THE HAMILTON PROJECT

POLICY PROPOSAL 2017-05 | APRIL 2017

Understanding and Addressing Teacher Shortages in the United States

Thomas S. Dee and Dan Goldhaber

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We believe that today's increasingly competitive global economy demands public policy ideas commensurate with the challenges of the 21st Century. The Project's economic strategy reflects a judgment that long-term prosperity is best achieved by fostering economic growth and broad participation in that growth, by enhancing individual economic security, and by embracing a role for effective government in making needed public investments.

Our strategy calls for combining public investment, a secure social safety net, and fiscal discipline. In that framework, the Project puts forward innovative proposals from leading economic thinkers — based on credible evidence and experience, not ideology or doctrine — to introduce new and effective policy options into the national debate.

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APRIL 2017

This policy proposal is a proposal from the authors. As emphasized in The Hamilton Project's original strategy paper, the Project was designed in part to provide a forum for leading thinkers across the nation to put forward innovative and potentially important economic policy ideas that share the Project's broad goals of promoting economic growth, broad-based participation in growth, and economic security. The author(s) are invited to express their own ideas in policy papers, whether or not the Project's staff or advisory council agrees with the specific proposals. This policy paper is offered in that spirit.

BROOKINGS

Abstract

While anecdotal accounts of substantial teacher shortages are increasingly common, we present evidence that such shortages are not a general phenomenon but rather are highly concentrated by subject (e.g., mathematics, science, and special education) and in schools (e.g., those serving disadvantaged students) where hiring and retaining teachers are chronic problems. We discuss several promising, complementary approaches for addressing teacher shortages.

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Chapter 1. Introduction

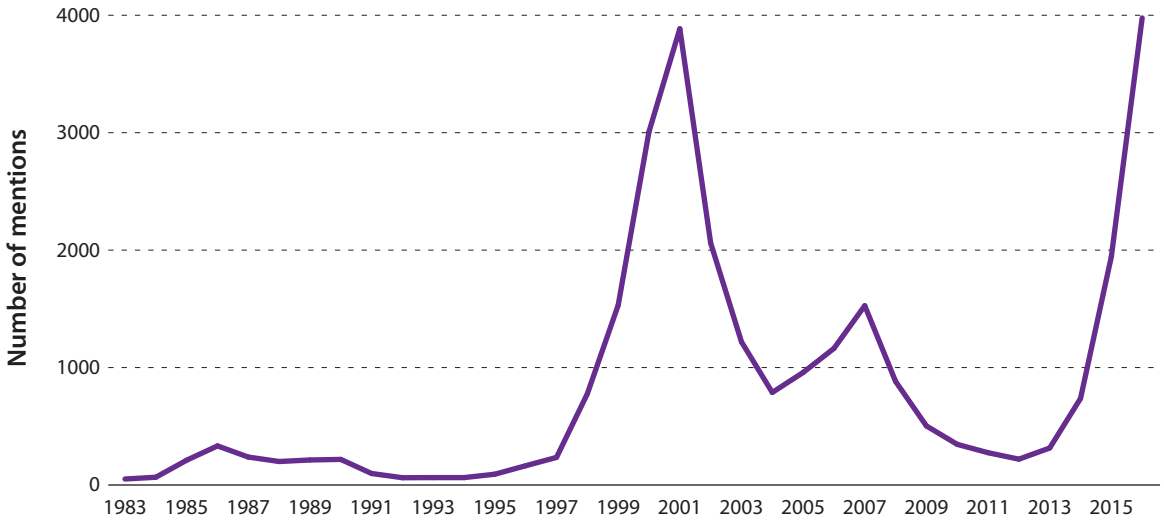
At the beginning of the 2016–17 school year, the Clark County School District in Nevada (the nation's fifth-largest district, serving more than 300,000 students) had nearly 1,000 classroom teacher vacancies (Rebora 2016). By December 2016, more than 700 of these teaching positions remained open while the district relied on unlicensed and substitute teachers to fill gaps. Such accounts of school districts having extraordinary difficulties hiring teachers have proliferated recently. For example, Motoko Rich (2015) wrote in the *New York Times*, "Across the country, districts are struggling with shortages of teachers . . . [as] a result of the layoffs of the recession years combined with an improving economy in which fewer people are training to be teachers."

To place the current news coverage of teacher shortages in some historical context, we gathered time-series data on coverage of teacher shortages for a period spanning more than three decades. We plot the annual counts of the news mentions of "teacher shortages" in figure 1. An astute eye will note that the mentions of teacher shortages follow a cyclical pattern, with sharp increases during periods of economic expansion and tightening labor markets and decreases during economic downturns when the labor market is more slack. Yet it is also notable that the increase during the past few years of economic expansion is still quite unusual, resembling that of 2001, and underscoring the significant attention this topic has received recently.

In this policy proposal we discuss evidence on the character and determinants of these shortages, and find that challenges in hiring teachers are indeed becoming more acute. But we also stress that these challenges appear to be concentrated in specific high-need subjects such as special education and STEM (i.e., science, technology, engineering, and mathematics) and in hard-to-staff schools (e.g., schools serving student populations with concentrated poverty). The distinction between these areas of acute challenge and the more generic public discussion about "teacher shortages" is important for two reasons. First, policy efforts that are not targeted toward where those shortages

FIGURE 1.

Mentions of "Teacher Shortage" in U.S. News Coverage, 1983–2015



Source: Authors' calculations based on data from NewsBank.

actually exist are likely to be unnecessarily costly and relatively ineffectual. Second, the challenges of recruiting teachers in hard-to-staff schools and subjects are longstanding, indicating that existing policies and practices have failed to address them.

Given the challenges just described, we make explicit proposals for practitioners and policy makers at the local and state levels. These proposals embody a variety of complementary strategies that have promise with respect to attenuating these hiring challenges and supporting efforts to better connect the production of teachers with labor market needs and hence build a stable and effective teacher workforce. We suggest the following specific actions that could help address these challenges:

1. K–12 school districts should
    - Provide financial incentives targeted narrowly to teachers in high-need subjects and hard-to-staff schools;
    - Implement improvements in district hiring practices, with an emphasis on early hiring and aggressive recruitment; and
    - Provide labor market signals about district needs by varying the number of student teaching slots according to anticipated future hiring.
2. State regulatory authorities should
    - Increase flexibility with respect to alternative pathways into the teaching profession though the use of alternative licensure in high-need areas;
    - Coordinate with one another so as to create meaningful licensure reciprocity across states; and
    - Provide teacher candidates with information on the varied job prospects in particular teaching fields.

