Online Appendix

Human Capital Depreciation and Returns to Experience

Michael Dinerstein, Rigissa Megalokonomou, and Constantine Yannelis

A Teacher Assignment Process Appendix

A.A Types of Teacher Assignments in Greece

This section provides additional institutional details to complement the discussion in Section I. The education system in Greece appoints teachers to either permanent or temporary positions. Permanently appointed teachers ("permanent teachers") are considered to be civil servants and once hired they enjoy job security. Every year they have the option to remain at their previous school. Teachers appointed to temporary positions ("temporary teachers") are employed on a contract basis for no more than ten months. Each year they must re-apply through a centralized assignment system for a new short-term appointment. Even if they receive an assignment in the following year, it will almost certainly be at a different school. These temporary teachers, formally called substitute or deputy teachers, can be either *full-time*, teaching 16-23 classroom hours per week at a standardized salary,[1] or *hourly*, teaching up to 4 hours per week at a standardized hourly rate.

The fraction of teachers in temporary assignments has grown considerably over the last two decades. Between 2011 and 2015, there was a 35% increase in the number of deputy teachers who were employed by schools, such that now 15-20% of the teacher workforce are on temporary contracts (OECD, 2018). This share varies by district. Temporary teachers might be the minority in schools in affluent urban neighborhoods, but often dominate in small and remote areas, especially in the islands (OECD, 2018).

There are at least two reasons behind this trend. First, budgetary pressures since the 2008 financial crisis have increased the use of temporary staff to cover teaching needs. As civil servants, permanent teachers count as a long-term liability to the national budget. In an attempt to reduce these committed expenditures, the European Commission agreed that European structural funds could be used to cover the salaries of temporary teaching staff in Greece and other European countries (OECD, 2018). In practice, these expenditures do not represent salaries, but payments for educational services.[2] Second, since 2009 Greece has had a hiring freeze for

[1] In practice, nearly all full-time deputy teachers teach the maximum 23 hours per week, where hours refer to classroom instruction time. Less commonly, a full-time deputy teacher could agree to work between 5 and 15 hours per week. These teachers get monthly prorated payments. Full-time permanent teachers with fewer than 6 years of experience teach 23-24 hours per week while more experienced teachers cover 20-21.

[2] Thus, temporary teachers do not get paid during the summer, unlike permanent teachers.

permanent staff. As hiring new temporary teaching staff has became the only way to cover teaching needs in schools, an increasing number of teachers have been hired on a contract basis.

A.B How the System Determines First Assignments from Waitlists

University graduates with a degree in education prior to 2011 were entitled to a teaching position in a Greek public school, and are assigned via waitlists. For each subject, there are two main types of waitlists for teachers depending on teachers' seniority.[3] The first list is for fresh university graduates with no prior teaching experience. Each year fresh graduates are added to the ends of the waiting lists according to their exact date of degree conferral. If graduates share the same date of degree conferral, ties are broken in favor of the teacher with the higher university grades. Unlike other higher education systems where a university's graduates receive their degrees on the same day, in Greece degree conferral occurs once the pivotal course's grade is entered. The pivotal course is often a student-teaching assignment or involves a written thesis or oral defense.

Once a teacher rises to the top of the list, a position is offered to this teacher the next time it is requested by a school. The lists do not distinguish geographically, so the offered position may be anywhere in the country. The teacher has a week to file the requisite paperwork to accept the position. Occasionally, the position will involve teaching at multiple schools in the same district. The time waiting for an assignment depends on the teacher's waitlist position, the length of the list, and the number of openings. We provide more descriptive statistics in Section II, but typical wait times during our sample period were several years (Tsakloglou and Cholezas, 2005). In recent years, the supply of teachers has outpaced demand, as the prospect of eventually receiving a permanent teaching position with a high salary and job security may overcome the need to wait for the position.[4] Furthermore, many university students choose

[3]To be eligible for the waitlists, the following conditions must be met: (a) the applicants must be either Greek or from North-Epirus or Greeks from Constantinople/Istanbul and from the islands of Imvros and Tenedos (Law No. 3832 / 1958) or European Union citizens (Law No. 2431/1996), (b) male applicants must present a military certificate that shows that they have served their compulsory military service or a certificate that shows that the applicant has a military exemption, and (c) expatriates from Cyprus, Egypt, Turkey and North-Epirus must submit a birth certificate and a certificate to the Ministry certifying that they are Greeks. There is no age restriction.

