of certain skill sets required for teacher competency. As the teacher preparation institution did not modify licensure requirements, there were potential issues of equity regarding whether the students with whom preservice teachers were working had adequate internet access. Although Hill’s work was exploratory and not empirical in nature, this article underscores the importance of further investigating the impact of COVID-19 on preservice teacher experiences, as the quantity of empirical literature on this topic is still limited.

Within the first couple of months of the pandemic-induced shutdown, Choat et al. (2021) surveyed 29 state-accredited teacher education programs in Washington. Preparing institutions, reported only minimal impacts on enrollment projections, suggesting that at least in the immediate short term, this aspect of the teacher pipeline was unaffected. However, because of the shift to remote learning, 22.7% of undergraduate teacher candidates had a reduction in the time spent in their student teaching experiences, and 41.6% of undergraduate teacher candidates shifted their student teaching to remote learning. The extent to which these altered student teaching experiences impact preservice teachers’ transition into teaching, success and effectiveness, and retention in the teaching profession remains unclear.

Emmerichs et al. (2021) investigated differences in preservice teachers’ self-concept of professional knowledge, as measured by the Technological Pedagogical and Content Knowledge

questionnaire. Using repeated cross-sectional data from a postsecondary institute in Germany, Emmerichs and colleagues first established that participants who were in the pre-COVID group were comparable with participants in the post-COVID group along baseline characteristics of age and gender. Multivariate analyses indicated significant differences between groups' self-concept of professional knowledge, and post hoc univariate contrasts indicated significant differences along all subscales except the technological knowledge subscale. This study has several limitations. First, these differences could reflect actual deficits in competencies, but they could instead be indicative of self-perceptions for unpreparedness. Secondly, the sample is limited to preservice teachers in the area of biology within a singular institution in Germany, limiting the generalizability of these findings. Finally, although the authors demonstrated that groups were equal on expectation along the dimensions of age and gender, there is a multitude of other factors that were not observed in the present study that could bias results. Still, the results from this study provide some initial evidence regarding a potential negative impact of COVID-19 on preservice teacher development.

4.1.12 COVID-19 and preservice music teacher experiences

Student teaching is the capstone experience of a music education degree (Draves, 2013). Student teaching provides many invaluable opportunities for preservice music teachers to develop salient skills for their successful transition to inservice teachers, including classroom management skills, rehearsal skills, and administrative work. In fact, in first-year music teachers' reflections, student teaching was the most valuable experience for the development and refinement for many of these skills, particularly classroom management (Conway, 2015). Additionally, student teaching is a critical stage for identity development and socialization into the profession; the relationship between student teacher and cooperating teacher often serves as a

vehicle for this development (Draves, 2013). Given the importance and value placed upon the student teaching experience, the shift to online student teaching experiences raises several important questions and concerns regarding the preparation of music teachers.

Thomas et al. (2021) surveyed music education student teachers in Georgia between April 14th and May 12th, a period consisting of approximately the second month of the COVID-19 shutdown. Thomas and colleagues asked 29 professors at 23 institutions to forward a survey to their current student teachers. Due to the sampling method, the precise response rate is unknown, but 37 student teachers responded, estimated to be about a 32% response rate based on certification exam data. School or LEA policy prevented about one-quarter ($n = 9$) of the student teachers from continuing their internship experience during the shutdown, and another three student teachers simply were never contacted by their cooperating teacher. Another 21 students (56.7%) were officially permitted to continue with their internship but were not given access to the school's online teaching platform, effectively limiting their internship involvement to near zero. Overall, preservice teachers expressed concerns over their ability to develop lesson plans, their overall professional growth, and the general lack of engagement they had with students.

4.1.2 Teacher Shortages and Alternative Pathways

The pandemic's potential impact on teacher attrition and career entry/readiness of new teachers poses a challenge for schools and LEAs to address teacher shortages. One widely-adopted strategy to address teacher shortages has been the adoption of so-called "alternative pathways" to teaching (Cochran-Smith et al., 2011). While the processes and procedures vary, all 50 states and the District of Columbia have adopted such programs (Woods, 2016). Even though media discourse has propagated discussions of a national teacher shortage, more nuanced examinations of the evidence have revealed that teacher shortages are instead focused in specific

content areas and locales (Dee & Goldhaber, 2017; Thompson, 2022). Although the research into differences in student outcomes and teacher effectiveness across pathways has been mixed (Woods, 2016), research on retention rates has consistently found that teachers who entered the profession through an alternative pathway left at higher rates (Cochran-Smith et al., 2011; Mitani et al., 2022). This finding was also true for music teachers examined in Chapter 3 of this dissertation. Consequently, the number of teachers with an alternative pathway hired in a content area is a strong proxy for hiring difficulties experienced within a content area/LEA (Goldhaber et al., 2021), and may be potentially indicative of future shortages as the revolving door of turnover persists.

4.1.3 Summary

The literature on the potential impact of COVID-19 on teacher shortages broadly is in its infancy. The extent to which music teachers contributed to the ‘Great Resignation’ during the pandemic is unclear, as well as how the pandemic impacted the transition of music teacher graduates into the workforce. In this paper, I address these gaps in the empirical literature by first comparing the number of teachers serving as instructors of music courses without certification in music (i.e., certified in non-music areas or an alternative pathway) in the years before and after the pandemic. This measure served as a proxy indicator for the severity of the music teacher shortage experienced each year (Goldhaber et al., 2021). Then, I leveraged a strong quasi-experimental design to examine the impact of COVID-19 on the retention patterns of early-career music teachers and music education graduates’ transition into the teaching profession. The following research questions guided this inquiry:

RQ1: How has the COVID-19 pandemic impacted the music teacher shortage in Maryland?

RQ1a: How has the number of music teachers who are not certified in music changed since the start of the pandemic?

RQ1b: How has the COVID-19 pandemic impacted the retention and attrition patterns of early-career music teachers in Maryland?

RQ1c: How has the COVID-19 pandemic impacted the workforce transition of new music education graduates in Maryland?

4.2 Method

I analyzed data from the Maryland Longitudinal Data System, a statewide administrative data system. Access to data is restricted and all reported results must undergo suppression review to limit deductive disclosure risk. At the minimum, sample sizes must be rounded to the nearest 10, any reported percentages must be rounded to the nearest whole number, and any observed cell with fewer than 10 observations must be omitted or combined with other categories.

This chapter is an extension of the analyses from chapters 2 and 3. I re-analyzed the final analytic files developed for the previous chapters. Working from the final analytic file for Chapter 3, I first identified all newly hired individuals teaching music courses who held a provisional or conditional license (RQ1a). Then, I determined the yearly proportion of teachers who left public school teaching in Maryland (RQ1b). I also conducted a restricted analysis on the subpopulation of teachers of color (racial/ethnic categories had to be combined due to deductive disclosure risk) to investigate the extent to which the COVID-19 pandemic unequally impacted music teachers of color. Working from the final analytic file for Chapter 2, I determined the yearly proportion of graduates who were observed entering the Maryland public school music teacher workforce (RQ1c). To examine the potential unequal impact of COVID-19 across race/ethnicity, I also determined the yearly proportion of graduates of color (racial/ethnic

categories had to be combined due to deductive disclosure risk) who were observed entering the Maryland public school music teacher workforce.

