Teachers' Beliefs About Students' Social Disadvantage
Exploring High School Contexts and Teachers' Influence on the Achievement Gap

by

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ABSTRACT

The association between social background and academic achievement has long been of significant interest within sociology, yet we know little about how teachers understand this relationship. Substantial enthusiasm has recently surrounded "transformational" schools, where poor and minority students achieve at levels far higher than their social background predicts, and their implications for educational inequality. Case studies of such schools portray a widespread belief among teachers of empowerment to overcome student disadvantages, but the effect of such teacher beliefs has not been generalized to schools broadly. This dissertation pursues a more systematic exploration of whether teachers' beliefs about social disadvantage are a key aspect of school success by analyzing the prevalence of more empowered or, conversely, more helpless beliefs, their association with other teacher traits and school contexts, their relationship to student outcomes, and their implications for racial and socioeconomic inequality by using multilevel quantitative analyses and large-scale, nationally representative data from the High School Longitudinal Study of 2009.

The first empirical chapter shows that among math and science teachers, although the most helpless attitudes are rare, a nontrivial minority of teachers express them; empowered attitudes are somewhat more prevalent. Teachers' beliefs are largely independent of their human capital, but are strongly related to school context, with the most important predictors being school culture and school racial/socioeconomic

composition, rather than school reform characteristics or academic composition as might be expected. The second empirical chapter finds that the students of more empowered teachers have better motivation and achievement in math. However, evidence is mixed as to whether these relationships are explained by selection of students into classrooms/schools or by a causal influence of teachers' beliefs on student outcomes. Finally, interaction analyses in the third empirical chapter reveal that the relationship between teachers' beliefs and student achievement is much stronger for black students than for other groups, but rather than poorer students benefiting most, this effect increases for more advantaged black students. In sum, this dissertation indicates that teachers' beliefs about students' social disadvantage may have implications for inequality in education, although not necessarily in the exact ways we might have expected.

CHAPTER 1

Introduction

Disparate educational opportunities and outcomes along racial and socioeconomic lines are among the most persistent challenges facing U.S. society. The influence of social inequality on education has prompted considerable debate over whether schools ought to be held accountable for racial and socioeconomic disparities in academic outcomes, or whether entrenched inequality in broader society means some students face hardships too difficult for teachers and schools to overcome. Extensive evidence indicates that non-school factors primarily drive students' academic outcomes. Yet, substantial enthusiasm has recently surrounded "transformational" schools, which claim to establish conditions that enable students to achieve at levels far higher than their social background predicts. A condition commonly ascribed to such schools is a widespread belief among teachers of empowerment over student outcomes—a conviction that teachers can ensure students are not precluded from reaching their full potential by family background or social disadvantage. This suggests that such empowered teacher beliefs may be a key aspect of promoting high achievement—or, conversely, that beliefs of helplessness in the face of social disadvantage may be a hindrance.

However, evidence that such empowered teacher beliefs are key to promoting high achievement is based largely on case studies and personal accounts (Kopp 2011; Wilson 2008), as well as psychological research with small samples (e.g. Gibson and Dembo 1984; Guskey and Passaro 1994; Woolfolk and Hoy 1990). No research has

examined the prevalence of empowered or, conversely, helpless beliefs among teachers nationally and we know little on a broad scale about the school contexts that support different beliefs about teachers' and schools' capacity to overcome social disadvantage. Furthermore, specific methods have not been conclusively tied to success in "transformational" schools. Although empowered beliefs have been highlighted in case studies of successful schools serving a high-poverty student body, the relationship deserves greater scrutiny because other aspects of such schools may actually be driving results. This dissertation pursues a more robust test of this theory by using national-level data on teachers' beliefs about students' social disadvantage.

Background

Although racial and ethnic disparities in educational outcomes narrowed during the 1970s and 1980s, on many measures progress toward racial equality stagnated thereafter (Gamoran 2001); estimates suggest that at our current rate it will take over 70 years to eliminate the black-white achievement gap (Reardon 2013). Meanwhile, the achievement gap between children from high-income and low-income families widened substantially over the latter half of the twentieth century (Reardon 2011). Explanations for class- and race-based academic disparities often emphasize group differences in socioeconomic and cultural resources, but some researchers contend that schools perpetuate gaps by neglecting some students' learning and fostering attitudes that diminish students' potential (Paige and Witty 2010). An educational model that has been termed "transformational" (Kopp 2011) or "gap-closing" (Wilson 2008) attempts to tackle disparities in part through a culture that assumes schools must alter the educational trajectory predicted by a child's background. Accounts of such schools convey that their

teachers widely espouse a highly empowered attitude toward student outcomes—that student background need not be a barrier. This attitude appears to be present as part of both individual teachers' beliefs and the broader ethos of the school culture. This dissertation focuses on the extent to which individual teachers believe that students' social disadvantages can be overcome.

Past research in psychology has embedded individual teachers' beliefs about whether students' social background poses an obstacle within the concept of "teacher efficacy." The early development of scales to measure teacher efficacy (e.g. Gibson and Dembo 1984; Guskey and Passaro 1994) indicated a multi-faceted concept, with a dimension of "general teaching efficacy" reflecting the extent to which a teacher perceives external obstacles to effective teaching. However, recent psychological research has primarily focused on the self-oriented dimension of "personal teaching efficacy" (Tschannen-Moran and Woolfolk Hoy 2001) and has largely ignored the "general teaching efficacy" concept that more closely bears on the notion that teachers can have a "transformational" role in children's lives. Research examining teacher effects on general student populations largely focuses on teachers' human capital, such as their teaching experience and certification status (e.g. Darling-Hammond and Youngs 2002; Goldhaber and Brewer 2000; Rice 2010). But teachers' attitudes toward students likely also matter, and helpless beliefs may be especially detrimental for students who are viewed as unlikely to succeed. Persistent academic disparities likely reinforce stereotypes about poor students of color, feeding teachers' underestimation of their latent potential (Ferguson 2003). Teachers' expectations for individual students are more strongly related to achievement for black and low-income students than for students in general (Jussim,

Eccles, and Madon 1996), which may elucidate why teachers' beliefs of empowerment have primarily been identified as crucial in schools that serve these populations. Given the strong interest within sociology in how social background relates to achievement, this dissertation argues that teachers' beliefs about this relationship should be considered from a sociological perspective concerned with educational inequality. Furthermore, it draws on the school effects research tradition within sociology to examine the school contexts of teacher beliefs, testing the role of important school-level factors suggested in case studies.

Research Questions and Approach of the Core Dissertation Papers

My dissertation presents a quantitative analysis of a national sample of nearly 7,000 teachers from across the U.S., measuring their beliefs regarding the extent to which they can overcome social disadvantages stemming from family background and home environment and impact student learning and achievement. I use restricted-access data from the High School Longitudinal Study of 2009 (HSLS:09), a nationally representative sample of more than 21,000 9th graders in 944 high schools. HSLS:09 is the most recent among data on schools and student progress collected by the National Center for Education Statistics, and the first to include teacher data at this scale, allowing for a more accurate national picture of teachers' beliefs than yet exists. Its extensive teacher data, provided in wave 1 by the math and science teachers of sampled 9th graders, makes HSLS:09 uniquely suited to address the four research questions of my dissertation:

Q1. How prevalent are beliefs of empowerment and helplessness among teachers nationally?

Q2. What teacher and school characteristics are associated with more helpless or more

empowered teacher beliefs?

Q3. Are teachers' beliefs of empowerment or helplessness related to students' educational outcomes?

Q4. Does the relationship of these teacher beliefs to students' outcomes differ by students' race and socioeconomic status (SES), such that it might be consequential for achievement gaps?

To measure teachers' beliefs about students' social disadvantage, I draw on three items that gauge the extent to which teachers believe social background is a barrier to student achievement. Teachers expressed the extent to which they agree or disagree with the following items:

- The amount a student can learn is primarily related to family background.
- You are very limited in what you can achieve because a student's home environment is a large influence on their achievement.
- When it comes right down to it, you really cannot do much because most of a student's motivation and performance depends on their home environment.

Designed to be read largely as independent papers, each of the three core chapters of the dissertation presents the distributions of teachers' responses to these items, to justify their use for measuring the concept of teachers' beliefs about students' social disadvantage that I advance. The first paper discusses the distributions in more detail to answer Q1, offering the first understanding of how teachers' beliefs of helplessness and empowerment vary on a national level. The paper then addresses Q2, analyzing the relationships between teacher and school characteristics and teachers' beliefs. This analysis focuses on theoretically important key predictors: teachers' human capital

characteristics that are a common focus of the education policy literature on teacher effects, school reform factors that have been highlighted alongside teachers' beliefs in accounts of "transformational" schools, and school culture and composition, which are more commonly studied in the school effects tradition.

The second paper answers Q3, testing the relationship between teachers' beliefs and students' educational outcomes by focusing on math teachers and students taking math. This analysis examines how teachers' beliefs relate to three different motivational and achievement outcomes in math. It also provides several robustness checks that aid in interpreting the results by examining potential sources of selection in which students have teachers with more or less empowered attitudes, and testing a causal interpretation by exploiting variation in the timing of when students' outcomes were measured.

Finally, the third paper addresses Q4, analyzing whether there are heterogeneous effects in how teachers' beliefs relate to student outcomes for certain demographic subgroups. Focusing on math achievement, this paper examines differential relationships by student SES and student race, as well as student race-by-SES combinations. This analysis scrutinizes the implication in accounts of "transformational" schools that teachers' beliefs about students' social disadvantage should matter most for poor students of color, and illuminates the potential role of these teacher beliefs in patterns of inequality in education.

Organization of the Rest of the Dissertation

After a concluding chapter that discusses the dissertation's results, new questions raised by the findings, and future directions, the dissertation also includes three conceptual and methodological appendices. The first of these distinguishes my approach

from similar research in psychology. As noted above, past research in psychology has utilized the concept of "teacher efficacy" to study beliefs that are similar to the focus in this dissertation. In fact, the items I employ and similarly worded ones have been used to measure aspects of teacher efficacy in past research (see e.g. Gibson and Dembo 1984; Guskey and Passaro 1994). However, this literature has been fraught with debates about both theoretical and measurement issues, with teacher efficacy research ultimately moving toward more context-specific measurement of teachers' evaluations of personal competencies. Thus, although this area of research once encompassed a desire to understand teachers' beliefs that "any teacher's ability to bring about change is significantly limited by factors external to the teacher, such as the home environment, family background, and parental influences" (Gibson and Dembo 1984, p. 574), which is consistent with the interest here, this focus has been largely abandoned within recent psychological research. Appendix A provides an overview of the development of that literature and the measurement approaches that parallel mine, supplying a much more detailed justification of how my work departs from the teacher efficacy literature than any of my individual papers do.

Appendices B and C provide information relevant to each of the core chapters on how I tackled two important methodological challenges presented by the HSLS:09 data. Although HSLS:09 surveyed teachers, the data that NCES released do not include a teacher-level dataset. Instead, teacher survey responses were provided as variables on student-level records. Because treating teachers as the units of analysis was essential to my first dissertation paper (Chapter 2), and analyzing a three-level structure of students nested within teachers nested within schools was preferable in the second and third

papers, it was necessary to separate teacher data from student records and identify individual teachers. Appendix B describes how I accomplished this. Finally, HSLS:09's complex survey design requires weighting the data for it to be nationally representative. Because HSLS:09 did not provide a teacher dataset, and because teachers were not directly sampled for the study (the teachers of sampled students were asked to participate), HSLS:09 did not compute survey weights for the teachers. However, because their students were randomly sampled and because any teacher's probability of being sampled is directly related to the joint probability that one of more of her or his students was sampled, the teachers represent a quasi-random sample and I was able to compute weights for my teacher data. Appendix C describes this process.

Finally, as the entire dissertation encompasses a coherent, overarching project and draws on similar literature and many of the same citations across the core papers, I provide a single section of references at the end.

Contribution and Implications

Case study evidence suggests that a "transformational" education—where students excel in school despite social disadvantage—is possible when teachers do not assume students' background is an obstacle. However, existing case studies do not provide sufficient analysis to be an effective avenue to public policy. There is compelling evidence that teachers and schools can make a life-changing difference in the educational trajectories of poor and minority children, but the components of this influence must be appropriately scrutinized with greater generalizability to the broader educational landscape. The research literatures on teachers' human capital, teachers' beliefs, and effective school contexts each touch on a piece of this puzzle, but they rarely address one

another. I bridge these literatures by examining school, teacher, and student factors identified in each as influential for high achievement, addressing concerns present in other work that teachers' beliefs simply represent other omitted factors. This dissertation empirically tests how teachers' beliefs of helplessness or empowerment to overcome social disadvantage relate to teachers' other characteristics, features of school context, and students' educational outcomes within high schools. It pays particular attention to any implications such teacher beliefs hold for educational inequality. Informed by research regarding the achievement gap, school effects, teacher effects, and teacher efficacy and expectations, as well as popular theories of "transformational" schools, the project examines teacher beliefs in a nationally representative context.

Although this dissertation does not study "transformational" schools specifically, I draw on case studies of such schools as motivation because they point to teachers' empowered attitudes as playing an important role in reducing educational inequality. Given the seeming intractability of racial and socioeconomic achievement disparities and their implications for stratification, and given that "transformational" schools have been praised as narrowing these gaps, it is important to understand whether this central aspect of their model is especially influential for low-income and minority students on a broader scale. If helpless beliefs disproportionately impact the most disadvantaged students, this might perpetuate inequality; on the other hand, if the most empowered teachers work in schools primarily serving poor students of color, this would reduce gaps. Understanding the school context of such beliefs will highlight environments to emulate and those most in need of intervention. Understanding school and teacher influences on inequality is fundamental to implementing school conditions that support the high achievement

necessary to reduce disparities—disrupting a longstanding and pernicious pattern, and ensuring social background need not dictate educational destiny.

CHAPTER 2

School Contexts of Empowerment and Helplessness to Overcome Students' Social Disadvantage: An Examination of How Schools Shape Teachers' Beliefs About What Is Possible

Introduction

Although explanations for race- and class-based achievement disparities are myriad, they often emphasize structural factors, such as socioeconomic differences, and cultural factors, such as attitudes toward schooling, while downplaying ways in which schools themselves are responsible for achievement (e.g. Gamoran 2001; Ogbu 1978). Yet recent years have seen the spread of an educational model where the school is precisely the difference-maker. These "transformational" schools are trumpeted in education policy circles for enabling their students to "defy the odds"—to achieve at levels far higher than their socioeconomic background would predict—and narrowing the achievement gap in the process (Kopp 2011).

Descriptions of "transformational" schools share several common features and themes, but central to most accounts is an abiding commitment among teachers to the belief that the social disadvantages their students face cannot be permitted to be a barrier to effective teaching and student learning. Accounts of these schools describe teachers as expressing attitudes of empowerment over student outcomes despite any social hardships that students face and a rejection of the idea that a student's potential might be limited by his or her socioeconomic status or neighborhood (Chenoweth 2007; Kopp 2011; Paige

and Witty 2010; Wilson 2008). Such accounts suggest that these empowered teacher attitudes may be a key aspect of school success, and imply that empowerment over social disadvantages could be an important aspect of successful schooling and the reduction of educational inequality more broadly. This also implies, conversely, that more helpless attitudes among teachers may be a hindrance to progress toward educational equality on a larger scale.

Skepticism remains regarding the true extent of "transformational" schools' success, and whether positive results are due to components of the schooling model or due to selective student enrollment (e.g. Ravitch 2010). However, studying the components of their model should help to settle these debates, and the widespread literature pointing to the importance of teachers' beliefs and attitudes for student outcomes (e.g. Good 1987; Ferguson 2003; Lee and Loeb 2000; Lee and Smith 1996; Pajares 1992; Palardy and Rumberger 2008; Tschannen-Moran and Woolfolk Hoy 2001) makes it reasonable to suspect that the particularly empowered teacher attitudes commonly described in case studies of these schools may be an important source of their apparent success. Yet the literature on "transformational" schools is primarily based on case studies and personal accounts (Chenoweth 2007; Kopp 2011; Paige and Witty 2010; Wilson 2008). No research has examined the prevalence of these beliefs among teachers nationally to identify whether these empowered beliefs are likely to be distinctive to such "transformational" contexts, or conversely, how prevalent helpless attitudes are among teachers more broadly.

Furthermore, many see widespread promise in the "transformational" model's potential to change the educational trajectories of disadvantaged students. Realizing this

promise on a larger scale may involve selecting for, or inculcating in teachers, a sense of empowerment to overcome the hardships in students' lives that might predict educational mediocrity absent school intervention. However, we know little of a generalizable nature about the characteristics of empowered teachers or the characteristics of the school context that support different beliefs about teachers' and schools' capacity to overcome social disadvantage and influence student achievement. Understanding how such beliefs are systematically related to other teacher and school characteristics is important for assessing the implications of case study evidence that points to empowered teacher attitudes as central to school reform.

This paper uses data from the nationally representative High School Longitudinal Study of 2009 (HSLS:09) to explore this highly touted feature of school reform in a broader context than yet exists among case study reports. This permits greater generalizability about the types of teachers that have more empowered or more helpless beliefs, and the school contexts that such teachers work in. I use multilevel modeling to properly nest teachers within schools. My analysis begins by examining the prevalence of empowered and helpless attitudes toward overcoming students' social disadvantage among teachers nationally. Then I pursue a descriptive analysis of which teacher and school characteristics are the most important predictors of teachers' beliefs. My analysis focuses on conceptually important characteristics of teachers and schools: teachers' background and human capital, school reform factors, school culture, and school academic and demographic composition.

In the remainder of the paper, I focus my literature review on three key areas: First, I describe in more depth the case studies that suggest teachers' beliefs may be a

crucial aspect of successful school reform. I discuss why they point especially to teachers' beliefs about the extent to which students' social disadvantage is an obstacle as a key aspect of success, but I also discuss other common reform-oriented features that "transformational" schools possess that could be alternative explanations of their success. Second, I discuss existing research on teachers' beliefs and attitudes, as well as research on teachers' human capital, noting how these literatures have not considered interrelationships among these teacher characteristics and how both have overlooked teachers' beliefs about social disadvantage. Third, I summarize literature on the contextual characteristics commonly studied in the school effects literature, focusing on school culture and composition, and why we might expect these school characteristics specifically to be related to teachers' beliefs about students' social disadvantage. Next, I describe the dataset, HSLS:09; my sample, which is nationally representative of high schools and specific to 9th grade math and science teachers; and my multilevel modeling approach before describing my findings. The results indicate that empowered teacher attitudes are not widespread but neither are they rare; the most helpless attitudes are rare, but nevertheless exist among a nontrivial minority of teachers. Teachers' beliefs are largely independent of their human capital, but appear to be related in important ways to school context, with the most important predictors being school culture and school racial/socioeconomic composition, rather than the school reform characteristics or academic composition that might be expected. Some of these findings are surprising for their lack of importance, while others contradict the hypothesized direction of effects, which I discuss in the conclusion of the paper.

Schools That Are Closing the Achievement Gap and the Emphasis on Teacher Attitudes

Racial and ethnic disparities in educational outcomes are well documented, and explanations typically point to socioeconomic and cultural differences between groups. But ever since the 1966 publication of Coleman et al.'s *Equality of Educational Opportunity*, researchers have sought to understand the role of schools' social and organizational structure in producing—or ameliorating—racially stratified outcomes. Increasing research and popular media have focused attention on schools that enroll primarily students of color or from high poverty backgrounds (or both), yet have levels of academic achievement much higher than the students' social background would typically predict. That these schools appear to subvert the commonly assumed relationship between minority status or poverty and low academic outcomes suggests that there is something about their educational model that is highly effective.

Accounts have alternately termed them "transformational" (Kopp 2011), "gap-closing" (Paige and Witty 2010; Wilson 2008), or "No Excuses" (Wilson 2008) schools. I call attention to these schools not because this analysis examines them specifically, but because a) they typically endorse a specific attitude among teachers that this project examines, b) they have some other common features that this study will include when investigating the school contexts that accompany (perhaps promoting or precluding) particular teacher beliefs, and c) their success with students from low-SES and minority backgrounds suggests that beyond being effective, this model may have implications for the achievement gap.

The "transformational" terminology has been used by Wendy Kopp, founder of Teach for America, who defines transformational education as altering the course of a student's educational trajectory to excel beyond what is predicted by the student's socioeconomic background (Kopp 2011). She notes that leaders in transformational schools "have an unshakable belief in the potential of children" (p. 71). These sentiments suggest that transformational schools' personnel assume that students possess unrealized potential for success and that it is schools' responsibility to disrupt mediocre achievement trajectories instead of sustaining them. Similarly, one aspect of the "No Excuses" moniker at schools like KIPP is that the "founders and staff steadfastly reject explanations from any quarter for low achievement, whether a district apologist's appeals to *demographic destiny* or a child's excuse for failing to complete an assignment" (Wilson, 2008, p. 7; emphasis added). In other words, teachers at these schools emphasize that social background is neither an indicator of student potential nor an insurmountable obstacle.

The emphasis teachers place on overcoming social disadvantages and helping *all* children achieve at high levels is central to accounts of such gap-closing schools. Yet their success has also been regarded as statistically deceptive or as an artifact of other conditions at such schools (e.g. Ravitch 2010; Rothstein 2004). Some "transformational" schools have been criticized for "creaming" the most motivated or engaged low-SES students, or not enrolling students with the highest needs. This selectivity in student enrollment is plausible partly because many schools highlighted as "transformational" are charters (although regular neighborhood schools have also been highlighted [see e.g. Chenoweth 2007]). Although large-scale studies comparing charter schools to nearby

public schools find enough variability to show that charter schools are only sometimes better—and often worse—than the public school options their students would have (CREDO 2009; Gleason, Clark, Tuttle, Dwoyer, and Silverberg 2010), charter schools' increased autonomy may allow them to engage in certain practices that school reform advocates argue are important aspects of school success. Extended instructional time and selectivity in teacher hiring, even including monetary incentives, are among several common features to which "gap-closing" schools' success has been attributed, and at least some research suggests some of these school reform features can be beneficial for student outcomes (Angrist, Pathak, and Walters 2011). This all suggests empowered teacher attitudes may be more common in schools that have undertaken aspects of this broader school reform agenda.

Teacher Attitudes and Other Teacher Effects

Accounts of "transformational" schools are by no means the first instances of educational literature to point to the importance of teachers' beliefs and attitudes. A substantial literature on teachers' expectations of individual students demonstrates the importance of teachers' early judgments of students' potential for their eventual success (e.g. Good 1987; Ferguson 2003; Jussim and Harber 2005; Paige and Witty 2010; Rist 1970), especially for students from groups who face some level of societal stigmatization or stereotyping (Jussim, Eccles, and Madon 1996).

A different approach has attempted to capture teachers' attitudes about the potential of teaching more broadly. The literatures on teacher efficacy and teacher responsibility have examined teacher beliefs that are similar to the beliefs about the extent to which students' social disadvantage poses an obstacle that are the focus of this

paper. Researchers in psychology have conceptualized "teacher efficacy" as comprising two distinct dimensions, contrasting "personal teaching efficacy" against "general teaching efficacy." Personal teaching efficacy (also termed self-efficacy) reflects a teacher's feelings about his or her own competence and skills to stimulate student learning (Gibson and Dembo 1984; Tschannen-Moran and Woolfolk Hoy 2001). General teaching efficacy, in contrast, reflects the "belief that any teacher's ability to bring about change is significantly limited by factors external to the teacher, such as the home environment, family background, and parental influences" (Gibson and Dembo 1984, p. 574). In other words, general teaching efficacy reflects a teacher's general perspective on the extent to which teaching can promote learning or is hindered by outside factors, and thus appears closely related to the ideology that "transformational" schools seem to espouse. In early work, general teaching efficacy was operationalized using similar belief measures to those used in this paper, in addition to others. However, most recent psychological research in this area has focused almost exclusively on the self-oriented dimension of "personal teaching efficacy," reflecting beliefs about one's personal skills and abilities, and with measuring "efficacy" in ways that are more specific to particular teaching tasks and contexts (Tschannen-Moran and Woolfolk Hoy 2001). Although the types of teacher beliefs investigated here have a history in the teacher efficacy literature, recent work argues that they are not appropriate for "capturing the essence of efficacy" (Tschannen-Moran and Woolfolk Hoy 2001, p. 801). For this reason, I recast the beliefs I study as teachers' beliefs about students' social disadvantage, rather than as teacher efficacy.

A more sociological approach to the study of teachers' beliefs lies in the literature on teachers' responsibility for student learning, reflecting teachers' "willingness, interest, and care for how and what all his or her students learned" (Lee and Smith 1996, p. 115). The teacher responsibility concept is relevant because its underlying idea includes, in Lee and Smith's (1996) words, "teachers' internalizing responsibility for the learning of their students, *rather than attributing learning difficulties to weak students or deficient homelives*" (p. 114; emphasis added). Importantly, though, responsibility for student learning has not actually been measured by examining whether teachers attribute difficulties to students' home environment or see family background as an obstacle. My work departs from the teacher responsibility literature by emphasizing beliefs that specifically reference social background.

Although I position my work as capturing a different belief construct, because teacher efficacy and teacher responsibility represent the closest constructs to the newly conceptualized beliefs that I seek to understand, these past literatures are a useful guide for what we may expect to find regarding teachers' beliefs about students' social disadvantage. These literatures demonstrate the importance of teachers' beliefs and attitudes for student outcomes, including students' motivation, learning, and achievement (Lee and Loeb 2000; Lee and Smith 1996; Tschannen-Moran and Woolfolk Hoy 2001), supporting the plausibility of teachers' beliefs about students' social disadvantage being a key to school success.

Unfortunately, the literatures on teachers' beliefs rarely examine the interrelationships between teachers' attitudes and their other characteristics. Teachers' human capital characteristics are a common focus in the teacher effects literature.

Academic background (Darling-Hammond and Youngs 2002), content knowledge in one's subject (Goldhaber and Brewer 2000), years of experience (Rice 2010), and certification or licensure (Goldhaber and Brewer 2000; Kane, Rockoff and Staiger 2008) are characteristics that have been found to be important predictors of student outcomes, although significant influences of each are not consistently found (Peske and Haycock 2006). Furthermore, in describing "transformational" education, Kopp (2011) often describes Teach For America teachers, who have typically graduated from some of the country's most selective colleges. It is uncommon for studies of teachers' beliefs to control for teachers' human capital (see Palardy and Rumberger 2008 and Lee and Loeb 2000 for exceptions), and even more rare for a multitude of human capital characteristics to be considered simultaneously. It is unclear whether teachers' beliefs might stand in for teachers' human capital, or vice versa, in predicting student outcomes. Moreover, there is a paucity of literature suggesting how teachers' beliefs and teachers' human capital relate to one another. Focusing on a specific type of beliefs, this paper contributes to filling this gap.

Evidence from School Effects Research

As with the teacher effects literature, the school effects literature illuminates how school characteristics, including more collectively-focused attitudinal variables, relate to student outcomes, but offers less insight into how school context might relate to the beliefs individual teachers hold. For example, school sector and school size are commonly measured; a number of studies demonstrate an academic advantage to Catholic and secular private schools and to small or moderately sized schools (see e.g. Coleman Hoffer, and Kilgore 1982; Carbonaro and Kovay 2010; Lee 2000; Lee and

Burkam 2003). Differences in school funding have also long been thought to be key drivers of differences in schools' average achievement, but findings on this topic have been mixed (e.g. Hanushek 1989, 1994; Hedges, Laine, and Greenwald 1994; Payne and Biddle 1999).

School effects research also bears out the importance of school culture and process as predictors of school success. Researchers have called attention to the importance of high standards and the greater "academic press" of a curriculum constrained to more rigorous courses (Goddard, Sweetland, and Hoy 2000; Lee and Burkam 2003). Hoy, Sweetland, and Smith (2002) examine schools' collective efficacy, which reflects teachers' and school leaders' common belief that the organization as a whole is capable of influencing learning and fostering improvement. They find that collective efficacy enhances school achievement, and may enhance the effect of academic press (Hoy, Sweetland, and Smith 2002). Research on academic emphasis and collective efficacy further suggests that these aspects of school culture may be especially important for achievement in schools serving a low SES and high minority student population, but that the presence of these characteristics may be more likely in high SES schools.

Some studies extend this work from an examination of factors that predict student success to an examination of factors that predict teachers' beliefs, although as with research on individual teachers, studies of teacher efficacy and teacher responsibility provide the closest measures to the attitudes studied in the present paper. For example, Goddard and Goddard (2001) examine how school collective efficacy predicts individual teacher efficacy. They argue that although they are theoretically related, individual and collective efficacy are distinct types of efficacy, where collective norms provide social

persuasion to shape teachers' views and encourage them to persist in efforts that coincide with group norms, while sanctioning teachers who fail to follow norms. When considering mean prior achievement, mean SES, and collective efficacy of schools simultaneously in an analysis of elementary schools in one urban district, they find that school collective efficacy is the only significant predictor of individual teacher efficacy (although they encourage other researchers to examine whether different patterns emerge in demographically different school environments). Similarly, Lee, Dedrick, and Smith (1991) find that a stronger sense of school community predicts higher teacher self-efficacy. They theorize that a "unified and consensual set of organizational goals" is beneficial to school effectiveness, because it creates "a social consensus about the academic mission of the school" (Lee, Dedrick, and Smith 1991, p. 193). Schools with a stronger sense of community may be more effective because there is greater coordination between a strong organizational purpose and the school's core technical operations.

Further bolstering a role for school culture in predicting teachers' beliefs, Diamond, Randolph, and Spillane (2004) draw on Horvat and Antonio's (1999) concept of "organizational habitus," which they describe as teachers' and administrators' race and social class-based perceptions, appreciations, and dispositions. According to the authors, organizational culture produces "a pervasive stream of beliefs, expectations, and practices that flow throughout a school. The organizational habitus is like a current that guides teacher expectations and sense of responsibility in a particular direction" (Diamond, Randolph, and Spillane 2004, p. 76). In an ethnographic study of several urban schools they found that teachers in schools serving primarily low-income students of color largely emphasized students' deficits. However, they found that in the lone disadvantaged school

in their study where staff promoted an organizational habitus emphasizing high standards, teachers' sense of responsibility for student learning was bolstered; teachers in this school viewed students' social circumstances as a challenge they could overcome.

Although Diamond, Randolph, and Spillane's (2004) work indicates the importance of school culture for teacher beliefs and expectations, it also suggests that teachers broadly are likely to express more helpless attitudes when they teach students of color and students from lower-SES backgrounds. In most of their predominantly low-income and African American study schools, which lacked an organizational habitus of high expectations, teachers focused on students' deficits and felt less responsible for student learning. This is consistent with findings from the teachers' expectations literature discussed above, which also suggests teachers are likely to feel more helpless when they have a primarily poor or minority student body. Stipek (2012), however, notes that scant literature exists on the relationship between student characteristics and teachers' self-efficacy, and in a study of elementary school teachers, she finds that a higher percentage white student body actually predicts lower teacher self-efficacy. She also finds no relationship between proportion poor or proportion reading below grade level and teacher self-efficacy.

These findings are somewhat surprising, presenting mixed evidence as to the types of school demographic composition we would expect to predict more empowered or more helpless teacher beliefs. Furthermore, we might expect that teachers would feel more helpless in schools that have low academic performance or more empowered in highly effective schools—either because the beliefs contribute to those outcomes or because student failure leads to pessimistic views about overcoming social disadvantage,

while academic progress confirms that hardships can be overcome. However, research to date does not provide definitive evidence on how schools' academic composition predicts teachers' beliefs.