We conclude by summarizing this evidence and our recommendations and by discussing some of the practical impediments to addressing hiring challenges in an effective manner.

Chapter 2. The Challenge

The many recent anecdotes about the challenges some school districts face in hiring teachers are startling. However, a systematic examination of the nature of teacher shortages suggests that teacher shortages are concentrated among certain types of schools, and for teachers of particular subjects. Understanding the scope for effective and appropriately targeted policy solutions to these challenges requires understanding key institutional details and the evidence from research on teacher labor markets.

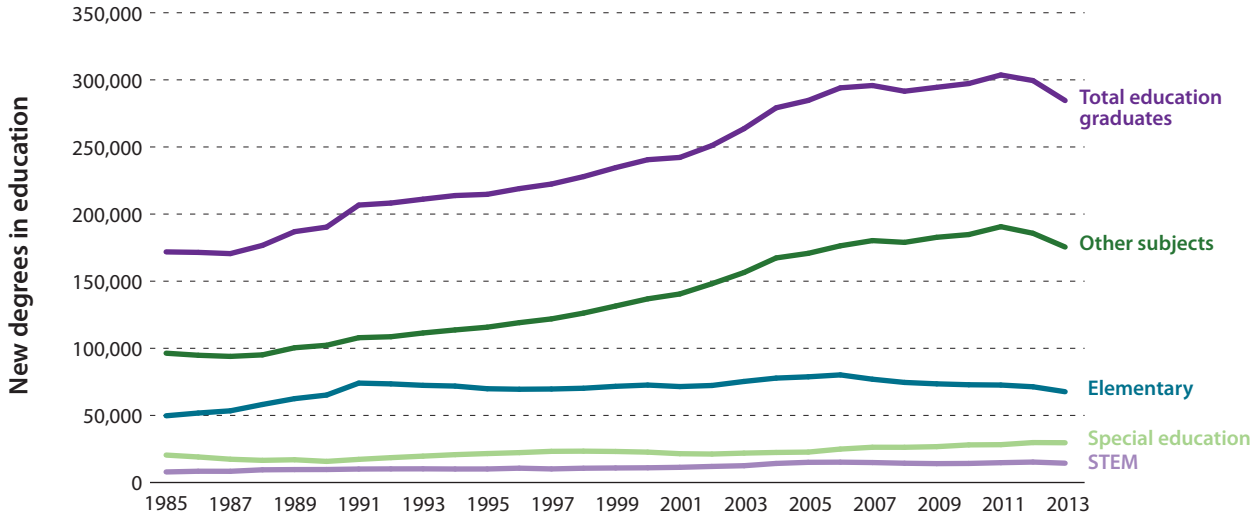
EVIDENCE ON TEACHER SHORTAGES

Interpreting the evidence related to teacher shortages is not entirely straightforward. Labor shortages do not have a particularly precise theoretical or practical definition in markets where salaries and task characteristics (e.g., technology, class sizes) can be varied. Nonetheless, the federal government does provide guidance with its official designation of "teacher shortage areas" (Cross 2016). This designation can be specific to grades or subject areas within a state, or to specific geographic areas (i.e., to specific districts or schools). Teachers serving in a designated teacher shortage area become eligible to receive certain program benefits, including cancellation of Perkins Loans and fulfillment of obligations under Teacher Education Assistance for College and Higher Education (TEACH) grants (Federal Student Aid 2017). Federal guidance on teacher shortage areas emphasizes counts of teaching positions under three categories: (1) positions that are unfilled; (2) positions filled by teachers who have irregular, provisional, temporary, or emergency certification; and (3) positions filled by certified teachers who are teaching academic subjects outside their area of preparation.

There is not strong evidence for broad difficulties in filling teaching positions. For example, despite a modest uptick in recent years, pupil-teacher ratios in the U.S. have long declined (this trend is predicted to continue). Similarly, Cowan et al. (2016) show that, although there is a modest recent decline in education graduates, the longer-term trend is one of increasing labor supply (figure 2). Cowan et

FIGURE 2.

Annual Education Graduates, 1985–2013



Source: Cowan et al. 2016.

TABLE 1.

Emergency Teaching Permits/Waivers in California, School Years 2011–15

		Permits/Waivers in Selected Subject Areas	
School Year	Total Permits/Waivers	Special Education	STEM
2011-12	2,266	902	454
2012-13	2,162	840	400
2013-14	3,073	1,435	472
2014-15	4,397	1,627	722
2015-16	6,261	2,165	918

Sources: California Commission on Teacher Credentialing 2016; California Department of Education n.d.

Note: The permit/waiver counts refer to temporary credentials and limited-assignment permits designed to meet staffing needs. The subject areas included as special education are deaf/hard of hearing, mild to severe disabilities, early childhood special education, and physical and visual impairments. The subject areas included as STEM are biology, chemistry, physics, mathematics, geoscience, and industrial/technology education.

al. (2016) also show that the number of education graduates produced annually far exceeds the number of teachers new to the labor market who are hired, implying a robust backstop to increases in teacher demand. Finally, a recently released report from the U.S. Department of Education (Rahman et al. 2017) suggests that changes in the fraction of teachers with conventional licensure have been modest nationwide. Using National Assessment of Educational Progress data, Rahman et al. report that the percentage of eighth graders taught by a state-certified math teacher fell from 92 percent in school year 2012–13 to 90 percent in school year 2014–15.

But while the above evidence suggests that strong claims about national teacher shortages might not be justified, it is possible that the currently available national data are not sufficiently recent to capture the increase in teacher shortages reflected in current news coverage (figure 1). Fortunately, state data sources can provide more-recent information. For example, in a widely discussed report, Sutcher, Darling-Hammond, and Carver-Thomas (2016) state that California is experiencing severe shortages with sharp growth in substandard credentials, which now comprise a third of all teaching credentials issued in 2015. In table 1 we use information from the California Commission on Teacher Credentialing to examine this issue.

Potential teachers in California who do not meet the training and subject-matter competency requirements contained in state licensure rules can nonetheless receive a permit or waiver to teach a particular course for one year if there are "immediate and acute" staffing needs. Similarly, credentialed teachers can receive a "limited assignment teaching permit" to teach out of their area when there is a staffing vacancy or need. In table 1 we show the number of these permits and waivers over each of the past five school years. The use of these emergency teaching credentials grew dramatically beginning in the 2013–14 school year. By school year 2015–16, the number of these "substandard" credentials issued by the state had nearly tripled. Though the number of such credentials issued in school year 2015–16 reflects conspicuous growth, the level is small relative to the nearly 300,000 public school teachers in the state.