[4]See Kathimerini for a discussion. Stylianidou et al. (2004) discusses the relative attractiveness of teaching to other options.

teaching degrees without expecting such a long wait. In Appendix Table A.8, we show summary statistics from our online survey of 200 current and former teachers. Just 34% of teachers were aware of the centralized assignment system at the point they were deciding on a profession; but once they entered the system, 76% report understanding the assignment process and 73% knew their exact waitlist position. The increasingly long wait times have led to large protests and politicians have recently proposed changing the system.[5]

A.C Accumulating Credits for Subsequent Assignments

After teachers complete their first temporary assignment, via the fresh graduates list, they enter the second subject-specific list, which consists of teachers who have some prior teaching experience or have taken a written assessment (ASEP). Position in the experienced waitlist depends on their teaching credits, which teachers collect based on their prior experience, score in ASEP, and other factors. Once teachers rise to the top of this list, they get assigned a temporary teaching position. When they complete it, they earn additional teaching credits and re-enter the experienced teachers waitlist for the next temporary assignment. This is (like the initial assignment) a contract-based employment for up to 10 months. We plot histograms of the 1995 degree cohort's wait times for first and second assignments in Appendix Figure A.2. While teachers have long waits for their first assignment, second assignments typically occur one year later with some teachers waiting two or three years.

Teachers earn one teaching credit for each month of prior teaching in a school that is located in an urban area, but they earn two teaching credits per month of prior teaching in remote areas and islands. They also collect credits based on their marital status and the number of children that they have. Job performance for prior teaching does not alter credits.

The ASEP examination system was introduced in 1997 (Law No. 2525/1997) to guarantee permanent positions to teachers that scored the highest on assessments that tested subject-specific and general pedagogic knowledge (Stylianidou et al., 2004). The ASEP examination took place every two years until 2008, the last time it was offered (OECD, 2018). For the sample period, ASEP examinations took place in 2002, 2004, 2006, and 2008 and the weights assigned to ASEP performance and waitlist-related teaching credits as well as academic cre-

[5] See Euronews for a discussion.

dentials changed annually.

Credits determine the order for temporary assignments and any potential permanent assignments. In more recent years, budget constraints have reduced the number of permanent positions, with the 2008 – 2020 hiring freeze eliminating new permanent positions entirely. In 2020, around 10,500 new permanent positions were announced to be filled in 2021 and 2022.

A.D Prospective Teachers' Actions

As part of this process, prospective teachers with university degrees in education have several decisions. While they wait for an assignment, teachers may find alternate ways to generate income.[6] Importantly, these activities may not include taking a full-time job, which would remove a teacher's public school teaching eligibility.[7] If the prospective teacher takes full-time formal employment or notifies the government that she no longer wants to be considered for temporary public school teaching positions, then she will no longer appear on the lists. Finally, if offered a position the teacher finds unattractive or unacceptable, a teacher may reject it. Rejection, however, is quite costly. The teacher is placed at the end of the waitlist and becomes ineligible for any assignments in the following two years. Rejections tend to be rare, but if they were more common and selective they might pose identification challenges. Lists are released publicly, and thus there is little to no scope for manipulation or changing one's order once assigned.

[6] Waiting teachers are not eligible for unemployment insurance.

[7] This restriction prevents teachers from working at private schools, though the Greek private education sector is small at 7% enrollment share.

B Data Appendix

B.A Waitlists

B.A.1 Waitlist Types

The first component of the dataset is teachers' waitlists from Greece (Greece Ministry of Education and Religious Affairs, 2003-2012). These waitlists rank teachers who are waiting for a school assignment as a deputy teacher (*thesi anapliroti*). They can be found on the website of the Ministry of Education under e-aitisi.sch.gr, for data starting in the 2003-04 school year. On the Ministry of Education website, there is a list of several waitlists. Two types of waitlists are relevant for our empirical analysis. These are:

1. Main lists for experienced high school deputy teachers

2. Main lists for inexperienced high school deputy teachers

The Greek translation for each one of those is "*Pinakes katataxis anapliroton deuterovathmias ekpaideusis*" and "*Pinakes katataxis anapliroton deuterovathmias ekpaideusis midenikis proipiresias*," respectively.