The Present Study

The literatures just described provide a guide as to the types of school characteristics that may relate to teachers' beliefs. However, there is not extensive research examining predictors of teachers' beliefs, and particularly because this paper expands the study of teacher attitudes to a new type of beliefs—teachers' beliefs about students' social disadvantage—I explore a variety of school characteristics. The literature is most firm in demonstrating that school norms and culture relate to teachers' beliefs, although many of these studies are based on small samples. (Lee, Dedrick, and Smith's [1991] findings on a sense of school community are based on a nationally representative sample, however.) I explore the role of a school culture of high expectations similar to the beneficial "organizational habitus" that Diamond, Randolph, and Spillane (2004) describe. Case studies and personal accounts of "transformational" schools highlight other aspects of a reform-oriented agenda alongside empowered teacher beliefs, so I test how school reform characteristics relate to beliefs. And by testing how multiple aspects of school academic and demographic composition relate to teachers' beliefs, I aim to provide some clarity on the mixed findings in this area. Furthermore, we have little evidence on the types of teachers we might expect to exhibit a sense of agency to overcome the social disadvantages that their students face. Much of the research on teachers, particularly research concerned with education policy, has focused on teachers' human capital. However, this research rarely incorporates measures of teachers' beliefs,

and it's unclear whether teachers' attitudes are strongly related to their academic background or other preparation. This paper contributes to this void by exploring several aspects of teachers' human capital as well as teachers' demographic background.

DATA

This paper uses data from the first wave of the High School Longitudinal Study of 2009 (HSLS:09), a survey administered by the National Center for Education Statistics (NCES) to a nationally representative sample of 944 high schools and more than 21,000 9th graders between September 2009 and February 2010. Uniquely important for this project, HSLS:09 garnered participation from teachers, school principals, and school counselors, providing extensive data on school context. Students were sampled from school 9th grade enrollment lists, without regard to the courses in which they were enrolled. After sampling, if the student was enrolled in math or science in fall 2009, the teacher of the student's respective course was asked to complete a survey on his or her own background and beliefs. This sampling strategy means the teachers in HSLS:09 are not representative of all teachers at sampled schools nor are they strictly representative of teachers nationally or of teachers of all subjects; yet they do comprise a large sample of teachers experienced by a representative sample of 9th graders and therefore provide a more accurate picture of teachers' beliefs nationally than yet exists.

Sample restrictions are based solely on the presence of appropriate links between teachers and schools; both math and science teachers remain in the sample if they can be linked to a school. Using the restricted-access version of HSLS:09, students are linked to their schools and data for teachers is separated from student records, resulting in sample sizes of 6,850 teachers in 910 schools.[1,2] Roughly three-fifths of sampled teachers teach

math and two-fifths teach science. I impute missing data using multiple imputation by chained equations (using -ice- in Stata), which fills in missing values based on plausible values determined by the distribution of the variable itself and the covariates in the imputation model. Because teachers in the same school cannot have different values on school variables, I performed imputation in two steps, imputing missing school data first and missing teacher data second, incorporating school variables into the imputation model. Data analysis presented here employs ten imputed datasets.

Teachers' Beliefs About Students' Social Disadvantage

HSLS:09 is ideally suited to this analysis because it includes belief measures that specifically reference students' social disadvantage. Other NCES datasets lack such specific belief measures. Teachers in HSLS:09 responded to questions about their level of agreement with three items that have traditionally been subsumed within the psychological measure of "teacher efficacy," as described in the literature review, but which I argue are distinctly valuable for their ability to gauge teachers' beliefs about disadvantages stemming from students' social background and whether they view student background as a barrier to effective teaching and student achievement. I measure teachers' beliefs based on the extent to which teachers agree or disagree with the following items:

- The amount a student can learn is primarily related to family background
- You are very limited in what you can achieve because a student's home environment is a large influence on their achievement
- When it comes right down to it, you really cannot do much because most of a student's motivation and performance depends on their home environment

Teachers respond using a Likert-type scale, and in each case strong agreement is akin to expressing that family background and home environment are obstacles the teacher is essentially helpless to overcome. In contrast, strong disagreement reflects a sense of empowerment to overcome students' social disadvantages. The full distributions of teachers' responses to the individual belief items are shown in Table 2.1. The distributions differ somewhat across the three items, but in each case, disagreement is the most common response. Strong disagreement—the most empowered response—is less common, but is expressed by 5.4 to 17.8 percent of teachers. This suggests that empowered teacher beliefs are likely not rare enough to be confined to "transformational" schools. Strong agreement—representing the most helpless response category—is rare across the three items, reported by 2.1 to 7.4 percent of teachers. It is heartening that it is uncommon for teachers to express such pessimistic attitudes about their capacity to overcome students' social disadvantage, but it is important to note that at a national level, these small percentages nevertheless indicate a nontrivial minority of teachers who feel very helpless when faced with social disadvantage.

Because these beliefs reflect a common latent attitude, I combine the three items into a latent summary measure of teachers' beliefs about students' social disadvantage in order to analyze a single measure of teachers' beliefs as my outcome. I do this through a confirmatory factor analysis of the entire sample of HSLS:09 teachers with standard errors clustered by school. Standardized coefficients for each belief in the CFA model were above the 0.5-0.6 threshold indicating a strong relationship with the latent construct, and the coefficient of determination indicates that the teachers' beliefs factor explains 69.4 percent of the total variance in the observed belief items. Figure 2.1 displays the

CFA model. My final teachers' beliefs measure is standardized ($M = 0$, $SD = 1$), with high values indicating more empowered beliefs and low values indicating more helplessness.

Teacher Characteristics

I examine both demographic and human capital characteristics of teachers as predictors of their beliefs. Demographic variables include teachers' sex (indicator for male) and race (indicators for black, Asian, Latino, or some other race, with white as the reference). Human capital variables include the teacher's highest degree received (indicators for AA/BA, Educational Specialist diploma, or Ph.D./professional degree, with MA as the reference), overall years of experience teaching high school, and an indicator for whether the teacher is new (in her or his first 1 or 2 years) to her or his current school. I also analyze certification status (indicators for none, probationary, or emergency/temporary/waiver certification, with regular certification as the reference), as well as a separate indicator for having entered teaching through an alternative certification program, and whether the teacher held a job that required college-level math prior to teaching.

Lastly, I examine the selectivity of the teacher's college or other postsecondary institution. This is measured by merging data from the NCES-Barron's Admissions Competitiveness Index Data Files[3] to data in HSLS:09 on the higher education institutions that teachers' attended. I took a multi-step approach to assign a selectivity ranking to as many teachers as possible because linking with HSLS:09 was not the original purpose for which the NCES-Barron's files were constructed. I first merged the NCES-Barron's data to Integrated Postsecondary Education Data System (IPEDS) codes

provided in HSLS:09 for teachers' undergraduate and graduate schools (if attended) based on the closest matching year from the NCES-Barron's file and the teacher's reported degree year in HSLS:09. Second, if a teacher attended multiple institutions, I assigned the selectivity ranking of the most competitive institution she or he ever attended. Third, I used data from IPEDS (publicly-available online) on open admissions colleges to code institutions as noncompetitive if no NCES-Barron's data could be matched but a teacher's IPEDS code *did* match to an IPEDS code identified as open admissions (or accepting 100 percent of applicants) in 2005.

Descriptive statistics for all teacher variables are shown in Table 2.2. The sample is less predominantly female (58 percent female) than the teaching force nationally due to HSLS:09's inclusion of only high school math and science teachers. Teachers are predominantly white (78 percent); 5.7 percent are African American, 9.1 percent are Latino, and 4.9 percent are Asian. Nearly all teachers received a master's (52 percent) or college-level (44 percent) degree. Regular certification is, not surprisingly, most common (77 percent), but non-negligible percentages hold an emergency (10 percent) or probationary certification (4.8 percent), and 7.4 percent have no certification at all. Additionally, more than a quarter of teachers received their certification through an alternate certification route, and 26 percent had a math- or science-related job prior to teaching. Teachers in this sample have an average of 10.3 years of experience teaching high school, but 24 percent have only worked at their current school for one or two years. Finally, most teachers attended a Competitive (45 percent), Very Competitive (24 percent), or Less Competitive (11 percent) college or university, according to Barron's rankings. Although attendance in the highest ranks of Most Competitive and Highly

Competitive is relatively uncommon, it is nevertheless more common than attendance at Noncompetitive schools. (The seven Barron's rankings are shown as categories for descriptive purposes, but regression models control for selectivity as a continuous variable, as tests indicated no non-linearity in how college selectivity relates to teachers' beliefs.)

School Context

School Reform Factors

I measure three different characteristics that tap aspects of schools' engagement in a reform-oriented agenda. I include an indicator for whether the school is a charter school. I measure the instructional hours per school day, as extended school days have been advocated as a way to enhance student outcomes. And I include an indicator for whether the school or district offers incentives to attract math and science teachers.

School Culture

I measure a school culture of high expectations using teacher and counselor reports of their perceptions of school staff. Math teachers rated the expectations of math teachers at the school, science teachers rated the expectations of science teachers at the school, and school counselors rated the expectations of teachers, the counseling staff, and the principal at the school. HSLS:09 created a scale for each of these respondents' ratings using multiple input items for each scale, where each respondent reported perceptions of school staff on parallel items. The items that a teacher or counselor responded to had the stem, "Teachers in this school…" "Counselors in this school…" or "The principal in this school…" and respondents reported their level of agreement with six to eight different endings: "… set high standards for students' learning," "… believe all students can do

well," "… have given up on some students," "… care only about smart students," "… expect very little from students," "… work hard to make sure all students learn," "… set high standards for teaching," and "…make expectations for instructional goals clear to students" (the latter two items were only asked in the case of teachers' and counselors' perceptions of teachers and teachers' perceptions of teachers, respectively). My final school culture variable takes the mean of all of these school staff scale responses as a measure of the overall culture of high expectations of school personnel.[4] Importantly, while this school culture measure captures aspects of academic press and an organizational habitus of high expectations as studies cited above have done, it does not rely on beliefs that specifically reference students' social disadvantage, as my outcome variable of individual teachers' beliefs does. Thus, this variable is intended to capture the "pervasive stream" (Diamond, Randolph, and Spilanne 2004, p. 76) that may guide teachers' beliefs, but is not merely an organizational aggregation of those beliefs.

School Composition

I use three measures of school academic composition. First, I gauge whether the school serves a college-going student body by measuring the percent of seniors from the previous year who went on to a 4-year BA-granting college or university, as reported by the principal. Second, I include a variable indicating whether the school failed to make adequate yearly progress (AYP) the previous year or had been identified as "in need of improvement" due to AYP requirements. Third, I include a variable measuring the year of AYP improvement the school is in, where later years indicate a higher level of sanction and thus higher values indicate a long-term pattern of school academic failure.

This variable ranges from 0 (not designated in need of improvement) to 5 (implementation of restructuring).

I measure school demographic composition based on the racial and socioeconomic backgrounds of the student body. Schools are designated as "high poverty" if greater than 75 percent of the student body receives free or reduced-price lunch. This cutoff point follows both Rumberger (2007) and a special report of the Institute of Education Sciences on high-poverty schools (Aud et al. 2010). I use the same cutoff to define schools with high African American (>75 percent black), high Latino (75 percent Latino), and high white (>75 percent white) composition. Schools that did not fall into one of these categories were defined as diverse (and a manual inspection of the data suggested this was a valid categorization). I include indicators for high black, high Latino, and diverse composition in my analysis models, and treat high white as the reference category. I also create interactions between my high poverty indicator and each of these racial composition indicators.

Additional School Variables

School reform factors, school culture, and school composition are the key school predictors of interest in this analysis, but I also test the role of a number of structural and organizational characteristics commonly examined in the school effects literature in predicting teachers' beliefs. These include school size, sector (indicators for Catholic and private, with public as the reference), locale (indicators for urban, town, and rural, with suburban as the reference), and region (indicators for Northeast, Midwest, and West, with South as the reference). I include measures of average daily attendance and the percentage of capacity to which the school is filled, which capture aspects of school

cohesion and overextension, as well as roughly proxying for levels of funding. HSLS:09 sampled schools with a 9th grade; I include an indicator for whether the school includes elementary or middle school grades, rather than being a stand-alone high school. I also include several measures of the academic and instructional environment. These include whether the school does not offer any advanced placement (AP) or international baccalaureate (IB) courses, whether the school has more advanced math and science requirements than the standards set by the state department of education, whether all 9th graders take the same math and science courses (i.e. the school does not track 9th grade math and science), whether the school offers a special college preparatory program such as Upward Bound or AVID, and whether the school offers assistance to teachers working with struggling 9th graders.

Descriptive statistics for all school variables are shown in Table 2.3. Less than 5 percent are charter schools, while nearly 18 percent of schools or school districts offer incentives to attract high school math and science teachers. More than 30 percent of schools failed to make AYP or have been designated "in need of improvement." Most of these schools have only been failing to make AYP for one or two years, however. (Year of "in need of improvement" for AYP is shown as categories for descriptive purposes, but is included in regression models as a continuous variable.) The majority of schools have a predominantly white student body (57.4 percent have greater than 75 percent white students), while only 6.7 and 5.9 percent of schools are predominantly black or predominantly Latino, respectively. Diverse schools constitute 36 percent of the sample, while 11.5 percent of schools are classified as high poverty.

METHODS

To analyze the predictors of teachers' beliefs about students' social disadvantage I use two-level linear regression models, also known as hierarchical linear modeling, in HLM. I estimate random-intercept models and employ HLM in order to correct for teacher clustering within schools (which violates assumptions about the independence of observations), and to weight the data at both levels to adjust for HSLS:09's complex survey sampling design.[5]

Indexing individual teachers with *i* and schools with *j*, my equations can be displayed in separate levels. I estimate the following teacher-level equation:

$$Beliefs_{ij} = \beta_{0j} + \beta_{1j}T_{ij} + r_{ij}$$

where *T* represents a vector of teacher-level predictors and β_1 is a vector of coefficients on those predictors. The outcome $Beliefs_{ij}$ represents teachers' predicted beliefs on the beliefs scale. Then a school-level model also predicts the random intercept:

$$\beta_{0j} = \gamma_{00} + \gamma_{01}S_j + u_{0j}$$

where *S* is a vector of school-level key predictors and controls, and γ_{01} is a vector of coefficients on those variables.

My analysis begins by describing how teachers' own characteristics relate to their beliefs, using a two-level model with only teacher-level predictors. I discuss bivariate relationships as well as the results of a multivariate model predicting teachers' beliefs using all of my measures of teachers' demographic and human capital characteristics (Model 1). I then analyze the school context of teachers' beliefs. I discuss bivariate relationships between my key predictors of interest and teachers' beliefs. Then, because many school characteristics may be correlated with one another, I build up several

models of teachers' beliefs, each controlling for teachers' demographic and human capital characteristics. I start by modeling teachers' beliefs using just basic structural and organizational characteristics of schools (Model 2). I then add measures of the school instructional environment (Model 3). These two models assess how commonly studied features of schools relate to teachers' beliefs about students' social disadvantage.

Next, I add each key predictor to the model individually and in blocks. For example, Model 4.1 adds charter status alone, Model 4.2 adds incentives to attract teachers alone, Model 4.3 adds school instructional hours alone, and Model 4.4 includes all of these school reform factors in the model simultaneously. Model 5 is a single model adding my measure of a school culture of high academic expectations, while Model(s) 6 adds measures of school academic composition and Model(s) 7 adds measures of school socioeconomic and racial composition. Finally, to check for collinearity among the key predictors, Model 8 includes all of the key school context predictors in a single model simultaneously.

RESULTS

Analysis of Teachers' Characteristics as Predictors of Teachers' Beliefs

Examining the bivariate relationships between teachers' characteristics and their beliefs, we actually see little evidence that teachers' beliefs are related to their other traits. The bivariate analyses suggest two significant relationships by teacher demographics: male teachers express beliefs' about social disadvantage nearly a third of a standard deviation lower than female teachers, and Asian teachers express beliefs nearly a half a standard deviation lower than white teachers. Black and Latino teachers do not differ

significantly from whites in their beliefs, though a marginally significant relationship suggests multiracial/other race teachers feel more empowered to overcome social disadvantage than white teachers do. The bivariate relationships also indicate that teachers' beliefs are largely independent of teachers' human capital characteristics. With a p-value just equal to 0.05, alternative certification is the only human capital variable significantly related to teachers' beliefs, and it indicates that teachers who entered teaching through an alternative certification program have more helpless attitudes toward overcoming social disadvantage. Table 2.4 shows results from Model 1 predicting teachers' beliefs with all teacher characteristics, and the results are largely unchanged from the bivariate findings: teachers' beliefs are only related to being male and Asian—both groups expressing relatively more helpless attitudes—and are independent of teachers' preparation, education, and experience. Notably, college selectivity is unrelated to teachers' beliefs, suggesting that empowered teacher attitudes are not simply evident in Teach for America-type teachers who have attended the most selective colleges. These results demonstrate that teachers' beliefs are not merely a reflection of teachers' training and background and, importantly, counter the common perception that the most empowered teachers are part of a reform-oriented movement that uses alternative certification and competitive programs as ways to bypass traditional teacher education and quickly enter the classroom

Analysis of the School Context of Teachers' Beliefs

Simple bivariate analyses reveal more important relationships between teachers' beliefs and the key school characteristics that are the focus of this paper. Most notably, school culture is a strong and significant predictor of individual teachers' beliefs, with a

one standard deviation increase in high academic expectations predicting teachers' beliefs nearly 18 percent of a standard deviation more empowered. Contrary to the indication of some literature that teachers' attitudes are most negative toward students of color, schools with a predominantly black student body have teachers with much more empowered attitudes—over half a standard deviation higher than in predominantly white schools. Although the bivariate relationship between teachers' beliefs and high poverty composition is not significant, its positive sign similarly suggests that teachers' attitudes are more empowered when the student body is more disadvantaged. Although each of the academic composition variables only attains a marginally significant bivariate relationship with teachers' beliefs, each is in the expected direction, with failure to make AYP and failure for more years each predicting more helpless teacher attitudes, while a greater percentage of college-going students predicts more empowered teacher attitudes. Finally, none of the school reform factors are significant predictors of teachers' beliefs in bivariate analyses. Because we would expect many of these relationships to be confounded by other aspects of schools, the following models build in additional school controls.

Table 2.5 displays results from models predicting teachers' beliefs with organizational/structural characteristics (Model 2) and aspects of the instructional environment (Model 3). Model 2 indicates just one among this host of commonly-studied school characteristics is related to teachers' beliefs: teachers' beliefs are predicted to be over a third of a standard deviation higher in Catholic schools as compared to their public counterparts. This relationship persists in Model 3 when instructional variables are added to the model. We also see that in schools where all 9th graders take the same math

course—that is, schools that do not have tracking—teachers' beliefs are a quarter of a standard deviation more empowered. There is no such relationship for science tracking, but high school math is much more hierarchically organized than high school science coursework. It may be that foregoing the ability labeling of tracked classes helps teachers to feel more empowered to overcome social disadvantage because they perceive all of their students as being on equal footing.

School Reform Factors. Now I turn to analyzing the key school contextual factors that are of interest in this paper. The results in Table 2.6 reveal that whether considered on their own or as a block, school reform factors are unrelated to teachers' beliefs. Charter status, instructional hours per day, and teacher incentives each show no notable relationship with teachers' beliefs. Similar to the non-finding regarding teachers' college selectivity, this indicates that empowered teacher attitudes are not simply an aspect of reform-oriented school contexts.

School Culture. The result in Table 2.7 indicates that even with several other aspects of schools controlled, a school culture of high expectations still predicts significantly more empowered teacher beliefs. Thus, school culture does not merely reflect school organization or strong instruction. A one standard deviation increase in school personnel's perceptions that other school staff hold themselves and students to high standards predicts teachers' beliefs about students' social disadvantage roughly 15 percent of a standard deviation more empowered.

School Academic Composition. The results in Table 2.8 demonstrate that teachers' beliefs are unrelated to the academic composition of their school, even with several potentially confounding characteristics of schools controlled. This non-finding is notable

because we might suspect that teachers' beliefs about the extent to which they can overcome students' social disadvantage would stem from the academic success they experience and witness among their students. Although the directions of the coefficients in Table 2.8 are consistent with such a story, none of them are statistically significant, and their magnitudes are substantively quite small. This finding contradicts a reverse causality-type story that would suggest that teachers form their beliefs based on their students' academic outcomes.

School Socioeconomic and Racial Composition. The results in Table 2.9 are at first consistent with the simple bivariate relationships I found between school socioeconomic and racial composition and teachers' beliefs. When considering high poverty status alone in Model 7.1, we see no significant relationship with teachers' beliefs, while racial composition alone in Model 7.2 again indicates that teachers in predominantly black schools express beliefs that are a half a standard deviation more empowered than their counterparts in predominantly white schools. Predominantly Latino and diverse schools are no different than predominantly white schools, however. These results hold in Model 7.3, where predominantly black composition predicts highly empowered teacher beliefs even when school socioeconomic composition is controlled. We know that race and class are intricately intertwined, however, and this is especially true in the U.S.'s racially and socioeconomically segregated schools. Model 7.4, then, adds interactions between schools' racial and socioeconomic composition as predictors of teachers' beliefs, and the results are striking. Rather than in predominantly black schools generally, teachers with the most empowered attitudes are actually in high-poverty predominantly black, high-poverty predominantly Latino, and high-poverty diverse

schools. Relative to non-poor white schools, teachers in high-poverty black schools express beliefs that are 1.8 standard deviations higher—a significant and substantively very large jump. Teachers in high-poverty Latino and high-poverty diverse schools express attitudes that are 80 to 90 percent of a standard deviation more empowered. In stark contrast, teachers in high-poverty white schools exhibit the most helpless attitudes—90 percent of a standard deviation lower than teachers' in non-poor white schools. These surprising results lend themselves to two possible explanations. Self-selection may motivate particularly empowered teachers to pursue jobs teaching a more socially disadvantaged student body because they especially value making a difference for such students. Alternatively, the strong relationship between school race and class composition and teachers' beliefs could be driven by teachers in high-poverty high-minority schools feeling disproportionate pressure to express socially desirable attitudes about their students. I discuss these possibilities in more detail below.

All Key School Predictors. Finally, Model 8 in Table 2.10 presents results of a model that controls for all teacher traits and school organizational/instructional characteristics as in the previous models, but includes all of the key school predictors of interest simultaneously, in case their interrelationships masked their true effects in the previous results. The findings for high-poverty schools are amplified further in Model 8. Teachers' beliefs in high-poverty black schools are nearly two standard deviations more empowered than in non-poor white schools. With all other school characteristics controlled, teachers in high-poverty Latino and high-poverty diverse schools are predicted to have beliefs 1.17 and 1.35 standard deviations more empowered, which is even larger than in Model 7.4. The result for high-poverty white schools is amplified as

well: with other characteristics controlled, teachers in such schools are predicted to have beliefs that are 1.13 standard deviations more helpless than the beliefs of teachers in non-poor white schools. The finding for school culture persists at a slightly attenuated magnitude, with schools that have a culture of high academic expectations still having teachers with significantly more empowered attitudes toward overcoming social disadvantage. Finally, the negative coefficient for charter school status may be notable; it borders on significance by conventional standards, and because the sample of charter schools is small, it may be imprecisely estimated. If this is the case, it would suggest that rather than being the case that charter schools have teachers whose beliefs are no different than their regular school counterparts, that teachers in charter schools actually express beliefs that are over a quarter of a standard deviation more helpless—an important contradiction to the literature that would imply that charter schools would be more likely to hire teachers who feel empowered to overcome students' social disadvantages.

DISCUSSION

A large literature indicates that teachers' beliefs and attitudes are an important part of the educational context that students experience, and recent case studies and personal accounts suggest that teachers' beliefs specifically about the extent to which they can overcome students' social disadvantage may contribute to teachers and schools actually mitigating barriers posed by social hardships and helping students to succeed. The findings presented here help to clarify the role of such beliefs by studying them at a national level. I find that the most empowered attitudes are not so rare that they are likely

to be confined to the "transformational"-type school settings described in case studies. The most helpless attitudes toward overcoming social disadvantage, on the other hand, are rare, expressed by only 1.5 to 7 percent of high school math and science teachers (depending on the specific belief examined). However, when considered on a national scale, these small percentages nevertheless represent a nontrivial number of teachers with very negative views that some students will encounter.

I find that teachers' beliefs about their capacity to overcome social disadvantage are unrelated to teachers' human capital characteristics, even with several traits tested. This suggests that teachers' beliefs do not stem from their own preparation experiences, and is consistent with the view that teachers' beliefs are set early in teachers' own education and are not highly malleable (Pajares 1992), which we might question if teachers' beliefs were directly related to their experience teaching. However, it is also possible that heterogeneity within human capital categories—e.g. different kinds of MA degree or alternative certification programs—could relate to teachers' beliefs in ways that are not revealed in this analysis.

I show that teachers' beliefs differ partly by demographic background, with male and Asian teachers exhibiting more helpless attitudes than female and white teachers, respectively. The finding for Asian teachers is surprising in light of research that indicates whites are more likely than Asian Americans to see ability as inborn, and that Asian Americans are more likely to see a connection between effort and achievement (Hsin and Xie 2014). However, a possible explanation is that Asian teachers take less responsibility for student achievement themselves because they believe it is up to students to muster the effort to overcome disadvantages. Unfortunately, HSLS:09 does

not contain data on teachers' socioeconomic background. Given that teachers' beliefs relate to their demographic background more strongly than to other teacher traits, I suspect we might see a relationship between teachers' social class background and their beliefs as well, though this remains an empirical question.

Although teachers' beliefs are independent of their human capital characteristics, they are related —and unrelated—to school context in some important and surprising ways. I find scant evidence that teachers' beliefs are associated with schools that have undertaken aspects of recent education policy reforms. Longer school days and school- or district-proffered incentives show no relationship with teachers' beliefs. And the marginally significant negative coefficient for charter status in my final model indicates that, if anything, charter school teachers have more helpless attitudes toward overcoming social disadvantage—a finding that may be noteworthy because the small sample of charter schools could produce imprecise estimates of the charter school effect.

In schools with a strong culture of high academic expectations, teachers' beliefs are consistently more empowered. This supports Diamond, Randolph, and Spillane's (2004) view of an organizational habitus guiding the race- and class-based beliefs of school staff. And my null results for school academic composition suggest that teachers' beliefs about students' social disadvantage are indeed race- and class-based beliefs, rather than based in student ability or achievement levels. Yet my findings on school socioeconomic and racial composition are not consistent with Diamond, Randolph, and Spillane (2004), which found deficit-oriented thinking among teachers in nearly all of the poor, predominantly minority schools they studied. Instead, I find that there is an important relationship between high poverty composition and teachers' beliefs that

operates differently depending on school racial composition. Although the most helpless teacher attitudes are evident in high poverty predominantly white schools, teachers in high poverty diverse, high poverty Latino, and especially high poverty black schools feel dramatically more empowered. In considering these results, one must consider the possibility of social desirability bias in teachers' responses. Teachers in schools with a predominantly high-poverty and high-minority student body may be more likely to express beliefs that are consistent with socially desirable attitudes about overcoming social disadvantage. Particularly given the light that No Child Left Behind shined on achievement disparities, teachers may recognize it as unacceptable to express pessimistic beliefs about poor black and Latino students' potential, whereas expressing pessimism about poor whites' potential may not be similarly suppressed. Given the nature of HSLS:09 survey data, it is impossible to investigate this possibility; but some readers may question whether teachers' reports of their beliefs can be trusted. Diamond, Randolph, and Spillane's (2004) findings suggest that teachers are *not* restrained in their expressions of negativity about poor students of color, but it is possible that their in-depth interviewing and ethnographic approach may have contributed to the types of responses teachers were willing to give.

Another explanation for the relationship between school race and class composition and teachers' beliefs could be that empowered teacher beliefs are idiosyncratic to schools serving poor students of color, and thus could be an important aspect of a "gap-closing" school model. A more likely alternative explanation, though, may be that teachers do not choose to teach a high poverty, high minority student body unless they feel like they can make a difference. It is possible that these teachers are

better prepared psychologically for the challenges they face, whereas teachers in high poverty white schools may be less likely to anticipate that their racially dominant students will face substantial challenges and therefore develop a more helpless stance toward overcoming disadvantages when they encounter setbacks in teaching.

The various explanations I offer for my findings blend interpretations of the results as reflecting both causal and selection mechanisms, but I can only speculate on this point. Although HSLS:09 is a longitudinal study, teachers were only surveyed in the first wave. With only a single wave of observational data, it is impossible to disentangle the extent to which the relationships I document stem from school context influencing teachers' beliefs, or whether they result more from selection, such as through teachers with certain beliefs seeking out employment at certain types of schools, or principals selectively hiring based on beliefs. For example, it is possible that a school culture of high expectations influences individual teachers' beliefs by establishing norms and encouraging cohesion. However, an equally plausible explanation is that principals in schools with a strong culture seek to hire teachers who have beliefs consistent with that culture, or that empowered teachers only desire to teach in schools with a correspondingly positive culture. The reality may be that both mechanisms operate to some extent. Although there is some evidence on other types of teacher beliefs to suggest that they are not highly malleable (Pajares 1992), which is consistent with my finding that even a pattern of academic failure is not related to teachers' beliefs, to better understand teachers' beliefs specifically about overcoming social disadvantage, future research should track this type of belief over time to understand if beliefs change, and if so, what causes precipitate changes. Although this paper contributes to the literature by

studying teachers' beliefs in a national context, another limitation to this analysis is that it is generalizable only to high school contexts and secondary math and science teachers. Additional research is necessary to understand whether different individual or contextual factors matter for teachers of lower grades or different subjects.

The substantial enthusiasm surrounding "transformational" or "gap-closing" schools encourages a more systematic examination of the components of these schools' approach. The empowered attitudes toward overcoming social disadvantage consistently expressed by teachers in accounts of such schools suggest teachers' beliefs may be one such important component, and the large educational literature supporting the role of other types of teacher attitudes in student success confirms that beliefs are a plausible source of school effectiveness. This paper demonstrates the independence of teachers' beliefs from their human capital, so efforts to recruit "highly qualified teachers" based on their preparation will do little in terms of capturing teachers with empowered attitudes. However, it appears that poor students of color are already the most likely students to be exposed to the teachers who feel empowered to overcome students' social disadvantages. If these beliefs do contribute to transforming educational trajectories, this should be a positive sign. This question hinges on whether such teacher beliefs are indeed related to student outcomes at a national level. Outside the scope of the current paper, I take up this issue in the next paper of the dissertation.

NOTES

[1] Construction of the teacher dataset is described in Appendix A.

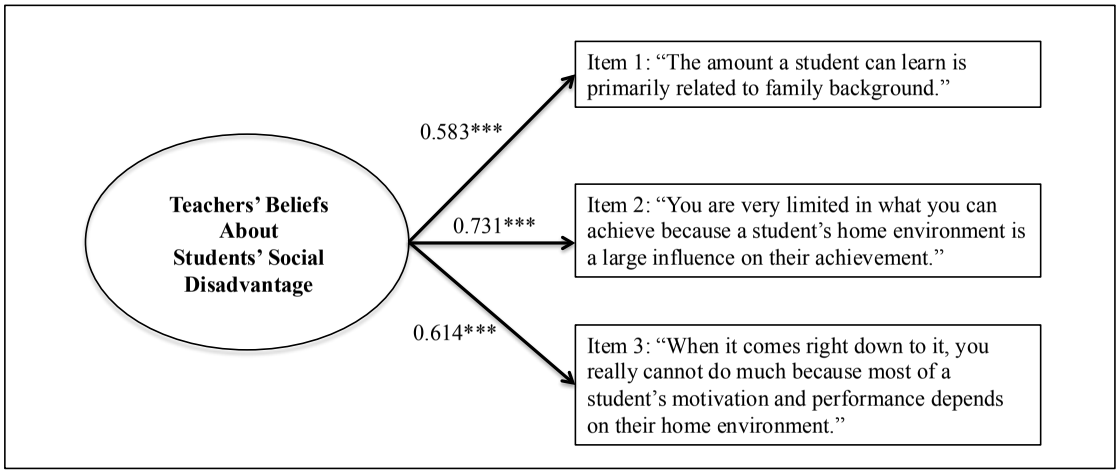
[2] Sample sizes are rounded to the nearest ten to comply with NCES license requirements.