4.2.0 Empirical Strategy

To address research questions two and three, I employed an interrupted-time series (ITS) design, a strong quasi-experimental design that leverages an exogenous shock to a system (Shadish et al., 2002). In the present study, the COVID-19 pandemic is the exogenous shock to the music teacher pipeline. That is to say that no early-career music teacher or music education graduate could influence whether and when the pandemic occurred. The most critical aspect of this identification strategy is that the ‘treatment’ (i.e., COVID-19 pandemic) under investigation refers to the totality of the pandemic. It is impossible to disentangle the direct health effects of the virus and the multitude of policies at state, local, and school/institution levels. Thus, the identification of the causal effect of the COVID-19 pandemic refers to the molar package of all aspects of the pandemic.

The identification strategy for the ITS design relies on several assumptions regarding the functional form of the model. Most importantly, causal inference requires that “any time-varying unmeasured confounder is relatively slowly changing so that it would be distinguishable from the sharp jump of the intervention indicator” (Linden, 2015, p. 483). In the case where the pre-intervention trend is flat, and the post-intervention has a sharp change that is sustained over time, the assumption plausibly holds. In the case of an existing pre-intervention trend, caution should be exercised before attributing causal claims; following advice from Linden (2015), I thus employed several tests to verify the underlying assumptions for all analyses presented.

The empirical model underpinning ITS analysis is shown in (4.1) (Turner et al., 2021):

$$Y_t = \beta_0 + \beta_1 t + \beta_2 D_t + \beta_3 [t - T_I] D_t + \varepsilon_t \quad (4.1)$$

Where:

- Y_t is the outcome measured at time period t . The outcome for analysis one was the proportion of early-career music teachers who left public school teaching in Maryland. The outcome for analysis two was the proportion of music education graduates observed entering the teaching profession the following year.
- T_I is the time of the interruption (Academic Year 2019-2020 for both analyses, as the Pandemic began in March 2020)
- D_t is a dummy indicator equal to 0 in the pre-intervention period and 1 in the post-intervention period (All academic years starting in 2019-2020)
- β_0 is the baseline intercept
- β_1 is the pre-intervention slope
- β_2 is the change in level at interruption T_I
- β_3 is the change in slope post-intervention
- $\varepsilon_t = \rho\varepsilon_{t-1} + \mu_t$, a residual error term that allows for first-order autocorrelation coefficient ρ of adjacent measures

For each ITS analysis, I first graphically investigated the data by plotting the proportion of early-career music teachers who left MD public school teaching (RQ1b) and the proportion of music education graduates who entered the teaching profession (RQ1c). Prior to fitting ITS models, I investigated the “number of lags in the data for which autocorrelation is present” (Linden, 2015, p. 486) by first specifying an OLS model with Newey-West standard errors with a zero-order lag autocorrelation in Stata. I then used the post estimation command `actest` to determine the correct autocorrelation structure. After determining the correct number of lagged-order of autocorrelation, I fit the final models using the `itsa` command, which fits an ITS model using

OLS with Newey-West standard errors. Due to the relatively few time periods observed, I performed a robustness check (i.e., by checking for significant interruptions at multiple points in time prior to the pandemic) after each primary analysis when significant interruptions were found (Linden, 2015).

4.3 Results

Due to data confidentiality restrictions, reported sample sizes in all cells are rounded to the nearest 10 and percentage points are rounded to the nearest whole number. Cells with fewer than 10 observations were combined with other categories or omitted. Results are organized by research question. First, I report the results of each analysis independently, then report their collective significance regarding the overall research question.

4.3.1 RQ1a: Provisionally-licensed teachers

Over time, there has been an increase in the proportion of music teachers holding a provisional license, as shown in Figure 4.1. Importantly, this analysis is descriptive, not causal. The year-over-year increase from the 2019-2020 academic year to the 2020-2021 academic year was approximately 1.46 percentage points, about a 44% increase. This increase followed a similarly sized increase of 1.2 percentage points between 2018 and 2019. The increase in the proportion of music teachers holding a provisional license suggests that LEAs had, on average, a more difficult time hiring certified teachers to fill vacancies. However, it also suggests that the proliferation of provisionally licensed music teachers has been ongoing.

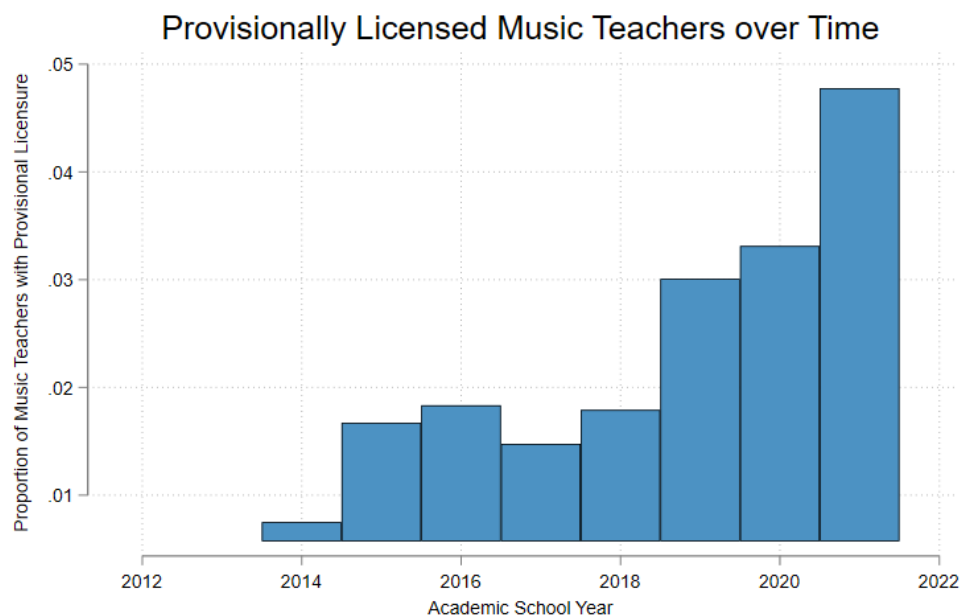


Figure 4.1 Provisionally Licensed Music Teachers

4.3.2 RQ1b: Attrition of early-career teachers

The interrupted time series analysis demonstrated no significant effect of the COVID-19 pandemic on the attrition rates of early-career music teachers, whether measured by the level ($p = .737$) or slope ($p = .693$). Results were consistent in the full analysis and the restricted analysis for teachers of color. Graphic representation of the ITS analysis for all early-career music teachers is shown in Figure 4.2, and graphic representation of the ITS analysis for early-career music teachers of color is shown in Figure 4.3. It appears that early-career music teachers did not contribute to the “Great Resignation,” and that the pandemic did not lead to increased attrition of early-career music teachers. In fact, attrition rates of early-career music teachers in the first two years of the pandemic (at 14% following the end of the 2020 school year and 13% at the end of the 2021 school year) were among the lowest rates of all observed periods.