B.A.2 Waitlist Content

There are up to fifty subject waitlists. Categorizations are based on the subjects that teachers teach. Teachers obtain these specializations during their university undergraduate studies and they have to report their specialization when they enter these lists. For example, PE01 teachers specialize in teaching religion studies, PE02 teachers specialize in teaching Greek language, history and other literature subjects, PE03 teachers teach mathematics, etc. Teachers can only teach subjects that belong to their categorization. In the main analysis, we restrict attention to five subject categorizations that are tested on the national exams (Panhellenic). These are: PE02, PE03, PE04, PE09, and PE19. Subject PE02 is for Greek/History/Ancient Greek teachers (*filologoi*), subject PE03 is for mathematicians (including Algebra, Statistics, and Geometry), PE04 is for science teachers, subject PE09 is for Economics teachers, and subject PE19 is for Computer Science teachers. For PE04, we include four subcategorizations: PE04.01 (physics), PE04.02 (chemistry), PE04.04 (biology), and PE04.05 (geology). Usually, there is no PE04.03 list.

In each waitlist, we have a list of teachers with information on the teacher's identity (first name, last name, father's name, mother's name, date of birth), the teacher's degree (degree mark, degree date, subject of specialization), whether the teacher has received any other specialized training (Braille, foreign languages, etc.), and a teachers' past experiences, such as whether obligatory military conscription was completed, that affect eligibility. The waitlists also contain information on *moria*, which are points that teachers collect in order to obtain future assignments. Moria can be collected through various ways: academic qualifications, professional experience, social criteria, and other criteria like knowing foreign languages. We also observe *moria* experience, which refers to the number of *moria* credits accrued through professional teaching at a *moria*-eligible school after initial assignments.[8]

B.A.3 Ranking Teachers

Waitlist observations are ranked by sum of *moria* on the waitlists. This variable perfectly predicts rank on the waitlist. The only waitlist for which the sum of collected *moria* does not predict a teacher's position on the list is the main waitlist for inexperienced teachers. This is the waitlist for fresh graduates, who are ranked based on the following lexicographic ordering: (oldest) degree year, (oldest) degree month, (oldest) degree day, (highest) degree mark. Due to bureaucratic hurdles and subject-specific exam days, the degree date offers enough variation that tie-breaking with the degree mark is relatively uncommon.

Regulations for teacher assignments are governed by law 1268/1982 (25, par.12) of the Constitution, according to which: "A student is automatically announced a degree holder (thereby ceases to have a student status) following the end of the exam period during which they fulfilled the requirements of their degree completion. According to Law 1268/1982 (clause 25, paragraph 12) and the decision of the Council of State (Decision 366/1994), as well as the ensuing explanation on the relevant document from the Ministry of Education (17-5-2004, 5/45340/B3), the date of degree conferral of the degree holder is the date of

[8] By definition, this information is only available for the experienced teacher lists; inexperienced teachers have yet to accrue experience.

announcement of the grade of the last exam by the member of teaching faculty."

B.A.4 Eligibility

For someone to be included in these waiting lists, the following conditions must be met: a) the applicants should be either Greek or from North-Epirus or ethnic Greeks from Constantinople and from the islands of Imbros and Tenedos (Law No. 3832 / 1958) or European Union citizens (Law No. 2431/1996); b) male applicants should present a military certificate that shows that they have served their compulsory military service or a certificate that shows that the applicant has a military exemption; and c) expatriates from Cyprus, Egypt, Turkey and North-Epirus should submit a birth certificate and a certificate to the Ministry certifying that they are Greeks. There is no age restriction.

B.B Assignments

The second component of our dataset is assignments (Greece Ministry of Education and Religious Affairs, 2004-2011a). Assignment data include information on teacher identity (first name, last name, father's name and, sometimes, mother's name), the taught subject (PE02, PE03, etc.), and the teacher's assignment unit. The assignment is typically at the district level and is given by a letter and a region, e.g., A Evrou, B Evrou, A Artas, B Artas, etc. The prefix/letter refers to the regional office of the school authority of the relevant region. For a minority of teachers, the assignment data includes the specific school the teacher was assigned to.