[3] A more complete description of the NCES-Barron's Admissions Competitiveness Index Data Files can be accessed at http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2010331.

[4] Analyses using the standard deviation of this variable—to tap cohesion among school personnel—suggested the overall mean is sufficient to capture the predictive role of school culture.

[5] Because teachers were not directly sampled in HSLS:09 but can be separated from student data and considered as a distinct level of analysis, I derived weights for teacher-level data by calculating the teacher's probability of selection as a function of the joint probabilities of her students' selection probabilities. Construction of the teacher weights is described in Appendix B.

Figure 2.1. Confirmatory Factor Analysis Model of Teachers' Beliefs



Note: Standard errors clustered by school. Coefficient of determination = 0.694.

Table 2.1. Full Distributions of Items Used to Measure Teachers' Beliefs of Helplessness and Empowerment

"The amount a student can learn is primarily related to family background"

Response	Frequency	Weighted Percent
Strongly agree	280	4.01
Agree	1,610	23.47
Disagree	3,770	54.81
Strongly disagree	1,190	17.72
Total	6,850	100

"You are very limited in what you can achieve because a student's home environment is a large influence on their achievement"

Response	Frequency	Weighted Percent
Strongly agree	460	7.38
Agree	2,510	37.96
Disagree	3,520	49.23
Strongly disagree	370	5.43
Total	6,850	100

"When it comes right down to it, you really can not do much because most of a student's motivation and performance depends on their home environment"

Response	Frequency	Weighted Percent
Strongly agree	140	2.14
Agree	1,000	15.62
Disagree	4,410	64.45
Strongly disagree	1,310	17.80
Total	6,850	100

Note: Teachers' responses are weighted to approximate national representativeness for ninth grade math and science teachers. Overall N and cell frequencies are rounded to the nearest ten to comply with NCES license requirements. Numbers that do not sum properly are due to rounding error.

Table 2.2. Descriptive Statistics of Teachers

	Weighted Mean	SD
Demographic Characteristics		
Sex		
Female	0.582	–
Male	0.418	–
Race		
White	0.784	–
Black	0.057	–
Hispanic/Latino	0.091	–
Asian/Pacific Islander	0.049	–
2+ races or American Indian	0.020	–
Human Capital Characteristics		
Highest Degree Received		
BA or AA	0.440	–
MA	0.519	–
Educational Specialist diploma	0.018	–
PhD/MD/law degree/other professional degree	0.022	–
College Selectivity Ranking (Barron's)		
Most competitive	0.051	–
Highly competitive	0.088	–
Very competitive	0.241	–
Competitive	0.454	–
Less competitive	0.108	–
Noncompetitive	0.050	–
Special	0.080	–
Math- or science-related job prior to teaching	0.258	–
Alternative certification	0.269	–
Certification Status		
None	0.074	–
Regular	0.778	–
Probationary	0.048	–
Emergency/temp/waiver	0.100	–
Years taught 9-12 (max. of math, science, or any subject)	10.316	8.610
Teacher is new (1st or 2nd year) to current school	0.239	
Teachers' beliefs about students' social disadvantage	-0.029	1.018
N	6,850	

Note: Sample sizes are rounded to the nearest ten to comply with NCES license requirements.

Table 2.3. Descriptive Statistics of Schools

	Weighted Mean	SD
Basic Institutional/ Organizational Features		
Sector		
Public	0.795	–
Catholic	0.048	–
Private	0.157	–
Location		
Suburban	0.212	–
Urban	0.206	–
Town	0.174	–
Rural	0.408	–
Region		–
South	0.330	–
Northeast	0.162	–
Midwest	0.308	–
West	0.200	–
Number of students (school size)	678.438	663.471
Gradespan (lowest grade elementary or middle)	0.363	–
Average daily attendance	93.449	6.273
Enrollment (percent capacity to which school is filled)	87.894	13.503
Instructional Environment		
No AP or IB classes offered	0.284	–
Special college prep program offered	0.383	–
Math requirements more advanced than State Dept. of Ed	0.193	–
Science requirements more advanced than State Dept. of Ed	0.157	–
No tracking in 9th grade math	0.211	–
No tracking in 9th grade science	0.628	–
Assistance offered to teachers with struggling 9th graders	0.329	–
School Reform Factors		
Charter school	0.045	–
Average instructional hours per day	6.098	0.625
School/district offers incentives to attract teachers	0.179	–
School culture of high academic expectations	0.047	0.594
School Academic Composition		
School failed to make AYP	0.310	–
Year of "In Need of Improvement" for AYP		
0	0.794	–
1	0.078	–
2	0.073	–
3	0.035	–
4	0.014	–
5	0.007	–
% of 2008-09 seniors who went to 4-year college	49.630	28.652
School Race/Class Composition		
High poverty (> 75% FRPL)	0.115	–
High white composition (>75%)	0.574	–
High black composition (>75%)	0.067	–
High Latino composition (>75%)	0.059	–
Diverse composition	0.363	–
N	910	

Note: Sample sizes are rounded to the nearest ten to comply with NCES license requirements.

Table 2.4. Coefficients from Multilevel Models of Teachers' Characteristics as Predictors of Teachers' Beliefs about Students' Social Disadvantage

	Model 1
Teachers' Demographic Characteristics	
Male teacher	-0.297***
	(0.058)
Race (ref: White)	
Black	0.177
	(0.132)
Asian/Pacific Islander	-0.520***
	(0.115)
Hispanic	-0.132
	(0.127)
Other race (multiracial or Amer. Indian)	0.316
	(0.182)
Teachers' Human Capital Characteristics	
Highest Degree Earned (ref: MA)	
BA or AA	-0.072
	(0.061)
Educational Specialist diploma	-0.119
	(0.118)
PhD/MD/law degree/other professional degree	0.236
	(0.159)
College selectivity (Barron's ranking)	0.026
	(0.034)
Teacher held math/science-related job before teaching	-0.043
	(0.057)
Alternative certification	-0.082
	(0.069)
Certification Status (ref: Regular certification)	
No certification	0.203
	(0.122)
Probationary certification	-0.145
	(0.124)
Emergency/temp/waiver certification	-0.171
	(0.102)
Years of teaching experience in grades 9-12	-0.002
	(0.004)
Teacher is new (1st or 2nd year) to this school	0.037
	(0.068)
Intercept	0.164
	(0.169)
Observations	
Schools	910
Teachers	6,850

Note: Model is weighted at each level. Standard errors in parentheses.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 2.5. Coefficients from Multilevel Models of School Structural/Organizational and Instructional Characteristics as Predictors of Teachers' Beliefs about Students' Social Disadvantage

	Model 2 Structural/Organizational Context	Model 2 Add Instructional Environment
Intercept	0.091	0.142
	(0.138)	(0.147)
School Structural/Organizational Characteristics		
School size (# of students)	-0.000	-0.000
	(0.000)	(0.000)
School sector (ref: Public)		
Catholic	0.348***	0.348**
	(0.094)	(0.111)
Private (not Catholic)	0.336	0.249
	(0.183)	(0.176)
Locale (ref: Suburban)		
Urban	-0.052	-0.038
	(0.091)	(0.086)
Town	-0.145	-0.170
	(0.144)	(0.133)
Rural	-0.074	-0.083
	(0.095)	(0.097)
Region (ref: South)		
Northeast	-0.145	-0.130
	(0.102)	(0.093)
Midwest	0.074	0.053
	(0.097)	(0.093)
West	0.230	0.196
	(0.132)	(0.123)
School includes elementary or middle school grades	0.024	0.050
	(0.112)	(0.111)
Average daily attendance	0.001	0.003
	(0.006)	(0.006)
Enrollment as percent of school capacity	0.004	0.004
	(0.004)	(0.004)
School Instructional Environment		
No AP or IB classes offered		0.080
		(0.108)
Special college prep program offered		-0.041
		(0.068)
Math requirements more advanced than State Dept. of Ed		0.145
		(0.131)
Science requirements more advanced than State Dept. of Ed		-0.182
		(0.131)
No tracking in 9th grade math		0.247*
		(0.114)
No tracking in 9th grade science		-0.114
		(0.079)
Assistance offered to teachers with struggling 9th graders		-0.050
		(0.076)
Observations		
Schools	910	910
Teachers	6,850	6,850

Note: Models control for teachers' demographic and human capital characteristics and are weighted at each level. Standard errors in parentheses. Full model results including coefficients for control variables are available by request from the author.

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

Table 2.6. Coefficients from Multilevel Models of School Reform Factors as Predictors of Teachers' Beliefs about Students' Social Disadvantage

	Model 4.1	Model 4.2	Model 4.3	Model 4.4
	Charter status	Instructional Hours	Teacher Incentives	All School Reform Factors
Charter school	-0.126			-0.129
	(0.161)			(0.160)
Instructional hours per day		-0.008		-0.015
		(0.069)		(0.070)
School/district offers incentives to attract math or science teachers			0.053	0.055
			(0.089)	(0.090)
Observations				
Schools	910	910	910	910
Teachers	6,850	6,850	6,850	6,850

Note: Models control for teachers' demographic/human capital characteristics and school organizational/instructional characteristics. Models are weighted at each level. Standard errors in parentheses. Full model results including coefficients for control variables are available by request from the author.

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

Table 2.7. Coefficients from Multilevel Model of School Culture as a Predictor of Teachers' Beliefs about Students' Social Disadvantage

	Model 5
	School Culture
School culture of high academic expectations	0.254***
	(0.064)
Observations	
Schools	910
Teachers	6,850

Note: Model controls for teachers' demographic/human capital characteristics and school organizational/instructional characteristics. Model is weighted at each level. Standard errors in parentheses. Full model results including coefficients for control variables are available by request from the author.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 2.8. Coefficients from Multilevel Models of School Academic Composition as Predictors of Teachers' Beliefs about Students' Social Disadvantage

	Model 6.1	Model 6.2	Model 6.3	Model 6.4
	Failed to make AYP	Year of AYP Improvement	% Go to 4-Year College	All Academic Composition Variables
School failed to make AYP	-0.094			-0.017
	(0.079)			(0.090)
Year of AYP improvement		-0.061		-0.049
		(0.040)		(0.047)
% of '08-'09 seniors who went to 4-year BA-granting college/university			0.003	0.002
			(0.002)	(0.002)
Observations				
Schools	910	910	910	910
Teachers	6,850	6,850	6,850	6,850

Note: Models control for teachers' demographic/human capital characteristics and school organizational/instructional characteristics. Models are weighted at each level. Standard errors in parentheses. Full model results including coefficients for control variables are available by request from the author.

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

Table 2.9. Coefficients from Multilevel Models of School Socioeconomic and Racial Composition as Predictors of Teachers' Beliefs about Students' Social Disadvantage

	Model 7.1	Model 7.2	Model 7.3	Model 7.4
	SES Composition	Racial Composition	SES & Racial Composition Together	SES & Racial Composition Interacted
SES Composition				
High poverty (> 75% FRPL)	0.184		0.044	-0.918***
	(0.130)		(0.145)	(0.216)
Racial Composition (ref: >75% white)				
High black composition (>75%)		0.535*	0.555*	-0.145
		(0.246)	(0.263)	(0.344)
High Latino composition (>75%)		0.224	0.211	0.275
		(0.140)	(0.164)	(0.170)
Diverse composition		0.133	0.133	0.127
		(0.076)	(0.085)	(0.085)
*SES*Racial Composition Interactions*				
High-poverty black				1.819**
				(0.498)
High-poverty Latino				0.814*
				(0.342)
High-poverty diverse				0.952***
				(0.240)
Observations				
Schools	910	910	910	910
Teachers	6,850	6,850	6,850	6,850

Note: Models control for teachers' demographic/human capital characteristics and school organizational/instructional characteristics. Models are weighted at each level. Standard errors in parentheses. Full model results including coefficients for control variables are available by request from the author.

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

Table 2.10. Coefficients from Multilevel Model of All Key School Characteristics of Interest as Predictors of Teachers' Beliefs about Students' Social Disadvantage

	Model 8
	All Key School Predictors
School Reform Factors	
Charter school	-0.285
	(0.154)
Instructional hours per day	-0.010
	(0.063)
School/district offers incentives to attract math or science teachers	-0.005
	(0.077)
School Culture	
School culture of high academic expectations	0.221**
	(0.064)
Academic Composition	
School failed to make AYP	-0.038
	(0.083)
Year of AYP improvement	-0.056
	(0.040)
% of '08-'09 seniors who went to 4-year BA-granting college/university	0.002
	(0.002)
SES Composition	
High poverty (> 75% FRPL)	-1.131***
	(0.244)
Racial Composition (ref: >75% white)	
High black composition (>75%)	-0.040
	(0.357)
High Latino composition (>75%)	0.326*
	(0.160)
Diverse composition	0.146
	(0.081)
*SES*Racial Composition Interactions*	
High-poverty black	1.942***
	(0.504)
High-poverty Latino	1.170**
	(0.368)
High-poverty diverse	1.349***
	(0.269)
Observations	
Schools	910
Teachers	6,850

Note: Model controls for teachers' demographic/human capital characteristics and school organizational/instructional characteristics. Model is weighted at each level. Standard errors in parentheses. Full model results including coefficients for control variables are available by request from the author.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

CHAPTER 3

Teachers' Beliefs About Students' Social Disadvantage and Students' Educational Outcomes

Social inequality in education prompts debate over the extent to which schools ought to be held accountable for racial and socioeconomic disparities in academic outcomes, or whether highly entrenched inequality in broader U.S. society means some children face challenges too difficult for teachers and schools to overcome. Extensive evidence indicates that non-school factors primarily drive achievement (e.g. Gamoran 2001). However, substantial enthusiasm has recently surrounded so-called "transformational" schools, which claim to establish conditions that enable students to achieve at levels far higher than their socioeconomic background predicts. Accounts of such schools invariably highlight a widespread belief among their teachers of empowerment over student outcomes—a conviction that teachers can ensure students are not precluded from reaching their full potential by family background or social disadvantage. This suggests that such empowered teacher beliefs may be a key aspect of promoting high achievement—or, conversely, that beliefs of helplessness in the face of social disadvantage may be a hindrance.

However, descriptions of the success of "transformational" schools exist almost entirely in case studies and personal accounts (e.g. Kopp 2011; Wilson 2008), as well as a growing body of experimental evidence on specific educational models where the "intervention" involves multiple educational dimensions besides teacher attitudes (e.g.

Angrist et al. 2012; Dobbie & Fryer 2011). Our understanding of teacher beliefs of helplessness or empowerment to overcome social disadvantage has not benefitted from systematic analysis or large-scale data. Studies in psychology have examined "teacher efficacy"—which has sometimes been conceptualized to include similar beliefs—but generally with small samples, often from just a few districts or schools, or preservice teachers at an individual university (e.g. Gibson and Dembo 1984; Guskey and Passaro 1994; Woolfolk and Hoy 1990). At the same time, studies of teacher effects that *have* systematically analyzed national data most commonly focus on teachers' human capital characteristics, overlooking psychological and interactional qualities of teachers, such as their beliefs about students' potential or the nature of teaching. Moreover, both of these literatures seldom account for the school contexts in which teachers with varying beliefs or human capital characteristics work. The sociological construct of "teacher responsibility" has brought attention to how much teachers internalize the responsibility for student learning instead of blaming students for failure (e.g. Lee and Smith 1996; Lee and Loeb 2000). Yet although it has been theorized that teacher responsibility captures teachers' beliefs of empowerment to affect learning, the concept has not been measured with specific reference to students' social background or home lives.

This paper focuses specifically on teachers' beliefs about the extent to which they can overcome students' social disadvantage and examines whether these beliefs relate to high school students' educational outcomes. Unlike prior case studies, this analysis examines such teacher beliefs in a nationally representative sample by using data from the first wave of the High School Longitudinal Study of 2009 (HSLS:09), permitting greater generalizability about their role in student success. I use multilevel modeling to

properly nest students within teachers and teachers within schools. A key goal of the paper is to isolate the relationship between teachers' beliefs and student outcomes, and at each level of analysis I account for factors that potentially confound this relationship. I control for numerous aspects of teachers' human capital in case teachers' beliefs about the nature of teaching merely reflect things like their experience teaching or their academic preparation. And I take into account school characteristics that have also been highlighted in accounts of "transformational" schools—as well as academic research on effective schools—and might explain such schools' apparent success in educating students to high levels, rather than teachers' attitudes. Thus, the paper establishes whether a significant relationship exists between teachers' beliefs about students' social disadvantage and students' educational outcomes independent of teachers' human capital traits and in schools broadly, outside of the specific environments described in case studies of "transformational" schools.

In the remainder of the paper, I first describe the case studies that suggest teachers' beliefs may be a crucial aspect of successful school reform and highlight why they point especially to teachers' beliefs about the extent to which students' social disadvantage is an obstacle. I then discuss existing research on teacher effects on students, particularly how teachers' human capital, expectations of individual students, and other beliefs relate to students' educational outcomes, noting how each of these literatures has overlooked teachers' beliefs about social disadvantage. Next, I describe the dataset, HSLS:09; my sample, which is nationally representative of high schools and specific to math teachers and ninth grade students taking math; and my multilevel modeling approach before describing my findings. The results indicate that the students of teachers with more

empowered beliefs have better educational outcomes across three different measures in math. However, results are mixed as to whether these relationships are likely to be due to selection in which students have which teachers or due to a causal influence of teachers' beliefs on student outcomes. The results describe several analyses that seek to elucidate the proper interpretation of the role of teachers' beliefs for student success.

Teachers' Beliefs in "Transformational" Schools

Recent case studies have raised the profile of what are often termed "transformational" (Kopp 2011) or "gap-closing" (Paige and Witty 2010; Wilson 2008) schools—terms that stem partially from the schools' approach and partially from their results. These are schools that enroll primarily students of color from high poverty backgrounds, that have high levels of academic achievement, and that appear to enable their students to improve swiftly. Charter schools are often highlighted in this regard (Angrist, Pathak, and Walters 2011; Wilson 2008), leading to questions about the results of some "transformational" schools because they may have selective enrollments. For example, they may be criticized for "creaming" the most motivated students, or for not enrolling students with the highest needs, such as English Language Learners or special education students (Ravitch 2010). Such criticisms preclude firm conclusions about the extent of these schools' success. But some traditional public schools have shown remarkable success as well. Chenoweth (2007), for example, describes only open enrollment neighborhood schools in her book, *It's Being Done*—the "it" in this case being school practices that reduce the relationship between student background and student achievement and result in student performance that has implications for closing

long-standing achievement disparities. To the extent that "gap-closing" schools embrace the challenge of overcoming hardships in students' lives, they have at least engaged with one of our educational system's most entrenched dilemmas. Thus, I draw attention to them not because this paper focuses specifically on these settings, but because their methods are worthy of more systematic attention.

The "transformational" or "gap-closing" approach assumes that students possess unrealized potential and that schools must alter the educational trajectory that a child's socioeconomic background predicts. For example, Kopp (2011) describes leaders in "transformational" schools as having "an unshakable belief in the potential of children" (p. 71). Similarly, one aspect of the "No Excuses" moniker at schools like KIPP (Knowledge Is Power Program) is that the "founders and staff steadfastly reject explanations from any quarter for low achievement, whether a district apologist's appeals to demographic destiny or a child's excuse for failing to complete an assignment" (Wilson 2008, p. 7). These sentiments suggest that "transformational" schools actively dissuade personnel from forming expectations for students' outcomes based on their past achievement or social conditions. Rather, they assume that it is schools' responsibility to disrupt mediocre achievement trajectories instead of sustaining them. A condition commonly described in accounts of such schools, then, is a widespread belief among teachers of empowerment over student outcomes—a conviction that teachers can ensure students are not precluded from reaching their full potential by family background or social disadvantage. School effects research demonstrates the benefit of a school culture that broadly reflects similar attitudes. A school's academic emphasis, the collective efficacy of its faculty—the common belief that the organization as a whole is capable of

influencing learning— and its faculty's taking collective responsibility for student learning have all been shown to be influential for achievement (Hoy, Sweetland, and Smith 2002; Lee and Smith 1996; Teddlie 2010). But despite both case study evidence on "transformational" schools and school effects literature suggesting that within-school attitudes about the extent to which teachers can overcome social disadvantage are related to student success, teachers' beliefs about the extent to which student background is a barrier have not been tested systematically as an important influence that individual teachers may have on their students.

At the same time, in these case studies and research on effective schools there is also the possibility that other aspects of schools are actually what produce better outcomes for students. As mentioned, charter schools are often highlighted in accounts of "transformational" schools; these may be schools that have undertaken a variety of reforms, or that hire teachers who are unusual in ways besides their beliefs. Or, schools' academic emphasis may be reflected in instructional qualities that are independent of teachers' individual attitudes. Additionally, the lack of systematic analysis of such school contexts means that other school characteristics commonly understood to relate to student outcomes, such as school size (Lee and Burkam 2003), resources and funding (e.g. Payne and Biddle 1999; Wenglinsky 1997), and student body composition (e.g. Condron and Roscigno 2003; Crosnoe 2009; Owens 2010) are not typically mentioned as potential sources of positive outcomes. These possibilities highlight the fact that teachers' beliefs about students' social disadvantage need to be analyzed specifically, to understand their particular role, and that school context must be accounted for in a detailed fashion.

Teacher Effects Literature Focuses on Human Capital

In part to better understand schools' role in student achievement, researchers have paid increasing attention to the crucial influence of the classroom teacher (Darling-Hammond and Youngs 2002). Yet much of the literature examining teacher effects on students using large-scale data focuses exclusively on teachers' human capital. Academic background (Darling-Hammond and Youngs 2002), content knowledge in one's subject (Goldhaber and Brewer 2000), years of experience (Rice 2010), and certification or licensure (Goldhaber and Brewer 2000; Kane, Rockoff and Staiger 2008) are characteristics that have been found to predict teachers' estimated effects on student outcomes.

Significant influences of each of theses factors are not consistently found (Peske and Haycock 2006; Lankford, Loeb, and Wyckoff 2002), perhaps because of collinearity among traits (Darling-Hammond and Youngs 2002), so there is debate about precisely which teacher characteristics are most important for student learning. However, there is broad consensus that teachers vary considerably with respect to their effectiveness (Rowan, Correnti, and Miller 2002). Recent research in the human capital tradition suggests that as-yet-unmeasured teacher characteristics contribute greatly to their potential impact on students. Rivkin, Hanushek, and Kain (2005) demonstrate variation within schools in quality of instruction that is substantial enough to bear on educational inequality, although they find that they can only explain a modest degree of the differences in their estimates of teacher effects using more commonly measured characteristics such as years of experience and highest degree received.

Importantly, this research tradition has not addressed non-human capital characteristics of teachers. These large-scale analyses rarely consider psychological qualities such as teacher attitudes or interactional qualities such as how teachers engage with students alongside qualities such as teachers' preparation, experience, or certification. Palardy and Rumberger (2008), who analyzed teachers' human capital, attitudes, and instructional practices simultaneously, is a notable exception in this regard. Examining a national sample of first graders, their results indicate that teachers' attitudes and practices are more strongly related to achievement gains than teachers' preparation is. It is unclear whether this pattern would hold for high schoolers, but Palardy and Rumberger's (2008) work suggests that it is possible that teacher beliefs provide a missing link in explaining teacher quality.

Evidence that Teachers' Expectations and Beliefs Matter

Literature reflecting the long-standing sociological insight that interpersonal expectations can shape subsequent behaviors and interactions provides smaller scale evidence that aspects of teacher-student interaction do matter for student outcomes. Merton (1948) first suggested the self-fulfilling prophecy effect, whereby a false judgment about an individual alters behavior such that the individual eventually fulfills the early expectation. Rosenthal and Jacobson's 1968 *Pygmalion in the Classroom* demonstrated self-fulfilling prophecies of teachers' expectations by showing that when teachers' erroneously judged students to be high performers, the students' achievement increased (see Good 1987; Jussim and Harber 2005; Paige and Witty 2010). Rist (1970) found that teachers are more available to perceived high achievers and more active in their learning. Thus, teachers' early expectations lead to a self-fulfilling prophecy of low

achievement for the students that teachers perceive as "slow learners" with less potential than other students because teachers consequently provide them with fewer educational opportunities (Rist 1970). Although these early studies provoked substantial controversy, Lee and Loeb (2000) assert that early controversy has been overcome by the weight of the evidence documenting self-fulfilling prophecy effects of teacher expectations.

On the other hand, Jussim, Eccles, and Madon (1996) contend that a strong relationship between teachers' perceptions and their students' achievement is primarily due to the accuracy of teachers' perceptions based on students' past performance. Although "accurate" perceptions of past performance may explain why teachers' expectations are good predictors of students' later achievement, Good (1987) argues that a similar but subtler and more common process may occur with "sustaining" effects. This occurs when "teachers expect students to sustain previously developed behavior patterns, to the point that teachers take these behavior patterns for granted and fail to see and capitalize on changes in student potential" (Good 1987, p. 32). This notion conveys that unrevealed potential may be ignored (Good 1987). Furthermore, the concept of a student's "potential" can be challenging, because to the extent that potential is not synonymous with past performance, it may be easy for teachers to overlook (Ferguson 2003).

The literature on teachers' expectations highlights how teachers' attitudes toward students can be reflected in their interactions with students and behaviors in the classroom, in turn influencing students' learning. These studies have typically measured teachers' evaluations of the potential of specific individual students. A different approach has attempted to capture teachers' attitudes about the potential of teaching more broadly.

Two concepts are relevant to the beliefs examined in this paper: teacher efficacy and teacher responsibility.

Teacher efficacy, defined as teachers' beliefs that they can successfully bring about student learning, has primarily been the province of psychology. This literature indicates that teacher efficacy is related to student outcomes, including student efficacy, motivation, and achievement (Tschannen-Moran and Woolfolk Hoy 2001). The early development of scales to measure teacher efficacy (e.g. Gibson and Dembo 1984; Guskey and Passaro 1994) indicated a multi-faceted concept, including dimensions of "personal teaching efficacy" and "general teaching efficacy." In this early work, "general teaching efficacy" was operationalized using similar belief measures to those used in this paper, in addition to others, and was considered to reflect the extent to which a teacher perceives external obstacles to effective teaching. However, most recent psychological research in this area has been primarily concerned with the self-oriented dimension of "personal teaching efficacy," reflecting beliefs about one's personal skills and abilities, and with measuring "efficacy" in ways that are more specific to particular teaching tasks and contexts (Tschannen-Moran and Woolfolk Hoy 2001). Thus, although "teacher efficacy" literature once incorporated beliefs "that any teacher's ability to bring about change is significantly limited by factors external to the teacher" (Gibson and Dembo 1984, p. 574), recent studies have largely ignored the general teaching efficacy concept.

Lee and Smith (1996) took the study of teachers' beliefs in a more sociological direction, developing a measure of teachers' collective responsibility for student learning, reflecting teachers' "willingness, interest, and care for how and what all his or her students learned" (p. 115). They aimed to develop a measure that would subsume aspects

of teacher efficacy, and by establishing a measure of *collective* responsibility they theorized this teacher attitude as forming a coherent organizational property of schools. Their original work and its extensions have shown that schools with higher collective responsibility have higher levels of student learning (Lee and Loeb 2000; Lee and Smith 1996). The concept of teacher responsibility bears some similarity to teachers' beliefs about social disadvantage that are the focus of this paper because its underlying idea includes, in Lee and Smith's (1996) words, "teachers' internalizing responsibility for the learning of their students, *rather than attributing learning difficulties to weak students or deficient homelives*" (p. 114; emphasis added). Importantly, though, collective responsibility for student learning has not actually been measured by examining whether teachers attribute difficulties to students' home environment or see family background as an obstacle.

Figure 3.1 presents a conceptual framework for how teachers' beliefs may affect student outcomes: beliefs are made manifest in teachers' behaviors (e.g. the material they teach, their teaching style, and their interactions with students), which in turn influence students' own attitudes and behaviors (e.g. their motivation, self-perceptions of ability, persistence, etc.), which then influence student learning and achievement. The findings in the literatures on teacher expectations, efficacy, and responsibility support such an understanding of why teachers' beliefs would matter for student outcomes, and give good reason to believe that teachers with strong, committed, efficacious attitudes are beneficial for students. It is important to note, however, that beliefs are not equivalent to action, and it is theoretically possible for teachers to suppress their beliefs such that they are not manifested in their behaviors toward students. Although I theorize that beliefs should

matter for student outcomes because teachers' beliefs influence teachers' behaviors, I do not (and cannot) test this mechanism empirically in the present analysis.

Rather, this paper builds on the theoretical and empirical findings in the bodies of work on teacher efficacy and responsibility with a conceptualization of teachers' beliefs that specifically reflect views about the extent to which students' family origins and home life are barriers to teaching. I recast these attitudes as teachers' beliefs about students' social disadvantage to reflect that despite bearing some resemblance to the teacher efficacy and responsibility constructs, the focus is squarely on how teachers perceive students' social background. This focus is partially inspired by the mounting case study evidence suggesting that such beliefs among teachers play a crucial role in their capacity to provide "transformational" educational experiences. In addition, although the relationship between social background and achievement is one of the most enduring interests within education, we know surprisingly little about how teachers understand this relationship. By measuring whether teachers see an inevitable link between social background and student achievement, the beliefs studied here capture that understanding. This paper also builds on the teacher efficacy and responsibility literatures by expanding the study of teachers' beliefs to three levels: examining individual teachers' beliefs and how they relate to students' learning, while also accounting for aspects of school context broadly.

The Present Study

Despite a common interest in how teachers affect students, two main strands of research in this vein—literatures on teachers' human capital traits and teachers' expectations and beliefs—have occurred largely parallel to one another. In addition, both

literatures rarely explore broader contextual features of schools. Or, in some cases, teachers' beliefs are aggregated to the school level rather than considered among individual teachers; though teachers' beliefs may collectively form a school culture, teachers' individual attitudes likely also form a culture for the classroom. By bridging these literatures, this paper provides conceptual clarity and empirical knowledge about how multiple aspects of all three domains—schools, teachers, and students—relate to one another. Furthermore, success has not been conclusively proved nor have specific methods been conclusively tied to success in "transformational" schools. Although attitudes of empowerment over social disadvantage have been highlighted in case studies of successful schools serving a high-poverty student body, the relationship deserves greater scrutiny because it is unclear whether teachers' beliefs about their capacity to overcome social disadvantage are indeed related to student outcomes, or whether other aspects of such schools are driving results. This paper takes a first step toward describing how such empowered teacher beliefs relate to student outcomes in a national sample of high schools, using a large sample of teachers. It considers teachers' beliefs in concert with their human capital characteristics to understand whether they are intricately linked or operate independently. And it takes into consideration many potential confounding characteristics of students, teachers, and schools to isolate the role of teachers' beliefs about social disadvantage.

DATA

To analyze the relationship between teachers' beliefs and students' educational outcomes, I use data from the first wave of the High School Longitudinal Study of 2009 (HSLS:09), a National Center for Education Statistics study on a nationally representative

sample of 944 high schools and 21,000 ninth graders. During the fall of 2009, HSLS:09 fielded surveys of students, parents, school administrators, teachers, and school counselors. Most relevant for measuring teachers' beliefs, the math and science teachers who taught sampled ninth graders completed extensive surveys.