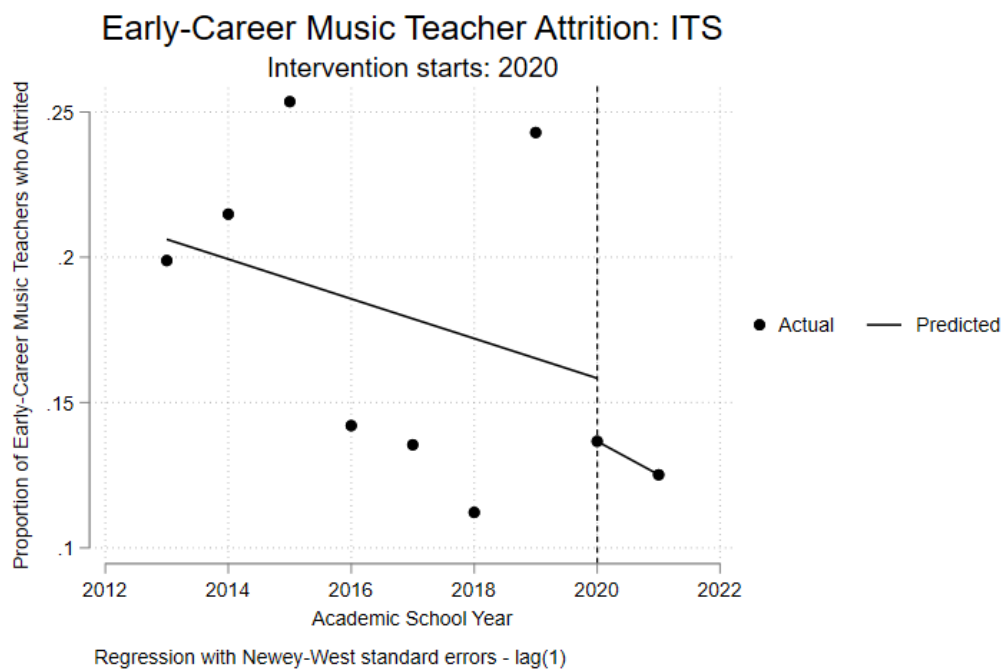


Figure 4.2 Early-career music teacher attrition ITS

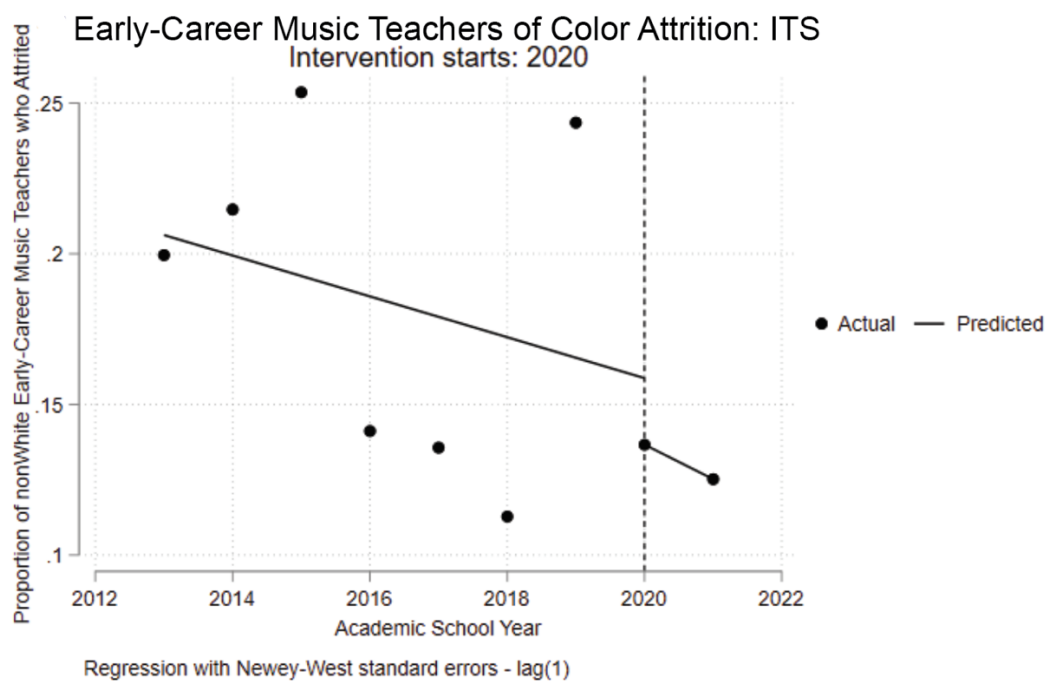


Figure 4.3 Early-career music teacher attrition ITS (Teachers of Color)

However, results from these analyses are more accurately characterized as descriptive in nature, rather than causal. The exogenous shock of the pandemic created conditions typically considered optimal for an interrupted time series analysis and the causal interpretations that follow, but the data from this specific subpopulation of music teachers did not meet the assumptions regarding the functional form. As previously stated, any time-varying unmeasured confounder must be slow changing (Linden, 2015). Post hoc examination of the secular trend revealed that the functional form did not exhibit sufficient linearity due to year-to-year variation in attrition and a lack of statistical power from a relatively small population size. Researchers leveraging an ITS analysis to examine the impacts of the COVID-19 pandemic in other contexts or subpopulations could still glean causal insights provided these assumptions were met (e.g., locales that experienced stable year rates of attrition among music teachers prior to the pandemic).

4.3.3 RQ1c: Postsecondary graduates' transition

Results from the interrupted time series analysis on music education graduates' workforce transition were not as clear. The first analysis, shown in Figure 4.4, demonstrated a significant change in the slope following the pandemic interruption period. There was an initial decrease in the rate of workforce entry that was not statistically significant ($\beta = -.091, p = .077$) following the end of the 2020 academic year (i.e., the earliest months of the pandemic in the United States). However, this decrease in level was immediately followed by a sharp increase in slope ($\beta = .227, p < .001$). As the pre-intervention trend was not flat and there were only two post-intervention periods observed, I followed up this analysis with several robustness checks, testing for false significant interruptions in 2012, 2014, 2016, and 2018. In these robustness checks, there were no significant changes in 2018 or 2016, but a significant change in slope in

2014 ($\beta = .042, p = .026$), and a significant change in 2012 in both level ($\beta = .110, p = .011$) and slope ($\beta = .974, p < .001$). Consequently, readers should exercise caution in drawing a causal interpretation.