B.C Test Scores

We have test score data from the Ministry of Education (Greece Ministry of Education and Religious Affairs, 2003-2011b). For the national sample, we have the composite score built from the following subjects: Greek Language, History, Mathematics, Physics, Biology, special modules, and Economics. The test score data is at the individual level, which we aggregate to the school- or district-level in our district-level model.

B.D Individual Level Data

There are 22 public schools for which we have individual test scores and other outcomes for the 10th, 11th, and 12th grade (Greece High School Archives, 2001-2011). These schools maintained an electronic archive, with data at the student-teacher-class level, which we then hand-collected. The student-level data are available for the students of all three grades for these 22 schools. The teacher-level data provides us with a teacher identifier for each grade, class, year, school and subject combination. The years available varies by school.

C Teacher Survey

We conducted a survey of current and former teachers between December, 2019 and January, 2020 (Dinerstein et al., 2019-2020). The survey was conducted using Qualtrics, and the sample was drawn using advertisements in Facebook groups for Greek teachers, as well as internet forums for Greek teachers. The survey asked respondents about their perceptions and experiences with the waitlist system and process, as well as the activities they engaged in while waiting and once assigned. Respondents were offered a small Amazon gift card for participation, though take-up of the gift card was very low.

We attach the survey, plus an English translation, to this appendix. Appendix Table A.8 shows summary statistics for selected survey variables. Approximately three-quarters of teachers are aware of their waitlist positions and understand the assignment process, but just one-third of teachers understood the assignment process when they decided to become a teacher. Only 12% of teachers ever rejected an assignment. Appendix Figure A.10 shows the distribution of the number of years on waitlists.

The survey examined what teachers did while on the waitlists, and if they continued any activities once assigned. Appendix Table A.1 shows the activities in which individuals participated while waiting. Approximately one-half of teachers gave private lessons. Nearly 40% of teachers worked in a non-education position while 19% worked in the education sector but in a non-teaching position. One-third of teachers continued with studies and 16% started a family. Many teachers reported engaging in multiple activities while waiting.

Appendix Table A.2 explores jobs teachers engaged in while working as a deputy teacher, and whether these activities had started when the teacher was on the waitlist. The top-row shows that around 30% of teachers engage in part-time work, while teaching in the public system. Among these teachers, the most common form of part-time work is offering private lessons, though small fractions of teachers report working in other industries. The fraction of teachers continuing an activity they started while waiting is quite similar. Conditional on continued activities, private lessons is by far the most common.

Appendix Table A.3 regresses whether a teacher participated in an activity or continued part time work on a teacher's years waiting for her first assignment. In the left column the dependent variable is an indicator variable for whether the teacher participated in an extra activity, and in the right column the dependent variable is an indicator variable for whether the teacher participated in an extra activity, while working as a public school teacher, that had been started while the teacher was waiting for an assignment. The results indicate that there is no statistically significant relationship between years waiting and either outcome. The point estimates are quite small as are the robust standard errors, so we can rule out even a small correlation between years waiting and participating in an activity or continuing an activity once assigned.

Default Question Block

The University of Chicago, Electronic Description and Participation Agreement in the survey
Number of the Survey: 19-1614
Title of the Survey: Human Capital Depreciation
Researchers: Michael Dinerstein, Rigissa Megalokonomou, Constantine Yanellis

Description: We are academics at the University of Chicago and Queensland conducting research on Greek teachers. We want to ask you some questions about your experience, and what you did while waiting as a teacher. This will help us with our research. The survey should only take 10 minutes, your responses are completely anonymous.
Reward: If you finish the survey, we will offer you a $5 Amazon gift card that will be sent to the email address that you will provide us with.

Contact and Questions: You can only take the survey once. Please answer all the questions. If you have any question about the survey, please email us: spyridon.kypraios@chicagobooth.edu

We really appreciate your input!