Students were sampled from school ninth grade enrollment lists, without regard to the courses in which they were enrolled. After sampling, if the student was enrolled in math or science in fall 2009, the teacher of the student's respective course was asked to complete a survey as well. This sampling strategy means the teachers are not strictly representative of teachers at their school, of all subjects, or of teachers nationally; yet they do comprise a large sample of teachers who taught a representative sample of ninth graders and therefore can provide a more accurate representation than yet exists of how teachers' beliefs about students' social disadvantage relate to their students' outcomes at a national level.

The results presented in this paper focus only on math courses, restricting the analytical samples to students who were enrolled in math and can be linked to a math teacher. I do this because HSLS:09 did not administer a standardized test in science, limiting the outcome variables that can potentially be used in analyzing science classes. Otherwise, sample restrictions are based solely on the presence of appropriate links between students, teachers, and schools; no sample member can remain in the analysis without being linked to sample members at the other two levels. Using the restricted-access version of HSLS:09, students are linked to their schools and data for teachers is separated from student records, resulting in sample sizes of 4,010 math teachers that can be linked to 16,040 students taking math courses in 890 schools.[6,7]

I handle missing data using multiple imputation by chained equations (using a combination of -ice- and -mi impute- in Stata), which fills in missing values based on plausible values determined by the distribution of the variable itself and the covariates in the imputation model. Because units at lower levels of nesting cannot have different values at higher levels (e.g. students in the same school cannot have different values on school variables), I performed imputation in three successive steps, whereby missing school data were imputed first; missing teacher data were imputed second, incorporating school variables into the imputation model; and missing student data were imputed third, incorporating school and teacher variables into the imputation model. Data analysis presented here employs ten imputed datasets.

Key Variables

Teachers' Beliefs About Students' Social Disadvantage

Compared to other NCES datasets that have longitudinal data on students or teachers, HSLS:09 is uniquely suited to this analysis because it includes belief measures that specifically reference students' social disadvantage. Teachers in HSLS:09 responded to questions about their level of agreement with three items that have traditionally been subsumed within a measure of "teacher efficacy," as described in the literature review, but which I argue are distinctly valuable for their ability to gauge teachers' beliefs about disadvantages stemming from students' social background and whether they view student background as a barrier to effective teaching and student achievement. I construct my measure of teachers' beliefs based on the following items:

- The amount a student can learn is primarily related to family background.

- You are very limited in what you can achieve because a student's home environment is a large influence on their achievement.
- When it comes right down to it, you really cannot do much because most of a student's motivation and performance depends on their home environment.[8]

Responses are reported with a Likert-type scale, and in each case strong agreement is akin to saying that family background and home environment are such strong influences on learning and performance that the teacher is relatively helpless to make a difference. In contrast, strong disagreement is indicative that a teacher instead feels empowered to overcome disadvantages. The full distributions of teachers' responses to the individual belief items are shown in Table 3.1. The distributions differ somewhat across the three items, but in each case, disagreement is the most common response, while strong disagreement—the most empowered response—is less common. For all three beliefs, strong agreement—representing the most helpless response category—is rare, but is nevertheless expressed by a nontrivial minority of teachers. Utilizing teachers' self-reported beliefs raises some concern about social desirability bias in teachers' responses. Although it is impossible to test for this with the survey data at hand, that some degree of agreement and strong agreement is present in the distributions provides some reassurance that teachers are not merely responding in ways that they believe to be socially acceptable.

To treat these teachers' beliefs as a single predictor of student outcomes, I combine the three beliefs into a latent summary measure of teachers' beliefs about students' social disadvantage through a confirmatory factor analysis of the entire sample of HSLS:09 teachers (both math and science), with standard errors clustered by school.

Standardized coefficients for each belief in the CFA model were above the 0.5-0.6 threshold indicating a strong relationship with the latent construct, and the coefficient of determination indicates that the teachers' beliefs factor explains 69.4 percent of the total variance in the observed belief items. Figure 3.2 displays the CFA model. My final teachers' beliefs measure is standardized ($M = 0$, $SD = 1$), with high values indicating more empowered beliefs and low values indicating more helplessness.

Student Outcomes

I employ multiple measures of students' educational outcomes in math, which are more likely to be related to math teacher attributes than are more general measures of academic performance. Two outcomes are motivational scales created by HSLS:09 using several student survey responses and principal components factor analysis. The third outcome is the student's score on a math assessment designed and administered by HSLS:09. Student motivational variables were included because the study was fielded during the fall semester, and teachers may influence student attitudes earlier in the school year than they influence results on achievement tests. The timing of the survey poses a challenge because students have been exposed to teachers for less time than if outcomes were measured at the end of the school year. However, no theory of teaching suggests that it takes an entire year of exposure for teachers' influence on students to be measureable. Moreover, data collection for HSLS:09 took place from September 2009 to February 2010—not all at the beginning of the year—leading to variation in the timing of when students were surveyed and tested that I exploit in robustness checks on my results.

Math interest is a scale variable created by HSLS:09, to assess the student's interest in his or her fall 2009 math course. It incorporates six student responses: "You

are enjoying this course very much," "You think this class is a waste of your time," "You think this class is boring," indication that math is the student's favorite school subject or least favorite school subject, and indication that the student is taking the course because he or she really enjoys math. The math interest scale is standardized to have a mean of 0 and standard deviation of 1.

Math self-efficacy is also a scale created by HSLS:09 and measures the student's confidence in his or her ability to succeed in the math course he or she was enrolled in at the time of the survey. Inputs to the math self-efficacy scale are four items: "You are confident that you can do an excellent job on tests in this course," "You are certain that you can understand the most difficult material presented in the textbook used in this course," "You are certain that you can master the skills being taught in this course," and "You are confident that you can do an excellent job on assignments in this course." HSLS:09 standardized the math self-efficacy scale to have a mean of 0 and standard deviation of 1.

Finally, HSLS:09 administered an assessment of algebraic reasoning to all students and used this math assessment to compute estimates of students' math skills in algebra, *theta*. HSLS:09 then standardized these *theta* scores, resulting in a standardized test score that provides a measurement of student math achievement, norm-referenced to the 9th grade student population. For consistency and ease of interpretation, I standardize this test score measure to have a mean of 0 and standard deviation of 1 as well.[9]

Control Variables

I control for a number of variables at each level that plausibly are correlated with both students' educational outcomes and their teachers' beliefs, and therefore may

confound the primary relationship of interest in this paper: the relationship between teachers' beliefs about students' social disadvantage and students' academic outcomes.

Student Characteristics

I control for student sex, race, and native language (indicators for English only, non-English only, or bilingual with English). Although all sample members are 9th graders, I control for age because some students are considerably younger or older than typical ninth graders. I also control for family structure (indicators for two-parent, one-parent plus additional guardian, one-parent, or other family structure) and socioeconomic status, which is measured using an HSLS:09-created composite scale that combines family income, parental education, and parental occupational prestige. Descriptive characteristics of the analytic sample of math students are shown in Table 3.2 alongside descriptive statistics for the full sample of 9th graders in HSLS:09, demonstrating that the analytic sample of 9th graders taking math are demographically similar to 9th graders nationally.

Teacher Characteristics

At the teacher level, I control for demographic characteristics—teachers' sex and race—and human capital. Since much of the literature on teacher effects focuses on teachers' human capital, controlling for these characteristics ensures that teachers' beliefs do not merely stand in for other factors. I control for the teacher's highest degree received (indicators for AA/BA, MA, Educational Specialist diploma, or Ph.D./professional degree), overall years of experience teaching high school, and whether the teacher is new (in her or his first 1 or 2 years) to her or his current school. I also control for certification status (indicators for none, regular, probationary, or emergency/temporary/waiver

certification), as well as a separate indicator for having entered teaching through an alternative certification program, and whether the teacher held a job that required college-level math prior to teaching.

Lastly, I account for the selectivity of the teacher's college or other postsecondary institution. This is measured by merging data from the NCES-Barron's Admissions Competitiveness Index Data Files[10] to data in HSLS:09 on the higher education institutions that teachers' attended. Because the NCES-Barron's files were not originally constructed to be linked to these data, I took a multi-step approach to assign a selectivity ranking to as many teachers as possible. I first merged the NCES-Barron's data to Integrated Postsecondary Education Data System (IPEDS) codes provided for teachers' undergraduate and graduate schools (if attended) based on the closest matching year from the NCES-Barron's file and the teacher's reported degree year in HSLS:09. Second, if a teacher attended multiple institutions, I assigned the selectivity ranking of the most competitive institution she or he ever attended. Third, I used data from IPEDS (publicly-available online) on open admissions colleges to code institutions as noncompetitive if no NCES-Barron's data could be matched but a teacher's IPEDS code *did* match to an IPEDS code identified as open admissions (or accepting 100 percent of applicants) in 2005.

Descriptive statistics for all teacher variables are shown in Table 3.3. Nearly all teachers received a master's (51 percent) or college-level (46 percent) degree (teachers with only an associate's degree are combined with teachers who earned a bachelor's, since few teachers have an AA as their highest degree received), rather than a professional or doctoral degree. Over 77 percent of teachers have a regular certification,

but 10 and 5 percent hold an emergency or probationary certification, respectively, and 7 percent have no certification at all. Additionally, nearly a quarter of teachers received their certification through an alternate certification route, and 22 percent had a math-related job prior to teaching. Teachers in this sample have an average of 10.2 years of experience teaching high school, but 24 percent are new to their current school. Finally, most teachers attended a Competitive (45 percent), Very Competitive (25 percent), or Less Competitive (11 percent) college or university, according to Barron's rankings. Although attendance in the highest ranks of Most Competitive and Highly Competitive is relatively uncommon, it is nevertheless more common than attendance at Noncompetitive schools. (The seven Barron's rankings are shown as categories for descriptive purposes, but regression models control for selectivity as a continuous variable, as tests indicated no non-linearity that would require using indicators as predictors of students' outcomes.)

School Characteristics

At the school level I control for several basic institutional/organizational features. These include sector (public, Catholic, or private), location (suburban, urban, town, or rural), region (South, West, Midwest, Northeast), and school size (number of students). I also include an indicator for grade span (whether the school includes elementary or middle grades) and measures of average daily attendance and enrollment as a percent of capacity, which proxy for schools' financial resources and demand among students.

I further account for a number of school characteristics that may independently relate to students' academic performance. These include measures of school academic composition (the percent of seniors going on to a four-year college, indicators of the school's pattern of making adequate yearly progress [AYP]), school racial and class

composition (percent receiving free or reduced-price lunch, percent of each racial group), the instructional environment of the school (whether the school lacks AP or IB offerings), and school reform characteristics (charter status, incentive pay for teachers, and increased instructional hours). Because these variables only serve as controls in this analysis, I do not describe them in detail in this paper. However, each of these control variables, along with descriptive statistics of schools on all variables, are displayed in Table 3.4. This extensive school-level data available in HSLS:09 encompasses a number of characteristics that have been studied in research on effective schools as well as features besides teachers' empowered beliefs that have been highlighted in accounts of "transformational" schools. Thus, I control for school context in a much more detailed way than previous work examining how teachers' human capital or teachers' beliefs relate to students' educational outcomes.

METHODS

To analyze the relationship between teachers' beliefs about social disadvantage and students' educational outcomes I use three-level linear regression models, also known as hierarchical linear modeling, in HLM. For each outcome tested, I estimate a random-intercept model[11] and employ HLM in order to correct for student and teacher clustering within schools (which violates assumptions about the independence of observations), and to weight the data at all three levels to adjust for HSLS:09's complex survey sampling design.[12]

Indexing individuals with *i*, teachers with *j*, and schools with *k*, my equations can be displayed in separate levels. I estimate the following student-level equation:

$$Math_{ijk} = \pi_{0jk} + \pi_{1jk}X_{ijk} + e_{ijk}$$

where *X* represents a vector of student-level controls and π_1 is a vector of coefficients. The outcome $Math_{ijk}$ represents students' predicted math interest, math self-efficacy, or math achievement score. Then, at the teacher level I estimate:

$$\pi_{0jk} = \beta_{0k} + \beta_{1k}Beliefs_{jk} + \beta_{2k}T_{jk} + r_{0jk}$$

where β_1, the coefficient on teachers' beliefs, is the primary coefficient of interest, *T* represents a vector of teacher-level controls and β_2 is a vector of coefficients. Finally, at the school level I estimate:

$$\beta_{0k} = \gamma_{000} + \gamma_{001}S_k + u_{00k}$$

where *S* is a vector of school-level controls, and γ_{001} is a vector of coefficients. I estimate the same set of equations for each of the three educational outcomes, each of which is a continuous variable measured at the student level. For each outcome, I first establish the size and significance of its bivariate relationship with teachers' beliefs; I then test how this relationship changes when accounting for various potentially confounding characteristics at each level. To contextualize the findings relative to other teacher effects, I also make some comparisons between the teachers' beliefs coefficient and the coefficients for various teacher human capital characteristics.

RESULTS

Students' Math Interest

Table 3.5 shows multilevel model results of the relationship between teachers' beliefs and students' math interest scale score. The bivariate model (Model 1) demonstrates that there is a significant positive association between teachers' beliefs

about students' social disadvantage and students' math interest, indicating that the more empowered a teacher feels, the higher her students' interest in the math class is predicted to be. The coefficient of 0.072 implies that a one standard deviation increase in teachers' beliefs of empowerment corresponds to about a 7 percent of a standard deviation increase in students' math interest. This relationship is attenuated somewhat (to 0.063) when accounting for student background factors (Model 2), but additionally controlling for teachers' other characteristics (Model 3) and school contextual factors (Model 4) does little to reduce the relationship further, and it remains statistically significant. With all controls in the model, a one standard deviation increase in teachers' beliefs predicts a 6 percent of a standard deviation increase in students' math interest. Thus, the beliefs math teachers hold about the extent to which they can overcome students' social disadvantage have a small but significant relationship with the interest their students have in their class.

Importantly, the model controls for teachers' human capital, demonstrating that teachers' beliefs operate independently from teachers' human capital—at least in how they relate to students' interest in their math course. Examining Model 4 with all controls, some of these human capital characteristics are themselves related to students' math interest. Having a teacher who is new to the current school is significantly related to lower interest in the class; having a new teacher predicts math interest roughly a quarter of a standard deviation lower. Just one indicator of teachers' level of education shows a significant relationship with students' interest in their math course: holding a doctorate or professional degree predicts a sizable jump for interest in math, over one third of a standard deviation. Other characteristics, such as teachers' certification status and college selectivity, are not significantly related to their students' math interest, which makes the

significant relationship between teachers' beliefs and students' math interest all the more notable. A variety of aspects of teachers' human capital that are typically examined in teacher effects literature are *not* significant predictors of students' math interest, whereas teachers' attitudes toward overcoming social disadvantage are.

Students' Math Self-Efficacy

The results for the second motivational outcome, students' math self-efficacy, appear similar to the results for math interest when considering the bivariate relationship, but the relationship disappears with even minimal controls. Shown in Table 3.6, the bivariate association between teachers' beliefs and students' math self-efficacy is a statistically significant 0.06—similar magnitude to the coefficient for math interest. Yet with the addition of student background controls in Model 2, the coefficient is reduced and is no longer significant, a result which persists with the addition of teacher and school controls in Models 3 and 4. This is a surprising finding. As much of the past research on similar types of beliefs—teacher efficacy—is in psychology, students' self-efficacy is a commonly considered outcome, and previous research indicates a link between teacher efficacy and student efficacy (Tschannen-Moran and Woolfolk Hoy 2001).

However, some aspects of teachers' human capital significantly predict students' self-efficacy in math. As with the results for math interest, having a teacher who is new to the current school predicts math self-efficacy among students more than a tenth of a standard deviation lower. Aspects of teacher certification are also related to math self-efficacy: the students of teachers with an emergency certification score a fifth of a standard deviation lower on the self-efficacy scale compared to students with a regularly

certified teacher. (A similar relationship exists for students with a teacher who is not certified, but it is only marginally significant by conventional standards.) And the students of teachers who entered the profession through an alternative certification program score nearly 12 percent of a standard deviation higher on math self-efficacy.

Students' Math Achievement Score

Finally, Table 3.7 displays results from multilevel models estimating the relationship between teachers' beliefs about social disadvantage and students' math achievement. Once again, we see a significant bivariate association between teachers' beliefs and student outcomes. Having a more empowered teacher predicts higher test scores, with the coefficient of 0.068 indicating that a one standard deviation increase in teachers' beliefs corresponds to almost a 7 percent of a standard deviation increase in math achievement. This relationship is reduced when controlling for student characteristics in Model 2, reflecting background differences in achievement scores, but not when controlling for teacher characteristics in Model 3, reflecting that teachers' beliefs are largely independent of their human capital and other characteristics. A significant relationship between teachers' beliefs and students' math achievement remains even when differences in students' background and teacher traits are taken into account. However, controlling for characteristics of the school context reduces the coefficient further, to 0.042, such that the coefficient on teachers' beliefs only borders on significance ($p = 0.071$) in Model 4 with all controls. This suggests that the observed association may be an artifact of selection on school contextual factors, although it is possible that there is a small relationship between teachers' beliefs and students' math achievement that is imprecisely estimated.

The findings for teachers' human capital traits are largely consistent with other work on "effective teachers" that has examined test score outcomes (see, e.g., Darling-Hammond and Youngs 2002 and Rice 2010 for reviews), identifying significant associations for new teachers and by certification status. Having a teacher who is new to the school predicts test scores one eighth of a standard deviation lower. And both emergency certification and no certification predict worse test score outcomes, with the effect for no certification being especially large at over half a standard deviation drop in math achievement score predicted. Thus, even if the positive relationship that teachers' beliefs have to math test performance is meaningful, it is less than a tenth of the magnitude of lacking certification and a third of the magnitude of having a new teacher. (Or, put another way, the positive relationship between teachers' beliefs and math test scores is equivalent to less than a tenth of the magnitude of having a regularly certified teachers as compared to a teacher without certification, or a third of the magnitude of having a teacher who has passed the two-year mark at their current school). These results have important implications for how we think about the influence that teachers have on students, which I discuss further in the conclusion to the paper.

Robustness Checks to Probe Selection vs. Causality Interpretations

My analysis considers motivational outcomes in addition to math achievement as dependent variables because HSLS:09 was fielded in the fall semester of the academic year, and I expected that if teachers' attitudes are influential for student outcomes, they might impact students' motivation more immediately than their achievement, and thus we might see stronger relationships between teachers' beliefs and students' motivation than between teachers' beliefs and student achievement. We see some evidence of this in that

the relationship between teachers' beliefs and students' math interest persists even when controlling for numerous potential confounders, whereas the relationship between teachers' beliefs and achievement is smaller in magnitude and only borders on significance with all controls, which muddles our understanding of whether the latter relationship is merely imprecisely estimated or evidence of selection. To complicate the interpretation further, the results for the other motivational outcome, students' math self-efficacy, show very little evidence of an important relationship, instead suggesting that the significant bivariate association with teachers' beliefs is due to student selection on background factors.

The observational nature of the data and the single wave of data available for both teachers and students pose important limitations in the extent to which we can determine whether these results are due to selection or weak but present causality. My analysis accounts for many potentially confounding factors at the student, teacher, and school levels, but my analysis may omit important unobserved variables. One such important confounder is students' prior interest in math or prior achievement. To gain insight into how to interpret these results despite this limitation, I probe my results further for evidence of selection or a causal relationship in three additional robustness checks that exploit the data that *is* available in HSLS:09.

Analysis of Proxies for Math Preparation/Performance

I investigate the contribution of two potential sources of student selection to my results for students' math interest and math achievement (I do not analyze students' math self-efficacy further). I incorporate two variables that are imperfect measures of prior

performance, to be sure, but to some extent proxy for students' engagement and achievement in math.

First, Model 5 adds to the main model a control for the level of math course the student is in—indicators for whether it is a non-academic, low-academic, or high-academic course relative to average-level math courses for 9th graders.[13] This tests whether the relationships I observe are due to students who are more interested in math enrolling in higher level math courses while teachers' feel more empowered when they teach more advanced students, or conversely, that students who have little interest in math take lower level courses, while their teachers' feel helpless when they teach remedial courses. Model 5 in Table 3.8 shows how the teachers' beliefs coefficient changes for the math interest and math achievement outcomes when the course level indicators are added. Although the coefficient in the model for math interest is attenuated to 0.053 (from 0.060 in Model 4), it remains statistically significant. The coefficient for math achievement is reduced substantially, however, and is no longer even marginally significant.

Second, Model 6 adds to the main model a control for the grade the student received in his or her 8th grade math course (self-reported by the student). Although this is not a strong proxy for prior achievement, it serves to test whether students with poor preparation in math end up with teachers who have more helpless attitudes, whereas students with stronger preparation have more empowered teachers. Model 6 in Table 3.8 shows how the teachers' beliefs coefficient changes for the math interest and math achievement outcomes when a linear measure of a grade of A through F is added. This control reduces the relationship between teachers' beliefs and students' math interest

more markedly, to 0.038, and it is no longer significant. The coefficient in the model for math achievement is even smaller than in previous models, only 0.019. The results in Models 5 and 6 give reason to believe it is possible that there is selection in either which students end up with teachers with different types of beliefs, or in how teachers with differing beliefs end up in different kinds of classrooms. (These results are also consistent with a reverse causality argument, which would suggest that teachers form their beliefs about what is possible based on the interest and ability they observe in their students; I return to this potential interpretation in the concluding discussion of the paper.)

Analysis of the Effect of Teachers' Beliefs by Timing

Due to differences in course offerings and grading practices across schools, as well as the extent to which grades are affected by inputs besides achievement such as effort and good behavior, the measures just described are weak proxies for achievement. Nevertheless, they appear to introduce some degree of signal regarding students' preparation and performance, rather than simply adding noise to the model. However, my last robustness check likely introduces less measurement error. HSLS:09 was fielded in the fall of the 2009 to 2010 academic year, but the study team administered student interviews and the math assessment at varying points between September 2009 and February 2010 (or April 2010 for the last student interviews). These dates are included with the data, so as a final check I interact teachers' beliefs with the interview/test timing (as well as a squared term to account for non-linearities as high school students may switch teachers for the second semester of the year). If the relationship between teachers' beliefs and the outcome is entirely due to selection, we would not expect the relationship

to change over time. On the other hand, if the relationship is causal, we would expect that more time with the teacher will lead to a stronger effect on student outcomes.

Models 7 and 8 in Table 3.9 show results from models adding an interaction between teachers' beliefs and the timing of the student interview (in the model predicting math interest) and the timing of the math test (in the model predicting math achievement), respectively. That is, the model adds an interaction between teachers' beliefs and the timing of when the outcome variable was measured. These models keep the control for the student's grade in his or her 8th grade math class; despite being a weak proxy, it accounts for some degree of selection and provides a more conservative model. Thus, the results in Models 7 and 8 are net of preparation (to the extent it is captured in the 8th grade measure). Interestingly, these models show no significant interaction effects for math interest (Model 7), but relatively large interaction effects for math achievement (Model 8). The lack of significant interactions between teachers' beliefs and the timing of the student interview in the model for math interest suggests that the relationship between teachers' beliefs and math interest is consistent across time, which is consistent with a selection interpretation, or could be consistent with my justification for including motivational outcomes: math interest may be impacted by teachers' attitudes more immediately at the beginning of the school year, and this causal effect may remain constant through the semester. The results for math achievement (Model 8), however, show a significant interaction whereby the relationship between teachers' beliefs and student achievement grows stronger as the semester progresses—that is, as the student is exposed to the teacher longer. Together, these coefficients predict a negative relationship between teachers' beliefs and math achievement at the beginning of the school year, an

association of about zero after one month, but then an effect of 5.3 percent of a standard deviation after two months, 7.5 percent of a standard deviation after three months, and 6.3 percent of a standard deviation after four months. (As a result of the negative coefficient on the squared term, the predicted association is only 0.017 after five months, suggesting a shift right around the time we would expect a new semester to be starting for high school students.)

DISCUSSION

The results just described provide mixed evidence on the role that teachers' beliefs about social disadvantage play in students' educational outcomes. Teachers' beliefs are significantly related to all three math outcomes in bivariate associations, but just minimal controls eliminate their significant relationship with students' math self-efficacy. On the other hand, the significant relationship between teachers' beliefs and students' math interest is robust to the inclusion of all student, teacher, and school controls—except for the addition of the student's grade in 8th grade math as a proxy for prior math achievement, suggesting that much of the relationship between teachers' beliefs and math interest is owed to how students are selected into different teachers' classrooms based on preparation. The relationships we see between teachers' beliefs and math achievement are more complicated still. The inclusion of controls for school contextual factors reduces the findings on teachers' beliefs to non-significance, and a control for the student's prior grade reduces it even further. Both of these findings indicate that the relationship between teachers' beliefs and math achievement are due to the types of students and teachers that select into certain schools, as well as student

selection based on preparation. However, the significant interaction between teachers' beliefs and the timing of the test administration, even net of prior preparation, is not consistent with a selection argument; instead, that robustness check provides some evidence that the small relationship we observe between teachers' beliefs and students' math achievement may in fact be causal. It is not simply that students score higher when they are tested later in the school year, but teachers' beliefs actually matter more the longer a student has been exposed to the teacher. This is what we would expect if teachers' beliefs about the extent to which teaching can overcome social disadvantage have a causal impact on their students' test scores.

Research and popular literature give strong theoretical reasons to expect a causal relationship between teachers' beliefs and student outcomes, and that we care about how teachers influence students provides a strong motivating interest for the question of how teachers' attitudes toward social disadvantage relate to student outcomes. In motivating the paper, however, I noted that there may be a number of factors in "transformational" schools, where empowered teacher beliefs have been lauded, that drive gap-closing results. And we know that in schools nationally there are many factors shaping selection of different types of students and teachers into different types of school environments. The possibility that the relationship between teachers' beliefs and student outcomes is simply driven by selection is a threat that is present in any observational study, and the concern is amplified in the present one by the availability of only one wave of HSLS:09 data. At each level of analysis I account for factors that potentially confound the relationship between teachers' beliefs and students' academic outcomes. I account for numerous aspects of teachers' human capital to ensure that teachers' beliefs are not

merely capturing their training or other qualifications. I control for several student characteristics that are typically correlated with academic outcomes. And I capture school context in a much more detailed way than previous work on teacher effects, considering characteristics of effective schools as well as characteristics of "transformational" schools that may be correlated with teachers' beliefs. Nevertheless, because I find some evidence of selection and some evidence of causality, my results cannot definitively determine what brings about the observed relationships between teachers' beliefs and student outcomes.

Beyond selection, another potential threat to such causal inference is that teachers' beliefs about the extent to which social disadvantage is an obstacle could actually be shaped by their students' achievement level. This type of reverse causality argument would posit that perhaps teachers judge the performance level of the students in their classes and then form their beliefs about how effective teaching can be. Reverse causality could produce the relationships found in this paper, making it a plausible alternative. Unfortunately, in the absence of longitudinal data, I cannot directly test whether students' outcomes change in response to teachers' beliefs, or whether teachers' beliefs instead change in response to students' performance. One of my robustness checks provides some evidence on this issue: if teachers' beliefs were merely a response to the ability level of the students' they teach, the relationship between teachers' beliefs and students' math interest would likely not remain when controlling for students being in a non-academic or low-level academic course. Another reason I am disinclined to believe that the relationships I observe are due to reverse causality is that evidence on teachers' beliefs about the nature of teaching suggests that these types of beliefs are actually

formed early in teachers' own education and are relatively stable rather than being easily changed (Pajares 1992).

The most direct way to test this possibility, though, would be with data that measures teachers and students over time—a type of research design that has been rare in the education world (for example, HSLS:09 did not survey teachers in wave 2). Future research examining teachers' psychological and interactional qualities would shed additional light on these issues if teachers' were surveyed over time. In my conclusion to the dissertation, I describe a future project that would gather repeated data on beliefs and attitudes from teachers in multiple types of settings to gain more traction on the question of causal inference.

A key goal of this paper was to isolate the role that teachers' beliefs about students' social disadvantage have in student outcomes in a national sample of schools, rather than in the selective settings that have been highlighted in case studies. I find that on a broad scale there are associations between teachers' beliefs and students' outcomes in math, but that these relationships can primarily be explained by factors selecting students into particular classrooms and schools. However, I also find some evidence that the relationship between teachers' beliefs and math achievement is causal, as it grows stronger with greater exposure. These competing explanations suggest that the most likely conclusion may be that both selection and causality are at work.

Although these results do not provide definitive evidence about the role of teachers' beliefs, they indicate that further research is needed before we can accurately understand their role or completely reject their importance in "transformational" schooling. Given that variability in teacher effectiveness is not adequately explained by

teachers' human capital characteristics alone (Rivkin et al. 2005), and that this paper finds that teachers' beliefs are independent of teachers' human capital in their relationships to outcomes in math, an additional contribution is in showing that these two strains of research on teachers can be combined to reach a more complete understanding of teachers' role in student outcomes. In studying student outcomes, teachers' beliefs add new rather than redundant information about teachers' capabilities.

Although I find that the role of teachers' beliefs is independent of teachers' human capital, I also find that their role is of a smaller magnitude than several human capital characteristics are predicted to have, which is an important contribution to our understanding of teacher effects on students. Consistent with some prior research, I find that teachers' human capital is strongly associated with student outcomes. Across the dependent measures and models tested here, a one standard deviation increase in teachers' beliefs about students' social disadvantage predicts roughly a 4 to 6 percent of a standard deviation increase in math outcomes. By comparison, having a teacher who has been at the school for more than 2 years (i.e. is not new) predicts math outcomes that are a tenth to a quarter of a standard deviation higher. And having a teacher with no certification predicts over half of a standard deviation lower math achievement score. These results indicate that teachers' human capital is an appropriate focus for education policy that aims to provide students with the most effective teachers. The beliefs tested in this analysis, however, represent only a small subset of the psychological traits that teachers bring to their interactions with students. Given the independence of teachers' beliefs from their human capital, it is also possible that a more complete measurement of teachers' other attitudes toward students could come closer to rivaling the importance of teachers'

human capital, as other research that examines both attitudes and human capital simultaneously has found (Palardy and Rumberger 2008). This is an intriguing empirical question, and a fruitful avenue for future research would be in studying the relative contribution of teachers' beliefs and other traits to their students' academic outcomes. This could have useful implications for enhancing our understanding of teacher-student interactions and guiding education policy on teachers.

Although the magnitudes of the effects of teachers' beliefs found in my analysis are small, empirical benchmarks provide some reason to believe there is substantive meaning in the small coefficients. Hill et al. (2008) find that expected annual achievement gains are substantially lower in the high school years than in elementary school. Clark et al. (2013) argue that this means small effect sizes can be substantively meaningful when the target population is older, like the 9th graders in this study. If we were to treat the 4 percent of a standard deviation coefficient found in the main model for math achievement as an "effect" of teachers' beliefs (acknowledging that this makes a strong assumption, but for the sake of illustration), by Hill et al.'s (2008) benchmarks, this amounts to roughly 17 percent of the expected annual gain in math achievement for 9th graders—or 1.7 months of additional schooling in a ten-month academic year (Clark et al. 2013). Thus, although across models the coefficients on teachers' beliefs are small, especially relative to the findings for teachers' human capital, they perhaps should not be discounted.