There was a similar pattern observed in the analysis of music education graduates who were persons of color (PoC), shown in Figure 4.5. There was a substantive decrease in the level of workforce entry in 2020 ($\beta = -.247, p = .026$), followed by an even sharper increase in slope ($\beta = .375, p < .001$). As before, I followed up this analysis with a robustness check, testing for false significant interruptions in 2012, 2014, 2016, and 2018. Across all robustness checks, there were no significant changes in level or slope ($p > .05$), providing support for a causal interpretation. The COVID-19 pandemic caused a noticeable decrease in the rate of Maryland public school teacher workforce entry among graduates of color with degrees in music education in the first year of the pandemic. However, this trend was quickly reversed the following year, with one of the highest rates of workforce entry (70%) among graduates of color across the 14-year observation period.

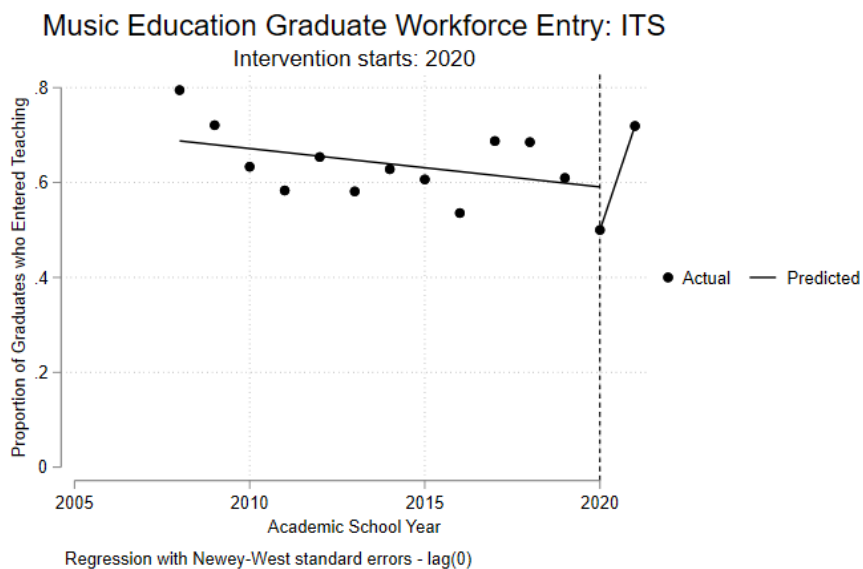


Figure 4.4 Workforce entry ITS

Music Education Graduates (PoC) Workforce Entry: ITS

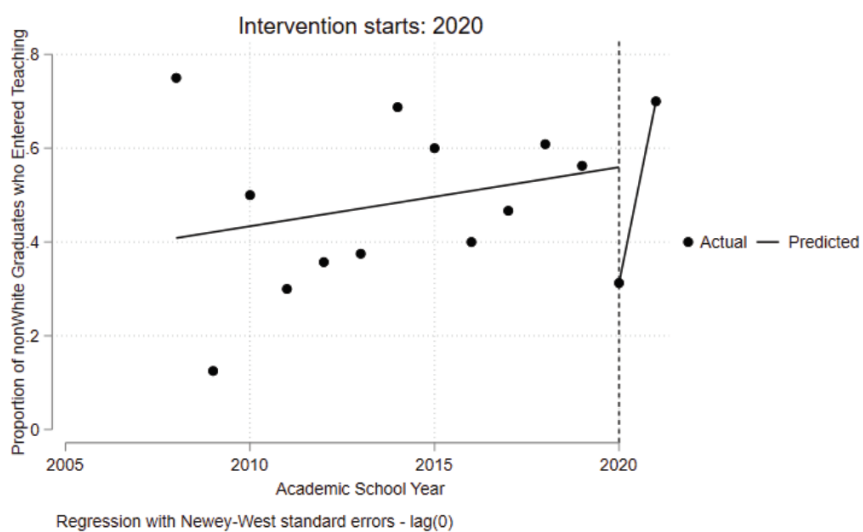


Figure 4.5 Workforce entry ITS (persons of color)

4.3.4 RQ1: How has the COVID-19 pandemic impacted the music teacher shortage in Maryland?

Results from the first analysis indicated that the music teacher shortage in Maryland during the pandemic was the worst it has been across all observable years. The number of music teachers on a provisional or conditional certification has been consistently growing over the five years prior to the pandemic onset. Results from the early-career attrition analysis indicate that, in the first two years of the pandemic, attrition of early-career teachers did not contribute any more to the teacher shortage than in previous years. The sharp decrease in the entry rate of 2020 music education graduates may potentially explain the increase in provisional licensures during the 2021 school year, but the decrease was not statistically significant across all graduates, and individuals of color constituted only a small fraction of music education graduates. Thus, the current study does not provide enough empirical evidence to suggest that the COVID-19 pandemic exacerbated the music teacher shortage in Maryland due to changes in the early-career teacher workforce.

4.4 Discussion

The results of this study provided a first look into how the COVID-19 pandemic may have impacted the music teacher shortage in Maryland through the lens of early-career music teachers. Although these results suggest a null impact, there are two big caveats to this conclusion. First and foremost, the scope of this investigation was narrowly defined, focusing on current and aspirant music educators in their transition into the workforce and their earliest years of teaching. Consequently, one of the analyses was limited by the low sample size and high variation in the yearly attrition rates. Secondly, the impacts of COVID-19, even within this narrow scope, may not be fully manifest in the observable years immediately following the pandemic's onset. With

these limitations, I discuss the results of the present study regarding implications for music teachers, teacher educators, and music education researchers.

4.4.01 Implications for Music Teachers and Teacher Educators

The COVID-19 pandemic has impacted nearly all facets of music teaching. Concerns over health and safety, the sudden switch to emergency remote learning, masking and distancing requirements, aerosol production in band and chorus, and restrictions on gatherings for concerts are among just some of the ways in which the music teaching profession changed (Hash, 2021b; Miksza et al., 2022; Parks et al., 2021; Shaw & Mayo, 2022; Thomas et al., 2021). Although the steady rates of attrition and workforce entry before and in the first two years of the pandemic may be positive news, the positive news should not obfuscate the very real challenges and stress these teachers have and currently are experiencing. To maintain consistent rates of workforce entry and teacher retention moving forward, teachers require support to alleviate these stresses and challenges, lest attrition rates rise, and workforce entry declines due to a lagged effect of the pandemic.

