

CALDER Polycymakers Council

Opinion Brief

Understanding the Early Teacher Pipeline: What We Can (and, Importantly, Can't) Learn From National Data

Dan Goldhaber
American Institutes for Research/CALDER

Kris Holden
American Institutes for Research/CALDER

Suggested citation:

Goldhaber, D. & Holden, K. (2020). *Understanding the Early Teacher Pipeline: What We Can (and, Importantly, Can't) Learn From National Data*. (CALDER Policy Brief No. 21-1120). Washington, D.C.: National Center for Analysis of Longitudinal Data in Education Research.

The crafting and dissemination of this opinion brief was supported by the National Center for the Analysis of Longitudinal Data in Education Research (CALDER), which is funded by a consortium of foundations. For more information about CALDER funders, see www.caldercenter.org/about-calder. We wish to thank Hannah Putman, Nell Sedransk, and Roddy Theobald for helpful comments. **WARNING: this brief contains the author's unmoderated opinions about controversial issues, which may cause dizziness, nausea, and/or seizures.** Note that the views expressed are those of the authors and do not necessarily reflect those of funders or the institutions to which the authors are affiliated.

Understanding the Early Teacher Pipeline: What We Can (and, Importantly, Can't) Learn From National Data

Dan Goldhaber
American Institutes for Research/CALDER

Kris Holden
American Institutes for Research/CALDER

CALDER Policy Brief No. 21-1120

Understanding the early teacher pipeline, how many and what types of individuals are pursuing a teaching credential, is critically important. Unfortunately, the two national data collections that can be used to explore this provide incomplete and contrasting pictures. We find that Title II and Integrated Postsecondary Data System (IPEDS) information about the early teacher pipeline diverge in the number of individuals completing their training as teachers. Title II is explicitly intended to describe the early teacher pipeline, but undercounts teacher candidates. IPEDS also provides an incomplete picture as, for instance, it likely suffers from “double counting”. In the concluding section we describe changes to data collection that could lead to more accurate and detailed information about the early teacher pipeline.

Keywords: Teacher Preparation, Title II Reports, IPEDS

This policy brief was originally posted in November 2020 and was updated in April 2021.

Why We Need a National Picture of the Early Teacher Pipeline

There are compelling reasons to better understand more about the *early teacher pipeline*—from the point at which individuals express a clear interest in teaching by taking basic licensure tests or enrolling in teacher preparation programs (TPPs) to the point at which they are fully credentialed and eligible to teach. There are at least three reasons why it is important to get a national perspective on the early teacher pipeline:

- (1) The quality of the teacher workforce has clear implications for the social and economic health of the country. And gaining a better understanding of what influences the pursuit of a teaching career is key to influencing the quality and quantity of the teacher workforce. This is particularly important today because there is evidence that interest in pursuing a career in teaching is sliding; for example, for the first time, a majority of parents surveyed by PDK International in September 2018 stated that they did not want their children to pursue teaching as a career (Kappan, 2018).
- (2) Debates about the teacher pipeline often play out nationally, even while using data from selected states to make a point. The problem with drawing national inferences from particular states is that states may differ substantially from one another because key teacher policies (e.g., licensure, evaluation, and tenure) are state functions (Author et al., 2015).
- (3) Increasing attention is being placed on the diversity of the teacher workforce and the mismatch between the proportion of students and teachers of color. A growing body of work indicates that teacher diversity is greatly limited prior to individuals' employment in the teacher labor market (e.g., U.S. Department of Education, 2016, p.15), and prospects appear limited for significantly addressing the “diversity gap” through policies that focus on current teachers—instead, focusing on earlier prospective teachers could have a greater impact (Putman et al., 2016).

But while there is a clear need for a national picture of the early teacher pipeline, getting a detailed national perspective turns out to be quite challenging. There are only two national sources of annual information on the number of individuals pursuing teaching: Title II reports,

which are explicitly intended to get a national picture of the early teacher pipeline and thus focus narrowly on the enrollment of individuals in TPPs and whether they complete their programs' requirements; and the Integrated Postsecondary Data System (IPEDS), which focuses more broadly on the number of college students by areas of study. As we describe below, these two data sources provide an incomplete and sometimes contradictory picture of the early teacher pipeline.