THE DIFFERENTIATED NATURE OF TEACHER SHORTAGES

The recent data from California are consistent with some districts facing challenges in hiring conventionally licensed teachers within the current set of policies and practices. Examining time-series data from other states, we sometimes observed similar trends. For example, in New York, over the five-year period ending in school year 2015–16, the number of teachers lacking certification in their subject roughly tripled. However, in other states we examined (e.g., Missouri), we did not find similar trends. And states vary considerably in their fractions of teacher assignments with conventional credentials. In the 2015 National Assessment of Educational Progress data, the percent of eighth graders with a state-certified mathematics teacher varies from 61 percent in Ohio to 99 percent in Nebraska (Rahman et al. 2017, Table A31).

Both an older empirical literature and recent anecdotal accounts (e.g., Ingersoll 2003; Will 2016) have noted differences in teacher shortages across states and communities. In particular, this literature indicates that teacher shortages are typically concentrated in schools serving economically disadvantaged students, in rural schools, and in schools serving a larger concentration of minority students. For example, in school year 2015–16 school-level data from New York, we find that the share of classes with a teacher lacking conventional certification is 6.5 percent. However, in schools with few to no black students, the rate is 2.5 percent, and in schools with the highest concentrations of black students, the rate is 13.2 percent.

In order to provide more systematic evidence on the patterns in these recent school-level data, we examined how the share of classes with a teacher lacking conventional licenses is predicted by the share of students eligible for the National School Lunch Program (NSLP), the share of students who are black, and the share who are Hispanic. We also controlled for the location of the school—city, rural, or town—with suburban schools as the reference group.

Our results, which are available upon request, are consistent with the previous research. Higher concentrations of economically disadvantaged students, black students, and Hispanic students are associated with a significantly higher share of classes taught by teachers without conventional licensure. For example, our estimates indicate that a 50 percentage point increase in the share of students who are black implies an increase of 3.4 percentage points in the share of classes taught by teachers without licenses, holding constant the school location and the share of students in the NSLP program.

The differences associated with a school's location are also quite stark. Relative to suburban schools, the share of classes in urban schools taught by teachers lacking conventional licensure is 8 percentage points higher, holding constant the school's racial mix and the share of students in the NSLP program. Rural schools and, to a lesser extent, schools in towns, are also more likely to employ teachers lacking conventional licensure.

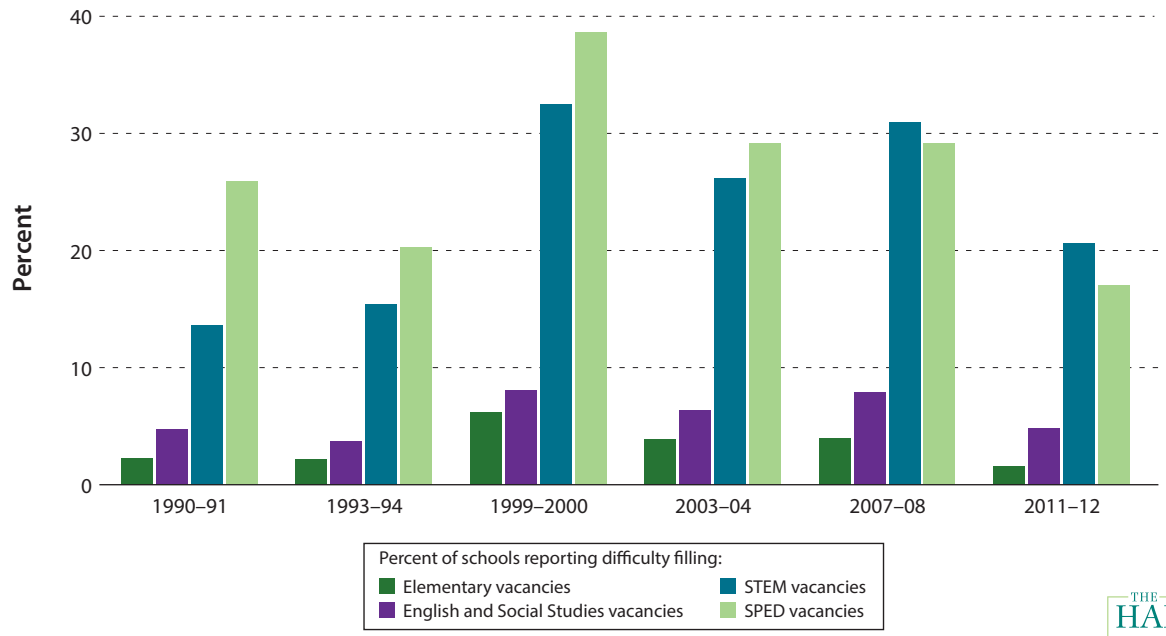
Another well-documented and noticeable feature of teacher shortage measures that focus on the prevalence of teachers without conventional credentials is how they are particularly prominent in hard-to-staff subjects such as STEM and special education (e.g., Marder 2016). We see clear evidence for this in the recent data for California (table 1) where emergency permits and waivers for special education and STEM teachers constituted nearly 50 percent of the total in school year 2015–16.

Figure 3, drawing from national data analyzed by Cowan et al. (2016), shows that schools are substantially more likely to report hiring difficulties in special education and STEM fields while reporting little difficulty in hiring elementary school, English, and social studies teachers. The difficulty in hiring teachers of all kinds was most pronounced in school year 1999–2000, consistent with the earlier finding that newspaper stories about teacher shortages are much more likely to arise during periods of robust economic activity and tight labor markets.

Notably, however, these cyclical changes in the reported difficulty of staffing schools tend to be smaller than the differences in the difficulty of staffing across subjects. For instance, the percentage of schools reporting challenges with hiring STEM and special education teachers during periods when the overall challenge of staffing is low (school year 1993–94) far exceeds the challenge of hiring for elementary education vacancies during a period where the overall challenge of staffing is high (school year 1999–2000).

FIGURE 3.

Percentage of Difficult-to-Fill Teacher Vacancies, Select School Years



Source: Cowan et al. 2016.
Note: SPED = special education.

LICENSURE AND TEACHER EFFECTIVENESS

The rhetoric around teacher shortages often makes an implicit assumption that the possession of the conventional state licensure for teaching a subject is associated with a higher level of teacher preparedness. However, the literature on the links between state certifications and teacher effectiveness is more nuanced (Boyd et al. 2007), and relatively little is known about how licensure requirements affect the supply of high-quality teachers or which teacher candidates would be hired under licensure policies (Goldhaber 2010).