The relatively small magnitudes of the coefficients for teachers' beliefs about students' social disadvantage may suggest that teachers' beliefs *are* an important aspect of successful schooling, but that other important components must also be present to

yield large gains in student performance. Although teachers' sense of empowerment to overcome social hardships has been highlighted as an important component of a "transformational" school environment, it is not the only commonality that can be found in accounts of such schools. A preliminary investigation into this possibility using HSLS:09 proved too imprecise to provide definitive evidence on this point. The effect of teachers' beliefs on math achievement is nearly two to three times larger for teachers who attended colleges in Barron's top two to three selectivity categories, but this relationship is only substantively large, while being statistically insignificant. No such relationship exists for alternatively certified teachers, and I do not find any evidence that the relationship between teachers' beliefs and student motivation is particularly strong for alternatively certified teachers or those from the most selective colleges.

A more promising possibility may be in examining empowered teachers who work in schools that also have a strong organizational culture of high expectations among school personnel more broadly. Personal accounts of "transformational" schools highlight both the empowered beliefs of individual teachers as well as a transformational ethos embedded in the school culture, so it is unclear whether empowered beliefs could primarily matter when teachers are embedded in an organizational environment that reflects the same attitude. Analyzing this possibility suggests that the relationship between teachers' beliefs and both math interest and math achievement increases two- to fourfold when the school culture places a greater emphasis on having high expectations of students, but HSLS:09 does not produce estimates precise enough to be persuasive on this point. HSLS:09 has two limitations on its ability to address this question. First, sample sizes of teachers per school are not large. Second, because the data are for high

schools, the culture of departments may shape teachers' attitudes and practice more than the culture of the entire school, and most data in HSLS:09 addresses school characteristics rather than department characteristics. In theory, though, it makes sense that if teachers' beliefs matter for students' educational outcomes, their effect would be augmented in schools that are otherwise functioning in effective ways. Investigating what, if any, conditions must be present for teachers' beliefs to be most beneficial would be an intriguing area of future inquiry. To the extent that "transformational" schools have fostered higher achievement among poor students of color, the limited results in this paper indicate that teachers' empowered attitudes are not enough to account for their results.

Particularly because these teacher beliefs have been highlighted in such distinctive contexts, to the extent that these schools have developed a model capable of transforming educational outcomes, understanding whether any benefits of this type of model are nationally generalizable is necessary for determining if effective models can be widely scaled up. This paper considers students, teachers, and schools broadly, in a national sample, rather than in selective contexts. Popular literature on "transformational" schools suggests that empowered beliefs matter for student success. This paper provides only limited evidence that this is true on a national scale. For each educational outcome examined—students' interest in their math class, self-efficacy for their math class, and math achievement—teacher beliefs of greater empowerment over social disadvantage predict higher scores, but much of each relationship can be explained by other student- and school-level factors.

It is important to note that although these results can be generalized to high schools and ninth grade math classes nationally, it is unknown whether these findings on teachers' beliefs can be generalized to teachers and classes in other subjects or at other grade levels. Future work will need to test this empirically to derive even more generalizable results about teachers' beliefs about students' social disadvantage.

It is possible that the average effects studied in this paper mask differential benefits for certain subgroups. "Transformational" or "gap-closing" schools primarily serve a high poverty, high minority student population—this is chiefly why they have these monikers. Findings in the teacher expectations literature that students of color and lower class students are most vulnerable to self-fulfilling prophecies may elucidate why empowered teacher beliefs have primarily been identified as important in schools serving students of color and from lower socioeconomic backgrounds (Jussim, Eccles, and Madon 1996; Jussim and Harber 2005). Teachers' beliefs of empowerment to overcome social disadvantage may matter most when teachers actually teach students who truly face—or who teachers at least perceive to face—social and demographic disadvantages. If that is the case, the average effects of teachers' beliefs estimated in this paper may underestimate how beneficial empowered teacher beliefs are in the contexts where they matter most—a possibility I test next, in my final empirical paper, Chapter 4.

NOTES

[6] Construction of the teacher dataset is described in Appendix B.

[7] Sample sizes are rounded to the nearest ten to comply with NCES license requirements.

[8] Past research classified these and similarly worded items in the dimension of "general teaching efficacy" (see e.g. Gibson and Dembo 1984; Guskey and Passaro 1994).

[9] A more complete description of the construction of the math interest and self-efficacy scales, as well as the math assessment methodology and full documentation on HSLS:09 can be accessed at http://nces.ed.gov/surveys/hsls09/hsls09_data.asp.

[10] A more complete description of the NCES-Barron's Admissions Competitiveness Index Data Files can be accessed at http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2010331.

[11] A model with school fixed effects rather than random effects would be another approach to this question. I do not employ a fixed effects approach for a few reasons. Conceptually, an important part of the motivation for studying teachers' beliefs about students' social disadvantage comes from the different types of schools where empowered teacher beliefs have been highlighted. We would expect teachers' beliefs to vary across schools, and indeed about one fourth of the variation in both teachers' beliefs and student achievement is between schools in HSLS:09. This partitioning of the variance could be the source of difficulty in estimating a fixed effects model. Additionally, with school fixed effects, measurement error will contribute a greater proportion of variation to my estimates than in a random effects model. Because both my key independent variable and my outcome variables may contain some measurement error, I opt not to magnify any bias that may cause.

[12] Because teachers were not directly sampled in HSLS:09 but can be separated from student data and considered as a distinct level of analysis, I derived weights for teacher-level data by calculating the teacher's probability of selection as a function of the joint probabilities of her students' selection probabilities. Construction of the teacher weights is described in Appendix C.

[13] This categorization of math courses is based on a categorization of high school math courses in similar NCES data created by Burkam and Lee for a U.S. Department of Education 2003 report.

Figure 3.1. Conceptual Framework for Understanding How Teachers' Beliefs Affect Student Outcomes

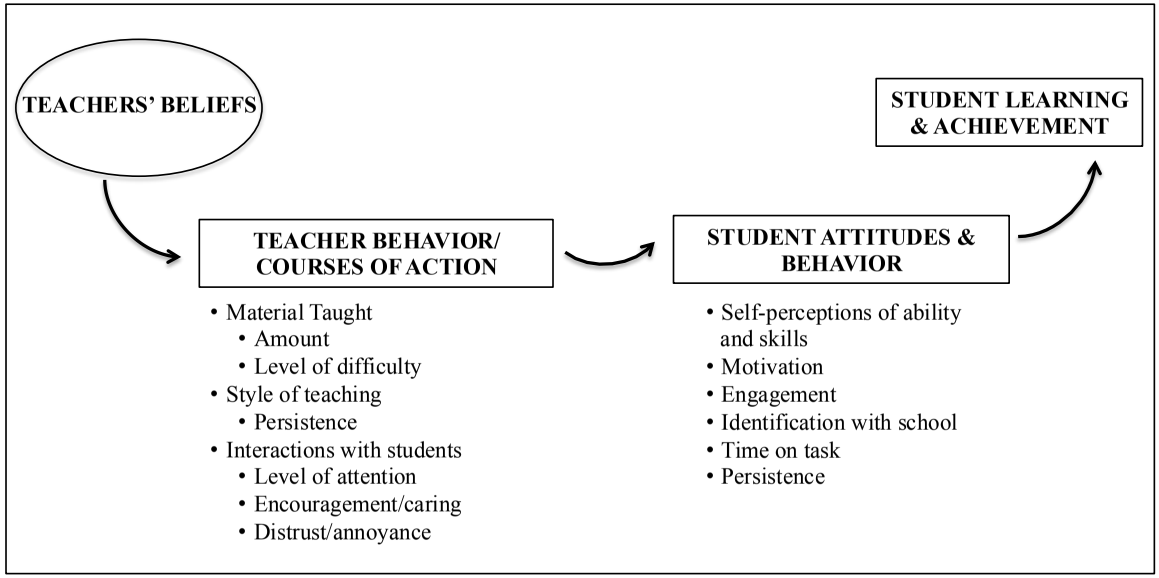
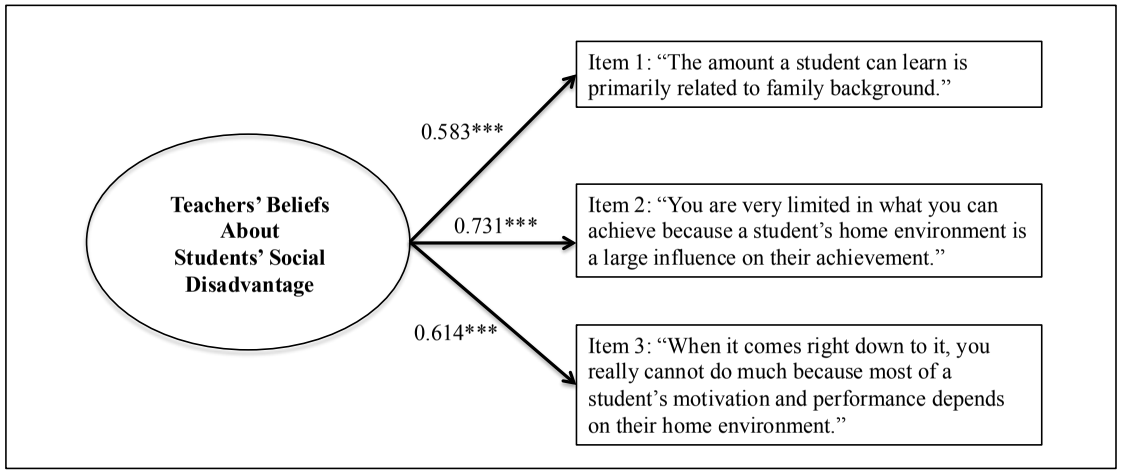


Figure 3.2. Confirmatory Factor Analysis Model of Teachers' Beliefs



Note: Standard errors clustered by school. Coefficient of determination = 0.694.

Table 3.1. Full Distributions of Items Used to Measure Teachers' Beliefs of Helplessness and Empowerment

"The amount a student can learn is primarily related to family background"

Response	Frequency	Weighted Percent
Strongly agree	140	3.73
Agree	890	20.98
Disagree	2,250	57.12
Strongly disagree	730	18.18
Total	4,010	100

"You are very limited in what you can achieve because a student's home environment is a large influence on their achievement"

Response	Frequency	Weighted Percent
Strongly agree	260	7.31
Agree	1,440	38.43
Disagree	2,100	48.74
Strongly disagree	210	5.52
Total	4,010	100

"When it comes right down to it, you really can not do much because most of a student's motivation and performance depends on their home environment"

Response	Frequency	Weighted Percent
Strongly agree	70	1.46
Agree	580	16.01
Disagree	2,590	64.74
Strongly disagree	780	17.80
Total	4,010	100

Note: Teachers' responses are weighted to approximate national representativeness for ninth grade math teachers. Overall N and cell frequencies are rounded to the nearest ten to comply with NCES license requirements. Numbers that do not sum properly are due to rounding error.

Table 3.2. Descriptive Statistics of Students

	Analytic Sample of 9th Graders Taking Math		Full HSLS:09 Sample Representative of 9th Graders in U.S.	
	Weighted Mean	SD	Weighted Mean	SD
Demographic Characteristics				
Sex				
Female	0.498	–	0.497	–
Male	0.502	–	0.503	–
Race				
White	0.530	–	0.518	–
Black	0.128	–	0.135	–
Hispanic/Latino	0.217	–	0.222	–
Asian/Pacific Islander	0.039	–	0.040	–
Native American/Alaska Native	0.006	–	0.007	–
2+ races	0.080	–	0.077	–
Student's first language				
English only	0.828	–	0.824	–
Other language only	0.107	–	0.115	–
English and other language equally	0.065	–	0.061	–
Age	14.860	0.596	14.874	0.611
Family structure				
Two-parent	0.576	–	0.568	–
One-parent plus partner/guardian	0.167	–	0.168	–
One-parent	0.212	–	0.219	–
Other	0.046	–	0.045	–
Socioeconomic status (HSLS:09 scale)	1.868	0.750	1.859	0.751
Educational Outcomes				
Math Self-Efficacy Scale Score	0.0440	0.9932		
Math Course Interest Scale Score	0.0425	0.9889		
Math Achievement Score	-0.087	0.991		
N	16,040		21,440	

Note: Sample sizes are rounded to the nearest ten to comply with NCES license requirements.

Table 3.3. Descriptive Statistics of Teachers

	Weighted Mean	SD
Demographic Characteristics		
Sex		
Female	0.594	–
Male	0.406	–
Race		
White	0.777	–
Black	0.060	–
Hispanic/Latino	0.100	–
Asian/Pacific Islander	0.051	–
2+ races or American Indian	0.013	–
Human Capital Characteristics		
Highest Degree Received		
BA or AA	0.463	–
MA	0.506	–
Educational Specialist diploma	0.017	–
PhD/MD/law degree/other professional degree	0.014	–
College Selectivity Ranking (Barron's)		
Most competitive	0.053	–
Highly competitive	0.081	–
Very competitive	0.248	–
Competitive	0.449	–
Less competitive	0.111	–
Noncompetitive	0.047	–
Special	0.010	–
Math-related job prior to teaching	0.220	–
Alternative certification	0.238	–
Certification Status		
None	0.072	–
Regular	0.774	–
Probationary	0.051	–
Emergency/temp/waiver	0.103	–
Years taught 9-12 (max. of math, science, or any subject)	10.230	8.646
Teacher is new (1st or 2nd year) to current school	0.240	
Teachers' beliefs about students' social disadvantage	-0.008	0.989
N	4,010	

Note: Sample sizes are rounded to the nearest ten to comply with NCES license requirements.

Table 3.4. Descriptive Statistics of Schools

	Weighted Mean	SD
Basic Institutional/ Organizational Features		
Sector		
Public	0.796	–
Catholic	0.047	–
Private	0.157	–
Location		
Suburban	0.214	
Urban	0.205	–
Town	0.178	–
Rural	0.403	–
Region		–
South	0.339	–
Northeast	0.150	–
Midwest	0.309	–
West	0.203	–
Number of students (school size)	689.883	679.151
Gradespan (lowest grade elementary or middle)	0.339	–
Average daily attendance	93.275	6.217
Enrollment (percent capacity to which school is filled)	85.981	15.665
Instructional Environment		
Does NOT offer AP or IB courses	0.300	–
School Academic Composition		
School failing to meet AYP	0.387	–
Year of "In Need of Improvement" for AYP		
0	0.775	–
1	0.092	–
2	0.076	–
3	0.033	–
4	0.015	–
5	0.009	–
% of 2008-09 seniors who went to 4-year college	48.278	29.071
School Race/Class Composition		
% Receiving free/reduced-price lunch	37.907	26.720
% White	70.015	30.650
% Black	13.501	22.694
% Latino	12.164	20.052
% Asian	2.853	6.508
% Native American	1.467	6.264
School Reform Characteristics		
Charter school	0.044	–
Average instructional hours per day	6.148	0.628
School/district offers incentives to attract teachers	0.267	–
N	890	

Note: Sample sizes are rounded to the nearest ten to comply with NCES license requirements.

Table 3.5. Coefficients from Multilevel Models of Teachers' Beliefs about Students' Social Disadvantage Predicting Students' Math Interest

	Model 1	Model 2	Model 3	Model 4
Teachers' Beliefs About Social Disadvantage	0.072**	0.063*	0.062**	0.060*
	(0.026)	(0.026)	(0.023)	(0.024)
Student Background Controls		✓	✓	✓
Teacher Demographic & Human Capital Controls			✓	✓
School Context Controls				✓
Coefficients on Teachers' HC Characteristics (Model 4 only)				
Highest Degree Received (ref: MA)				
College degree				0.022
				(0.053)
Educational Specialist diploma				0.006
				(0.122)
Doctorate or Professional degree				0.365*
				(0.139)
College Selectivity				-0.007
				(0.019)
Previous math-related job				-0.076
				(0.048)
Alternative certification				0.042
				(0.050)
Certification Status (ref: Regular)				
No Certification				0.013
				(0.070)
Probationary Certification				0.063
				(0.093)
Emergency Certification				-0.062
				(0.094)
Years of teaching experience				-0.005
				(0.003)
New to current school				-0.245***
				(0.056)
Observations				
Schools				890
Teachers				4,010
Students				16,040

Note: Model includes controls indicated and is weighted at each level. Standard errors in parentheses. Full model results including coefficients for control variables are available by request from the author.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3.6. Coefficients from Multilevel Models of Teachers' Beliefs about Students' Social Disadvantage Predicting Students' Math Self-Efficacy

	Model 1	Model 2	Model 3	Model 4
Teachers' Beliefs About Social Disadvantage	0.060*	0.041	0.039	0.035
	(0.025)	(0.025)	(0.023)	(0.023)
Student Background Controls		✓	✓	✓
Teacher Demographic & Human Capital Controls			✓	✓
School Context Controls				✓
Coefficients on Teachers' HC Characteristics (Model 4 only)				
Highest Degree Received (ref: MA)				
College degree				0.008
				(0.046)
Educational Specialist diploma				0.020
				(0.100)
Doctorate or Professional degree				0.218
				(0.183)
College Selectivity				-0.017
				(0.017)
Previous math-related job				0.016
				(0.043)
Alternative certification				0.119*
				(0.054)
Certification Status (ref: Regular)				
No Certification				-0.150
				(0.087)
Probationary Certification				-0.140
				(0.092)
Emergency Certification				-0.195*
				(0.080)
Years of teaching experience				-0.003
				(0.002)
New to current school				-0.115*
				(0.055)
Observations				
Schools				890
Teachers				4,010
Students				16,040

Note: Model includes controls indicated and is weighted at each level. Standard errors in parentheses. Full model results including coefficients for control variables are available by request from the author.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3.7. Coefficients from Multilevel Models of Teachers' Beliefs about Students' Social Disadvantage Predicting Students' Math Achievement

	Model 1	Model 2	Model 3	Model 4
Teachers' Beliefs About Social Disadvantage	0.068*	0.052*	0.054*	0.042
	(0.029)	(0.024)	(0.023)	(0.023)
Student Background Controls		✓	✓	✓
Teacher Demographic & Human Capital Controls			✓	✓
School Context Controls				✓
Coefficients on Teachers' HC Characteristics (Model 4 only)				
Highest Degree Received (ref: MA)				
College degree				0.030
				(0.048)
Educational Specialist diploma				0.100
				(0.122)
Doctorate or Professional degree				0.180
				(0.128)
College Selectivity				0.023
				(0.016)
Previous math-related job				0.007
				(0.051)
Alternative certification				-0.041
				(0.052)
Certification Status (ref: Regular)				
No Certification				-0.560***
				(0.088)
Probationary Certification				-0.069
				(0.095)
Emergency Certification				-0.225**
				(0.078)
Years of teaching experience				0.002
				(0.002)
New to current school				-0.119*
				(0.053)
Observations				
Schools				890
Teachers				4,010
Students				16,040

Note: Model includes controls indicated and is weighted at each level. Standard errors in parentheses. Full model results including coefficients for control variables are available by request from the author.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3.8. Coefficients from Robustness Checks Controlling for Proxies of Math Level/Preparation in Multilevel Models of Teachers' Beliefs about Students' Social Disadvantage Predicting Students' Math Interest and Achievement

	Model 5		Model 6	
	Outcome: Math Interest	Outcome: Math Achievement	Outcome: Math Interest	Outcome: Math Achievement
Teachers' Beliefs About Social Disadvantage	0.053*	0.024	0.038	0.019
	(0.024)	(0.021)	(0.023)	(0.022)
Student Background Controls	✓	✓	✓	✓
Teacher Demographic & Human Capital Controls	✓	✓	✓	✓
School Context Controls	✓	✓	✓	✓
Indicators for 9th Grade Math Course Level	✓	✓		
Grade in 8th Grade Math Course			✓	✓
Observations				
Schools	890	890	890	890
Teachers	4,010	4,010	4,010	4,010
Students	16,040	16,040	16,040	16,040

Note: Model includes controls indicated and is weighted at each level. Standard errors in parentheses. Full model results including coefficients for control variables are available by request from the author.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3.9. Coefficients from Robustness Checks Adding Interactions Between Teachers' Beliefs and Timing of Outcome Measure to Multilevel Models of Teachers' Beliefs about Students' Social Disadvantage Predicting Students' Math Interest and Achievement

	Model 7	Model 8
	Outcome: Math Interest	Outcome: Math Achievement
Teachers' Beliefs About Social Disadvantage	0.008	-0.093*
	(0.045)	(0.038)
Student Background Controls	✓	✓
Teacher Demographic & Human Capital Controls	✓	✓
School Context Controls	✓	✓
Grade in 8th Grade Math Course Control	✓	✓
Timing Interactions		
Teachers' Beliefs*Interview month	0.002	
	(0.045)	
Teachers' Beliefs*Interview month^2	0.005	
	(0.009)	
Teachers' Beliefs*Test month		0.107*
		(0.042)
Teachers' Beliefs*Test month^2		-0.017
		(0.009)
Observations		
Schools	890	890
Teachers	4,010	4,010
Students	16,040	16,040

Note: Model includes controls indicated and is weighted at each level. Standard errors in parentheses. Full model results including coefficients for control variables are available by request from the author.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

CHAPTER 4

Teachers' Beliefs About Students' Social Disadvantage and Disadvantaged Kids: Who Benefits Most from Empowered Teacher Attitudes?

Substantial enthusiasm has recently surrounded so-called "transformational" (Kopp 2011) or "gap-closing" (Paige and Witty 2010; Wilson 2008) schools, which serve primarily low-income and racial minority students and foster strong academic performance and outcomes. By educating low-income and racial minority students to high levels, these schools appear to alter the educational trajectories that students' social background might predict, thus why they have been termed "transformational" for students' lives. This further means their apparent success has implications for closing longstanding achievement disparities by student race and socioeconomic status. Although it has not been conclusively proven that such schools indeed transform educational trajectories, to the extent that they have engaged with altering the entrenched relationship between social background and academic achievement, such school contexts are worthy of greater attention and the components of their apparent success should be appropriately scrutinized.

A common feature in insider and observer accounts of these schools is a widespread belief among teachers of empowerment over student outcomes. That is, teachers at these schools widely espouse the view that student background disadvantages need not limit students' potential to achieve. However, these descriptions typically appear in personal accounts and smaller scale case studies. The foregoing papers in my

dissertation have examined such teacher beliefs of empowerment—or their converse, helplessness—to overcome social disadvantage in a national sample of schools. My second paper finds some evidence that teacher attitudes of greater empowerment to overcome students' social disadvantage are significantly related to better student outcomes in math, but can offer only mixed conclusions as to whether these relationships are due to selection or the causal relationship popularly theorized in accounts of "transformational" schools. That paper examined average effects across all students in my sample of 9th graders. These average relationships may mask heterogeneous associations between teachers' beliefs and educational outcomes for the students we would expect to be most vulnerable to helpless teacher attitudes or to benefit most from having a teacher with more empowered beliefs.

There is reason to expect that the relationship between teachers' beliefs about students' social disadvantage and student outcomes may differ by student background. On its face, we might expect that a teacher's belief that social disadvantage is a barrier to effective teaching might only be activated if she teaches students who indeed face social disadvantages. Beyond this, teachers' attitudes of empowerment to overcome social disadvantage have primarily been highlighted as important for student outcomes in case studies of "transformational" schools, where the student population is primarily high poverty and high minority (Chenoweth 2007; Kopp 2011; Paige and Witty 2010; Wilson 2008). Furthermore, the literature on teachers' expectations for student performance shows that teachers' expectations can be self-fulfilling prophecies because they influence the educational opportunities that teachers provide for different students (see Good 1987; Jussim and Harber 2005; Paige and Witty 2010; Rist 1970). This literature demonstrates

that teachers' expectations are lowest and matter most for groups of students who bear some social disadvantage or stigma, particularly low achieving, lower class, and African American students (Jussim, Eccles, and Madon 1996).

This paper analyzes whether the relationship between teachers' beliefs and student achievement differs by student race and socioeconomic background. Specifically, I test whether teachers' beliefs about the extent to which they can overcome students' social disadvantage are differentially related to students' math achievement by student socioeconomic status (SES), student race, and student race-SES combinations, using a nationally representative sample of schools and 9th graders to permit greater generalizability beyond the selective contexts in which empowered teacher attitudes have been highlighted. Building on the analysis in the previous paper, I use three-level hierarchical linear models and add cross-level interactions between teachers' beliefs and student demographic characteristics to the model in Chapter 3 that controls for student selection in the most conservative way—based on math preparation from the 8th grade year in school.

In the remainder of the paper, I reiterate why case studies of "transformational" schools indicate that a focus on student race and social class is warranted. I then focus my literature review on what the research literature indicates about the differential influence teachers' expectations and beliefs have for students from different backgrounds. Next, I describe the dataset, HSLS:09, and my sample, which is nationally representative of high schools and specific to math teachers and 9th grade students taking math, focusing on how student background is measured. I then explain my multilevel modeling approach and illustrate how I model cross-level interactions, before discussing my findings. The results

indicate that the average effect in my second paper indeed masks important heterogeneity by student race and class, but that the story is not as straightforward as accounts of "transformational" schools would imply. These accounts suggest that teachers' attitudes should matter most for poor students of color. The results of this paper reveal that the relationship between teachers' beliefs and student achievement is much stronger for African American students than for other groups, but this effect increases for more advantaged African American students, rather than less advantaged ones. My conclusion discusses one potential explanation for this unexpected pattern, and the implications of these results for inequality.

"Transformational" Schools for Poor Students of Color

Explanations for class- and race-based academic disparities often emphasize group differences in socioeconomic and cultural resources, but some researchers contend that schools perpetuate gaps by neglecting some students' learning and fostering attitudes that diminish students' potential (Paige and Witty 2010). An educational model that has been termed "transformational" (Kopp 2011) or "gap-closing" (Wilson 2008) attempts to tackle disparities in part through a culture that assumes schools must alter the educational trajectory predicted by a child's background. School effects research confirms the benefit of a school culture akin to this model, showing that a school's academic emphasis and collective efficacy of its faculty are influential for achievement (Hoy, Sweetland, and Smith 2002; Teddlie 2010).

Substantial enthusiasm has recently surrounded such "transformational" schools. In serving students of color (primarily African American and Latino) who come from low-income families, and by fostering high academic performance and positive

trajectories, these schools appear to have disrupted typical patterns that predict low achievement and other poor outcomes for students from these backgrounds. A condition commonly ascribed to such schools is a widespread belief among teachers of empowerment over student outcomes—a conviction that teachers can ensure students are not precluded from reaching their full potential by family background or social disadvantage. That these teacher attitudes have been highlighted in schools that are tackling academic disparities—one of the United States' most pernicious educational dilemmas—provides motivation for studying such teacher beliefs more systematically. Yet that these are schools serving a mostly poor and minority student body also provides reason to suspect that teachers' beliefs of empowerment may be especially beneficial for certain groups of students—or conversely, that certain groups may be most harmed by exposure to teachers who feel helpless to overcome social disadvantages that students face.

Teachers' Beliefs and Expectations

Another reason lies in the literature on teachers' expectations of individual students, which shows that teachers' expectations of high or low achievement can be reflected in their interactions with students and behaviors in the classroom, and in turn influence students' own behavior and learning (Good 1987; Jussim and Harber 2005; Rist 1970). Figure 4.1 presents a conceptual model of how teachers' beliefs and expectations may affect student outcomes in this manner. It is important to note that teachers' beliefs are not necessarily reflected in their behavior; teachers may be able to suppress the influence of their beliefs on their behavior, or students may not perceive the influence of teachers' beliefs in their interactions. However, insofar as teachers' beliefs may influence

students, it is likely that this occurs through the way beliefs are manifested in teachers' actions.

The literature on teachers' expectations has focused on self-fulfilling prophecy effects, whereby a false judgment about an individual alters behavior such that the individual eventually fulfills the early expectation (Merton 1948). There is disagreement about how widespread such self-fulfilling prophecies are in teacher-student interactions (see, e.g. Jussim, Eccles, and Madon 1996; Lee and Loeb 2000), but there is consensus that teachers' expectations are lowest and matter most for students from disadvantaged groups. In one early study in this area, Rist (1970) showed that teachers' beliefs about kindergarteners' potential are highly correlated with students' social class, and that teachers make themselves more available to perceived high achievers and are more active in their learning. Thus, teachers' early expectations lead to a self-fulfilling prophecy of low achievement for the most economically disadvantaged students because teachers perceive them as "slow learners" with less potential than other students, and consequently provide them with fewer educational opportunities (Rist 1970).

In national samples, teachers rate black students more negatively than they rate white students, in both early elementary school and middle school, seeing them as "poorer classroom citizens than are white students" (Downey & Pribesh 2004, p. 275). A meta-analysis of studies on teachers' expectations of children from different racial and ethnic groups concludes that teachers hold lower expectations for African American and Latino children than for white children, and hold the highest expectations for Asian American children. These differential expectations align with differential speech and feedback patterns, whereby white students receive more positive speech and feedback

from teachers (Tenenbaum and Ruck 2007). McKown and Weinstein (2008) show that differential expectations of students based on race-linked academic stereotypes contribute substantially to racial achievement disparities at the end of the year.

Jussim, Eccles, and Madon (1996) contend that a strong relationship between teachers' perceptions and their students' achievement is primarily due to the accuracy of teachers' perceptions based on students' past performance. Although "accurate" perceptions of past performance may explain why teachers' expectations are good predictors of students' later achievement, Good (1987) argues that a similar but subtler and more common process may occur with "sustaining" effects. Good (1987) defines sustaining expectation effects as when "teachers expect students to sustain previously developed behavior patterns, to the point that teachers take these behavior patterns for granted and fail to see and capitalize on changes in student potential" (p. 32). This notion conveys that unrevealed potential may be ignored (Good 1987). As Ferguson (2003) argues,

> …stereotypes of Black intellectual inferiority are reinforced by past and present disparities in performance and probably cause teachers to underestimate Blacks' potential more than Whites'. If they expect that Black children have less potential, teachers probably search with less conviction than they should for ways of helping Black children to improve and miss opportunities to reduce the Black-White test score gap" (Ferguson 2003, p. 494).

This highlights how the concept of a student's "potential" can be challenging, because to the extent that potential is not synonymous with past performance, it may not be readily observed (Ferguson 2003). The disproportionate burden of low teacher expectations placed on children of color—black and Latino children in particular—has potentially

large consequences for student achievement if teachers' fulfill incorrect judgments or sustain achievement patterns that do not reflect students' full potential.

Beyond teachers holding differential expectations for students of different backgrounds, Jussim, Eccles, and Madon (1996) show that the effects students experience from these expectations are largest for members of demographic groups who bear some societal disadvantage or stigma (see also Jussim and Harber 2005). They find that even controlling for prior math performance and self-concept in, effort in, and valuation of math, the relationship between teachers' expectations and student math achievement is strongest for low achieving, African American, and low SES students—and even stronger, in some cases, for students who share more than one of these vulnerabilities to expectancy effects. As Jussim et al. (1996) speculate, for students who consistently encounter low expectations from teachers, "Perhaps a supportive teacher who holds students to higher standards may be seen as such a breath of fresh air that many students are inspired to achieve more highly" (p. 355). Conversely, perhaps a teacher's low expectations of students of color activate concerns of being judged according to a negative academic stereotype, leading students to underperform due to stereotype threat (Steele and Aronson 1995).

Teachers' beliefs about students' social disadvantage are akin to stereotypes or broad expectations about what groups of students (rather than individuals, as is typical in the expectation effects literature) can accomplish. Based on the literatures that indicate that similar types of teacher beliefs matter for student achievement (Lee and Loeb 2000; Lee and Smith 1996; Tschannen-Moran and Woolfolk Hoy 2001), and that not only do teachers' expectations matter for student performance but they matter particularly

strongly for students from socially disadvantaged groups, it seems likely that teachers' beliefs about students' social disadvantage have differential effects for subgroups of students that depend on demographic background.