There are a number of potential reasons why early-career music teachers remained in the profession at consistent rates despite possible mounting stress throughout the first two years of the pandemic. One possibility was uncertainty over other employment options. If teachers were uncertain about what employment options were available and what that employment would mean for their health and safety, they may have opted to remain in the profession. Given that there was no way for these teachers to predict the longevity of the pandemic, they may have viewed forsaking their current job security as an untenable decision. Although I did not empirically examine rates of workforce exit for non-music teachers in the current study, evidence from other states (Anderson, 2021; Camp et al., 2022; Goldhaber & Theobald, 2022) suggests there was a

higher rate of workforce exit among the broader teacher population during the first years of the pandemic. This potential difference could be explained by the nature of undergraduate music teacher preparation; curricula center ensemble music experiences, which were largely considered unviable due to health and safety concerns. Without other music-focused employment prospects, early-career music teachers may have been uniquely situated to remain in the teacher workforce. The limited scope of this study prevents generalizability to all teachers in Maryland, so additional research on is needed to better situate these findings in a more holistic context.

The initial uncertainty over employment prospects as the pandemic took over may also explain the dip and subsequent rebound of teacher workforce entry rates among graduates with music education degrees. Although the observed workforce entry rates were not statistically significantly different from previous years across all graduates, the general may still provide some insight into the nature of music teacher labor markets. The pandemic impacted student teaching experiences (Choat et al., 2021; Hill, 2021; Thomas et al., 2021) and created an unpredictable employment climate as various workforce sectors across the country shut down abruptly or switched to remote or hybrid models. After waiting out the initial shock in Spring/Summer 2020 and forgoing employment in a fully remote instructional mode, the graduates may have decided to enter the teacher workforce in Fall 2021 with the following graduation cohort.

While the teacher shortage has been ongoing, the pandemic onset has come with a concomitant increase in the number of provisionally licensed music teachers hired by LEAs. Even though there is not enough evidence to suggest that the pandemic caused an increase in the number of such music teachers, the observed increase warrants action. As music teachers who pursued an alternative pathway to certification have higher attrition rates compared to

traditionally certified music teachers (see Chapter 3), mentorship and induction are of particular importance for these teachers to improve retention (Conway, 2015; Joiner & Edwards, 2008; Fantilli & McDougall, 2009). Otherwise, provisional licensure is a stop-gap solution to a teacher shortage that simply increases teacher turnover and has negative impacts on school climate, fueling more turnover (Sutcher et al., 2016). Music teachers working in districts with large numbers of provisionally licensed teachers may consider reaching out to such teachers, as a supportive professional network may improve workplace satisfaction and retention (Conway et al., 2002). Regardless of the pandemic status, the increased number of provisionally licensed teachers necessitates a concurrent increase in the number of supports they require.

Music teacher educators may influence the workforce transition of new music education graduates as time progresses and the pandemic evolves or recedes. Music teacher educators should be cognizant of how the pandemic may have impacted their state's need for music educators. Working alongside their other university colleagues, faculty can recruit aspirant music teachers and continue to support them throughout the degree program. Although preservice teachers may hold a multitude of career goals and interests, faculty could design coursework and field experiences that provide opportunities for preservice music teachers to engage in honest reflection and dialogue regarding hopes and concerns for careers after graduation.

4.4.02 Implications for Music Education Research

Although the early evidence from the present study suggests that the COVID-19 pandemic did not exacerbate the music teacher shortage in Maryland, there are several important considerations that researchers should continue to address in the coming years. First, the growing number of music teachers credentialed with a provisional license is a strong indicator that the music teacher shortage in Maryland is growing. The music education profession would benefit

from an extensive line of inquiry into the locales, severity, and trends of music teacher shortages across the country, building on the work of Hash (2021b).

The rise in provisionally licensed teachers raises questions regarding their background, and the music education profession would benefit from research into this understudied group of music teachers. Although the vast majority of teachers broadly and music teachers examined in the present study were licensed through a traditional teacher preparation program, the burgeoning number of provisionally licensed music teachers warrants such inquiry. It would be particularly informative to understand motivations for entering the music teacher workforce and the day-to-day challenges these teachers experience. Such qualitative inquiry may inform facets of both music teacher professional development and LEA mentorship/induction supports. Research using SLDSs may yield insight into their academic backgrounds, such as how many come from undergraduate music performance programs or come from a career shift later on in their adult life. Researchers could also leverage SLDSs to compare rates of provisionally licensed teachers between music areas, arts areas, and the broader education profession.

The impacts of the COVID-19 pandemic potentially extend beyond labor markets to other areas of music education. For example, the music education profession would benefit from inquiry into how the pandemic was related to K-12 student enrollment in music courses, curricula changes, professional development for music teachers, and the integration of technologies. Researchers could examine changes in enrollment trends, and there is a possibility to exploit variation in LEA policies regarding instructional mode (i.e., in-person, remote, or hybrid) and masking/distancing policies to make causal inferences. Comparing enrollment trends between aerosol-producing music ensembles (i.e., band and choir) to non-aerosol-producing music courses (i.e., orchestra, guitar, and piano) could be particularly informative to the music

education research and practitioner communities. Survey and qualitative research into the perceptions and lived experiences of music teachers and students in both K-12 and postsecondary settings may provide insight into potentially positive innovations in curricula, professional development, and technological integration while simultaneously elucidating the struggles and hardships that individuals endured. As teachers broadly (Marken, 2022; Jotkoff, 2022; Zamarro et al., 2021) and music teachers specifically (Miksza et al., 2022; Parks et al., 2021) experienced alarming levels of stress, burnout, and mental well-being, it is imperative to explore how to best provide support to students', teachers', and postsecondary faculty's well-being.

4.4.03 Conclusion

The music teacher shortage in Maryland has been getting progressively worse since before the pandemic, indicating deeper systematic issues that constrain the music teacher pipeline. Although media narratives may decry the pandemic as a harbinger of mass teacher exits (ABC News, 2022; Natandson, 2022), one should approach these claims with skepticism. While the pandemic has incurred and exacerbated severe difficulties for teachers, it would be disingenuous to purport that solving these problems would fix the teacher shortage. Scapegoating the ongoing teacher shortage on the pandemic would abdicate responsibility to effect meaningful reform in the education profession, including the professional stature of educators, salaries, school funding, accountability measures, etc.

Finally, although the results of this study may not be wholly generalizable to other states and locales, Hash (2021b) identified over 30 other locales experiencing shortages of music teachers. An important consideration for future research will be potential threats to the validity for researchers interrogating causal questions. For example, the Blueprint for Maryland's Future

legislation, a substantive education funding initiative, may pose a history threat to validity for future work in Maryland. As this legislation was passed in 2021, it will be impossible for researchers to disentangle the pandemic effects from effects stemming from this legislation. To ensure LEAs, schools, and students have enough qualified music teachers in the coming years, music teacher educators should collaborate with school systems to recruit music education majors, support their transition into the teacher workforce, and provide the appropriate supports to music teachers in their earliest years, regardless of their preparation pathway.