The link between licensure and teacher impact is better understood. Goldhaber and Brewer (2000) find that there is no observable effect on math or science achievement of having a teacher with emergency or probationary certification. By contrast, there is some recent evidence that assignment to a teacher with subject certification improves student outcomes. Dee and Cohodes (2008), using within-student comparisons across subjects, find that a subject-certified teacher appears to improve student achievement by 0.05 standard deviations. Using a similar research design and data from North Carolina, Clotfelter, Ladd, and Vigdor (2010a) also find that a teacher with subject certification improves student achievement. All three studies also find that the benefits of a subject-certified teacher are concentrated in mathematics but that certification in science appears to be unrelated to teacher effectiveness.[1] The particular relevance of teacher certification in mathematics is notable, given the unique challenges some districts face in hiring conventionally credentialed STEM teachers. However, the lack of consistent evidence for the relevance of other teacher certifications implies that caution should be observed when equating conventional certification with teacher effectiveness.

TEACHERS RESPOND TO COMPENSATION BUT RETENTION EFFECTS ARE LARGER THAN RECRUITMENT EFFECTS

Compensation is a natural factor to consider in addressing local and subject-specific teacher shortages. Research clearly shows that teacher mobility is influenced by salary (e.g., Clotfelter, Ladd, and Vigdor 2010b; Feng 2009; Hanushek et al. 2005). However, much of this evidence finds a relatively low level of teacher responsiveness to salary, suggesting it might be necessary to offer quite large monetary incentives to induce teachers to take positions in hard-to-staff schools and in subjects where shortages are concentrated. Hence there is disagreement in both the research and policy arenas about whether differentiated compensation—higher in places and subjects where teachers are scarce—is a useful strategy for addressing staffing issues (Barnum 2016). On the other hand, most of the research on differentiated compensation is based on variation in teacher salaries across districts, and there are only a few high-quality studies that investigate the

BOX 1.

Evidence on Teacher Responsiveness to Monetary Incentives

The Talent Transfer Initiative, an experiment that offered payments to teachers totaling $20,000 over two years, was designed to encourage highly effective teachers to move from advantaged schools to less-advantaged schools (Glazerman et al. 2013). The take-up rate for this program was quite low, with only 5 percent of teachers accepting the offers, but the majority of teachers who did transfer to high-poverty schools remained in them while they received the extra compensation (Glazerman et al. 2013).

Several other high-quality studies focus on the benefits of programs designed to improve the retention of specific kinds of teachers in schools serving disadvantaged students. Clotfelter et al. (2008) analyze a short-lived North Carolina program that provided a $1,800 bonus to math, science, and special education teachers serving in high-poverty or low-achieving schools. They estimate that this bonus reduced teacher turnover from 30 to 25 percent. Cowan and Goldhaber (2015) find similar retention effects in an investigation of a program in Washington that pays teachers who hold a National Board for Professional Teaching Standards (NBPTS) credential a $5,000 supplement for teaching in a high-poverty school, on top of $5,000 for being NBPTS certified. The observed reduction in attrition implied an elasticity of about 4.3, similar to the estimate in Clotfelter et al. (2008).

Springer, Swain, and Rodriguez (2016) assess a program in Tennessee that paid a $5,000 bonus to highly rated teachers in low-achieving schools. They find that receipt of the bonus improved retention among teachers in tested grades and subjects, with effect sizes similar to those in the previously discussed studies. They also compare the costs of the Tennessee retention bonus to other widely used interventions such as summer school and reductions in class size, concluding that the Tennessee bonus appears to be a relatively cost-effective way to increase student achievement. A study by Falch (2010) examines the effect of a wage premium paid in Norwegian schools with chronic labor shortages, finding an implied labor supply elasticity of 1.4 in response to this school-targeted pay increase. Importantly, this estimate reflects both the retention of current teachers and success in recruiting new hires, by contrast to previous, higher estimates reflecting only effects on retention.

responsiveness of teachers to incentives specifically targeted toward hard-to-staff subject areas or schools.

The evidence that does exist—described in box 1—tends to suggest that the cost associated with inducing teachers to move from one school to another is far greater than the cost associated with preventing teachers from making a move out of a current position.[2] One study finds an implied labor supply elasticity of 1.4—that is, a 1 percent rise in the wage increased employment by 1.4 percent—while studies that focus specifically on teacher retention find larger elasticities.

TEACHER LABOR MARKETS ARE LOCAL

The local, segmented nature of teacher labor markets is important to consider when addressing shortages. For example, several studies have found that both the location of student-teaching assignments and proximity to where a teacher grew up exert powerful influences on a school's capacity to recruit and retain (Boyd et al. 2004; Goldhaber, Krieg, and Theobald 2014; Krieg, Theobald, and Goldhaber 2016; Reininger 2012). This finding suggests that districts may have success with grow-your-own approaches to help address their teacher-workforce needs.

It is difficult to know the degree to which the localness of teacher labor markets reflects the preferences of prospective teachers or school system hiring officials, but there is some evidence that teacher labor markets are artificially constrained to be local and segmented because of state-specific licensing requirements, seniority rules, and the lack of portability for teachers' defined-benefit pensions. For instance, several studies find that the interstate mobility of teachers, even those residing near state borders, is substantially below levels that would be expected in light of considerable within-state mobility (Goldhaber et al. 2015; Kim et al. 2016; Podgursky et al. 2016). Goldhaber et al. (2015) examine the mobility of teachers in the Portland–Vancouver metropolitan statistical area that straddles the Oregon–Washington border. They find that teacher moves within a state are eight times more likely than teacher moves to a school in the other state. Similarly, using seven years of data from Wisconsin, Minnesota, and Iowa, Podgursky et al. (2016) find that 5 to 10 percent of the teacher workforce moved within their state on an annual basis. In contrast, the interstate mobility observed among these teachers was less than 0.1 percent. This lack of interstate mobility complicates efforts to address teacher shortages as surplus teacher labor in one subject area and state cannot easily be transferred to a different state with needs in that same area.

Chapter 3. The Proposals

In this section we propose several policies that will help increase the supply of teachers in places where shortages are a problem. Drawing on the relevant empirical evidence, we group the proposals into actions that could be taken by K–12 school districts and by state regulatory authorities.

There are two distinct issues when it comes to teacher shortages: (1) problems with staffing teachers with particular skills (particularly special education or STEM training), and (2) challenges that certain kinds of schools and districts—urban, rural, and those serving disadvantaged students—have in recruiting and retaining teachers. In discussing the initiatives below, we therefore highlight whether any specific initiative focuses on hard-to-staff subjects or the difficulties that disadvantaged schools face.