The Present Study

As noted in my second dissertation paper (Chapter 3), the literatures on teachers' beliefs and expectations just described seldom consider teachers' human capital characteristics—which the education policy literature treats as the most likely source of teacher effects—or broader contextual characteristics of schools. This paper takes these other influences on student achievement into account and uses a nationally representative sample of schools and students. I examine whether a set of teacher beliefs that reflect broad expectations about what is possible in the face of social hardships are differentially related to student achievement for different subgroups of students. Thus, the paper builds upon the teachers' beliefs and expectations literatures, and tests the implications of accounts of "transformational" schools in a more generalizable sample, while accounting for numerous potential confounders that could be the source of positive results in such case studies, rather than teachers' beliefs being particularly important.

DATA

Data for this paper come from the first wave of the High School Longitudinal Study of 2009 (HSLS:09), a National Center for Education Statistics study on a nationally representative sample of 944 high schools and 21,000 9th graders. During the fall of 2009, HSLS:09 fielded surveys of students, parents, school administrators, teachers, and school counselors. Most useful for this study, the math and science teachers who taught sampled ninth graders completed extensive surveys, and students from

racial/ethnic minority groups were oversampled to ensure sufficient sample sizes for subgroup analysis.

Ninth grade students were sampled, and if the student was enrolled in math or science in fall 2009 the teacher of the student's respective course was asked to complete a survey as well. This sampling strategy means the teachers are not strictly representative of teachers at their school, of all subjects, or of teachers nationally; yet they do comprise a large sample of teachers who taught a representative sample of ninth graders and therefore can provide a more accurate representation than yet exists of any differential relationships in how teachers' beliefs about students' social disadvantage relate to their students' outcomes at a national level.

The results presented in this paper focus only on math courses, restricting the analytical sample to students who were enrolled in math and can be linked to a math teacher. HSLS:09 only administered a standardized test in math, not in science. Otherwise, sample restrictions are based solely on the presence of appropriate links between students, teachers, and schools; no sample member can remain in the analysis without being linked to sample members at the other two levels. Using the restricted-access version of HSLS:09, students are linked to their schools and data for teachers is separated from student records, resulting in sample sizes of 4,010 math teachers that can be linked to 16,040 students taking math courses in 890 schools.[14,15]

I use multiple imputation by chained equations (using a combination of -ice- and -mi impute- in Stata) to handle missing data. This fills in missing values based on plausible values determined by the distribution of the variable itself and the covariates included in the imputation model. Because lower level units nested within the same

higher level unit cannot have different values at higher levels (e.g. students in the same school cannot have different values on school variables), I performed imputation in three successive steps, whereby missing school data were imputed first; missing teacher data were imputed second, incorporating school variables into the imputation model; and missing student data were imputed third, incorporating school and teacher variables into the imputation model. Data analysis presented here employs ten imputed datasets.

Key Variables

Teachers' Beliefs About Students' Social Disadvantage

HSLS:09 is uniquely suited to this analysis because it includes belief measures that specifically reference students' social disadvantage. Although other NCES datasets may have longitudinal data on students or teachers, they lack such specific belief measures. Teachers in HSLS:09 responded to questions about their level of agreement with three items that have traditionally been subsumed within the psychological measure of "teacher efficacy," as described in the previous papers, but which I argue are distinctly valuable for their ability to gauge teachers' beliefs about disadvantages stemming from students' social background and whether they view student background as a barrier to effective teaching and student achievement. I use the following items to construct my measure of teachers' beliefs:

- The amount a student can learn is primarily related to family background.
- You are very limited in what you can achieve because a student's home environment is a large influence on their achievement.
- When it comes right down to it, you really cannot do much because most of a student's motivation and performance depends on their home environment.[16]

Responses are reported with a Likert-type scale, and in each case strong agreement reflects the view that family background and home environment are very strong influences on learning and performance, such that the teacher is relatively helpless to make a difference. In contrast, strong disagreement reflects that a teacher instead feels empowered to overcome social hardships that his or her students face. Table 4.1 displays the full distributions of teachers' responses to the individual belief items. In each case, disagreement is most common, while strong disagreement—the most empowered response—is less common. For all three beliefs, strong agreement—representing the most helpless response category—is rare, but is nevertheless expressed by a nontrivial minority of teachers. It is possible that teachers exhibit some social desirability bias in their responses to these items. Although this is a possibility that I can neither definitively rule out nor investigate due to the nature of the data, if teachers uniformly believe it to be socially unacceptable to express helpless attitudes toward overcoming social disadvantage, despite the content of their true beliefs, we might expect the distributions to reflect even lower levels of the strongest agreement with each item. That a sizable contingent agrees with each item, and a nontrivial minority strongly agrees, provides some reassurance that teachers' responses do not merely reflect the attitudes that appear to be socially desirable.

I combine the three beliefs into a latent summary measure of teachers' beliefs about students' social disadvantage through a confirmatory factor analysis of the entire sample of HSLS:09 teachers (both math and science), with standard errors clustered by school. Because these beliefs reflect a common latent attitude, this allows me to treat these teachers' beliefs as a single predictor of student achievement. Figure 4.2 displays

the CFA model. Standardized coefficients for each belief in the CFA model were above the 0.5-0.6 threshold indicating a strong relationship with the latent construct, and the coefficient of determination indicates that the teachers' beliefs factor explains 69.4 percent of the total variance in the observed belief items. My final teachers' beliefs measure is standardized ($M = 0$, $SD = 1$), with high values indicating more empowered beliefs and low values indicating more helplessness.

Student Math Achievement

This paper focuses on students' math achievement as the key outcome of interest. HSLS:09 administered an assessment of algebraic reasoning to all students and used this math assessment to compute estimates of students' math skills in algebra, *theta*. HSLS:09 then standardized these *theta* scores, resulting in a standardized test score that provides a measurement of student math achievement, norm-referenced to the ninth grade student population. For consistency and ease of interpretation, I standardize this test score measure to have a mean of 0 and standard deviation of 1.[17]

Student Demographic Characteristics

The student demographic groups of interest in this analysis are defined by socioeconomic status and race. Student socioeconomic status is a continuous composite variable created by HSLS:09 that combines information on parents' highest education, parents' occupational prestige, and family income. For ease of interpretation, I transformed the SES variable to have a minimum of zero, so that zero values reflect the lowest level SES in the sample. Racial group classifications are based on student responses, where I code students as white, African American, Latino/Hispanic (regardless of race), Asian/Pacific Islander, American Indian/Alaska Native, or more than one race

(non-Hispanic). I also create variables that interact each of these racial groups with the SES composite variable.

Control Variables

As in my second dissertation paper (Chapter 3), I control for a number of student, teacher, and school variables that plausibly are correlated with both students' educational outcomes and their teachers' beliefs, and therefore may confound the relationship between teachers' beliefs about students' social disadvantage and student achievement. These characteristics include additional measures of students' social background, measures of teachers' demographic and human capital traits, and measures of the school organizational and instructional environment as well as the student body composition. This extensive list of controls accounts for numerous factors that could actually be the source of higher achievement rather than teachers' beliefs having a real role, including many variables that have been studied in research on school and teacher effects and factors besides teachers' beliefs that have been highlighted as components of success in accounts of "transformational" schools. I do not reiterate the details of these controls in this paper. However, each of these control variables, along with descriptive statistics of students, teachers, and schools on all variables, are displayed in Tables 4.2, 4.3, and 4.4. Unlike in Chapter 3, however, each model in this paper controls for the student's (self-reported) grade in his or her 8th grade math class. Thus, the analyses in this paper build on the most conservative model presented in the previous paper, where prior math achievement is proxied as closely as is possible in HSLS:09.

METHODS

My analysis uses three-level linear regression models, also known as hierarchical linear modeling, in HLM, in order to correct for student and teacher clustering within schools (which violates assumptions about the independence of observations), and to weight the data at all three levels to adjust for HSLS:09's complex survey sampling design.[18]

In this paper, I estimate random-intercept models, where the focus is on the coefficients on interactions between teachers' beliefs and student characteristics. The specific interactions estimated differ across models, but I illustrate my equations using student SES as the interaction of interest. Indexing individuals with *i*, teachers with *j*, and schools with *k*, my equations can be displayed in separate levels. I estimate the following student-level equation:

$$MathAch_{ijk} = \pi_{0jk} + \pi_{1jk}SES_{ijk} + \pi_{mjk}X_{ijk} + e_{ijk}$$

where *X* represents a vector of student-level controls and π_m is a vector of coefficients. *SES* represents students' socioeconomic status, and π_1 is the coefficient on student SES. (In alternative models, *SES* would be replaced with a vector of student race indicators, or student race-SES interaction variables, and π_1 would represent a vector of coefficients on those variables.) The outcome $MathAch_{ijk}$ represents students' predicted math achievement score. Then, at the teacher level I estimate:

$$\pi_{0jk} = \beta_{0k} + \beta_{1k}Beliefs_{jk} + \beta_{mk}T_{jk} + r_{0jk}$$

$$\pi_{1jk} = \beta_{10k} + \beta_{11k}Beliefs_{jk}$$

$$\pi_{mjk} = \beta_{m0k}$$

where *T* represents a vector of teacher-level controls and β_m is a vector of coefficients. The coefficients on teachers' beliefs, β_1 and β_{11}, are the primary coefficients of interest. This representation of the equations shows that whereas the teacher-level control variables in the model only predict the overall intercept, teachers' beliefs predict both the overall intercept as well as the student-level coefficient on SES, introducing a cross-level interaction. Finally, at the school level I estimate:

$$\beta_{0k} = \gamma_{000} + \gamma_{001} S_k + u_{00k}$$

$$\beta_{1k} = \gamma_{010}$$

$$\beta_{mk} = \gamma_{0m0}$$

where *S* is a vector of school-level controls, and γ_{001} is a vector of coefficients.

First, I estimate a model with teachers' beliefs interacted with just student SES (Model 1). Second, I estimate a model with teachers' beliefs interacted with just student race (Model 2). Third, I show that these first two models mask additional heterogeneity by student race-by-SES combinations with a model that interacts teachers' beliefs with student race-SES indicators (Model 3). I display and discuss my model results, and because three-way interactions can be difficult to interpret, I also show the results graphically and discuss their interpretation.

RESULTS

Table 4.5 shows the average effect of teachers' beliefs for the entire sample estimated in the previous paper, for purposes of comparison (Model 0); this coefficient comes from a model with identical controls to the models estimated in the present paper, except that the present paper adds interactions in each model. For Models 1, 2, and 3, Table 5 displays coefficients on all terms that include student SES or race, but it is the

terms that include teachers' beliefs—either their main effect or their interaction with other variables, all shaded gray—that are of primary interest. In Model 1, we see no significant main effect of teachers' beliefs (and its size is similar to Model 0, the analogous model without the interaction in Chapter 3). And although the teachers' beliefs by SES interaction is negative, indicating teachers' beliefs matter more for lower SES students than higher SES students, it is not significant and its magnitude is virtually zero. Results in Model 2, which includes interactions between teachers' beliefs and student race, are quite similar, with a similarly sized (and insignificant) main effect and no significant interactions for any racial group.

However, the results in Model 3, with interactions between students' race and SES added and the interaction of teachers' beliefs with these race-by-class combinations as well, show that substantial heterogeneity is masked in these previous two models. In particular, we see significant effects of teachers' beliefs for African American students, which increase in magnitude for higher SES blacks. This finding is in opposition to what accounts of "transformational" schools would suggest: rather than poorer black students benefitting most from having empowered teachers, it is more advantaged African American students who are most influenced by teachers' beliefs. It is worth noting that these coefficients are sizable—roughly 20 percent of a standard deviation—relative to the original main effect of teachers' beliefs—which is closer to 2 percent of a standard deviation.

The pattern for multiracial students is potentially similar to the pattern for African Americans, but because only the three-way interaction coefficient is significant, it is unclear at what point high on the SES distribution multiracial students differ from white

students in how teachers' beliefs impact them. We see no significant differences in the effects of teachers' beliefs for Latino students relative to white students, although in the case of Latinos the three-way interaction term is at least in the expected direction: although it is not significant, the coefficient indicates that teachers' beliefs are more influential for lower SES Latinos than higher SES Latino students. Finally, it is worth noting the results we see for whites, represented by the main effect on teachers' beliefs (since whites are the omitted racial group) and the teachers' beliefs by SES interaction. Although neither of these coefficients is significant, the main effect on teachers' beliefs, which indicates the effect for low SES whites, is triple its size in the previous models; its standard error is also much larger than it previously was. The coefficient on the teachers' beliefs by SES interaction is negative, suggesting that teachers' beliefs may matter more for lower SES than higher SES whites. Thus, it is possible that there is a positive effect of teachers' beliefs for low SES whites that is imprecisely estimated.

These results are more clearly interpreted when examined graphically. Figures 4.3, 4.4, and 4.5 present graphs separately showing the predicted achievement scores for white, black, and Latino students, respectively. Individual lines represent the 5^{th}, 25^{th}, 50^{th}, 75^{th}, and 95^{th} percentiles of the SES distribution, and plot the predicted math scores for students across the range of teachers' beliefs, from two standard deviations below the mean to two standard deviations above. The stacked lines in Figure 4.3 reflect the achievement differentials for white students from different SES backgrounds, but the lines are essentially flat, indicating the lack of any significant relationship between teachers' beliefs and math achievement for white students. The slight narrowing of the

lines with more empowered teacher beliefs reflects the positive main effect of teachers' beliefs for low SES whites, but as noted above this effect is not statistically significant.

Figure 4.4 is most striking, and represents the only strong significant results in how teachers' beliefs matter differentially for different demographic groups. The lines for the highest SES African American students, at the 75th and 95th percentiles of the SES distribution, are steep, whereas the lines for black students at the 5th and 25th percentiles are closer to being flat. Lower SES African Americans are predicted to have roughly the same math achievement, regardless of their teachers' beliefs. Math achievement rises sharply, however, for higher SES blacks who have an empowered teacher, and is predicted to be quite low among those with a teacher expressing helpless attitudes. Notably, mean math achievement among black students in the sample is -0.514. Thus, the predicted math score for high SES black students with a helpless teacher is roughly a quarter to a half a standard deviation lower, while those with the most empowered teachers are predicted to have achievement at least a half a standard deviation higher than the black mean. The predicted math scores for high SES black students with the most empowered teachers are similar to—or for the highest SES blacks, well above—the achievement predicted for whites of a similar SES background and with similar teachers.

Finally, the predicted scores for Latinos, presented in Figure 4.5, are also striking, though the lack of significant findings in the model results make their interpretation difficult. These predicted scores imply that Latino students actually do better than average when they have a teacher who feels helpless to overcome social disadvantage, and at least among the highest SES Latinos, worse with teachers who have more empowered attitudes. Among Latinos, we see little difference in predicted math

achievement among students of different SES backgrounds with the most empowered teachers, but sizable differences among students with the most helpless teachers, favoring high SES Latinos. These results are both surprising and perplexing if they are substantively meaningful, but due to the statistical insignificance of these findings in the model, it is unclear whether they represent real differences in how teachers' beliefs relate to Latino students' achievement.

DISCUSSION

The results presented here reveal that the average relationship between teachers' beliefs and student achievement indeed masks important heterogeneity by student race and class, but that the story is not as straightforward as accounts of "transformational" schools would imply. The relationship between teachers' beliefs and student achievement is much stronger for African American students than for other groups, but this effect increases for higher SES African American students. This is the opposite of what is suggested by literature on teachers' expectations and by case studies on "transformational" schools, which imply that lower-SES blacks—and potentially other students of color too—should benefit most from having a teacher with empowered attitudes. Instead, we see that it is higher SES blacks who get more of an educational boost from empowered teachers' beliefs, and who appear to do worst when they have teachers with helpless attitudes. Examining the graphed predicted scores, we do not see any substantive effect of teachers' beliefs on achievement for the lowest SES blacks.

It may be that in schools broadly, the doubly stigmatized status of being black and poor is obstinate enough that teachers' attitudes toward students make little difference. On the other hand, higher SES blacks may be especially influenced by apparent

judgments about their potential. Since many affluent African Americans trace their own backgrounds to more modest means, they may be highly aware of the precariousness of their social status. Lacy (2007) describes how upper-middle class black parents purposefully discuss with their children routes to reproducing their parents' status as well as the possibility of downward mobility if children follow the wrong path. Thus, for higher SES blacks an empowered teacher may be that "breath of fresh air" (Jussim et al. 1996, p. 355) that reinforces the possibility of reproducing advantage, whereas a helpless teacher may be the opposite message that reinforces the stigmatization of being black and the potential for downward mobility.

Theory about why teachers' beliefs should matter for student outcomes indicates that teachers' beliefs are made manifest in their behaviors, and that teacher behaviors influence students' own motivation and engagement. It may be that this is less the case for white and Latino students than for black students. Perhaps these groups derive their attitudes toward schooling more from their family or home lives, rather than their experiences in school. Recent work on "oppositional culture" at least suggests that schooling experiences are an important influence on African Americans' attitudes toward education, in that any evidence of opposition to schooling among black adolescents appears to emerge principally as a reaction to the sense that schools devalue them and deprive them of key resources and equitable access (Harris 2011; Tyson 2011).

My analysis is limited in its ability to make strong causal claims, however. Although I have accounted for many alternative causes of student achievement, including a rough proxy measure for students' prior math preparation, HSLS:09 only contains a single time point measurement of students with their teachers. I have described the results

using causal language because it is difficult to conceive of a selection story that would produce this pattern of heterogeneous effects. However, it remains a possibility that selection in which students have which teachers could actually be the source of these results. For example, the lack of effects we see for students from low SES backgrounds could be because they are exposed to the lowest skilled teachers, who may be less able to translate their beliefs—whatever those beliefs may be—into concrete practices that affect student achievement. However, such low skills would have to be captured by some dimension of teacher preparation that is distinct from all of the aspects of teachers' human capital that I account for, and given that teachers' beliefs are independent of all measured human capital characteristics, such a story remains hard to imagine.

Although there may be reason to suspect at least some selection in which students are most exposed to teachers' with helpless or empowered beliefs, or in the types of schools these teachers work in, there is also theory and empirical evidence to suggest a stronger causal relationship between teachers' attitudes and student achievement for marginalized groups (Jussin et al. 1996). The results presented here provide some additional support for that, but also contest the focus on the most disadvantaged students by providing evidence of the heightened vulnerability of more advantaged African Americans—and conversely, the disproportionate benefit more advantaged African Americans derive from educational resources.

On the whole, these results suggest that empowered teacher beliefs are not enough of a factor to account for the apparent success of "transformational" schools. Larger effects of teachers' beliefs for poor black students would be more consistent with such a story. However, the findings do point to the important role of teachers' attitudes for racial

inequality in schools more broadly. To the extent that these results can be interpreted as causal, having a teacher who feels empowered to overcome social disadvantage may be an influential psychological boost for higher SES black students. More ominously, the small minority of teachers with helpless attitudes may be most damaging to African American students. In some ways, then, these results cast doubt on the purported importance of teachers' beliefs in "transformational" schools. In others, though, the surprising findings presented here point to teachers' beliefs as a potentially important point of focus for confronting racial disparities in schools on a broader scale.

NOTES

[14] Construction of the teacher dataset is described in Appendix B.

[15] Sample sizes are rounded to the nearest ten to comply with NCES license requirements.

[16] Past research classified these and similarly worded items in the dimension of "general teaching efficacy" (see e.g. Gibson and Dembo 1984; Guskey and Passaro 1994).

[17] A more complete description of the math assessment methodology and full documentation on HSLS:09 can be accessed at http://nces.ed.gov/surveys/hsls09/hsls09_data.asp.

[18] Because teachers were not directly sampled in HSLS:09 but can be separated from student data and considered as a distinct level of analysis, I derived weights for teacher-level data by calculating the teacher's probability of selection as a function of the joint probabilities of her students' selection probabilities. Construction of the teacher weights is described in Appendix C.

Figure 4.1. Conceptual Framework for Understanding How Teachers' Beliefs Affect Student Outcomes

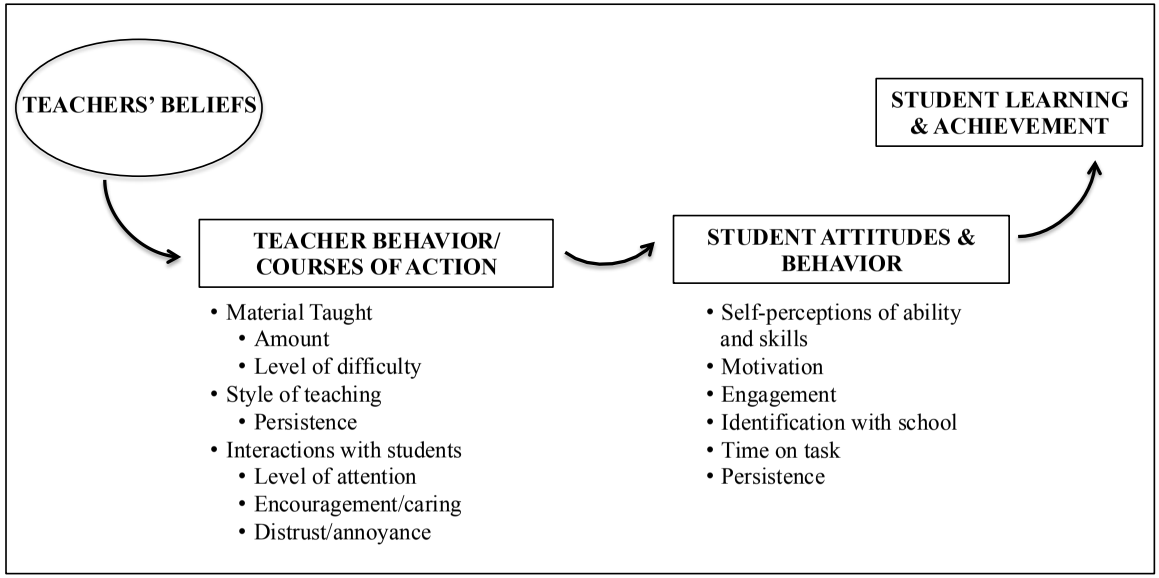
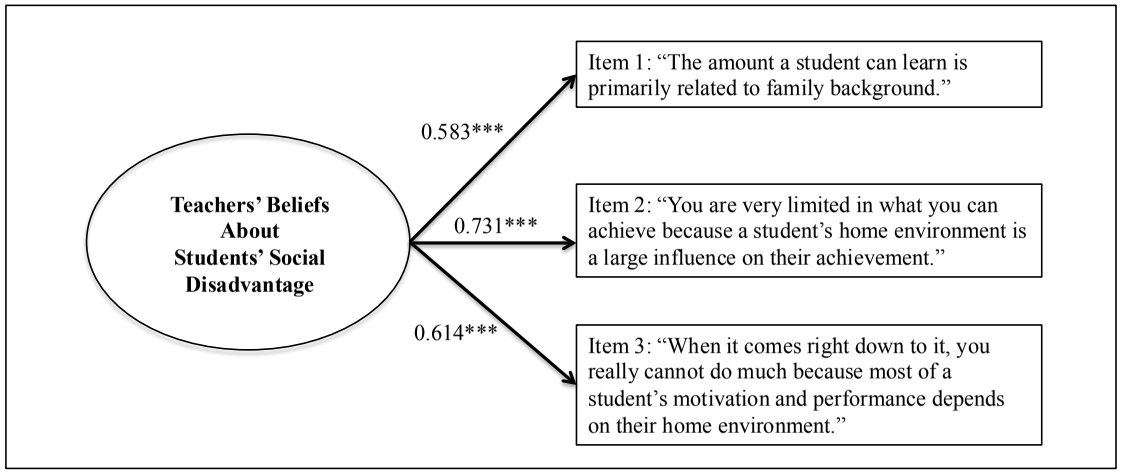


Figure 4.2. Confirmatory Factor Analysis Model of Teachers' Beliefs



Note: Standard errors clustered by school. Coefficient of determination = 0.694.

Table 4.1. Full Distributions of Items Used to Measure Teachers' Beliefs of Helplessness and Empowerment

"The amount a student can learn is primarily related to family background"

Response	Frequency	Weighted Percent
Strongly agree	140	3.73
Agree	890	20.98
Disagree	2,250	57.12
Strongly disagree	730	18.18
Total	4,010	100

"You are very limited in what you can achieve because a student's home environment is a large influence on their achievement"

Response	Frequency	Weighted Percent
Strongly agree	260	7.31
Agree	1,440	38.43
Disagree	2,100	48.74
Strongly disagree	210	5.52
Total	4,010	100

"When it comes right down to it, you really can not do much because most of a student's motivation and performance depends on their home environment"

Response	Frequency	Weighted Percent
Strongly agree	70	1.46
Agree	580	16.01
Disagree	2,590	64.74
Strongly disagree	780	17.80
Total	4,010	100

Note: Teachers' responses are weighted to approximate national representativeness for ninth grade math teachers. Overall N and cell frequencies are rounded to the nearest ten to comply with NCES license requirements. Numbers that do not sum properly are due to rounding error.

Table 4.2. Descriptive Statistics of Students

	Analytic Sample of 9th Graders Taking Math		Full HSLS:09 Sample Representative of 9th Graders in U.S.	
	Weighted Mean	SD	Weighted Mean	SD
Demographic Characteristics				
Sex				
Female	0.498	–	0.497	–
Male	0.502	–	0.503	–
Race				
White	0.530	–	0.518	–
Black	0.128	–	0.135	–
Hispanic/Latino	0.217	–	0.222	–
Asian/Pacific Islander	0.039	–	0.040	–
Native American/Alaska Native	0.006	–	0.007	–
2+ races	0.080	–	0.077	–
Student's first language				
English only	0.828	–	0.824	–
Other language only	0.107	–	0.115	–
English and other language equally	0.065	–	0.061	–
Age	14.860	0.596	14.874	0.611
Family structure				
Two-parent	0.576	–	0.568	–
One-parent plus partner/guardian	0.167	–	0.168	–
One-parent	0.212	–	0.219	–
Other	0.046	–	0.045	–
Socioeconomic status (HSLS:09 scale)	1.868	0.750	1.859	0.751
Educational Outcomes				
Math Self-Efficacy Scale Score	0.0440	0.9932		
Math Course Interest Scale Score	0.0425	0.9889		
Math Achievement Score	-0.087	0.991		
N	16,040		21,440	

Note: Sample sizes are rounded to the nearest ten to comply with NCES license requirements.

Table 4.3. Descriptive Statistics of Teachers

	Weighted Mean	SD
Demographic Characteristics		
Sex		
Female	0.594	–
Male	0.406	–
Race		
White	0.777	–
Black	0.060	–
Hispanic/Latino	0.100	–
Asian/Pacific Islander	0.051	–
2+ races or American Indian	0.013	–
Human Capital Characteristics		
Highest Degree Received		
BA or AA	0.463	–
MA	0.506	–
Educational Specialist diploma	0.017	–
PhD/MD/law degree/other professional degree	0.014	–
College Selectivity Ranking (Barron's)		
Most competitive	0.053	–
Highly competitive	0.081	–
Very competitive	0.248	–
Competitive	0.449	–
Less competitive	0.111	–
Noncompetitive	0.047	–
Special	0.010	–
Math-related job prior to teaching	0.220	–
Alternative certification	0.238	–
Certification Status		
None	0.072	–
Regular	0.774	–
Probationary	0.051	–
Emergency/temp/waiver	0.103	–
Years taught 9-12 (max. of math, science, or any subject)	10.230	8.646
Teacher is new (1st or 2nd year) to current school	0.240	
Teachers' beliefs about students' social disadvantage	-0.008	0.989
N	4,010	

Note: Sample sizes are rounded to the nearest ten to comply with NCES license requirements.

Table 4.4. Descriptive Statistics of Schools

	Weighted Mean	SD
Basic Institutional/ Organizational Features		
Sector		
Public	0.796	–
Catholic	0.047	–
Private	0.157	–
Location		
Suburban	0.214	
Urban	0.205	–
Town	0.178	–
Rural	0.403	–
Region		–
South	0.339	–
Northeast	0.150	–
Midwest	0.309	–
West	0.203	–
Number of students (school size)	689.883	679.151
Gradespan (lowest grade elementary or middle)	0.339	–
Average daily attendance	93.275	6.217
Enrollment (percent capacity to which school is filled)	85.981	15.665
Instructional Environment		
Does NOT offer AP or IB courses	0.300	–
School Academic Composition		
School failing to meet AYP	0.387	–
Year of "In Need of Improvement" for AYP		
0	0.775	–
1	0.092	–
2	0.076	–
3	0.033	–
4	0.015	–
5	0.009	–
% of 2008-09 seniors who went to 4-year college	48.278	29.071
School Race/Class Composition		
% Receiving free/reduced-price lunch	37.907	26.720
% White	70.015	30.650
% Black	13.501	22.694
% Latino	12.164	20.052
% Asian	2.853	6.508
% Native American	1.467	6.264
School Reform Characteristics		
Charter school	0.044	–
Average instructional hours per day	6.148	0.628
School/district offers incentives to attract teachers	0.267	–
N	890	

Note: Sample sizes are rounded to the nearest ten to comply with NCES license requirements.