Chapter 5. Conclusion

Music educators, researchers, and advocates should work with LEA and state policymakers to address growing teacher shortages and ensure all schools can employ qualified music teachers. In this chapter, I first consider evidence from these three empirical studies alongside the broader teacher labor market literature to provide policy recommendations for addressing the music teacher shortage in the State of Maryland. Although the evidence and recommendations presented are specific to Maryland, music teacher educators in other states experiencing music teacher shortages may consider how to adapt these recommendations when working within their unique contexts alongside education agencies. Next, I discuss how this document as a whole contributes to the broader music education field. I conclude this chapter with reflections on the leaks and filters along the music teacher pipeline that invariably contribute to the music teacher shortage.

5.1 Policy implications for Maryland

I offer three broad conclusions regarding the music teacher shortage in Maryland: 1) the attrition of early-career music teachers is a potent leak along the music teacher pipeline, 2) only a small majority of those who graduate with music education degrees from institutions of higher education in Maryland enter the Maryland K-12 public school music teacher workforce, and 3) the music teacher shortage has persisted for years, and there is not yet enough evidence to suggest that pandemic exacerbated the shortage in any meaningful manner regarding early-career music teachers. Importantly, policy recommendations provided are based on descriptive analyses; the efficacy of such recommendations is thus contingent upon not only fidelity of implementation but also upon exogeneity along the music teacher pipeline. That is, it is always possible that one's exit from the music teacher pipeline and the characteristics associated with

their exit was related to unobservable characteristics of the individuals, and policy levers targeting such characteristics would then be less effective. As researchers continue to explore music teacher labor markets with greater discernment, the expanding evidence base will lead to better policy recommendations and decisions.

5.1.10 Recommendations for Schools/LEAs

5.1.11 Cultivate mentoring relationships and supportive professional networks

Survival analyses from Chapter 3 revealed that early-career music teachers employed in LEAs with fewer FTE teachers were more likely to leave the profession. Although mentorship and induction practices were not directly observable in the MLDS, the number of FTE teachers served as a proxy measurement for the potential professional network of music teachers. As the quality of mentorship programs is particularly salient for early-career teacher job satisfaction and attrition risk (Conway et al., 2002; DeLorenzo, 1992; Fantilli & McDougall, 2009; Gallo, 2018; Joiner & Edwards, 2008; Krueger, 2000; Nguyen et al., 2019), expanded mentorship and professional networking opportunities may improve early-career retention. These opportunities may be of particular importance for music teachers that went through alternative certification pathways, who experienced far higher rates of attrition in their earliest years of teaching compared to traditionally certified music teachers.

Compared to the general teacher population, music teachers have unique needs as they are often isolated in their buildings as one of, if not the only, music specialist in their building. LEAs should consider how to support the unique needs of music teachers, such as content area-specific professional development, and how district mentorship and induction policies could be adapted to foster meaningful relationship building among music teachers. These adaptations could include partnerships with professional music education organizations, music education

faculty within Maryland's institutions for higher education, or even partnering with other nearby LEAs to provide meaningful professional development that specifically supports music teachers.

5.1.12 Provide additional supports in low SES schools

Analyses from Chapter 2 showed that the SES distribution of schools in which new music teachers were employed was similar to the state average, but new music teachers employed in lower SES schools were more likely to leave the profession, consistent with the broader teacher turnover literature (Borman & Dowling, 2008; Nguyen et al., 2019). One potential explanation for these findings is the mismatch in teacher background and their school of employment. Research has shown that preservice music teachers largely aspire to teach in schools similar to the ones they attended (Hellman, 2008; Kelly, 2003). As the music teacher candidates in these studies attended, on average, higher SES high schools, the potential mismatch in their background and employment could reduce job satisfaction. Additionally, other factors that teacher candidates reported valuing, such as administrative support, overall school culture, and classroom resources (Robinson, 2012), may be associated with school SES due to underlying systemic inequities in education (Carter Andrews et al., 2019).

Thus, additional supports for music teachers in lower SES schools may ameliorate the attrition of early-career music teachers. These supports could involve induction programs specifically designed to acclimate teachers to working in lower SES schools and financial resources for classroom materials (e.g., instruments, sheet music, music technology, etc.). Field experiences are an integral component of preservice teacher preparation, but the specific contexts within which a music teacher had their field experiences may differ from the teaching context in which a teacher finds employment. In fact, Goldhaber and colleagues (2017b) found that student teachers in Washington, on average, completed internships at higher SES schools and that

teachers were more effective in contexts that matched their student teaching placement. If these patterns hold for music teachers in Maryland, lack of experience in lower SES schools may have contributed to higher odds for attrition among early-career music teachers. School- and LEA-level administrators should consider teachers' background experiences and, particularly for teachers with less experience in lower SES schools, work to provide a positive and supporting structure for the music teacher to find success, as highly supportive administrators can mitigate attrition risk in music teachers (Hancock, 2008; Gardner, 2010; Madsen & Hancock, 2002; McLain, 2005). One caveat to these recommendations is the possibility that the relationship between school SES and turnover could be due to an unobserved confounder: some latent construct may be associated with higher attrition risk and employment in lower SES schools. Even if this were the case, the resulting impact on school districts remains the same, but school and LEA officials may need to work individually with teachers to identify the specific forms of additional support that could yield higher retention rates.

5.1.13 Cultivate a recruitment pipeline with music teacher preparation programs

When LEAs have or are expecting to have unfilled music teacher vacancies, developing partnerships with music teacher preparation programs proactively may help recruit new graduates into the labor force. Results from Chapter 2 indicated that approximately 40% of graduates with music education degrees do not enter the music teacher workforce in Maryland public schools, representing a substantive portion of the potential music teacher labor force. Some of these graduates may invariably pursue alternative career options regardless of available teaching opportunities, and some of these individuals may pursue teaching careers outside of Maryland. Regardless, the impact on the music teacher supply for Maryland public schools is the same. Emerging research suggests that hosting internship placements may have a meaningful

influence on one's decision to teach in the school district (Goldhaber et al., 2017b; Krieg et al., 2016). Beyond hosting preservice teachers for field experience, LEA officials could also keep music education faculty apprised of expected job openings and make themselves available to preservice teachers for questions and interview preparation.

5.1.2 Recommendations for Music Teacher Preparation Programs

5.1.21 Music education recruitment and admission practices

Music teacher educators should consider how to expand recruitment and admission practices to be more inclusive of students from a variety of backgrounds. As Chapter 2 results demonstrated, the vast majority of music teacher candidates came from affluent, majority-White suburban high schools. In Maryland, music teacher preparation programs are housed within postsecondary institutions with broad geographic, academic, and demographic coverage. Recruitment into music education programs and schools of music more broadly requires a concerted effort from music education faculty, applied lessons faculty, ensemble conducting faculty, and other supporting staff and faculty members. Working within institutional systems, music teacher educators can spearhead recruitment efforts to visit a variety of K-12 schools, connect with inservice music teachers, and be available for questions and conversations from potential music teacher candidates to encourage application and audition.