K–12 SCHOOL DISTRICTS

Increase the Use of Targeted Financial Incentives

The most direct way that school systems can address staffing issues is through compensation. Compensation-based incentives can be used to address both skill shortages and school shortages: it is conceptually straightforward to financially reward teachers in high-need subjects and in hard-to-staff schools. The evidence that monetary incentives affect retention is quite conclusive, suggesting that this is a sensible first step that policy makers should take to ameliorate both skill and school shortage staffing issues.

But recommendations to address teacher shortages through increased compensation often do not suggest targeting these incentives to the schools and subjects where shortages are particularly severe and chronic (Sutcher, Darling-Hammond, and Carver-Thomas 2016). We believe it is vital to stress the importance of targeting incentives. Adopting a broad and undifferentiated approach to compensation-based strategies for addressing staffing challenges is a mistake: it dramatically increases the costs of an already expensive reform without addressing what we have stressed remove is a targeted problem. To illustrate this point, consider the following illustrative calculations on the effects of targeted pay increases, informed by the relevant research.

Applying the labor supply elasticity estimated in Falch (2010), we calculate that if a targeted school increased the salaries of all its teachers—31.4 teachers per school, on average—by 2.3 percent, its teacher workforce would grow by one teacher. The cost of the school-wide salary increase that resulted in hiring this additional teacher would be approximately $40,000.[3] Overall, these results indicate that reducing teacher shortages through salary increases targeted at hard-to-staff schools is quite costly, though perhaps not prohibitively so for some states and districts. Stated differently, these estimates suggest that the annual cost of hiring and retaining a teacher through school-targeted salary increases is nearly twice that teacher's salary (including both the extra pay for existing teachers and the salary of the new teacher).

Another targeted approach focuses specifically on late-career retention incentives. Research on the effects of teacher pension rules suggests that such retention incentives would meaningfully affect teacher labor supply (Backes et al. 2016; Costrell and McGee 2010; Koedel, Podgursky, and Shi 2013).[4] Kim et al. (2016) simulate the effect of targeted retention bonuses for senior teachers rated as effective or those teaching in STEM fields. Their simulation shows that a one-year bonus of $5,000 would add about three teacher-years to the career of a STEM teacher and five to eight teacher-years to the career of a highly rated teacher. The cost of such a bonus program, at $30,000–$50,000 per additional teacher-year, is not small. However, the program would be cost-effective if it carefully targeted teachers with large positive impacts on student achievement.

Adopt Earlier, Aggressive Recruitment Practices

Local school districts are fundamental to the recruitment and selection of individuals into teaching, and they act as a second gateway (i.e., after state licensure) in determining which teacher candidates end up in the workforce. Their role in recruitment and selection is thus quite important. Research also suggests there are opportunities for school districts to be more strategic in their hiring processes. Indeed, there is mixed evidence about whether school districts generally hire the best applicants. Ballou (1996) and Hinrichs (2014) find relatively little evidence that teacher applicants with stronger academic credentials are more likely to get job offers or end

up in the teaching profession, whereas Boyd et al. (2013) focus on within-district transfers and do find evidence that transfer applicants with stronger academic backgrounds are more likely to be offered positions.[5] These mixed findings suggest that there is room for improvement in district hiring practices.

Moreover, while there is little systemic information about how school systems go about recruiting and selecting teachers, there is suggestive evidence that the school human-resource departments are generally not proactive and are often quite dysfunctional when it comes to teacher recruitment and selection (DeArmond, Shaw, and Wright 2009; Liu and Johnson 2006). In particular, there is evidence that late hiring is problematic for both student achievement and teacher retention. Papay and Kraft (2016), for instance, find that students in classrooms staffed by teachers who were hired after the beginning of the school year perform worse on math and reading tests, and that retention of late-hired teachers is substantially lower.[6] These findings are particularly relevant for addressing school shortages because late hiring was found to be much more prevalent among the schools serving disadvantaged students, the same schools that unsurprisingly face greater staffing challenges.

The idea that there are gains to be had from improved hiring practices is buttressed by the recent evidence discussed showing that, across the country, there are far more individuals pursuing a career in teaching than there are teaching jobs. Indeed, evidence suggests that over the past decade there are between 100,000–200,000 more individuals who graduate with a teaching degree each year than there are available teaching slots.[7] Of course, we do not know whether all those graduating with education degrees are ultimately willing to pursue teaching careers, but even if only a fraction wish to, it would suggest that there are upward of a million people in the labor market who at one point in the past decade wanted to teach (and had obtained a traditional teacher education degree) but did not find a teaching position. This suggests that there are ample opportunities for school systems to recruit individuals from other occupations and activities who already have the necessary credentials to teach.

This might require rethinking recruitment practices. Given the chronic teacher shortages concentrated in hard-to-staff schools and subjects, we believe school districts can and should do more to recruit broadly, aggressively, and in a targeted manner that reflects their particular needs. This could entail increased school district advertising and recruitment out of state, or the formation of partnerships between school districts and teacher education programs that cross state boundaries, such that there are channels to funnel teacher candidates out of states with excess teacher supply and into labor markets with excess teacher demand. There are also encouraging anecdotes about districts using technology to address teacher shortages in thoughtful ways that merit further replication and study. These include using data mining and analytics to guide early and effective recruiting (Flanigan 2016), as well as relying on social media (e.g., Twitter, Facebook, LinkedIn) to identify promising candidates (Wexler 2016).

Recruit Student Teachers Who Meet Anticipated Needs

The discussion thus far has tended to treat the issue of teacher supply as wholly outside the direct control of school districts. However, districts (alongside teacher education programs, or TEPs) have several potentially powerful means of influencing the supply of teachers. Licensure systems generally require that, before teacher candidates are eligible to participate in the labor market, they must complete a period of supervised student teaching. This requires close collaboration between TEPs and school districts. Both must agree to the assignment of student teachers and both are, to some degree, responsible for overseeing a teacher candidate's student teaching experiences.[8]

Policy makers and practitioners see student teaching as a key component of the teacher preparation process (Anderson and Stillman 2013) and there is growing evidence that the conditions under which student teaching occurs influences teacher effectiveness and retention.[9] Thus, over the long run, school districts play a vital role in the development of newly minted teachers. Attention to that developmental pipeline can help address teacher supply issues by influencing teacher hiring and retention.