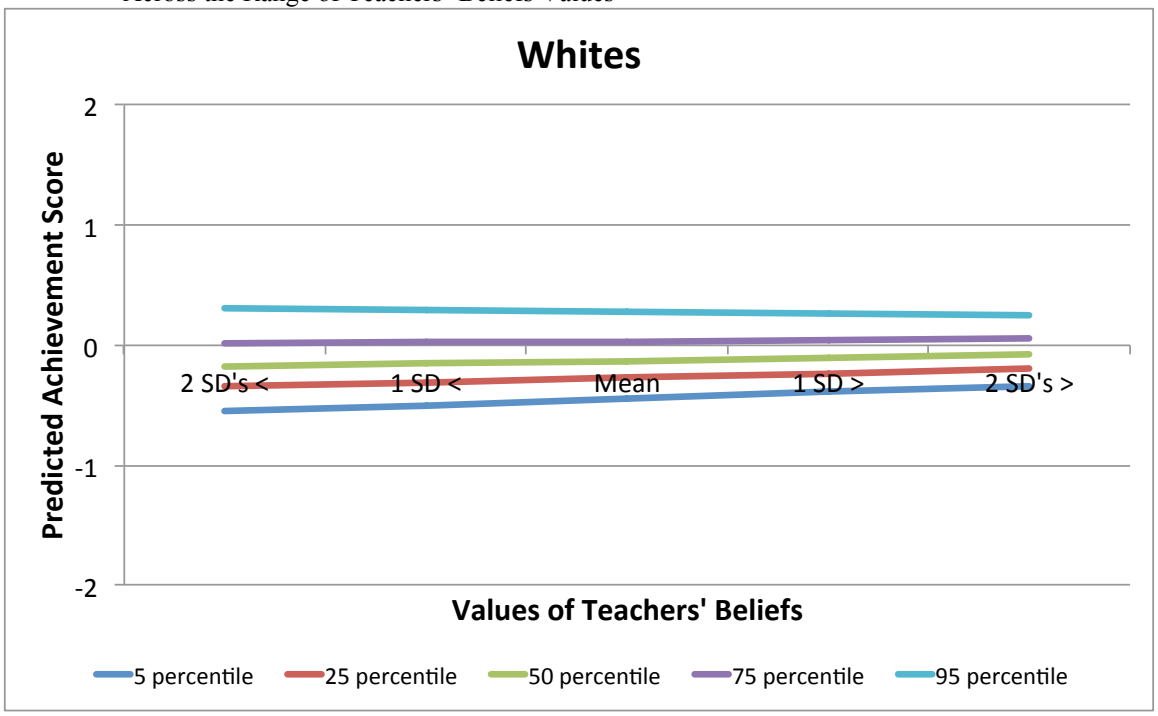
Table 4.5. Coefficients from Multilevel Models Predicting Students' Math Assessment Score, with Teachers' Beliefs Interacted with Students' Race and Socioeconomic Status

	Model 0	Model 1	Model 2	Model 3
	Main Effect of Teachers' Beliefs Only (from Chapter 3)	Teachers' Beliefs Interacted with Student SES	Teachers' Beliefs Interacted with Student Race	Teachers' Beliefs Interacted with Student Race* SES
Teacher Level				
Teachers' Beliefs About Social Disadvantage	0.019 (0.022)	0.023 (0.061)	0.024 (0.029)	0.077 (0.100)
Student Level				
Student Socioeconomic Status		0.261*** (0.041)	0.260*** (0.037)	0.285*** (0.049)
Student Race (Ref: White)				
Black		-0.228*** (0.061)	-0.244*** (0.060)	-0.003 (0.138)
Black*SES				-0.147* (0.059)
Latino		-0.124 (0.105)	-0.116 (0.102)	0.083 (0.136)
Latino*SES				-0.107+ (0.064)
Asian		0.246** (0.079)	0.243** (0.078)	0.016 (0.209)
Asian*SES				0.100 (0.082)
Native American		-0.132 (0.110)	-0.139 (0.113)	-0.599* (0.289)
Native American *SES				0.290* (0.145)
Multiracial		0.024 (0.060)	0.026 (0.062)	0.099 (0.174)
Multiracial*SES				-0.044 (0.077)
Cross-Level Interactions				
Teachers' Beliefs*SES		-0.002 (0.030)		-0.027 (0.041)
Teachers' Beliefs*Black			0.069 (0.044)	-0.249* (0.112)
Teachers' Beliefs*Black*SES				0.197** (0.057)
Teachers' Beliefs*Latino			-0.112 (0.075)	0.045 (0.100)
Teachers' Beliefs*Latino*SES				-0.103 (0.063)
Teachers' Beliefs*Asian			0.054 (0.061)	-0.077 (0.181)
Teachers' Beliefs*Asian*SES				0.059 (0.080)
Teachers' Beliefs* Native American			-0.025 (0.123)	-0.119 (0.241)
Teachers' Beliefs* Native Amer.*SES				0.045 (0.144)
Teachers' Beliefs* Multiracial			0.004 (0.068)	-0.230 (0.149)
Teachers' Beliefs*Multiracial*SES				0.121* (0.061)
Observations				
Schools		890	890	890
Teachers		4,010	4,010	4,010

Students	16,040	16,040	16,040

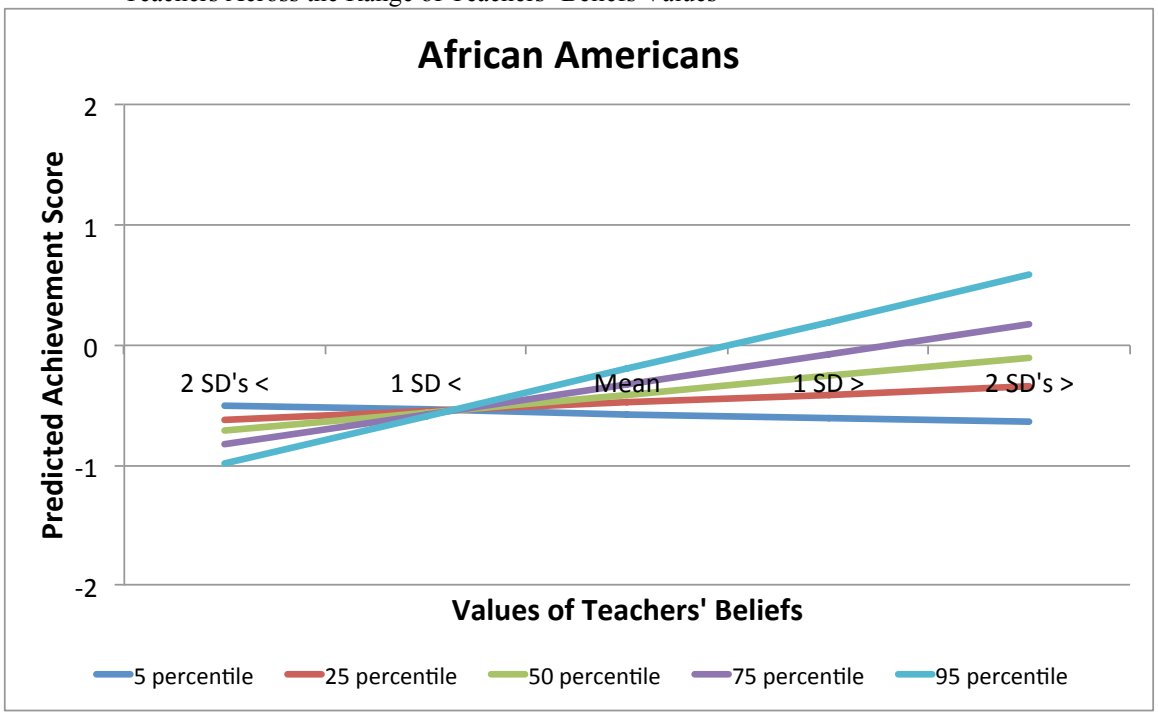
Note: Model includes controls for all student-, teacher-, and school-level covariates (including students' 8th grade math grade) and is weighted at each level. Standard errors in parentheses. Complete results including coefficients for control variables are available by request from the author.
$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Figure 4.3. Predicted Achievement Scores for White Students Across the SES Distribution with Teachers Across the Range of Teachers' Beliefs Values



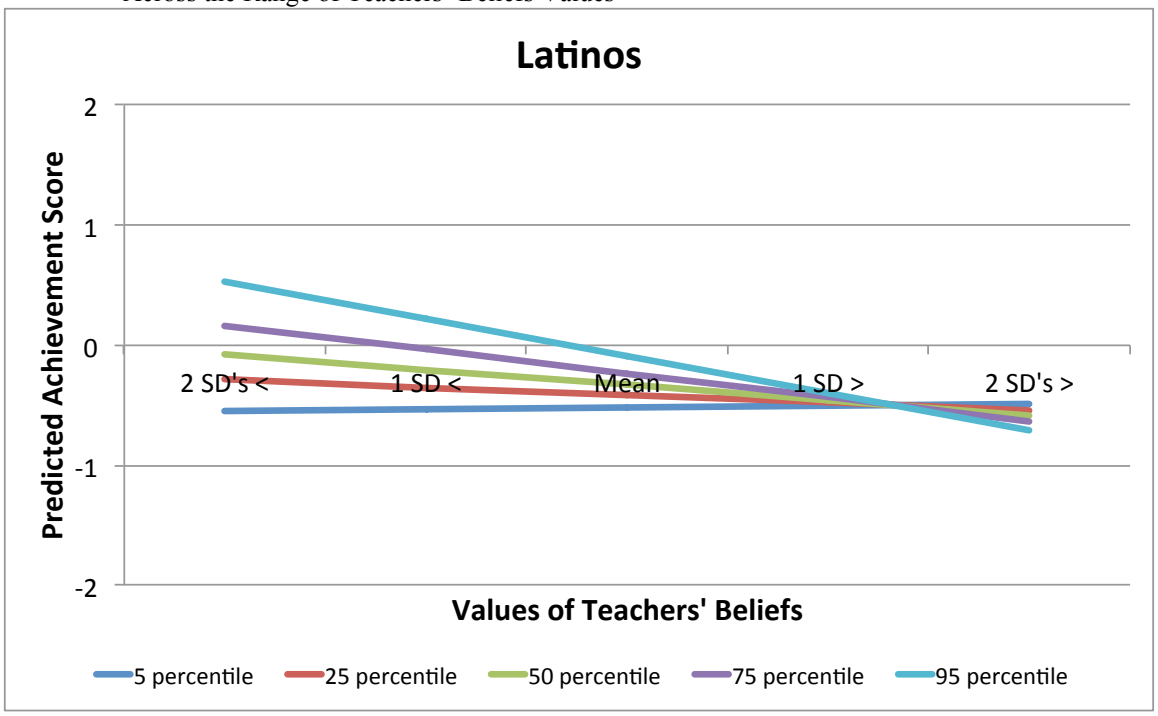
Note: Predicted scores based on Model 3 in Table 5. Mean achievement in the entire sample is 0. Mean achievement for whites (weighted) is 0.078.

Figure 4.4. Predicted Achievement Scores for African American Students Across the SES Distribution with Teachers Across the Range of Teachers' Beliefs Values



Note: Predicted scores based on Model 3 in Table 5. Mean achievement in the entire sample is 0. Mean achievement for blacks (weighted) is -0.514.

Figure 4.5. Predicted Achievement Scores for Latino Students Across the SES Distribution with Teachers Across the Range of Teachers' Beliefs Values



Note: Predicted scores based on Model 3 in Table 5. Mean achievement in the entire sample is 0. Mean achievement for Latinos (weighted) is -0.327.

CHAPTER 5

Conclusion

In this dissertation, I have drawn on popular theory about "transformational" schools' success and research literature on teachers' beliefs and other school effects to motivate studying teachers' beliefs about the extent to which they can overcome students' social disadvantage at a national level. I provide a more holistic understanding of such beliefs by analyzing their prevalence, their association with other teacher traits and school contexts, their relationship to student outcomes, and their implications for racial and socioeconomic inequality in education using a sample that is nationally representative of high schools and 9th graders. In this conclusion, I summarize my main findings, discuss their implications, and present ideas for avenues for future research.

Summary of Findings

In my first empirical chapter, I show that the most empowered attitudes toward overcoming social hardships that students face, while not widespread, are common enough that they are likely not limited to teachers in "transformational" schools. The most helpless teachers, on the other hand—those that view social disadvantages as an essentially insurmountable obstacle—are relatively rare, at least among high school math and science teachers. Nevertheless, with a teaching force as large as the one in the U.S., even this small percentage of teachers translates into a nontrivial number of students who encounter helpless attitudes among their teachers on a daily basis. I find no evidence that these teacher beliefs are related to numerous human capital characteristics that have been

the focus of education policy on teachers. Discussions of "highly qualified teachers" seldom discuss teachers' attitudes or the way that they interact with students. At least for the subset of beliefs studied here, my work shows that focusing on teachers' human capital will not capture other potentially important teacher attributes. However, I find that teachers' beliefs are related to their school context in significant ways, and these results point to the importance of school culture and composition, and away from some highly promoted strategies for school reform. That is, although charter schooling, incentivizing teachers, and lengthening the school day may be popular ideas for overhauling schools, my research finds that these strategies are unrelated to teachers' beliefs. Instead, I demonstrate that a school organizational culture of high academic expectations is positively related to individual teachers' beliefs, perhaps because school culture influences hiring decisions, shapes school norms, or buttresses teachers' own motivation and persistence. I also find that teachers' beliefs are strongly related to the demographic composition of their schools, but in surprising ways. It is schools serving predominantly poor students of color that have teachers whose beliefs regarding their capacity to overcome social disadvantage are most empowered. Given that past research has found that teachers' expectations are lowest for low-income and racial minority students, my findings suggest either that teachers' beliefs about social disadvantage differ somewhat from teachers' expectations for student achievement, or that recent years have seen substantial change in how teachers' perceive students from these backgrounds or express these perceptions (e.g. perhaps due to the imperative since No Child Left Behind that schools must close achievement gaps). Another likely interpretation may be that teachers do not choose to work—at least not for very long—in high poverty, high minority

schools unless they believe they can make a difference. Another implication of the results from the first empirical chapter is that the most helpless teacher attitudes, the converse of those espoused in "transformational" schools, are likely not a major contribution to racial inequality in education, both because helpless beliefs are relatively rare and because students of color are not particularly likely to be exposed to teachers who see social disadvantage as an insurmountable barrier. However, I find that the most helpless teacher beliefs are evident in poor white schools. This may suggest that helpless teacher attitudes could contribute to growing educational inequality by socioeconomic status.

In the second empirical chapter, my results provide mixed evidence on the question of how teachers' beliefs about students' social disadvantage relate to students' educational outcomes. The average effects tested in this paper demonstrate that the significant associations between teachers' beliefs and students' motivation and achievement in math may be explained by selection mechanisms in how students end up in certain teachers' classrooms, especially based on the types of schools that students and teachers are in and students' prior preparation in math. However, exploiting variation in the timing during the school year that students' math achievement was tested reveals that the relationship between teachers' beliefs and student achievement grows stronger after longer exposure to the teacher. This result is consistent with a causal interpretation of the positive relationship between beliefs and achievement, not a selection interpretation. If the results of this paper can be interpreted as causal effects, despite their small size relative to the effects on achievement of other teacher traits, empirical benchmarks of schooling effects on high schoolers suggest that the effect of teacher beliefs may be large enough that they should not be discounted. The mixed results in this paper suggest that

additional research on teachers' beliefs about students' social disadvantage is needed to better understand their influence on student outcomes.

This is especially true given the findings in the third empirical chapter, which demonstrate that the average effects just described mask a much larger, significant association for African American students that varies by their socioeconomic background. Although theory from the teachers' expectations literature and case studies of "transformational" schools would suggest that poor black students should benefit most from having a teacher with empowered beliefs and be most harmed by having a teacher with helpless attitudes, my third chapter finds that the effect of teachers' beliefs is relatively flat for the most disadvantaged blacks. However, math achievement among higher SES blacks is predicted to be substantially higher when they have an empowered teacher, and quite low when they have a teacher with helpless attitudes. Having an empowered teacher is predicted to raise high SES African American students' achievement by over a half a standard deviation above the average among black students, which is a similar level of achievement as whites from the same SES background have with similarly empowered teachers. More advantaged African American students who have a helpless teacher, on the other hand, are predicted to have math achievement that is a quarter to a half a standard deviation below the black mean. Although I still cannot make strong causal claims, the results of this paper are more difficult to explain with a selection story. Instead, it seems likely that teachers' beliefs about students' social disadvantage have an educationally consequential effect on African American students in particular, with blacks from more advantaged backgrounds being especially vulnerable.

Taken together, the results of this dissertation indicate that teachers' beliefs about students' social disadvantage play an important role in schools and may influence student outcomes, but that additional research would help to more definitively establish these relationships. School characteristics have strong predictive power on teachers' beliefs, especially by the race and class of the school's student body. Teachers' beliefs are related to student outcomes especially strongly for African American students. These results are strong indication that teachers' beliefs about students' social disadvantage may have implications for racial disparities in education, although not necessarily in the exact ways we might have expected. Even if these relationships result from some degree of selection, in this instance the potential "bias" of selection is less a nuisance and more a reflection of the social processes of interest (Sampson, Morenoff, and Gannon-Rowley 2002). Pursuing further research on these teachers' beliefs would help to clarify their causal influence or whether their importance hinges more on how teachers and students are systematically distributed in specific kinds of educational contexts.

Policy Implications and Directions for Future Research

A productive avenue for future research would be to study teachers' beliefs about students' social disadvantage over time. As I have mentioned, there is some evidence on teachers' beliefs about the nature of teaching that suggests that these types of beliefs are relatively stable (Pajares 1992). However, I cannot definitively say whether the construct of teachers' beliefs about students' social disadvantage that I advance is more closely aligned with deep-seated ideologies or with situational attitudes that change depending on the students a teacher has in any year, or even the challenges she or he faces on a

particular day. Surveys that ask teachers to report on their beliefs repeatedly over time would illuminate whether beliefs about social disadvantage are stable or change. Contextual information could help to address whether key successes, challenges, setbacks, and aspects of school context have any role in altering beliefs. This type of approach might also help to uncover the mechanisms that underlie the empirical results in this dissertation. Understanding the nature of these beliefs more completely is important for a full understanding of their role in student performance and how policies might be directed at improving interactions in the classroom.

An important contribution of this dissertation is that it examines teachers' beliefs about students' social disadvantage at a national level, rather than in the selective contexts where such empowered beliefs have been highlighted, or among a selective sample of teachers as is common in many studies of teachers' beliefs and attitudes. National data that includes teachers is often student-based, and often does not follow teachers—just as is the case with HSLS:09. This is unfortunate, because despite being organized to track student outcomes longitudinally, these datasets preclude a longitudinal analysis of a key educational context: the classroom. Some large-scale datasets have begun to follow teachers, however, and I see this as a productive avenue for future research. Greater attention to beliefs and attitudes in these data collection efforts is warranted. This dissertation finds that teachers' beliefs and human capital traits are independently related to student outcomes, and other research provides evidence that in some cases attitudes may be just as or more consequential for student outcomes (Palardy and Rumberger 2008). Even though the effect I find may be interpreted as small in magnitude, I measure only one type of teachers' beliefs, and their independence from

teachers' human capital suggests that additional psychological and interactional qualities of teachers in sum may help explain the variation we see in teacher effectiveness.

The evidence this dissertation is able to provide is not definitive that teachers' beliefs are a key site to intervene on behalf of student achievement generally. Insofar as "transformational" schools are a topic of policy interest for school reform, teachers' beliefs do not appear to be enough to account for the success of "transformational" schools. Future research might examine other common features in such schools to understand what contributes to their apparent success. Additionally, the mixed evidence on the average effects of teachers' beliefs leaves open the possibility that teachers' beliefs *are* an important aspect of effective schooling, but that other key aspects of successful schools must also be present to yield large gains in student performance. For example, perhaps empowered teachers are best able to translate their beliefs into behaviors that benefit students when other key resources or schooling structures are in place. This could be the explanation for "transformational" schools' success, or it could be a relevant missing link in understanding teachers' beliefs about students' social disadvantage more broadly.

This dissertation provides strong evidence that teachers' beliefs are educationally consequential in the broader landscape of schools for specific subgroups of students. In particular, high SES African American students in schools nationally benefit substantially from having a teacher with empowered attitudes. Interventions that aim to expose more high SES blacks to the most empowered teachers could contribute to narrowing racial achievement disparities. There is a small but nontrivial group of teachers who hold very helpless beliefs, and these teachers may do particular damage to African Americans.

These teachers should be a focus of research and intervention, which might be best targeted at the level of the individual teacher. Longitudinal research on teachers to understand how beliefs change, if at all, would also contribute to understanding how to intervene with teachers if altering beliefs is a desirable goal.

Finally, finding teachers with empowered beliefs or developing such beliefs in potential teachers may be an important way to encourage teaching in high needs schools, particularly schools serving a socially disadvantaged student body. An appropriate focus for interventions regarding teachers' beliefs could be in identifying how to get highly effective teachers to believe in the power of using their skills to transform students' educational trajectories and reduce educational disparities, and identifying how to support them in doing so.

APPENDIX A

Conceptual and Measurement Issues in Teacher Efficacy Research

The broad term "teacher efficacy" has been conceptualized as comprising two distinct dimensions—personal teaching efficacy and general teaching efficacy—but the way these two factors are interpreted has been the subject of some debate and confusion. My interests in this dissertation are more aligned with the component termed general teaching efficacy, which more closely reflects the extent to which a teacher views social disadvantages as strongly predicting student potential. This focus is an important point of departure from prior literature for my dissertation, because much of the recent research has focused on the more personal dimension of self-efficacy.

In this appendix, I provide a more detailed history of the concept of teacher efficacy, an overview of its theoretical underpinnings, and a summary of how theoretical arguments have contributed to the development of new instruments to measure teacher efficacy. I provide more depth on the scales that have been most widely used and that contain items similar or identical to the items I aim to use to represent teachers' beliefs about students' social disadvantage. I also provide two tables that summarize the primary similarities and differences in how these items have been measured (Table A1) and conceptualized (Table A2). Thus, the appendix is a summary of measurement issues in the teacher efficacy literature (i.e. rather than empirical findings regarding the antecedents or outcomes of efficacy), with a focus on measurement constructs that are similar to my own. Recent teacher efficacy literature has moved away from incorporating

general teaching efficacy, partly for methodological reasons but largely for theoretical ones. Thus, I maintain that despite their origins in teacher efficacy research, the teachers' beliefs I measure capture something different than the efficacy literature has historically advanced.

The titles of some recent articles are instructive of the state of the literature. Tschannen-Moran and Woolfolk Hoy titled their 2001 article, "Teacher efficacy: capturing an elusive construct," while Henson's 2002 article is titled, "From Adolescent Angst to Adulthood: Substantive Implications and Measurement Dilemmas in the Development of Teacher Efficacy Research." Tschannen-Moran et al. (1998) elaborate that teacher efficacy "enjoyed a celebrated childhood, producing compelling findings in almost every study, but it has also struggled through the difficult, if inevitable, identity crisis of adolescence" (p. 202). This "adolescent identity crisis" is due partly to confusion regarding the theoretical underpinnings of the concept of teacher efficacy, and partly to uncertainty about the soundness of its measurement properties.

The Origins of "Teacher Efficacy"

Teacher efficacy literature has its origins in two different theoretical strains, both based in psychology: Rotter's locus of control theory and Bandura's social cognitive theory. The concept of teacher efficacy originated with the RAND "Change Agent Study," a large-scale project conducted to understand the role of staff development in the success of federally-funded school reform programs (McLaughlin and Marsh 1978). The scope of the study was much larger than the role of teachers' beliefs, but the RAND questionnaire included two items meant to gauge teachers' "sense of efficacy" or "the extent to which

the teacher believed he or she had the capacity to affect student performance" (McLaughlin and Marsh 1978, p. 85). RAND's first item measured agreement with the statement, "When it comes down to it, a teacher really can't do much because most of a student's motivation and performance depends on his or her home environment." RAND's second item measured agreement with the statement, "If I really try hard, I can get through to even the most difficult or unmotivated students." A combined measure of both responses was used to represent efficacy. The RAND researchers found that teachers' sense of efficacy was positively—and strongly—related to each of the outcomes examined in the Change Agent Study, which sparked considerable interest among the academic community in further investigating and elaborating the concept. RAND's items have been replicated in several subsequent scales (see Table A1).

Tschannen-Moran, Woolfolk Hoy, and Hoy (1998) summarized the RAND researchers' conception of teacher efficacy "as the extent to which teachers believed that they could control the reinforcement of their actions, that is, whether control of reinforcement lay within themselves or in the environment" (p. 202), based on Rotter's theory of locus of control. Locus of control theory deals with whether one views outcomes as primarily under one's own control (internal locus of control) or primarily the result of environmental or other circumstances that are outside of one's control (external locus of control). Concurrently, a separate strand of teacher efficacy research developed from Bandura's social cognitive theory, which originated the concepts of self-efficacy and outcome expectancy. Self-efficacy reflects beliefs about the level of competence one expects to demonstrate in a certain situation, or "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (to cite an oft-

quoted definition from Bandura [1997, p. 3], quoted in Tschannen-Moran et al. 1998, p. 207). Social cognitive theory regards this efficacy expectancy as distinct from an outcome expectancy, which reflects beliefs about the likely consequences of executing a task at the expected level of competence.

The Teacher Efficacy Scale… and Its Critics

Pivotal for the development of teacher efficacy research was the way that important subsequent work combined (some would say conflated) these two theoretical forebears. Ashton and Webb (1982) developed a multidimensional model that extended Bandura's concept of self-efficacy to teachers. They argued that the first RAND item represented teachers' outcome expectations and the second RAND item reflected teachers' efficacy expectations, and they termed these dimensions teaching efficacy and personal efficacy, respectively (as explained in Guskey and Passaro [1994]). Following this lead,[19] Gibson and Dembo (1984) aimed to develop and validate a more useful instrument for measuring teacher efficacy, building on the original RAND construct. Although they recognized that the concept of *teacher efficacy* was based in locus of control theory, they sought to incorporate Bandura's meaning of *self-efficacy*, which is more concerned with a personal assessment of one's own competence to execute a behavior at the level one wants, rather than with whether the behavior will be causally related to a certain outcome. Essentially, Gibson and Dembo (1984) laid Bandura's concepts over the external and internal poles of locus of control theory. They state:

> "If we apply Bandura's theory to the construct of teacher efficacy, outcome expectancy would essentially reflect the degree to which teachers believed the environment could be controlled, that is, the extent to which students can be taught given such factors as family background, IQ, and

> school conditions. Self-efficacy beliefs would indicate teachers' evaluation of their abilities to bring about positive student change" (p. 570).

Subsequently, researchers working in the social cognitive theory tradition have disagreed with this application of Bandura's concepts (which I discuss more below); however, Gibson and Dembo's treatment was widely accepted until at least the mid- to late-1990s. They developed a 30-item scale based on teacher interviews and reviewing previous studies. A factor analysis of the scale revealed "two substantial factors," which the authors termed personal teaching efficacy (PTE) and teaching efficacy (TE). They assert directly that these factors correspond to the conceptions of efficacy advanced by both RAND (lead authors include McLaughlin, Berman, and Armor) and Bandura:

> Factor 1 appears to represent a teacher's sense of personal teaching efficacy, or belief that one has the skills and abilities to bring about student learning. This dimension corresponds to the specific item used in previous research (Berman & McLaughlin, 1977; Armor et al., 1976), "If I really try hard, I can get through to even the most difficult or unmotivated students." All of the items included in Factor 1 reflect the teacher's sense of personal responsibility in student learning and/or behavior and correspond to Bandura's self-efficacy dimension (p. 573).
>
> The second dimension that is reflected in Factor 2 represents a teacher's sense of teaching efficacy, or belief that any teacher's ability to bring about change is significantly limited by factors external to the teacher, such as the home environment, family background, and parental influences. This dimension reflects the teacher's belief about the general relationship between teaching and learning and is represented by the second item used in previous research (Berman & McLaughlin, 1977; Armor et al., 1976), "When it comes right down to it, a teacher really can't do much because most of a student's motivation and performance depends on his or her home environment." This second factor clearly corresponds to Bandura's outcome expectancy dimension (p. 574).

Gibson and Dembo published the 30-item scale as the Teacher Efficacy Scale (TES), but recommended that the 16 items that had significant factor loadings be the basis for a revised scale; these 16 items would become the TES measurement instrument

employed in many future studies. In one subsequent article, Hoy and Woolfolk (1990) argued that rather than reflecting an outcome expectancy in Bandura's sense, Gibson and Dembo's TE factor "appears to reflect a general belief about the power of teaching to reach difficult children and has more in common with teachers' conservative or liberal attitudes toward education" (p. 283). Nevertheless, they maintained the factor as a component of teacher efficacy and termed it general teaching efficacy, or GTE, a label that has stuck in much of the rest of the literature.

Multiple teams of researchers have extensively reviewed and summarized the research literature measuring PTE and GTE to date. For example, to test the reliability generalization of Gibson and Dembo's (1984) instrument, Henson et al. (2001) reviewed articles published between 1981 and 1999 that used the TES (as well as three other instruments that tap teacher efficacy, control, and responsibility through alternative metrics). Some studies that employed the TES were necessarily omitted because they did not provide reliability coefficients or other statistics required for Henson et al.'s analysis. However, even among studies providing the required statistics, the "authors were not surprised to find that "the TES was the most frequently used test, and the majority of reliability estimates (25 for PTE, 21 for GTE) were from scores on TES subscales" (p. 409-410). And in another comprehensive review, Tschannen-Moran et al. (1998) contend that the TES has been extensively used and "other researchers have confirmed the existence of two factors… with alphas ranging from .75 to .81 for PTE and from .64 to .77 for GTE…. Studies of both preservice and inservice teachers have found that from 18% to 30% of the variance between teachers is explained by these two factors. In

general, researchers have found the two factors to be only slightly related or not at all correlated" with one another (p. 212).

Although the TES became the predominant instrument for measuring teacher efficacy, at least two sets of researchers have argued that the scale is confounded by item wording. Guskey and Passaro's (1994) critique is perhaps the most well-known; it draws attention to the sign and referent used in Gibson and Dembo's items. Guskey and Passaro (1994) argue,

> Although the items that load on the personal efficacy factor all use the referent *I*, all are also positive and have an internal locus (i.e., 'I can'). Those items that load on the teaching efficacy factor nearly all use the referent 'teachers,' but also are negative and have an external locus (i.e., 'teachers cannot'). Thus, the interpretation of these two factors may confound type of efficacy with referent, sign, and locus (p. 630).

To test for wording confounds, Guskey and Passaro administered the TES items to a sample of 342 teachers (59 of whom were preservice teachers), but with alterations such that personal-internal measures become either teaching-internal or personal-external measures, and teaching-external measures become either personal-external or teaching-internal measures (see Guskey and Passaro 1994, p. 633 for typology). They produced a new teacher efficacy scale of 21 items that also captured two factors, bolstering earlier research in finding that teacher efficacy is multidimensional. But their results are inconsistent with the interpretation of these dimensions as personal efficacy and teaching efficacy. Instead, their factors indicate the distinction to be primarily internal versus external attributions. The teachers in their study "did not distinguish between their personal ability to affect students and the potential influence of teachers in general. Rather, the distinctions they drew related to beliefs about the influence they and all

teachers have, or do not have, on the learning of students, even those who may be considered difficult or unmotivated. Whether the item reference was 'my influence' or 'teachers' influence' made no difference" (p. 637).

The authors emphasize that their factors cannot be understood in a locus-of-control framework, which treats internal and external as "opposite poles in a bipolar, locus-of-control continuum" (p. 637); in other words, locus-of-control is a unidimensional concept, whereas Guskey and Passaro find that teacher efficacy *is* composed of conceptually distinct factors, which may be related but operate independently. Their interpretation is that the "internal factor appears to represent perceptions of *personal* influence, power, and impact in teaching and learning situations…. The external factor, on the other hand, relates to perceptions of the influence, power, and impact of elements that lie *outside the classroom* and, hence, may be beyond the direct control of individual teachers" (p. 639; italics in the original).

Although Guskey and Passaro (1994) called attention to the positive wording of the TES' PTE items and the negative wording of the TE (GTE) items, they interpret the altered items they test and the two factors they find as reflecting an internal/external distinction and do not reconsider the confounding role of sign in addition to referent. For example, the original item "When I really try, I can get through to most difficult students," and the altered item "Even when I really try, it is hard to get through to the difficult students" were considered "personal-internal" and "personal-external," respectively, in Guskey and Passaro's formulation. To my mind, a personal-positive and personal-negative distinction is at least as appropriate, if not more appropriate, for these two item wordings.

In fact, Woolfolk and Hoy (1990) also noted that the two factor solution of the TES was potentially confounded by the positive orientation of the PTE items and negative orientation of the GTE items. Deemer and Minke (1999) provide an explicit test of this suggestion, and aim to fill the gap left by Guskey and Passaro's investigation. Deemer and Minke (1999) note that

> the majority of the items on what they called the external factor are still negative in orientation (i.e., "I am very limited . . ."), whereas the majority of items on the internal factor are positive in orientation (i.e., "If I really try hard, I can . . ."). The one item that refers to an external influence on teaching but is positive in orientation ("The influences of a student's home experiences can be overcome by good teaching") loaded on the internal factor in Guskey and Passaro's analysis. Similarly, the one item that refers to an internal characteristic of teachers but is negative in orientation ("When a student is having difficulty with an assignment, I often have trouble adjusting it to his/her level") loaded on the external factor. Thus, it seems plausible that the positive and negative orientation of the items, rather than an internal-external distinction, could bias the factor structure of the TES (p. 4-5).

Deemer and Minke (1999) altered the orientation of the items and administered two modified versions of the TES to 196 teachers enrolled in summer graduate classes at one university in the northeast. Based on Guskey and Passaro's (1994) finding that teachers did not distinguish between what "I" or "teachers" could control or achieve, Deemer and Minke worded all of their items in the first person. Unlike in previous studies, a two factor solution did not accurately represent their data. Rather, a one factor solution came the closest to explaining a similar amount of variance as Gibson and Dembo's and Guskey and Passaro's findings. Retained items had both positive and negative orientations, but almost all were of the personal-internal wording.[20] Deemer and Minke conclude that the items of the TES primarily assess personal teacher efficacy (of Gibson and Dembo) or efficacy expectations (of Bandura) as a unidimensional concept.