Incomplete and Sometimes Contrasting Information

Information from Title II and IPEDS can be broadly categorized as focusing on counts of “enrollment,” i.e., those who are currently preparing for teaching; “completion,” i.e., those who have finished their preparation in the current year; and “licensed,” i.e., those who have received a teacher license in the current year. **Table 1** provides an overview of how these data collections differ in terms of the *specific* definitions of enrollment, completion, and licensed, coverage over time, and types of statistics reported.

Perhaps most notably, the data collections define enrollment and completion using different criteria. Enrollment for Title II is defined as participating in a TPP as a teacher candidate, while IPEDS reports students with a “field of study” in education. Completion is more complicated because for Title II reporting, TPPs set the standards by which candidates are considered to have “completed” the program, while IPEDS completion simply records the receipt of a degree or credential. So, for example, we would expect the two data collections to diverge in the case of students who are enrolled in TPPs and complete the coursework required to graduate from college but choose not to take in-state subject licensure tests. Those students will be counted as completing in IPEDS but will not be counted in Title II. Similarly, teacher candidates completing one-year TPPs are not recorded as “enrolling” in teacher education so will be missed in Title II enrollment, but not necessarily IPEDS. Moreover, Title II reports the number of teacher licenses awarded in a given year, while IPEDS does not report licenses at all. IPEDS records cover a long period of time (back to 1979–80), although not all elements are available each year. In contrast, Title II data is fairly recent, with enrollment and completion records starting in the 2000s.

As suggested by **Table 1**, the data sets provide *incomplete information* related to three contemporary policy concerns: the number of individuals pursuing a teaching career and what that portends for staffing challenges faced by K–12 schools; the extent to which teacher candidates are being prepared in traditional and alternative institutions; and the diversity of teacher candidates relative to the growing disparity between student and teacher diversity. We focus mainly on the number of individuals in the early teacher pipeline, but several distinctions between Title II and IPEDS are worth noting. Title II reports results for race/ethnicity only for enrollment data, while IPEDS reports race/ethnicity for both enrollment and completion data. For reasons we return to in the concluding section of this brief, we would like to know more about the race and ethnicity at both of these stages of the pipeline. Alternative preparation reporting differs substantially between Title II and IPEDS. IPEDS does not report enrollment or completions separately for alternative programs at institutions of higher education (IHEs), and due to the nature of the IPEDS survey collection, does not include enrollment or completion counts for non-IHE based alternative programs. While Title II reports enrollment and completion separately for traditional, IHE-based alternative, and non-IHE based alternative programs, defining what constitutes an alternative program is left to the state. This indicates that there is much ambiguity in how many teacher candidates are prepared in each pathway. We return to this point in the concluding section of this brief.

Focusing now on what these datasets suggest about the number of individuals pursuing a teaching career, it is interesting to ask the degree to which the two datasets appear to align with one another in terms of counts of individuals in the early teacher pipeline. While Title II and IPEDS differ in some ways, at a high level we would expect them to provide similar information, at least in terms of teacher candidate “completions” (as discussed above). **Figure 1a** shows the reported completions of teacher candidates over time generated from each dataset. While IPEDS data covers years back to 1979–80 (Cowan et al., 2016), we present only years for which Title II completion data is available. It is clear from both datasets that the number of completions were roughly constant following the 2008 financial crisis until 2009-10. Then, both datasets show a large and relatively similar drop in completions: From 2010–11 to 2014–15, the number of completions declines by about 45,000 for Title II and by about 40,000 for IPEDS.

In **Figure 1b**, we track this period of declining completions, reporting the percentage change in completions in each state from 2010–11 to 2014–15 using Title II data. This figure is very much aligned with the national narrative that school systems across the country have encountered severe staffing challenges (often reported as “teacher shortages”), at least partially due to declines in the enrollment in teacher preparation.

Almost all states, 48, appear to have experienced declining completions by teacher candidates over this period. Interestingly, however, the picture is not uniform—declines are quite severe in states like Illinois and Pennsylvania, around 40%, while others like New Jersey, Utah, and West Virginia have much smaller declines in completions, in the neighborhood of 0 to 10%. This figure is important both for highlighting the fact that states varied substantially in terms of changes in the early teacher pipeline, and in setting up a comparison with IPEDS data. In particular, in **Figure 2** we compare the percent change in completions for Title II and IPEDS for each state. The x-axis of the figure is organized by the size of the percent change in completions for each state according to Title II (the blue dot) and the corresponding figure for the change in completions according to IPEDS (the red dot); the horizontal lines indicate the national percent change for Title II and IPEDS.