Importantly, student teaching field placements are directly relevant to the real teacher shortage problems: the difficulties that particular districts and schools face with staffing as well as shortages in particular subject areas. In particular, the location of student teaching is quite influential for teacher labor supply. A study based on data from a sample of TEPs in Washington State (Krieg, Theobald, and Goldhaber 2016) finds that the location of a field placement is more predictive of a teacher candidate's first job location than is the location of the TEP she attended or her hometown. Forty percent of teachers from this sample got their first job teaching in the same district in which they taught as students, and more than 15 percent of teacher candidates were employed in the same school in which they student taught. Of course, this tendency partially reflects the choices of aspiring teachers who might prefer to student teach in a given location for the same reasons they prefer to obtain a first job in that location. However, the association could also be partially attributable to teacher candidates and schools finding good matches during the course of student teaching. If this is the case, districts struggling with staffing issues would likely benefit from hosting more student teachers.

School districts should also use student teaching slots as a means of addressing the mismatch in the supply and demand for teachers across different subject areas. Making

field placements available in subjects with anticipated future needs sends a strong signal about the likelihood of future employment to teachers in training. Field placements appear to be not just about educating teacher candidates, but also about giving school systems a first look at prospective hires, which offers districts the opportunity to help address teacher shortage issues through engagement with TEPs.

STATE REGULATORY AUTHORITIES

Modify Licensure Requirements in High-Need Areas

Access to the teacher labor market is determined by the rules of a state's teacher licensure (also commonly referred to as certification) system. These systems differ from state to state but usually require prospective teachers to pass one or more licensure tests; many states also require that prospective teachers graduate from an approved teacher training institution and obtain student teaching experience.[10] States are responsible for ensuring that new teachers meet minimum quality standards and licensure is the vehicle through which they attempt to accomplish this. Licensure supporters contend that such systems are necessary to place a lower bound on the knowledge and skills individuals have prior to becoming a teacher and having responsibilities over a vulnerable population. Some also argue that professionalizing teaching and making it a more exclusive career will help draw talent into the profession (Ripley 2014). However, apart from mathematics teaching, there is not consistent evidence that licensure is related to teacher effectiveness (Clotfelter, Ladd, and Vigdor 2010a; Dee and Cohodes 2008; Goldhaber and Brewer 2000).

One downside of these requirements is that they likely dissuade many individuals from entering the profession: mid-career professionals, for instance, might be unwilling to bear the cost of tuition expense or forgone earnings associated with completing formal pre-service training in approved TEPs. And, over the past two decades, there has been a sea change in the use of alternative routes into the profession as a source of teacher supply. In school year 2000–01, for instance, 25,615 teacher candidates were licensed after completing training through an alternative route, but by the turn of the decade the number of alternatively trained teacher candidates annually had grown to 48,736, an increase of more than 90 percent (U.S. Department of Education 2013).[11] There is also wide variation across states in how alternative routes are structured (e.g., the extent to which newly hired alternative-route teachers need to eventually satisfy all traditional licensure requirements), and in how much use states make of teachers with alternative credentials. Some states, including Texas and New Jersey, rely heavily on alternative programs as a source of teachers, whereas others, including Massachusetts and Oregon, make considerably less use of those programs (U.S. Department of Education 2013). Alternative programs are particularly likely to emphasize high-need fields like STEM and special education (U.S. Department of Education 2015).

It is difficult to know the extent to which alternative routes into the profession have added to the supply of potential teachers because we do not know whether some of the individuals who go through an alternative route program would otherwise have graduated from a traditional (college- and university-based) TEP. There is, however, some research suggesting that costs associated with satisfying licensure requirements act to reduce teacher supply. For instance, a study by Reback (2006) examines the effect of the number of years required to obtain a teaching license (i.e., whether it is possible for students to obtain a teaching credential through the undergraduate program in which they are enrolled or if they have to get a postgraduate credential to become eligible to teach). Reback's analysis is restricted to students who did not declare an interest in teaching while in high school in order to account for the likelihood that students pick their college in part based on the degree they intend to pursue. He finds that students graduating from highly selective colleges are very sensitive to entry costs related to whether their college offers an undergraduate teaching program leading to a teaching license, but graduates from less-selective colleges are not strongly influenced by the opportunity to get an undergraduate-based teaching license. Specifically, he finds that the addition of an undergraduate teacher certification program at a highly selective college is estimated to more than double the likelihood that college graduates become public school teachers (from about 3 percent to more than 7 percent).[12]

We propose that states develop and make more extensive use of alternative licensure programs, particularly for teacher candidates being prepared in high-need areas, such as STEM fields and special education. Changes to licensure policies are extraordinarily controversial because licensure is often treated as synonymous with teacher quality. Hence, we wish to make clear that our recommendation is not a call to abandon pre-service subject matter or pedagogical training as theory would suggest value in both. We must recognize, however, that licensure systems currently create an understaffing situation in high-need areas for many school systems. In some cases, the relevant alternative that schools face is not a conventionally versus an alternatively licensed teacher; rather, the choice is between an alternatively licensed teacher and a long-term substitute. Thus, we believe it makes sense for more experimentation and testing of alternative pathways into the classroom. Importantly, given that our recommendation is for experimentation, we think changes to licensure systems should expire automatically after a set number of years.

Create Meaningful Licensure Reciprocity With Other States

Because teacher licensure systems are state-specific, their requirements often differ. Licensure in one state does not

necessarily transfer to another. In some cases, licensure in a new state may simply entail passing a test, but in others prospective teachers might have to re-enroll in a teacher education program, despite having taught in public schools for years. Some states have established nominal reciprocity agreements. However, under these agreements, a credential in one state is either not genuinely recognized by other states or the agreement makes it prohibitively difficult for teacher candidates to tell what is required for reciprocity (Goldhaber, Grout, and Holden 2017).

The labor market friction created by state-specific licensure systems likely exacerbates the problem of equating teacher supply and demand in at least two important ways. First, the lack of portability of a teaching credential may dissuade some people who would otherwise be interested in teaching from pursuing this career. Second, and more pertinent to the immediate issue of teacher shortages, licensure policies inhibit the movement of qualified teachers from areas of surplus to areas of shortage. Similarly, it is not clear how many potential teachers are lost to the teacher labor market because teachers move across a state boundary and opt to leave the (public school) teaching profession rather than take the steps to become licensed in a new state.