They explain, "A separate external factor was not identified, and most of the items referring to outside influences on teaching were deleted when the positive-negative wording bias was eliminated…. Therefore, the two-factor structure that has been replicated throughout the literature appears to be at least partially an artifact of item wording and not the result of underlying, distinct construct dimensions." (p. 8).[21]

Although many studies find a two factor solution to the TES (Tschannen-Moran et al. 1998), Deemer and Minke (1999) are not the only ones who have questioned whether the TES has a two factor structure or whether researchers are accurately measuring teacher efficacy by treating it as two-dimensional. For example, two important advances in the teacher efficacy literature are theorizing about collective teacher efficacy and the development of an instrument to measure it (e.g. Goddard et al. 2000, and other work that I describe in more depth in my prospectus), and Tschannen-Moran and colleagues' (1998, 2001) development of a new instrument to measure teacher efficacy, the Teacher Self-Efficacy Scale (TSES, which I discuss in more detail below). Goddard and colleagues' find that collective teacher efficacy can be captured in one factor and Tschannen-Moran and Woolfolk Hoy (2001) find that a three factor solution for their new TSES measure can be collapsed into a single second-order dimension. Henson (2002) argues that these recent advances suggest a unidimensional conceptualization of teacher efficacy may be more appropriate.

Recent Developments in Teacher Efficacy Research and the Move Away from GTE

At this point, it is useful to revisit Hoy and Woolfolk's early (1990) argument in renaming Gibson and Dembo's TE factor "general teaching efficacy" (GTE); their

contention was that the factor "has more in common with teachers' conservative or liberal attitudes toward education" (p. 283) than with Bandura's concept of outcome expectancy. One year later, in an attempt to measure teacher efficacy for classroom management, Emmer and Hickman (1991) called the items reflecting "the relative influence on student behavior of events or characteristics beyond the teacher's control"—many of which were items adopted from the TES' TE/GTE factor—the "External Influences factor" (p. 759). Similarly, in their analysis of teacher efficacy, Henson et al. (2002) dubbed the scale "external attributions" "to more accurately represent the construct" (p. 33).

These efforts toward classifying GTE items as capturing something other than teacher efficacy are aligned with the most prominent direction the teacher efficacy literature has taken in the last ten to fifteen years. The locus of control origins of the teacher efficacy concept are seemingly being abandoned, while Bandura's framework is becoming more central. In part, this represents a theoretical argument that Gibson and Dembo erred in treating their second factor as consistent with Bandura's concept of outcome expectancy. In justifying their development of a new instrument, Tschannen-Moran and Woolfolk Hoy (2001) explain the inconsistency this way:

> Bandura [1986] pointed out that outcome expectancy adds little to the explanation of motivation because the outcome a person expects stems from that person's assessment of his or her own capabilities and expected level of performance, not from what it would be possible for others to accomplish under similar circumstances. Therefore, the items used to measure the second factor of teacher efficacy about the potential impact of teachers in general in the face of external impediments (GTE) cannot be considered an outcome expectancy (p. 792).

Furthermore, because Bandura argued that efficacy expectations are formed based on an

assessment of one's ability to perform at a given level *in a certain situation*, there has been a move in the teacher efficacy literature toward measuring efficacy with greater specificity to the teaching context, in particular to specific teaching tasks or curricula. Emmer and Hickman's (1991) efficacy for classroom management scale is one such attempt; more recent examples include efficacy for teaching science and efficacy for special education. The optimal context specificity is still the matter of some debate. But Tschannen-Moran and colleagues (1998, 2001) have lead the charge away from the TES and toward an instrument that includes an indication of context in its items.

Although they argue that their model "weaves together both conceptual strands" (i.e. locus of control and social cognitive theory), Tschannen-Moran et al.'s model is largely based on Bandura's work.[22] They argue, "a valid measure of teacher efficacy must assess both personal competence and an analysis of the task in terms of the resources and constraints in particular teaching contexts" (Tschannen-Moran and Woolfolk Hoy 2001, p. 795). They argue that these two assessments that teachers make are related to PTE and GTE, but are not identical concepts. They explain, "In our model, the judgment a teacher makes about his or her capabilities and deficits is self-perception of teaching competence, while the judgment concerning the resources and constraints in a particular teaching context is the analysis of the teaching task… the analysis of the teaching task bears some similarity to GTE, but it includes specific aspects of the teaching situation" (Tschannen-Moran et al., p. 231).[23] Tschannen-Moran et al. initially dubbed their model the Ohio State Teacher Efficacy Scale (OSTES), but then renamed it the Teacher Self-Efficacy Scale (TSES), a notable implication that their measurement of teacher efficacy tacks toward the "self-efficacy" interpretation.

While expressing some reservations about the need to subject the scale to additional analysis, Henson (2002) asserts that the "TSES is a promising development in the measurement of teacher efficacy" (p. 145). The TSES includes three factors with an equal number of items measuring each: efficacy for instructional strategies, efficacy for classroom management, and efficacy for student engagement (see p. 800 of Tschannen-Moran and Woolfolk Hoy (2001) for a list of items in the TSES long form). All of the items are worded in a fashion consistent with Guskey and Passaro's (1994) internal-positive direction, and none of them assess whether the teacher views students' family or home environment as an external constraint on teaching in the same way that GTE items do. Thus, their items seem to mainly accomplish more task specificity in measures of personal teaching efficacy (something that other researchers have called for), but ignore so-called general teaching efficacy entirely. Their final measure correlates poorly with the first RAND item ($r = 0.18$) and with GTE ($r = 0.16$; Tschannen-Moran and Woolfolk Hoy 2001, see p. 801). Their comment on this seems to imply that GTE is not *really* efficacy: "the lower correlations between GTE and other measures of efficacy suggest that this scale is the least successful in capturing the *essence of efficacy*" (p. 801; italics added for emphasis). Moreover, they view strong correlations with PTE as evidence for construct validity of their newly created scale. This suggestion that GTE is not aligned with efficacy's "essence" is echoed in Henson's (2002) comment on whether Gibson and Dembo's TES (and measures like it) is actually measuring efficacy. Henson contends, "Assessment of efficacy without reasonable context specificity may actually be assessment of a different construct altogether, perhaps of more general personality traits" (p. 140).

The move within the teacher efficacy research community toward measures that are context specific and less closely aligned with the locus of control framework is in part due to methodological concerns as well. Of all of the research I have encountered, Henson (2002) is the most critical of Gibson and Dembo's TES on methodological grounds. According to Henson,

> Unfortunately, not only were the theoretical operationalizations of the TES constructs questionable, but scores in Gibson and Dembo's (1984) original validation study were psychometrically weak. This is true despite the fact that the study was well-designed in its development of items from teacher interviews, factor analytic derivation of scales, multitrait–multimethod matrix analysis, and empirical investigation using the newly obtained instrument…. By most factor analytic standards (Gorsuch, 1983; Stevens, 1996), the variance accounted for is minimal at best, and is indicative of poor factorial validity (Thompson & Daniel, 1996) (p. 144).

Although Gibson and Dembo encouraged future research to continue to assess the psychometric properties of the TES, their measure was nevertheless largely adopted as the teacher efficacy standard. In Henson's judgment, "Unfortunately, the theoretical and psychometric weaknesses were overlooked, and researchers of teacher efficacy prematurely foreclosed on the instrument's developmental identity" (p. 144). Overall, Henson (2002) argues that the literature on teacher efficacy has failed to establish construct validity, and that researchers were too quick to accept instruments (particularly the TES) prior to sufficient evidence of validation.

In their reliability generalization study, mentioned earlier, Henson et al. (2001) found that the 21 reliability estimates of GTE in articles they reviewed had a mean reliability of .696, a standard deviation of .072, a minimum of .550 and a maximum of .820 (p. 413. The authors note, however, that their "results are tentative and limited by the dearth of score reliability estimates reported for data in hand," [p. 414]). Henson et al.

(2001) assert that the score reliability of GTE has historically been marginal, and that it may be questionable for researchers to continue using the GTE subscale due to documented issues with measurement error as well as construct validity. As a final blow to GTE's role in teacher efficacy research, Henson et al. argue, "Given the debate over the construct validity and current evidence of poor reliability of scores for the GTE subscale, the subscale should potentially be abandoned and replaced with efforts to more reliably measure the outcome expectancy dimension of Bandura's (1997) social cognitive theory" (p. 416).

One recent article attempts to revive the TES, arguing that prior findings are incomprehensible without a better understanding of the factor structure of the TES. Denzine, Cooney, and McKenzie (2005) argue, "Social cognitive theory also distinguishes outcome expectations from the locus-of-causality construct (Heider, 1958; Rotter, 1966; Weiner, 1986). For example, endorsing an item that reads… 'the home environment is the most important influence on student achievement' reflects an external locus of causality. Unlike outcome expectations, items assessing locus-of-causality beliefs are more general in nature items" (p. 699).[24] Based on this understanding, Denzine et al. (2005) reevaluated the TES for theoretical compatibility with the concepts of self-efficacy beliefs, outcome expectations, and locus of causality. Using Woolfolk and Hoy's (1990) 20-item version of the TES, Denzine et al. retain three items as hypothesized indicators of self-efficacy beliefs (SEB), three items as hypothesized indicators of outcome expectations (OE), and four items as hypothesized indicators of external locus-of-causality (E-LOC). Three of the four items they retained as indicators of E-LOC are nearly identical to the three belief items I use (see Tables A1 and A2). With a sample of

131 advanced preservice teachers at a university in the Southwest, Denzine et al. find that the SEB/OE/E-LOC three-factor solution provides an acceptable fit to the data. However, based on their finding that the relationship between SEB and E-LOC (a moderate, positive relationship) is inconsistent with social cognitive theory and with previous studies, like Henson et al. (2001), they too conclude that the TES is a poor representation of social cognitive theory and should be abandoned. Thus, Denzine et al. (2005) may be seen as consistent with other recent teacher efficacy literature in that it advocates the development of an instrument more consistent with Bandura's work. Most relevant for my work, however, is that Denzine et al. find that three of the most typically used GTE items—the items that I use—hang together as a single dimension.

Implications for My Research

Although Henson et al. (2001) and others present evidence that is damning of GTE, and Denzine et al. (2005) and others present reassessments of the underlying construct that GTE items represent, the argument that GTE does not reliably measure Bandura's concept of outcome expectancy is not equivalent to arguing that GTE, or its items, do not measure anything that is relevant to the study of education. In fact, if the argument is mainly that GTE should be abandoned for assessing outcome expectancy, the point is largely irrelevant to my work because my research questions do not lie in measuring the concepts of social cognitive theory. Rather, the teacher efficacy literature is relevant to me largely because of the items used in GTE and because of its implications regarding the importance of teacher attitudes more broadly, not particularly because of the concept of teacher efficacy. Tschannen-Moran and colleagues (1998, 2001) based

their model on Bandura's recent work, and their reading of his work suggests that he wanted a scale that encompassed teachers' sense of competence across a wide variety of tasks to capture the multifaceted nature of "teacher efficacy." This indicates that my study is not of "teacher efficacy" in the way most psychologists define it. Teachers' beliefs about student background as an obstacle have been used as one component of "teacher efficacy," but I am more interested in those specific beliefs than in all of the components of teacher efficacy as it has come to be defined.

Labone (2004) argues that teacher efficacy research needs to expand to incorporate alternative theoretical paradigms. One such alternative would be to examine teacher efficacy via the lens of critical theory, which argues that education should redress social inequality and injustice, and that reconstructing teaching and schools is necessary to accomplish this. Labone's description of the critical theory perspective is more consistent with the kinds of beliefs described in accounts of "transformational" schools than are most descriptions of teacher efficacy (especially self-efficacy). She explains that, especially in a context where the social background of teachers differs considerably from the social background of students, "it is necessary for teachers to broaden their focus beyond the classroom concerns of instruction and management and to develop skills that enable them to change the life chances of the students they teach" (p. 350). In other words, critical theorists advocate that teachers learn and demonstrate the skills necessary to provide their students with "transformational" educational experiences. And according to Labone, "Researchers are yet to investigate this role within the construct of teacher efficacy" (p. 350). My work enters in this gap, whether it truly exists within the teacher efficacy literature, or whether it would be considered outside the scope of "teacher

efficacy" research (insofar as there is a move to consolidate the literature around Bandura's concept of self-efficacy and Tschannen-Moran et al.'s emphasis on context specificity), and could potentially be considered under some other umbrella terminology in the study of teachers, such as "teacher locus of control," "teacher responsibility," or "teacher agency." For example, Woolfolk and Hoy (1990) state,

> Some researchers have noted that the TE [GTE] dimension has much in common with teachers' beliefs about the nature of ability—that is, about whether ability is a fixed trait or a malleable characteristic…. A belief that education is relatively powerless to overcome limitations imposed by a child's ability and home background appears to be a part of a more conservative orientation toward schooling (p. 89).

This assessment appear to be largely speculative on their part, however, and I have seen no other literature draw on the teachers' beliefs items that I use, aside from the measurement of general teacher efficacy (or "external influences," "external attributions," "external locus-of-causality," etc.).

Labone (2004) maintains that all of the scales employed in the teacher efficacy literature are chiefly concerned with teachers' efficacy for instructional tasks within the classroom, rather than "types of efficacy that facilitate social reconstruction" (p. 350). However, I would argue that teachers can reconstruct society in a more just way and make a difference in the lives of their students *through* their instruction. Labone (2004) "encourages researchers to focus on types of teacher efficacy for tasks beyond instructional effectiveness so that teachers can facilitate education in redressing social imbalances in society" (p. 357). However, although teachers may be able to redress social imbalances in a multitude of ways, I disagree that better *instruction*, especially for disadvantaged social groups, is necessarily outside the scope of this critical role.

Thus, in many ways my research must draw on the teacher efficacy literature, but

there is a considerable degree of non-overlap as well. Bandura argues that "People regulate their level and distribution of effort in accordance with the effects they expect their actions to have. As a result, their behavior is better predicted from their beliefs than from the actual consequences of their actions" (1986, p. 129, as cited in Henson [2002, p. 138]).). This theory of action is consistent with why I think teachers' beliefs about students' social disadvantage may be important. However, I view the literatures on teachers' expectations, self-fulfilling prophecies, and racial stigma as all bearing on teachers' beliefs in the classroom.

Pajares (1992) summarizes and synthesizes a large literature on teachers' beliefs, and clarifies how beliefs relate to knowledge and other concepts that are relevant to cognition. Beliefs are a type of knowledge, in the sense that a teacher may "know" that Emily is a fast-learner. Information, constructs, schemata, and beliefs constitute a generic knowledge structure, "but the structure itself is an unreliable guide to the nature of reality because beliefs influence how individuals characterize phenomena, make sense of the world, and estimate covariation" (p. 310). Previous experiences "color comprehension" or "create intuitive screens" that shape the way individuals—not just teachers—process and filter new information. These screens are based in evaluation and judgment, rather than objective fact. Importantly, the way these intuitive screens cluster together allow racial attitudes and stereotypical understandings to bear on beliefs about teaching. Pajares explains that attitudes are formed around constellations of beliefs, and

> clusters of beliefs around a particular object or situation form attitudes that become action agendas. Beliefs within attitudes have connections to one another and to other beliefs in other attitudes, so that a teacher's attitude about a particular educational issue may include beliefs connected to attitudes about the nature of society, the community, race, and even family (p. 319).

I contend that the belief items I use in this dissertation, while representing attitudes about an educational issue—teachers' influence on student achievement—are implicitly connected to attitudes about society, class, and race. Although the items' lack of context specificity may be a deficiency in the current trend of teacher efficacy research, their generality seems like an advantage in considering teachers' attitudes about the transformational role of teachers and schools. Even if these items are in the process of being abandoned by teacher efficacy researchers, or perhaps have already been abandoned, I see them as representing something that has not yet been addressed.

NOTES

[19] The piece most frequently cited to suggest that Gibson and Dembo (1984) were drawing on Ashton and Webb's model is a 1982 AERA paper presentation. Guskey and Passaro (1984) give the impression that Gibson and Dembo were building on Ashton and Webb's work and explicitly measuring the two dimensions in their model. However, Gibson and Dembo themselves say very little about Ashton and Webb as a strong influence, and merely note that their own findings "clearly conform to Bandura's conceptualization of self-efficacy and support Ashton and Webb's (1982) model of teacher efficacy" (p. 574).

[20] Neither of the items similar to ones I use were retained in Deemer and Minke's (1999) analysis (neither had significant loadings on the factor). However, their altered wordings of the items similar to mine read awkwardly to me (although Deemer and Minke argue that their analysis suggests there was clarity across items that were worded positively versus negatively.) See Table 1 for more detail on item wording.

[21] Although I agree that item wording may be a potential confounder and that Deemer and Minke's (1999) findings are illuminating, I am hesitant to conclude that no external factor exists based on one factor analysis of the responses of 196 teachers.

[22] They state, "The major influences on efficacy beliefs are assumed to be the attributional analysis and interpretation of the four sources of information about efficacy described by Bandura (1986, 1997)" (Tschannen-Moran et al. 1998, p. 227), which are enactive mastery experience, vicarious experience, verbal persuasion, and physiological and affective states. Although I can elaborate on these influences more if it would make the memo clearer, for now, I do not explain them in depth because they are mainly

relevant to the newest thread of teacher efficacy research, which, as we will see, I argue is broadly inconsistent with (and in some ways dismissive of) my interests.

[23] A sample item may give some indication of the level of context-specificity the scale accomplishes. One item reads, "How much can you assist families in helping their children do well in school?" (see Tschannen-Moran and Woolfolk Hoy, p. 800). This is the only item—at least from the original OSTES presentation—referencing the family. My understanding is that Tschannen-Moran and colleagues theorize that when teachers analyze the teaching task, they take into consideration the resources that they have at hand and the constraints that they expect to act on the completion of the task. This consideration of resources and constraints is what makes the analysis of the teaching task similar to GTE.

[24] The citations Denzine et al. include are for attributional theories. Although social cognitive theory distinguishes "control" from efficacy, Denzine et al. are the only authors I have encountered who suggest that social cognitive theory identifies "locus-of-causality" beliefs—or anything of that sort—and relates them to its other concepts.

Table A1. Item Wording in Studies Using Similar Measures of Teachers' Beliefs

Authors	Measurement Aim	General Efficacy/External Influences Items
RAND (e.g. McLaughlin & Marsh 1978)	2 items combined to measure teachers' "sense of efficacy."	* "When it comes down to it, a teacher really can't do much because most of a student's motivation and performance depends on his or her home environment."
Gibson & Dembo (1984)	16 item instrument called the Teacher Efficacy Scale (TES). Measures two factors: Personal Teaching Efficacy (PTE – 9 items) and Teaching Efficacy (TE – 7 items; later to be known as General Teaching Efficacy, or GTE).	* "A teacher is very limited in what he/she can achieve because a student's home environment is a large influence on his/her achievement." "If students are not disciplined at home, they aren't likely to accept any discipline." "The hours in my class have little influence on students compared to the influence of their home environment." * "The amount that a student can learn is primarily related to family background." "The influences of a student's home experiences can be overcome by good teaching." "If parents would do more with their children, I could do more." "Even a teacher with good teaching abilities may not reach many students."
Hoy & Woolfolk (1993)	10 item instrument considered a short form of the TES. Measures two factors: PTE (5 items) and GTE (5 items).	* "The amount a student can learn is primarily related to family background." * "A teacher is very limited in what he or she can achieve because a student's home environment is a large influence on his or her achievement." * "When it comes right down to it, a teacher really can't do much because most of a student's home environment is a large influence on his or her achievement." [*Sic*?] "If students are not disciplined at home, they aren't likely to accept any discipline." "If parents would do more for their children, I could do more."
Guskey & Passaro (1994)	21 items similar to Gibson & Dembo's but with altered referents ("I" vs. "teachers") + items originally used by RAND. Measures two factors: External (11 items) and Internal (10 items). Italics indicate items with wording altered from previous scales.	* "*I am* very limited in what *I* can achieve because a student's home environment is a large influence on his/her achievement." * "When it comes right down to it, a teacher really can't do much because most of a student's motivation and performance depends on his/her home environment." "Teachers are not a very powerful influence on student achievement when all factors are considered." "If students aren't disciplined at home, they aren't likely to accept any discipline." * "The amount a student can learn is primarily related to family background." "The hours in my class have little influence on students compared to the influence of their home environment." "I have *not been* trained to deal with *many of the* learning problems *my students have*." "When a student is having difficulty with an assignment, I *often have trouble* adjusting it to his/her level." "If parents would do more for their children, *teachers* could do more." "Even a teacher with good teaching abilities may not reach many students." "My teacher training program and/or experience *did not*

		give me the necessary skills to be an effective teacher."
Deemer & Minke (1999)	Two forms of 17 items each, similar to those from Gibson & Dembo and Guskey & Passaro, but with altered wordings to emphasize a positive vs. negative structure, and all with first-person referent. Each form contains 4 original general-external and 4 revised general-external items. (Revised items in parentheses.)	"The time spent in my class has little influence on students compared to the influence of their home environment." ("The time spent in my class has a big influence on students compared to the influence of their home environment.") * "The amount that a student can learn is related primarily to family background." ("The amount that a student can learn is not related primarily to family background.") "If students have little discipline at home, they are unlikely to accept any discipline." ("I can discipline students effectively even if they aren't disciplined at home.") * "I am very limited in what I can achieve because a student's home environment is a large influence on his/her achievement." ("Even though a student's home environment is a large influence on his/her achievement, I am not limited in what I can achieve with him/her.") "If parents would do more with their children, I could do more." ("If parents would do more with their children, it would not really help me do more.") "The influences of a student's home experiences can be overcome by my teaching." ("The influence of a student's home experience cannot be overcome by my teaching.") "Even a teacher with good teaching abilities may not reach many students." ("A teacher with good teaching abilities is able to reach almost all students.") "I am a very powerful influence on student achievement when all factors are considered." ("I am not a very powerful influence on student achievement when all factors are considered.")
Henson et al. (2002)	Principal components factor analysis of the TES. GTE items with significant factor loadings termed the External Attributions (or external locus of control) subscale.	"The hours in my class will have little influence on students compared to the influence of their home environment." * "The amount that a student can learn is related primarily to family background." "If students aren't disciplined at home, they aren't likely to accept any discipline." * "A teacher is very limited in what he/she can achieve because a student's home environment is a large influence on his/her achievements." "If parents would do more with their children, I could do more." * "When it comes down to it, a teacher really can't do much because most of a student's motivation and performance depends on his/her home environment."
Denzine et al. (2005)	Confirmatory factor analysis of a 3 factor solution to the TES, with factors of 1) Self-Efficacy	* "The amount a student can learn is primarily related to family background." * "A teacher is very limited in what he/she can achieve because a student's home environment is a large

	Beliefs, 2) Outcome Expectations, and 3) Locus of Causality. 4 GTE items retained and termed "external locus-of-causality beliefs"(E-LOC).	influence on his/her achievement." "Teachers are not a very powerful influence on student achievement when all factors are considered." * "When it comes right down to it, a teacher really can't do much because most of a student's motivation and performance depends on their home environment."

Note: Items marked with a * are either identical to or slightly re-worded versions of the teachers' beliefs items I use from HSLS:09. Typically, re-wordings are between versions that refer to, "I," "you," "a teacher," or "teachers."

Table A2. Teachers' Beliefs Items in HSLS:09 and Alternative Conceptualizations in Previous Studies

Teacher Efficacy Variables in HSLS:09*		Factor Tested or Identified in Previous Work					
Variable Label	Item Statement	Gibson & Dembo	Hoy & Woolfolk	Guskey & Passaro	Deemer & Minke	Henson et al.	Denzine et al.
T1FAMILY	"The amount a student can learn is primarily related to family background."	TE	GTE	External	GTE	EA (E-LOC)	E-LOC
T1STUACHIEVE	"You are very limited in what you can achieve because a student's home environment is a large influence on their achievement."	TE	GTE	External	GTE	EA (E-LOC)	E-LOC
T1HOMEFX	"When it comes right down to it, you really can not do much because most of a student's motivation and performance depends on their home environment."	—	GTE	External	—	EA (E-LOC)	E-LOC
T1DISCIPLINE	"If students are not disciplined at home, they are not likely to accept any discipline at school."	TE	GTE	External	GTE	EA (E-LOC)	Omitted
T1PARENT	"If parents would do more for their children, you could do more for your students."	TE	GTE	External	GTE	EA (E-LOC)	Omitted
T1RETAIN	"If a student did not remember information you gave in a previous lesson, you would know how to increase their retention in the next lesson."	PTE	PTE	Internal	PTE	—	SEB
T1REDIRECT	"If a student in your class becomes disruptive and noisy, you feel assured that you know some techniques to redirect them quickly."	PTE	PTE	Internal	PTE	PTE	SEB
T1GETTHRU	"If you really try hard, you can get through to even the most difficult or unmotivated students."	PTE	PTE	Internal	—	PTE	Omitted

* HSLS:09 combines these 8 variables into a scale that the study terms, "Scale of math (science) teacher's self-efficacy." My work uses the first 3. The variable labels listed are for generic teacher data. The variable labels HSLS:09 provides are identical, but begin with "M" for math teacher data and with "N" for science teacher data.

Note: PTE = Personal Teaching Efficacy, TE = Teaching Efficacy, GTE = General Teaching Efficacy, EA = External Attributions, E-LOC = External Locus-of-Causality, SEB = Self-Efficacy Beliefs, — = not considered, Omitted = considered, but eliminated from analysis for theoretical or methodological reasons.

APPENDIX B

Construction of Teacher Data

HSLS:09 surveyed the math and science teachers of sampled ninth graders. Due to this sampling strategy, HSLS:09 does not provide teacher-identified datasets that exclusively include teacher data. Instead, teachers' survey responses are provided as variables on the student data records. These teacher responses include variables representing teachers' self-reports about their own characteristics, background, and attitudes, as well as variables representing the teachers' assessments about the class attended by each sampled student that the teacher taught. All of these variables appear as "student data," but they are drawn from the teacher surveys.

Sample students can have data from two teachers if they were enrolled in both math and science, one teacher if they were enrolled in only math or only science, or no teachers if they weren't enrolled in either course. The teacher data available for an individual student is also limited in some cases if HSLS:09 could not make an accurate link between the students' math or science course and the teacher that should have been surveyed at the time of the first wave of data collection. Because schools vary in how many math (or science) courses are offered to ninth graders, some schools have only a few teachers in the data, while other schools have several.

In order to analyze data at the teacher level and facilitate nesting students within teachers/classrooms for multilevel analyses, it was necessary to construct data files that are identified by teachers, rather than by students. In addition, because any individual

student could have two teachers surveyed, it was necessary to create separate data files for math and science teachers. To do this, students were nested within schools and their values on all math teacher variables that are specific to the teacher herself were retained. (Variables that represent her assessment of the class were not, as they might vary across students if the teacher taught more than one sampled student). These teacher-specific variables include 137 measures such as teacher sex and race, years of experience teaching and certification type, evaluation of whether certain issues were problems for the school, and college major, to name just a few. These variables all represent self-reports by the teacher, and some values are even coded verbatim as string values (such as college major). Values on these teacher variables were then compared across the "student" dataset, and if *all* 137 values matched across records, including the school identifier, the records were confidently considered to represent the same unique teacher. These teachers were then assigned an identifier that can be linked back to the student record, and student identifiers were dropped. The data were then collapsed to contain only one record of data per math teacher and each row of data was assigned a unique teacher identifier.

This procedure was then repeated to construct a separate data file of science teacher data, with identifiers that do not overlap with the math teacher identifiers. Within the separate math teacher and science teacher datasets, an indicator was created to mark which subject the teacher taught. Lastly, the two datasets were combined to produce one datafile containing all of the teachers surveyed for HSLS:09.

APPENDIX C

Deriving Teacher-Level Weights in HSLS:09

Just as HSLS:09 did not provide teacher questionnaire responses as teacher-level data (see Appendix B), no teacher-level weights are included with the NCES-release data. HSLS:09 did not sample teachers from a sampling frame of math and science teachers. Rather, in order to gain substantial overlap between students sampled and teachers interviewed, teachers were selected based on being the math or science teacher of a ninth grader that was selected in the random sample of students. In this respect, HSLS:09 teachers represent a quasi-random sample of the math and science teachers experienced by ninth graders in the 2009 to 2010 school year. This provides a justification for deriving survey weights for the teachers, which is important for making inferences not just to the population of students experienced by these teachers, but to the population of teachers that students nationally experience. The quasi-random manner in which teachers were selected ensures that the probability of observing a teacher (i.e. the head of a particular class) is a function of the probability of sampling and observing the *b* students in that teacher's class.

Specifically, the probability of observing the teacher, *j*, is equal to the probability of observing at least one of the students, *i*, in that teacher's class. The probability of observing at least one of a teacher's students is logically equivalent to 1 minus the probability of observing none of that teacher's students. Thus, the probability of observing the teacher can be represented as:

$$Prob(observed)_j = Prob(\bigcup_{i=1}^{b} observed)_i = 1 - Prob(\bigcap_{i=1}^{b} (not\ observed)_i)$$

Similarly, the probability of not observing an individual student, *i*, is equivalent to 1 minus *Prob(observed)*$_i$. Furthermore, we know that conditional on the school having been selected, HSLS:09 sampled individual students at that school independently. In general, when two events are independent, the joint probability of their occurrence is equal to the product of their two probabilities—that is, P(A and B) = P(A)*P(B). This rule allows the intersection in the equation above to be represented as a product, as follows:

$$Prob(observed)_j = 1 - \prod_{i=1}^{b} (Prob(not\ observed)_i)$$
$$= 1 - \prod_{i=1}^{b} (1 - Prob(observed)_i)$$

This equation represents the teacher's probability of selection in a way that can be calculated based on available data regarding student probabilities of selection.

The creation of weights for the math and science teachers in HSLS:09 began with the mathematics course enrollee weight (W1MATHTCH) and science course enrollee weight (W1SCITCH) that HSLS:09 provides for individual students. These student-level weights include adjustments for nonresponse on the part of schools, students, and course-specific teachers, and are only non-missing and non-zero if a sampled student was enrolled in a math/science course (respectively) and was not considered questionnaire-incapable by HSLS:09 (see Chapters 3 and 6, HSLS:09 Base-Year Data File Documentation). Teacher weights were created separately for math and science teachers, utilizing only the course-specific weight for math or science.

In deriving teacher-level weights from these student-level weights, it is assumed that

$$W_{student*course,i} \cong \frac{1}{Prob(observed)_i}$$

That is, $W_{student*course,i}$, which is either W1MATHTCH or W1SCITCH, is approximately equal to the inverse of the probability that the student, *i*, is sampled and observed. Under this assumption, the probability of observing the teacher, *j*, can be re-written as:

$$Prob(observed)_j = 1 - \prod_{i=1}^{b}(1 - \frac{1}{W_{student*course,i}})$$

Using this formula, teacher probabilities were calculated by (1) calculating the individual student probabilities as the reciprocal of the individual student*course weight, (2) taking the complement of the student probability, (3) multiplying all of these complements together within-teacher, and (4) taking the complement of that total. Finally, the teacher weight, W_j, is calculated as the inverse of the probability of observing the teacher. That is,

$$W_j = (Prob(observed)_j)^{-1} = \frac{1}{1 - \prod_{i=1}^{b}(1 - Prob(observed)_i)}$$

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