Participation Agreement

- ○ Yes, I agree to participate in the survey
- ○ No, I don't agree to participate in the survey

Section 1: Background Info

Note:
At the end of the multiple-choice questions exist a text in order to write anything you want further

1.1 Did you start from the first day as a permanent or deputy teacher?

- Yes, I have started as permanent teacher from the 1st day
- No, I have started as deputy teacher from the 1st day
- I haven't started to work in a school yet
- None of the above

1.2 The position which you have is a full time, part-time or hourly paying position?

- Full time
- Part time
- Hourly paying
- None of the above

1.3 In what year did you get your teaching degree?

1.4 What is/was your teaching categorization (e.g. ΠΕ70, ΠΕ03, ΠΕ02 etc)?

1.5 If you have started to teach in a school, in what year did you receive your first deputy assignment?

1.6 If you ever left teaching, how many years post-degree did you?

1.7 What was the main reason you became a teacher?

Section 2: Understanding and Expectations of the System

2.1 If you were in the system with the waitlists. Did you know your waitlist position?

- Yes, I knew it
- No, I didn't know it
- None of the above

2.2 Did you understand the assignment process?

- Yes, I did
- No, I didn't
- None of the above

2.3 How long did you expect to wait for an assignment?

2.4 Were you aware of the waitlist and assignment systems when you chose to become a teacher?

- Yes, I was
- No, I wasn't
- None of the above

2.5 When you were on the waitlists, did ASEP performance affect position?

- ○ Yes, it did
- ○ No, it didn't
- ○ None of the above ________

Section 3: Time Spent Waiting

3.1 While waiting for assignments, which of the following did you do? Check all that apply.

- ○ Teaching in private lessons
- ○ Occupation in another field of a none education sector
- ○ Further studies
- ○ Teaching in private school
- ○ Create a family
- ○ Occupied is non-teaching position related to education sector
- ○ Other ________

3.2 What was your main motivation in choosing how to spend time waiting?

- ○ Economic factors
- ○ Improving skills
- ○ Other ________

3.3 How did you support yourself financially? Check all that apply.

- ○ Support by the family
- ○ Support by spousal income
- ○ Income from part time job
- ○ Income from occupation in another field of a none education sector
- ○ Other ________

3.4 Did you take any measures to improve your waitlist position (e.g., take an exam)?

Section 4: Attrition and Rejecting Assignments

4.1 Did you consider and/or end up leaving the system?

- ◯ Yes, I did
- ◯ No, I didn't
- ◯ None of the above

4.2 (If you left) How long did you consider leaving the system before you did?

- ◯ Before I have started to work in the school
- ◯ While you were waiting in the waitlist
- ◯ While you were working in school as a deputy teacher
- ◯ While you were working in school as a permanent teacher
- ◯ None of the above

4.3 What were the relevant considerations in making this decision? (more than one choice)

- ☐ Economic reasons
- ☐ Family reasons
- ☐ Physiological reasons
- ☐ Distance from the residency
- ☐ Uncertainty
- ☐ None of the above

4.4 Did you consider rejecting an assignment?

- ◯ Yes, I had rejected

- No, I hadn't rejected
- None of the above

4.5 What were the relevant considerations in making this decision?

- Economic reasons
- Family reasons
- Physiological reasons
- Distance from the residency
- Uncertainty
- None of the above

Section 5: Job Characteristics Once Assigned

(Answer for your first assignment)

5.1 Did you choose the district you ended up at?

5.2 Did you choose the school(s) you worked at?

5.3 Did you choose the classes(e.g, A1, A2 or A3 etc) you taught?

5.4 Did you choose the grades (e.g. A’, B’ or Γ’ of Primary school or A’, B’ or Γ’ of High school) you taught?

5.5 What categorization did you teach? Was this subject on the national exam?

5.6 How many schools did you work in?

5.7 What were the main skills you developed while teaching (if any)?

5.8 While you were working in a school, simultaneously you were working somewhere else?

- Yes,
Please, define the kind of occupation
- No

5.9 Did you continue an unofficial work-- which you had started while you were waiting in the waitlist-- when you took a permanent position in a school?