There is little direct quantitative evidence regarding how state-specific licensure policies affect the desirability of teaching as a profession, or whether it causes the loss of teacher talent. However, the available research indicates that, even along state borders, shockingly few teachers cross state lines. By contrast, within-state moves are more common. We view emerging proposals to reduce these labor-market frictions by implementing true licensure reciprocity as a low-cost means of helping to deal with teacher shortage problems. Regulatory reforms that help to create regional teacher labor markets (or even a national market) are likely to catalyze meaningful teacher mobility and to leverage the "reserve pool" of college graduates trained for teaching careers. One example is the recently proposed federal legislation, the Interstate Teaching Mobility Act (ITMA). If passed, this law would authorize the creation of a shared teaching application, allowing candidates to be granted initial licensure in multiple states without additional requirements. However, a fully comprehensive reform effort along these lines would also facilitate pension portability and harmonize seniority rules.

Provide Teacher Candidates with Better Information about Job Prospects

Given the difficulties in recruiting and retaining teachers with skills in areas like special education and STEM, it is unsurprising that teacher candidates with in-demand skills appear to have far brighter job prospects. Goldhaber, Krieg, and Theobald (2014), for instance, assess the likelihood that teacher candidates from a sample of TEPs in Washington end up in the teaching labor market. They find large differences according to the training specialty area of candidates: relative to teacher candidates licensed to teach elementary education, candidates who satisfy Washington's licensure requirements to teach in STEM and special education are 10 to 12 percentage points more likely, all else equal, to be employed in public schools one year (and also 5 years) after they are credentialed.[13]

We therefore propose that states generate this type of information about labor market prospects in various specialties and geographic areas, providing it to prospective teachers through TEPs.[14] To the extent that teacher candidates are not fully aware of this information, it might be expected to shape their training decisions, with respect to both geographic location and area of specialty. As teachers are better matched to teaching vacancies, local shortages will be alleviated.

Chapter 4. Questions and Concerns

1. Why do you propose narrowly targeted compensation increases, rather than a broad-based teacher salary increase?

The cost estimates associated with a targeted policy provide a basis for considering the attenuated cost-effectiveness of addressing teacher shortages through salary increases that are not targeted. In figure 3 we see that, in school year 2011–12, roughly 20 percent of schools reported difficulties in recruiting special education and STEM teachers whereas virtually no schools reported difficulties in recruiting in other specializations. If we view 20 percent of schools as hard to staff, a policy that provided salary increases to teachers in all schools would cost five times as much as a policy that targeted these schools.

The cost-effectiveness of uniform salary increases is substantially more attenuated when benchmarked against an incentive policy that simultaneously targets high-need subjects in hard-to-staff schools. For example, in U.S. public schools roughly 28 percent of teachers specialize in special education and STEM. Financial incentives targeted to such teachers in the 20 percent of schools that report recruiting difficulties in these subjects would essentially focus on just 5 to 6 percent of the teacher workforce. Relative to such a highly targeted approach, general increases in salary have a cost that is higher by a factor of roughly 18 (i.e., 1/0.056). The cost-effectiveness of broad salary increases might be even lower if they reduce the willingness of high-need teachers to teach in hard-to-staff schools.

These calculations illustrate the substantial gains in cost-effectiveness associated with targeting financial incentives to the schools and subjects where the needs are concentrated.

2. Does your proposal for meaningful teacher licensure reciprocity across states present insurmountable challenges for regulatory coordination?

We recognize that the political challenges involved in adopting and implementing licensure reciprocity are substantial. In particular, any efforts to harmonize pension wealth for teachers who move across states is likely to be particularly difficult. However, we also see several reasons for cautious optimism, particularly for more modest efforts that focus only on licensure reciprocity such as the federal Interstate Teaching Mobility Act proposed by Representative Andre Carson. While the fate of this federal proposal is uncertain, state-level policy makers under the aegis of organizations like the Council of Chief State School Officers and the National Governors Association also have the demonstrated capacity to coordinate such an innovation. Moreover, such an effort may benefit from both the current concern about teacher shortages and the seemingly bipartisan appeal of licensure reciprocity.

3. Why haven't you emphasized improvements in teacher working conditions as a way to address targeted teacher shortages?

Different aspects of teachers' working conditions, particularly the quality of a principal's leadership, are indeed highly predictive of teacher satisfaction and retention and are likely to influence the success of teacher recruitment as well. However, in contrast to the literature on targeted financial incentives, we have less credible evidence on how to design the relevant working conditions (e.g., validated strategies for the professional development of effective school leaders) and on their impacts. However, we believe it makes sense to experiment with working-conditions interventions. These might, for instance, entail school leadership rotation (e.g., an experiment for principals along the lines of the Talent Transfer Initiative) or principal professional development targeted to hard-to-staff schools and designed explicitly to address identified deficiencies.

4. Wouldn't efforts to raise the status of teaching as a profession also be justified?

The low (and possibly declining) level of prestige of the teaching profession is often cited as a significant barrier to recruitment (e.g., Wong 2016). Fewer than half of respondents to a recent poll (Harris Poll 2014) report that parents respect teachers and fewer than a third report that students respect teachers. It is also sometimes noted that teaching is a more respected profession in other developed nations. There is indeed some evidence that there are important cross-national differences in the prestige of the teaching profession (Barber and Mourshed 2007), with teachers' job status in the United States falling into the middle of the pack of comparison countries (Dolton and Marcenaro-Gutierrez 2013). However, the characteristics of the education pipeline and systems across these countries

are also quite different, so it is problematic to point to specific institutional features of teacher training, compensation, or workplace environment as the cause of these cross-country differences (Goldhaber 2009). Some public-service campaigns have sought to promote the teaching profession; however, we know of no convincing evidence on the efficacy of these broad efforts. We are skeptical that the prestige of teaching can be radically elevated through encouragement campaigns alone because status is intimately connected with compensation (Dolton and Marcenaro-Gutierrez 2013). Moreover, efforts to elevate the prestige of the teaching profession as a whole do not target the difficulties that disadvantaged schools persistently face in hiring and retention or that generally exist in staffing high-need subject areas. Nonetheless, we believe that the design, piloting, and careful evaluation of such efforts are justified as a complementary strategy.

Chapter 5. Conclusion

In recent years overly broad accounts of teacher-hiring challenges have proliferated. We do not find evidence for these challenges as a general phenomenon in U.S. public schools. However, we do find substantial evidence of teacher recruitment and retention challenges in high-need fields and hard-to-staff schools. In fact, these targeted teacher shortage challenges are related to longstanding problems with the ways in which we recruit, train, and compensate teachers. As such, we argue that solutions to staffing challenges should also be targeted.