Recruitment alone, however, may not yield the matriculation of students from more diverse backgrounds. Several gatekeeping processes filter out potential music teacher candidates from other backgrounds, such as de facto requirements for private lessons and audition repertoire expectations (Koza, 2008) upon which all faculty within schools/departments of music should reflect. Private lessons are a de facto requirement for acceptance into many music programs, depending on the instrument or voice type, because of the technical proficiency one is expected

to display during an audition. Rather than judging potential undergraduates solely against a rigor of technical mastery, I propose a broader assessment of musicianship and dispositional characteristics to aid in admissions decisions. By changing the audition paradigm from “what has the candidate achieved?” to “can we (faculty in the school of music) can help this candidate develop their broad musical skillset?”, the audition filtration along the music teacher pipeline will be minimized. Then, music faculty can extend their recruitment efforts to a much broader population of students with a variety of demographic, socioeconomic, and geographic backgrounds. For clarity – I am not suggesting lower audition standards – I’m suggesting the standards currently in place serve a very specific paradigm of student and instruction, and that the music community would benefit from rethinking what audition standards ought to accomplish.

5.2 Contributions to Music Education Scholarship

5.2.1 Leveraging State Longitudinal Data Systems for music education research

State longitudinal data systems, such as the MLDS, offer music education researchers rich sources of data for empirical investigations. The research studies contained within this document build upon the early music education research leveraging such data systems. In Chapter 1, I delineated how other music education researchers may gain access to such data systems for their own work. Although processes vary by state and data system, all researchers seeking access to these data may benefit from forging relationships with teams responsible for collecting and maintaining data, as well as approving research proposals.

Empirical investigations using state-level data provide two key benefits compared to nationally representative data. The largest benefit of nationally representative data is the breadth of coverage; the sampling frame ensures coverage across all states, locales, and persons.

However, this coverage comes with a concomitant trade-off over lack of depth in any one area, such as the background characteristics of individuals sampled and adequate sample size to examine smaller and more specific subpopulations, yielding reduced statistical power. SLDSs contain census-level data over an observable period of time, and thus offer a large range of background characteristics that can be incorporated into statistical models. For example, in Chapter 2, I incorporated numerous characteristics of an individual, as well as their high school, postsecondary institution, and place of employment. Although linking these types of data is possible in data sets such as the High School Longitudinal Study, researchers are limited to the questions asked in the particular year of each wave, and sample sizes quickly diminish as researchers narrow in on particular subpopulations. As such, SLDSs may be of particular interest to researchers investigating a narrowly-defined population. The second key benefit is state-level policy relevance, particularly when examining issues related to the music teacher pipeline and labor markets. The local nature of such markets (McHenry-Sorber & Campbell, 2019; Reininger, 2012; Thompson, 2022) coupled with national trends' lack of generalizability to individual states (Goldhaber & Holden, 2020) implores researchers and policymakers to consider state and local contexts. The music education research community would greatly benefit from additional rigorous quantitative analyses leveraging SLDSs.

There are several resources available to the music education research community that may aid individuals seeking to use SLDS data to answer research questions. The first step is understanding what data are available. Nearly 90% of SLDSs examined by Bloom-Weltman et al. (2021) included data on student demographics, school enrollment, and attendance, about 75% of SLDSs reported data on course enrollment and course completion, and 45% reported containing data on kindergarten readiness, with an additional 33% planning to include such data

in the future. Furthermore, nearly 70% of SLDSs reported the present or planned capacity to link K-12 student data to teacher data and nearly 80% reported the present or planned capacity to link K-12 student data to postsecondary outcomes. The Education Commission of the States (ECS) has compiled a comprehensive resource that profiles each SLDS (Jamieson et al., 2021). These profiles contain information on whether each state currently has an operational SLDS, its name, hosting agency, website, and any publicly available data dictionary, as well as which aspects of early childhood learning through workforce data are included in the SLDSs legislative and funding mandate. Even for states without a currently operational SLDS, this resource profiles other sources of state administrative data that may be of interest to music education researchers. One limitation of these large-scale data analyses will always be the constraints placed upon researchers due to the observable data. For this reason, the music education research community would benefit from relationships with state data agencies and other arts education agencies, such as the Arts Education Partnership, to collaboratively examine what data are available, how they may be useful in arts education research, and identify potential gaps in data availability. A key tenet behind the SLDS grant initiative was that better information would yield better decisions; music education researchers should capitalize on these available data sets and augment their current methodological approaches with analysis of SLDSs.

As work with SLDSs in the music education field is currently limited, I offer several suggestions that extend the inquiries from this dissertation. In these papers, I examined only the final stages of the music teacher pipeline, but SLDSs could be used to identify those in and out of the music teacher pathway, extending the analysis of Gris  (2019) within state-specific contexts. Several SLDSs contain data on postsecondary course enrollments; these data could be used to examine chokepoints within music degree programs, informing postsecondary music

faculty where to focus additional support structures for students. In Chapter 3, I found that approximately half of all new music teachers left teaching in Maryland public schools, raising questions about their employment pathways after teaching. Researchers could use SLDSs to link teachers who left the profession to other workforce outcomes. One understudied area of music education is the promotion prospects of teachers; do music and other arts teachers enter principalships and other administrative roles at comparable rates to other teachers? Salary increases among teachers historically have been tied to longevity and transition into administrative roles, although the recent Blueprint legislation in Maryland has allocated funding for teacher salary increases while remaining in the classroom. Elpus and Abril (2011; 2019) used national data to examine the demographics of music students at the secondary level across the country; Miller (2023) examined the same demographics for high school students in Maryland using MLDS data. Extensions of these works could illuminate changing trends over time not only at the high school level, but at middle, elementary, and postsecondary levels as well. Researchers could also use SLDS data to examine a more narrowly-defined subpopulation, such as the provisionally-licensed teachers included as part of analyses in Chapter 3, answering questions regarding their background, employment history, etc. When researchers are limited by the data available in the SLDS, they may consider augmenting their data analyses with researcher-designed surveys or interview protocols. For example, motivations for pursuing an alternative pathway to music teaching would be unobservable in SLDSs, but interviews with such current, aspirant, and/or former music teachers could greatly enhance and contextualize these analyses. Invariably, these rich data sources provide a multitude of opportunities for music education researchers to critically examine a multitude of pertinent music education issues across K-12, postsecondary, and music teacher contexts.