- Yes,
Please, define the kind of occupation
- No

Section 6: Assessment of skills most affected

6.1 While waiting, did you feel like you lost skills?

- Yes, I think this
- No, I don't think this
- None of the above

6.2 If so, which types of skills?

6.3 Did you take any steps to maintain skills? (e.g., attend workshops)

- Yes, I did

Please, define the kind of steps

- No, I didn't
- None of the above

Section 7: Miscellaneous and Open-ended Questions

7.1 Do you think teaching quality matters for national exam scores?

7.2 Do you consider the end of year tests important?

7.3 What are the incentives to do well as a teacher?

7.4 Anything else you want us to know about the system?

Είσαι Έλληνας/νίδα Εκπαιδευτικός; Κάνε κλικ ώστε να λάβεις μέρος στην έρευνα κα

Πανεπιστήμιο του Σικάγο, Ηλεκτρονικό Έντυπο Περιγραφής και Συμμετοχής στην Έρευνα

Αριθμός Έρευνας:

Τίτλος Έρευνας: Η Απαξίωση του Ανθρώπινου Κεφαλαίου

Ερευνητής/τές: Μίκαελ Ντίνεστέϊν Ρήγισσα Μεγαλοκονόμου Κωνσταντίνος Γιαννέλης

Περιγραφή: Είμαστε Ακαδημαϊκοί από το Πανεπιστήμιο του Σικάγο (The University of Chicago) και το Πανεπιστήμιο του Κουίνσλαντ (The University of Queensland, Australia). Διεξάγουμε μια έρευνα για τους Έλληνες-Ελληνίδες Καθηγητές/τριες και Δασκάλους/λες. Θα θέλαμε να συμπληρώσετε κάποιες ερωτήσεις σχετικά με την εμπειρία σας και το τι κάνατε ή κάνετε από την αποφοίτηση σας από το Πανεπιστήμιο μέχρι να ξεκινήσετε να εργάζεστε σε σχολείο για πρώτη φορά. Η διάρκεια του ερωτηματολογίου δεν θα ξεπεράσει τα 10 λεπτά, και η συμπλήρωση του ερωτηματολογίου γίνεται **τελείως ανώνυμα.**

Ανταμοιβή: Αν πληροίτε τα κριτήρια και συμπληρώσετε την έρευνα θα σας δοθεί δωροεπιταγή Amazon αξίας $5 ($5 Amazon gift card). Λαμβάνοντας μέρος σε αυτή την έρευνα, ίσως να μη σας ωφελήσει προσωπικά, αλλά εμείς θα πάρουμε χρήσιμες πληροφορίες που στο μέλλον θα βοηθήσουν άλλους εκπαιδευτικούς. Οι απαντήσεις σας είναι εμπιστευτικές και αφότου σας αποστείλουμε τη δωροεπιταγή, θα διαγράψουμε κάθε προσωπική σας πληροφορία.

Επικοινωνία & Ερωτήσεις: Μπορείτε να συμπληρώσετε την έρευνα μόνο μια φορά. Παρακαλώ να απαντήσετε σε όλες τις ερωτήσεις. Αν έχετε κάποια ερώτηση σχετικά με την έρευνα, παρακαλώ να μας στείλετε ηλεκτρονικό μήνυμα (email) : spyridon.kypraios@chicagobooth.edu

Συγκατάθεση Συμμετοχής:

○ Συμφωνώ να συμμετάσχω στην έρευνα

○ Δεν συμφωνώ να συμμετάσχω στην έρευνα

Μέρος 1: **Βασικές Πληροφορίες**

Επισήμανση:
Τα πλαίσια στο τέλος των ερωτήσεων επιλογής υπάρχουν ώστε να συμπληρώσετε αν θέλετε κάτι παραπάνω

1.1 Ξεκινήσατε απο την πρώτη μέρα να εργάζεστε ως μόνιμος εκπαιδευτικός ή ως αναπληρωτής;

○ Ναι, ξεκίνησα να εργάζομαι ως **ΜΟΝΙΜΟΣ** εκπαιδευτικός απο την 1η μέρα

○ Όχι, ξεκίνησα να εργάζομαι ως **ΑΝΑΠΛΗΡΩΤΗΣ** εκπαιδευτικός απο την 1η μέρα

○ Δεν έχω ξεκινήσει να εργάζομαι προς το παρόν

○ Κανένα από τα παραπάνω ________

1.2 Η θέση που κατέχετε είναι πλήρης, μερικής ή ωρομίσθιας απασχόλησης;