Visual inspection across states suggests that there are sometimes large differences between the percentage changes in completions according to Title II and IPEDS (the vertical distance between the blue and red dots), and there is little consistent pattern across states, with some cases where the states provide contradictory information about the change in completions from 2010-11 to 2014-15. In California, for example, Title II reports a decline of about 25% while IPEDS reports an *increase in completions* of about 3%. More broadly, and in contrast to Figure 2, 41 states are below zero for IPEDS, indicating more increases in completions.

Another important area in which the two datasets diverge is in the aggregate number of completions (as opposed to trends over time). In particular, returning to Figure 1, we see that the overall number of completions in each year is quite different depending on the data used to estimate it. The gap between Title II and IPEDS completions (represented by the vertical distance between the lines) varies from 15,000 to 40,000 teacher candidates per year. How large

is this gap? Prior work suggests that, typically, about 100,000 to 150,000 new teachers are hired without having prior teaching experience (Cowan et al., 2016). The difference then, is in the range of 10% to 40% of all positions that are filled by novice teachers each year.

What might explain the differences between Title II and IPEDS in teacher candidate completions? There are several explanations for how discrepancies could arise:

- Double counting existing teachers who continue their higher education
- Completions in alternative programs in each dataset may be classified differently
- Differences could be due to the definition of program completion across datasets
- IPEDS *undercounts* completions when teacher candidates pursue teaching as a minor rather than a major degree area.
- Relatedly, Title II may underreport completions in cases where teacher candidates finish their education degrees but seek out-of-state teacher licenses.

We explore the extent to which each of these features is likely to drive differences between Title II and IPEDS in Appendix A. In short, there are good reasons to think that double counting may explain a large share of the higher IPEDS counts, but we do not believe that one can make significant progress in terms of reconciling the differences.

Conclusions: Getting A More Comprehensive Picture

While Title II and IPEDS suggest a similar decline over time in the number of individuals in the early teacher pipeline, the picture differs drastically across some states. Examining one dataset versus the other could easily lead one to reach a different conclusion about whether the number of individuals preparing to teach is sufficient to meet the needs of a state's K–12 school system. This of course is problematic as teacher preparation is a state function.

Title II *is clearly an undercount* of the number of individuals obtaining credentials to teach. It is not surprising therefore that IPEDS data suggests that the number of completions is much higher than Title II. But, as we noted above, IPEDS may be an over-estimate of the new supply of

potential teachers given the double counting issue. Unfortunately, it is not possible to pin down precisely why the two datasets diverge, or which one is likely to be more accurate.

Additionally, some of the data that are *not collected in enough detail by either dataset* are relevant to a number of teacher pipeline policy debates and discussions related to, for instance, the diversity of the teacher workforce (Author et al., 2019) and the degree to which teacher training is occurring in traditional or alternative settings (Zeichner & Schulte, 2001).

Surprisingly, we do not really know the basic national numbers about diversity (or lack thereof) in the early teacher pipeline (prior Title II reports do not include data for *completions* by race/ethnicity that are required to contrast the diversity of enrolled candidates with the diversity of completing candidates—though this is now reported for 2018-19). Similarly, the definition of alternative programs is murky because each state defines for itself what constitutes a traditional or alternative program (NAS, 2020). Indeed these two issues are likely intertwined given that a significant share of teachers of color are prepared in alternative programs (U.S. Department of Education, 2016).

Resolving discrepancies and getting a clear national (and state-by-state) perspective on what the early teacher pipeline looks like is not complicated and may not be terribly costly. Many of the concerns discussed in this brief could be addressed by slightly modifying IPEDS and/or Title II survey collection efforts. IPEDS survey questions could provide clear direction to institutions about whether alternative programs should or should not be included, and the scope of IPEDS surveys could be expanded to cover non-IHE alternative preparation programs. IPEDS could also collect information on whether individuals are continuing their education or pursuing their first degree in a field of study. Similarly, Title II surveys could request additional information for enrollment and completion by race/ethnicity and degree level. These additional clarifications and data collections would help reconcile differences across the two datasets—one recent change has been to report completions by race/ethnicity. There is a fair degree of overlap, moreover, in what is collected in Title II and IPEDS, so there could be cost savings by consolidating these efforts.