These issues are perhaps best exemplified by thinking about the implications of using financial incentives to address staffing issues. The most straightforward policy lever that can be used to make a teaching job more desirable is to increase its compensation. Research on this approach illustrates the importance of targeting resources to areas of high need; meaningful impacts on staffing require fairly large financial outlays. Allocating funding to across-the-board salary increases to address problems that are primarily concentrated in particular subjects and schools spreads those finite resources so thinly that their effectiveness is sharply attenuated.

Other approaches to addressing teacher shortages also hold considerable promise. For example, creating regional or even a national labor market for teachers through true licensure reciprocity would make the teaching labor market more flexible and better able to address local shortages. At the local level, there are also entrepreneurial practices that districts can undertake to address their hiring challenges. For example, some districts are experimenting with aggressive, high-touch, digitally savvy recruitment strategies to attract teachers. This approach has the virtue that it can be implemented immediately and narrowly targeted to specific areas of need. Districts can also seek to attenuate teacher shortages with early recruiting efforts that expand the pool of available candidates as well as through the forward-looking use of student-teaching placements in anticipation of near-term hiring needs.

We should be careful to stress that, though these proposals have a compelling logic and supporting empirical evidence, the underlying evidentiary base is not perfect. Given the limited evidence, we encourage states and districts taking up these proposals to adopt an inquiry mindset in which the design, implementation, and evaluation of such efforts proceeds iteratively and accelerates the efficacy of such reforms at scale.

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Endnotes

1. These studies also suggest that there are significant learning gains from having a teacher with certification in social studies (Dee and Cohodes 2008) or English (Clotfelter, Ladd, and Vigdor 2010a).
2. To induce teachers to move from one school to another requires that the financial incentive overcome not only perceived differences in the benefits of teaching at one school versus another, but also the costs of the move itself. These costs might be financial (e.g., cost of a longer commute) as well as psychological (e.g., cost of acculturation at a new school).
3. The average teacher salary is roughly $55,000. Thus, the cost of increasing a school's wage bill for existing teachers by 2.3 percent is approximately $40,000 (i.e., .023 x 31.4 x 55,000). This amount excludes the direct salary of a newly hired teacher, the cost of recruiting the teacher, and any fringe-benefit costs related to the salary increase. In addition, this calculation assumes that the compensation increase is not implemented on a large scale, which could alter the assumed labor supply elasticity.
4. Note also that the early career attrition of teachers is not substantially different from attrition rates in other professions, but teachers are more likely than other professionals to retire early (Harris and Adams 2007).
5. There is similarly conflicting evidence when it comes to value-added measures of teacher effectiveness: studies by Hanushek et al. (2005) and Staiger and Rockoff (2010) do not find a relationship between teacher selection and value added, whereas Boyd et al. (2011) find that schools do tend to hire more-effective teachers among within-district transfer applicants.
6. The effect sizes are about .04 standard deviations on the test in math and just under .03 standard deviations on the test in reading.
7. The idea that there are gains to be had from improved hiring practices is also buttressed by two recent studies examining the information that school systems—Spokane Public Schools (Goldhaber, Grout, and Huntington-Klein 2017) and District of Columbia Public Schools (Jacob et al. 2016)—collect about teacher candidates and subsequent teacher outcomes. They find promising evidence that teacher effectiveness and retention can be predicted preservice, but also that school systems do not utilize this information as well as they might if their objectives are to maximize student achievement or teacher retention.
8. TEPs and school districts sign student teaching field placement agreements; responsibility for the oversight of student teachers is shared between a cooperating (or mentor) teacher on the district side and a field instructor on the TEP side.
9. Boyd et al. (2009) find that teachers are more effective when their student teaching has been well-supervised and is aligned with methods coursework. Ronfeldt (2012) finds that a candidate whose student teaching is in easier-to-staff schools leads to better outcomes in terms of retention and student achievement. Finally, Ronfeldt (2015) finds that placing student teachers in schools with higher levels of teacher collaboration and lower turnover is associated with greater teacher effectiveness. Most recently, Goldhaber, Krieg, and Theobald (2016) find that teachers tend to be more effective when their school's demographics are similar to those of the school where they student taught, and that teachers who student taught in schools with lower turnover have higher rates of retention once they enter the workforce.
10. For an in-depth discussion of the theory and evidence on teacher licensure, see Goldhaber (2004; 2010) and Kleiner (2000).
11. By comparison, the number of individuals licensed after completing training at a traditional college- or university-based program increased about 16 percent during this period.
12. For those who have a teaching degree, the only major hurdle to becoming eligible to teach is passing a licensure exam. The direct cost of these exams is pretty low and the great majority (more than 90 percent) of test takers in most states pass licensure tests the first time they take it (Gitomer, Latham, and Ziomek 1999; Goldhaber 2007). Still, there might be indirect costs associated with acquiring the knowledge necessary to pass these tests and prospective teachers often have to pass multiple exams. Thus, it is not surprising that research also finds that licensure-test requirements do have a considerable impact on the likelihood of pursuing a career as a teacher. Specifically, Hanushek and Pace (1995) examine a period before licensure testing was nearly universal and find that a state having a teacher test requirement reduces the probability that individuals pursue an education major by about 4 percentage points (or more than 30 percent).
13. Those licensed to teach English as a second language are similarly favored, albeit to a smaller extent.
14. This proposal is along the lines of the recently abandoned federal teacher preparation regulations (Ujifusa 2017) that would have required individual TEPs to provide information to teacher candidates about their job prospects.

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Highlights

In this paper, Thomas S. Dee of Stanford University and Dan Goldhaber of the University of Washington present evidence on the prevalence and nature of teacher shortages. They find that such shortages are not a general phenomenon but rather highly concentrated in certain subjects (e.g., STEM and special education) and types of schools (e.g., schools serving disadvantaged students) where hiring and retaining teachers is a chronic problem. They discuss several complementary approaches for addressing teacher shortages.

The Proposals

Strategies for K-12 school districts. The authors propose that schools implement targeted financial incentives, emphasize early and aggressive recruitment, and use student teaching positions to provide labor market signals about hiring needs.

Strategies for state regulatory authorities. The authors propose that regulators allow extensive use of alternative pathways into the teaching profession in high-need areas, while also providing teacher candidates with more information about the varied job prospects in different fields. In addition, regulatory authorities should implement meaningful licensure reciprocity across states, creating a more flexible teaching labor market.

Benefits

Teacher shortages are most common in schools serving economically disadvantaged students, in urban and rural schools, and in schools serving a larger concentration of minority students; subjects such as STEM fields and special education are also difficult to staff. Enhancing the supply of teachers in these areas will allow K-12 school districts to better serve their students.

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