○ Πλήρης απασχόλησης

○ Μερικής απασχόλησης

○ Ωρομίσθιας απασχόλησης

○ Κανένα απο τα παραπάνω ________

1.3 Ποιο έτος λάβατε το πτυχίο σας από το πανεπιστήμιο;

[▾]

1.4 Ποιά είναι η ειδίκευση σας όπως προσδιορίζεται από τον κωδικό σας (για παράδειγμα ΠΕ70, ΠΕ03, ΠΕ02 κλπ);

____

1.5 Αν έχετε ήδη εργαστεί σε σχολείο, ποιο έτος εργαστήκατε για πρώτη φορά ως αναπληρωτής/τριά καθηγητής/τριά;

1.6 Εαν κάνατε σπουδές στα παιδαγωγικά, αλλά αργότερα αποφασίσατε να αλλάξετε κλάδο, πόσα χρόνια αφού πήρατε το πτυχίο σας πήρατε αυτή την απόφαση;

1.7 Ποιος είναι ο κύριος λόγος που ασχοληθήκατε με το λειτούργημα του δασκάλου/ας;

Μερος 2: Κατανόηση και προσδοκίες από το σύστημα εκπαίδευσης

2.1 Εάν ήσασταν στο σύστημα με τις λίστες αναμονής για τη πρόσληψη αναπληρωτών, γνωρίζατε την θέση που κατείχατε στον πίνακα κατάταξης/αναμονής για τοποθέτηση σε σχολείο μετά από κάθε περίοδο νέων προσλήψεων;

- Ναι, γνώριζα
- Όχι, δεν γνώριζα
- Κανένα απο τα παραπάνω

2.2 Θεωρείται ότι είχατε κατανοήσει την διαδικασία τοποθέτησης σε σχολείο;

- Ναι, την είχα κατανοήσει
- Όχι, δεν την είχα κατανοήσει
- Κανένα από τα παραπάνω

2.3 Πόσο χρόνο περιμένατε στον πίνακα κατάταξης/αναμονής αναπληρωτών μηδενικής προϋπηρεσίας για να αρχίσετε να εργάζεστε σε σχολείο για πρώτη φορά;

▾

2.4 Θεωρείται ότι ήσασταν ενημερωμένος/η για τη διαδικασία με τις λίστες αναμονής και το σύστημα διορισμού όταν επιλέξατε να γίνεται δάσκαλος/α;

- Ναι, ήμουν ενημερωμένος/η
- Όχι, δεν ήμουν ενημερωμένος/η
- Κανένα από τα παραπάνω

2.5 Όταν ήσασταν στον πίνακα κατάταξης/αναμονής αναπληρωτών **μηδενικής προυπηρεσίας**, επηρέασαν τα μόρια του ΑΣΕΠ (εάν είχατε) την θέση σας στον πίνακα;

- Ναι, την επηρέασαν
- Όχι, δεν την επηρέασαν
- Κανένα από τα παραπάνω

Μέρος 3: Χρόνος Αναμονής

3.1 Όσο χρόνο περιμένατε ώστε να εργαστείτε για πρώτη φορά ως αναπληρωτής/τρια, τι από τα παρακάτω κάνατε; (Μπορείτε να σημειώσετε περισσότερες από μια απαντήσεις)

- ☐ Διδασκαλία σε κάποιο ιδιωτικό φροντιστήριο
- ☐ Παραδίδατε ιδιαίτερα μαθήματα
- ☐ Διευρύνατε τις σπουδές σας με κάποιο νέο τίτλο σπουδών
- ☐ Ξεκινήσατε μια οικογένεια
- ☐ Εργαστήκατε σε κάτι άλλο σχετικό με τον τομέα της εκπαίδευσης
- ☐ Εργαστήκατε σε κάτι άλλο, ΜΗ σχετικό με τον τομέα της εκπαίδευσης

- [ ] Άλλο (Να το αναγράψετε): ______

3.2 Ποιο ήταν το βασικό κίνητρο σας ώστε να επιλέξετε αυτό που κάνατε όσο χρόνο περιμένατε;

- ○ Οι οικονομικές απολαβές
- ○ Διεύρυνση των δεξιοτήτων
- ○ Άλλο (Να το αναγράψετε): ______

3.3 Πως υποστηρίζατε τον εαυτό σας οικονομικά όσο χρόνο περιμένατε; (Μπορείτε να σημειώσετε περισσότερες από μια απαντήσεις)