But beyond ways to clarify these issues about the *number* of completions, there are things we might want to know about the progression of individuals through their teacher education

experiences. Longitudinal tracking of teacher candidates while enrolled in TPPs would eliminate ambiguities like the double counting highlighted in this brief and could support research that pinpoints where prospective teachers are entering or exiting the pipeline. This, in turn, would permit research into the characteristics and experiences of teacher candidates who are not captured in count data. For example, it would allow policy and research to better link preservice experiences to inservice teacher outcomes and to assess how factors such as pay, working conditions, and education costs affect an important early indicator of the pursuit of a teaching career. To this end, states could work to collect and integrate TPP data into state longitudinal data systems (SLDS).

The bottom line is that we have shown that existing data sources do not provide a clear national picture of the early teacher pipeline, and we believe such a picture is necessary for understanding fundamental questions about the supply of tomorrow's teachers. Thus, we argue for considering modifications to Title II and IPEDS to get a more coherent, integrated system and to track teacher candidates longitudinally. If we are serious about learning about the nation's prospective teacher workforce, we need to think hard about how to make these annual data collections more comprehensive and useful.

References

- Cowan, J., Goldhaber, D., Hayes, K., & Theobald, R. (2016). Missing elements in the discussion of teacher shortages. *Educational Researcher*, 45(8), 460–462.
<https://doi.org/10.3102/0013189X16679145>
- Goldhaber, D., Grout, C., Holden, K. L., & Brown, N. (2015). Crossing the border? Exploring the cross-state mobility of the teacher workforce. *Educational Researcher*, 44(8), 421–431. <https://doi.org/10.3102/0013189X15613981>
- Goldhaber, D., Theobald, R., & Tien, C. (2019). Why we need a diverse teacher workforce. *Phi Delta Kappan*. <https://kappanonline.org/why-we-need-diverse-teacher-workforce-segregation-goldhaber-theobald-tien/>
- Kappan, P. D. (2018). Teaching: Respect but dwindling appeal. *The 50th annual PDK poll of the public's attitudes towards public schools*.
- Kraft, M., Brunner, E., Dougherty, S., & Schwegman, D. (2018). *Teacher accountability reforms and the supply of new teachers*.
https://scholar.harvard.edu/files/mkraft/files/kraft_et_al._2018_teacher_accountability_reforms.pdf
- National Academies of Sciences, Engineering, and Medicine. (2020). *Changing expectations for the K-12 teacher workforce: Policies, preservice education, professional development, and the workplace*. <https://doi.org/10.17226/25603>
- Putman, H., Hansen, M., Walsh, K., & Quintero, D. (2016). High Hopes and Harsh Realities: The Real Challenges to Building a Diverse Workforce. *Brookings Institution*.
- Putman, H., & Walsh, K. (2019). A Fair Chance: Simple Steps to Strengthen and Diversify the Teacher Workforce. *National Council on Teacher Quality*.
- US Department of Education. (2016). The state of racial diversity in the educator workforce. <https://www2.ed.gov/rschstat/eval/highered/racial-diversity/state-racial-diversity-workforce.pdf>.
- Zeichner, K. M., & Schulte, A. K. (2001). What we know and don't know from peer-reviewed research about alternative teacher certification programs. *Journal of Teacher Education*, 52(4), 266-282.