5.2.2 Music Teacher Pipeline and Labor Markets

Substantively, this dissertation provides a novel conceptual lens through which to investigate music teacher pipelines, labor markets, and the extent to which they may be similar or dissimilar to their non-music counterparts. Building upon previous labor market work (e.g., Hancock, 2008, 2009, 2016; Robison & Russell, 2022; Russell, 2012), the longitudinal investigations of observed career decisions within this document greatly strengthens the evidence base while providing several key insights that warrant further study. In Chapter 2, analyses showed that the majority of new teachers gained employment at the elementary level. In Chapter 3, analyses showed that about half of all early-career teachers who switched jobs also switched to a different grade level, and the vast majority of those moved to teaching older students. Furthermore, movers on average moved to a school with a lower proportion of students eligible for free/reduced-price lunch. This mobility pattern strongly suggests a perceived promotional aspect of relocation, consistent with conclusions brought forth by Hancock (2016). Importantly, perceived promotional aspects may be tied directly to school level and socioeconomic status, among other factors not observable in the MLDS data. One possible explanation for this pattern could be the large influence of high school music teachers on decisions to pursue music teacher careers (Rickels et al., 2013). When considered in tandem with results from Chapter 2 that showed graduates came from schools that were larger and more affluent than the state average, music teachers may seek relocation to schools that more closely emulate their own high school experience. Another explanation considers music teacher identity and socialization, that one's self-perception as a conductor is more strongly tied to their teacher identity compared to their musician identity (Isbell, 2008). In this instance, teachers would seek to move to schools that allow them to manifest their teaching as large ensemble conductors rather than as elementary

music teachers. In either case, survey and qualitative inquiry into promotion through relocation could enhance the profession's understanding of this phenomenon.

The music teacher pipeline is neither linear nor singular, but a complex system with leaks and filters along every stage. With the recent proliferation of provisionally licensed music teachers in Maryland, the difference between those who remain and those who have left the pipeline becomes less and less distinct. In previous studies, researchers have examined the homogeneity of music teacher (e.g., Elpus, 2015, Miller, 2023; Miller et al., 2021) and music student (e.g., Elpus & Abril, 2019; Miller, 2023) populations. Consistent with the work of Grisé (2019), analyses from Chapter 2 indicated that in Maryland, those who reached the final stage of the pipeline and entered public school music teaching represent only a select subset of the population along both individual and contextual characteristics. In the present study, newly employed teachers were disproportionately White and came from schools that had student populations that were larger, more White, and more affluent than state averages. Barriers to audition success (Koza, 2008) and degree persistence/completion (Fitzpatrick et al., 2014), compounded by inequalities in music education access and uptake at the secondary level (Elpus, 2022a; Miller, 2023) contribute to the homogeneity of the music teacher profession. The music education profession would greatly benefit from continued inquiry into leaks and filters along every stage of the pipeline. Faculty within collegiate music schools should consider how potential reforms to recruitment practices, audition processes, admission requirements, and curricula within music degree programs may provide a more clear and more accessible music teacher pipeline for all students.

5.3 Final Reflections

A high-quality music education in one school context does not have to be identical to the musical experiences of students in a different context. Currently, music teacher labor markets are broadly defined by four core teaching responsibilities: general music, band, chorus, and orchestra. The aspirant, current, and former music teachers examined within these studies were charged with the immense task of providing high-quality music education to all of their students, irrespective of their personal background, job duties, and employment characteristics. The connections they forged with music, students, and colleagues, as well as the resulting experiences, no doubt had a profound impact on any number of individuals, even among those who never formally entered the Maryland public school music teacher workforce. Labor markets are messy and convoluted; I labored to describe the relationships between just some of the factors involved so teachers, teacher educators, policymakers, and advocates alike can cultivate an educational paradigm where no schools have difficulty employing qualified music teachers. With the help of scholars past, present, and future, I aspire to turn ending the teacher shortage from a pipe dream to a reality.

Turning focus away from the individuals who comprised the analytic samples within these studies, I ponder deeply about the individuals who had already experienced leaks and filters along their pipeline prior to the point of postsecondary graduation. How many individuals do *Emily*, *Joshua*, and *Sue* represent? Further, how many individuals are there for whom the profession has not begun to understand their story? I cannot purport to have a singular solution for music education's homogeneity problem. Indeed, no singular individual can uproot the systemic barriers that filter people out of music education, and consequently, the music teacher pipeline. However, without individual action, the problem persists statically, and students are thus denied a music education. I implore those in the music education profession to consider how

music teaching and recruitment practices, course structures, class offerings, and gatekeeping prerequisites at both the K-12 and postsecondary levels may evolve so all students may thrive with music.

Finally, the pipeline has served as a useful metaphor for discussing the music teacher pathway and how individuals leak out indiscriminately or get filtered out inequitably. However, the pipeline also connotes one singular path in one direction. In the case of music teachers, it is a pathway that is quite narrowly defined and limited in breadth, consisting almost exclusively of large ensemble, western art music paradigms. If the profession wants more inclusive music education experiences for all students, perhaps a flawless pipeline should not be the end goal. Instead of patching the leaks and clearing the filters, the profession can demolish the pipeline and cultivate a richly diverse forest of musicians, musical experiences, and music teachers.

Appendix A

List of string searches to identify music courses

<i>Band</i>	<i>band</i>	<i>BAND</i>
<i>BND</i>	<i>Wind Ensemble</i>	<i>Wind Ens</i>
<i>JAZZ</i>	<i>Jazz</i>	<i>Jazz Ens</i>
<i>Jazz Band</i>	<i>PERCUSSION ENSEM</i>	<i>PERC ENS</i>
<i>Percussion</i>	<i>PERC</i>	<i>Percussion Ens</i>
<i>INSTR CHAMBER ENS</i>	<i>WOODWINDS</i>	<i>woodwinds</i>
<i>Small Ensemble</i>	<i>Contemporary Instrumental Ensemble</i>	<i>Orchestra</i>
<i>String</i>	<i>ORCHESTRA</i>	<i>STRING</i>
<i>ORCH</i>	<i>STG</i>	<i>Chorus</i>
<i>CHORUS</i>	<i>Vocal</i>	<i>VOCAL</i>
<i>General Music</i>	<i>GENERAL MUSIC</i>	<i>Music (gr</i>
<i>Music K</i>	<i>Music</i>	<i>MUSIC</i>
<i>Piano</i>	<i>PIANO</i>	<i>Guitar</i>
<i>GUITAR</i>	<i>GTR</i>	

Appendix B

Table B.1

<i>Logistic Regression model for workforce entry</i>	
Characteristic	Model 2
Female	.26 (.189)
<i>Race/Ethnicity</i>	
Black	.70 (0.389)
Hispanic	0.12 (0.529)
Asian	-0.84** (0.294)
Other/Unknown	-0.94* (0.462)
Out-of-State	-0.47 (0.316)
<i>Institution Fixed Effects</i>	YES
<i>Year Fixed Effects</i>	YES

Note: Coefficients are reported as log-odds. Standard errors were clustered at the institution-by-year level. Race/Ethnicity categories were combined to comply with suppression requirements. Hispanic refers to individuals from all racial groups that were Hispanic; other racial designations refer to non-Hispanic individuals within each group. Reference group for race/ethnicity was White.

* $p < .05$; ** $p < .01$; *** $p < .001$

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