Tables and Figures

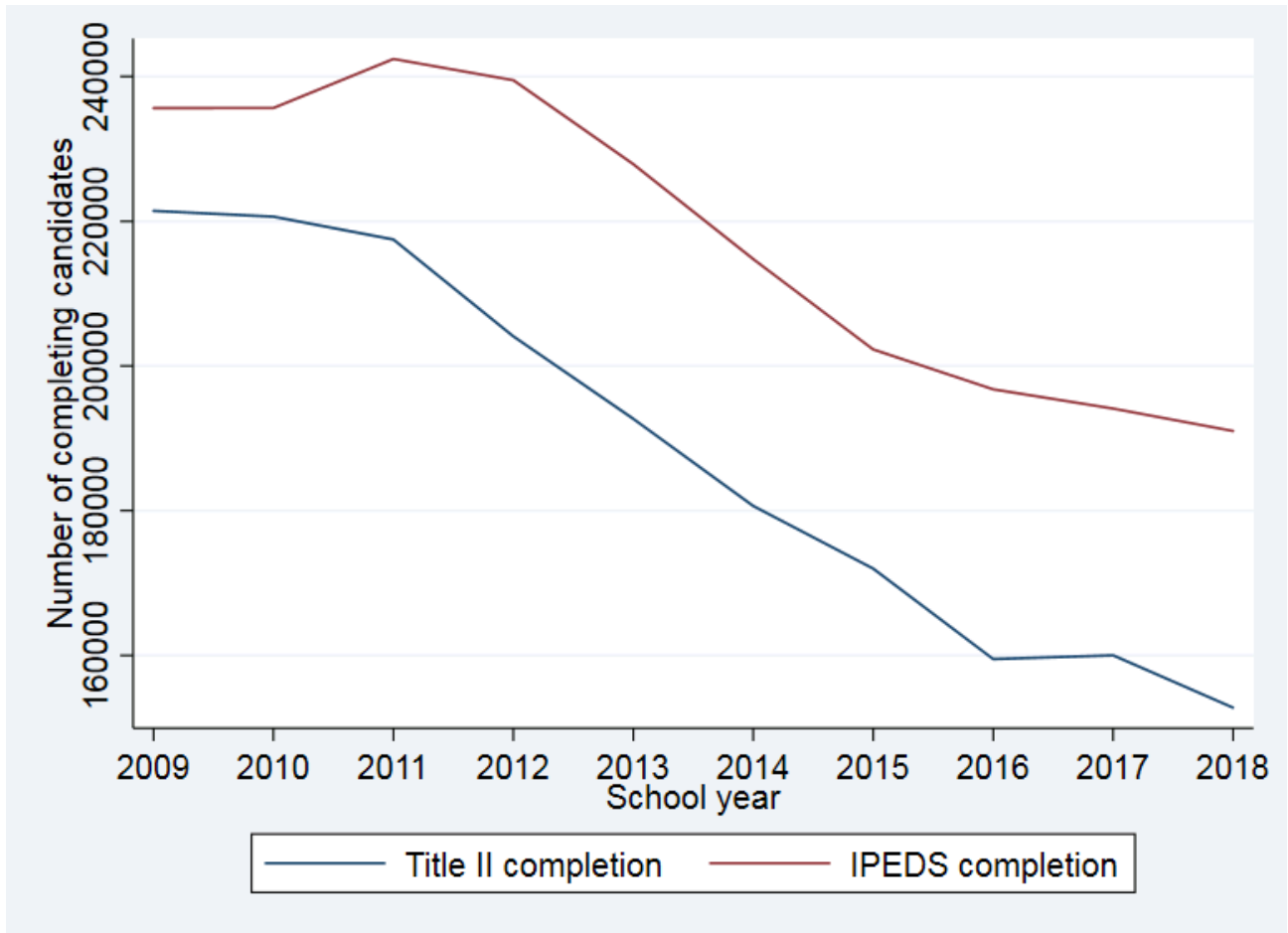
Table 1. Characteristics of Title II and IPEDS Data on Teacher Candidate Enrollment, Completion, and Licensure

Data collection ^a	Definition	First year of data ^b	Limited to initial license	Program or State data	Report statistics separately for:		
					Race/ ethnicity	Degree level	Alternative Programs ^c
<i>Panel A: IPEDS, area of study is education (CIP codes within 13)</i>							
Enrollment	Area of study in ED	1979-80	No	Program	Yes	Yes	No
Completion	Awarded ED degree	1979-80	No	Program	Yes	Yes	No
<i>Panel B: Title II, participate in TPP</i>							
Enrollment	Enroll in TPP	2010-11	Yes	Program	Yes	No	Yes
Completion	Met TPP requirements	2008-09	Yes	Program	No	No	Yes
Licensed	Obtain state license	2000-01	Yes	State	No	No	No

Notes. IPEDS data comes from NCES surveys of postsecondary institutions at <https://nces.ed.gov/ipeds/use-the-data>.

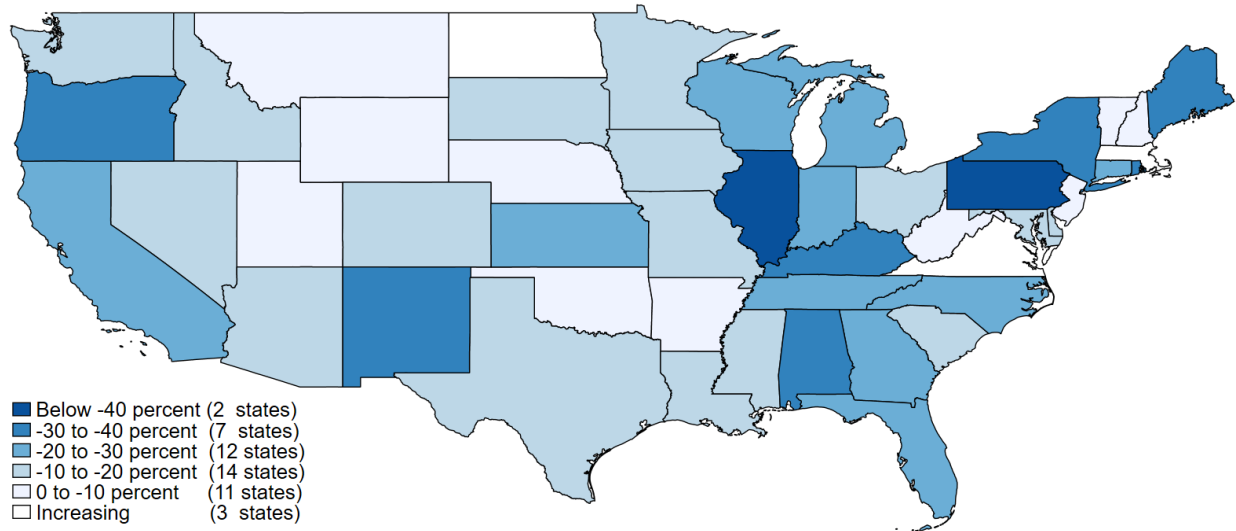
Title II data comes from federally reported information at <https://title2.ed.gov/>. ^a Both samples describe “enrollment”—e.g., individuals who are actively pursuing a teaching career—and “completion”—those who are finishing their preparation—and “licensed”—e.g., the state provided an initial teacher license; that said, each data collection uses a different precise definition, which is described in the second column. ^b Early years of IPEDS enrollment data are available every two years for recent data and Title II data on licenses is missing for 2008-09. In IPEDS, Race/ethnicity information is available starting in 1988-89 for both enrollment and completion. While the first year of IPEDS data is 1979-80, the second collection was not until 1983-84. ^c Due to the nature of IPEDS, alternative programs not based in IHE are not reported separately or even included in counts.

Figure 1a. Nationwide Trends in Title II and IPEDS Data for Teacher Candidate Completion



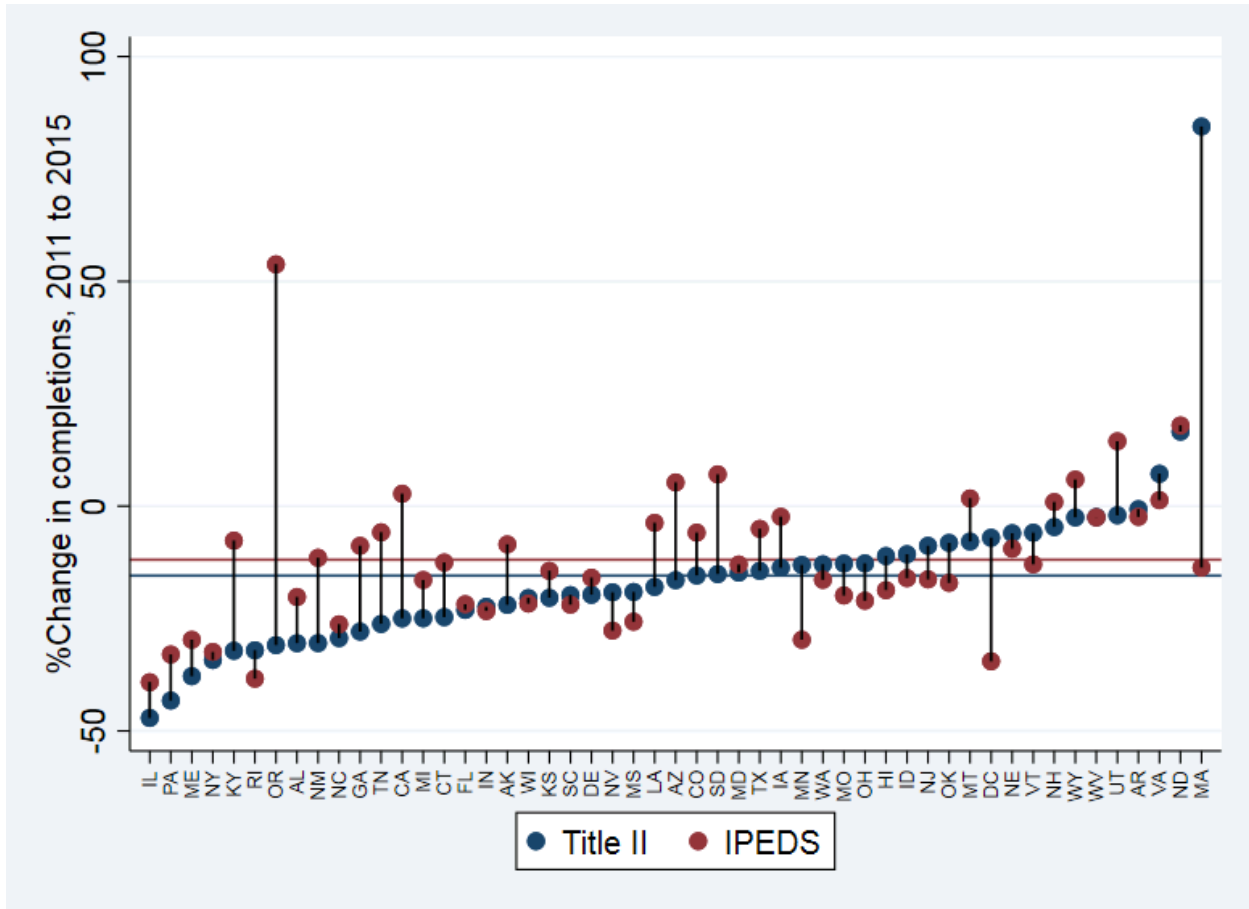
Notes. This figure compares Title II and IPEDS completion data over time. IPEDS includes individuals earning BA and MA degrees. Title II counts include both traditional and alternative programs. While IPEDS data covers years back to 1980, we present only years for which Title II completion data is available.

Figure 1b. Title II Percent Change in Teacher Candidate Completion, 2011–15, by State



Notes. This figure compares the percent change in Title II completions between 2011 and 2015 across U.S. states, during which time the supply of teacher candidates is generally considered to have declined.

Figure 2. Title II and IPEDS Percent Change in Completion, 2011–15, by State



Notes. This figure compares Title II and IPEDS completion data in the percent of completions in 2015 relative to 2011. The data is ordered from lowest to highest rate of Title II percent change. For example, Illinois has the largest reduction in completions as measured by Title II, while Massachusetts has the largest increase. The average change across states is about -0.12 for IPEDS and -0.16 for Title II. IPEDS includes individuals earning BA and MA degrees. Title II counts include only traditional programs and not alternative program completion. The correlation between Title II and IPEDS is 0.26.

Appendix A. Classifying IPEDS Enrollment and Completion

It is challenging to identify the correct field of study to capture teacher candidates in IPEDS data. As discussed in the text, IPEDS has a broader focus than Title II reports and prior literature has noted the challenges with using the broad, 2-digit CIP code for Education, which includes many nonteaching positions (e.g., educational leadership and administration, student counseling) and training outside of K–12 ages (e.g., adult education, pre–K). We follow Kraft et al. (2018) and use the following 6-digit CIP codes to identify education degrees: Education, General (13.0100-13.0101); Bilingual, Multi-lingual, and Multicultural (13.0201-13.0299); Curriculum and Instruction (13.0301); Special Education and Teaching (13.1000-13.1099); Teacher Education and Professional Development (13.1200-13.1299 and 13.1300-13.1399); ESL (13.1401-13.1499); and Education, Other (13.9999). We think these are sensible restrictions, but the degree to which these codes exclude valid teacher candidates or include individuals who are not teacher candidates is unclear.

Appendix B. Exploring Differences in Completions for Title II and IPEDS

As described briefly in the text, there are several potential explanations for differences in completion counts between Title II and IPEDS:

- Differences could be related to the issue of double counting existing teachers who continue their higher education. IPEDS does not distinguish between teacher candidates who are seeking their first license and teachers who are currently in the teacher workforce and seeking more advanced credentials. In contrast, Title II reporting focuses on teacher candidates who are seeking initial teacher licensure. IPEDS would thus tend to inflate counts of individual teacher candidates relative to Title II.¹
- Differences could be related to the way completions in alternative programs in each dataset are classified. In particular, it is not clear whether alternative IHE programs are included in IPEDS data, and IPEDS staff have informed us that the decision to include

¹ As discussed above, it is also possible that because IPEDS completions does not track individuals but rather the receipt of degrees, a student receiving two education degrees could hypothetically be counted twice.

these individuals is made by the institutions themselves (IPEDS Help Desk, personal communication, February 27, 2020).²

- Differences could be due to the definition of program completion as this differs across datasets: IPEDS counts education degrees, while Title II allows programs to define completion as having passed in-state licensure examinations (Putman & Walsh, 2019). There may be some segment of individuals who receive education degrees but who do not seek an endorsement or do not pass the necessary licensure examinations. These individuals would be seen as exiting the preparation pipeline prior to completing their preparation programs according to the Title II definition, but they still would be counted as completions according to IPEDS.
- The definition of completion in IPEDS could also *undercount* relative to Title II completions because, in some states, teacher candidates pursue teaching as a minor rather than a major degree area. In these cases, individuals would not be counted in IPEDS. In Texas, for instance, institutions of higher education have been explicitly prohibited from offering an undergraduate degree in education.³ Not surprisingly, then, examination of IPEDS data for Texas indeed suggests very few completions in education relative to Title II (around 6,000 in IPEDS versus about 20,000 to 25,000 in Title II).
- Relatedly, Title II may also underreport completions in cases where teacher candidates finish their education degrees but seek out-of-state teacher licenses. For example, a candidate who completes their coursework and student teaching in California and takes a teacher licensure test for Washington, but does not take an “in-state” licensure subject test in California would likely not be counted as completing by his or her California TPP. In fact, about 75% of TPPs define completion as having passed such a test.

We can explore the extent to which inconsistency between datasets is due to double counting and the ambiguity in IPEDS about institutional reporting on alternative IHE programs. For double counting, we use the fact that double counting should disproportionately affect master’s degree

² Given the ambiguity around whether IPEDS completions include or exclude alternative IHE programs, we have opted to exclude alternative IHE programs in Title II completions for Figure 1. That said, if IPEDS *does include alternative IHE programs*, then excluding alternative IHE programs from the Title II count will tend to exaggerate this gap by approximately 33% to 50%, depending on the year.

³ This has recently changed with the passage of House Bill 3217; <https://capitol.texas.gov/BillLookup/History.aspx?LegSess=86R&Bill=HB3217>.

completions in IPEDS data relative to bachelor's degrees. We believe that double counting helps explain some of the discrepancy between Title II and IPEDS. Specifically, the NCES beginning teacher survey indicates that we should expect about 80% of new teachers to have only a bachelor's degree, and about 17% should have a master's degree.⁴ We find that *less than 50% of IPEDS completions are bachelor's degrees*, suggesting that IPEDS completion counts include a large number of individuals already in the workforce who are returning to school to obtain a master's degree. Of course, this does not account that the rates of entering the teaching profession may differ by degree level, especially if earning a master's degree is a stronger signal than earning a bachelors.

To explore reporting on alternative programs, we examine whether there are greater discrepancies between Title II and IPEDS completions counts in states with greater shares of completions from alternative IHE providers. The logic here is that if dataset discrepancies are driven by the discretion that IHEs have in reporting completions in alternative programs, we should see more of them in states that have a greater share of alternative IHE providers. Surprisingly, however, there is only a small and statistically insignificant correlation between discrepancies and the share of alternative IHE completions. Unfortunately, it is not possible to say much of anything about the latter two hypotheses—whether discrepancies are related to the definition of completion or to out-of-state mobility. Neither dataset allows for the tracking of individuals in and out of teacher education programs, nor do they follow teacher candidates across state boundaries. In short, beyond the crude back-of-the-envelope assessments we described above, we do not believe that one can make significant progress in terms of reconciling the differences between the two datasets in completion counts at either the national or state level.

⁴ About 3% are reported to have either a doctorate or less than a bachelor's; see <https://nces.ed.gov/surveys/btls/cohort.asp>.