- [ ] Με την υποστήριξη της οικογένειας
- [ ] Με την υποστήριξη του εισοδήματος του/της συζύγου
- [ ] Με το μισθό από εργασία μερικής απασχόλησης
- [ ] Με το μισθό από εργασία μη σχετική με την εκπαίδευση
- [ ] Άλλο (Να το αναγράψετε): ______

Κάνατε κάποια ενέργεια ώστε να βελτιώσετε τη θέση σας στη λίστα αναμονής και να αυξήσετε τα μόρια σας (για παράδειγμα: δώσατε κάποιες εξετάσεις) ;

______

Μέρος 4: Αποχώρηση ή απόρριψη θέσης

4.1 Σκεφτήκατε να αλλάξετε κλάδο εργασίας και να βρείτε δουλειά σε άλλο κλάδο;

- ○ Ναι, το σκέφτηκα
- ○ Όχι, δεν το σκέφτηκα
- ○ Κανένα από τα παραπάνω ______

4.2 Αν ναι, σε ποιο στάδιο της διαδικασίας;

- ○ Πριν αρχίσω να εργάζομαι σε σχολείο
- ○ Όσο χρόνο περίμενα στη λίστα αναμονής
- ○ Κατά τη διάρκεια εργασίας μου σε σχολείο ως αναπληρωτής/τρια
- ○ Κατά τη διάρκεια εργασίας μου σε σχολείο ως μόνιμος/η
- ○ Κανένα από τα παραπάνω __________

4.3 Ποια στοιχεία σας οδήγησαν σε αυτή την απόφαση;

- ☐ Οικονομικοί λόγοι
- ☐ Οικογενειακοί λόγοι
- ☐ Ψυχολογικοί λόγοι
- ☐ Απόσταση από την κατοικία
- ☐ Αβεβαιότητα
- ☐ Άλλοι λόγοι __________

4.4 Είχατε απορρίψει κάποια προσφορά θέσης αναπληρωτή/τριάς;

- ○ Ναι, είχα απορρίψει
- ○ Όχι, δεν είχα απορρίψει
- ○ Κανένα από τα παραπάνω __________

4.5 Ποια στοιχεία σας οδήγησαν σε αυτή την απόφαση;

- ☐ Οικονομικοί λόγοι
- ☐ Οικογενειακοί λόγοι
- ☐ Ψυχολογικοί λόγοι
- ☐ Απόσταση από την κατοικία
- ☐ Αβεβαιότητα
- ☐ Άλλοι λόγοι __________

Μέρος 5: Χαρακτηριστικά της εργασίας ως καθηγητής/τριά

(Απαντήστε σύμφωνα με τις συνθήκες της πρώτης φοράς που εργασθήκατε)

5.1 Είχατε επιλέξει την περιοχή που σας προτάθηκε η θέση εργασίας;

5.2 Είχατε επιλέξει το/τα σχολείο/α που σας προτάθηκε η θέση εργασίας;

5.3 Είχατε επιλέξει τα τμήματα (Α1, Α2 ή Α3) που σας προτάθηκαν να διδάξετε;

5.4 Είχατε επιλέξει τις τάξεις (για παράδειγμα, Α', Β' ή Γ' Δημοτικού, ή Α', Β' ή Γ' Λυκείου) που σας προτάθηκαν να διδάξετε;

5.5 Τι μάθημα/ματα διδάξατε; Ήταν μάθημα/τα που εξετάζονταν στην διαδικασία των Πανελληνίων εξετάσεων;

5.6 Σε πόσα σχολεία εργαζόσασταν ταυτόχρονα;

5.7 Ποιες ήταν οι σημαντικότερες δεξιότητες που αποκτήσατε όσο διδάσκατε και γιατί;

5.8 Ενώ εργαζόσασταν σε κάποιο σχολείο, εργαζόσασταν ταυτόχρονα και κάπου αλλού;

- Ναι,
Παρακαλώ προσδιορίστε το είδος της δουλειάς:
- Όχι

5.9 Συνεχίσατε να κάνετε κάποια ανεπίσημη δουλειά--την οποία ξεκινήσατε να κάνετε όσο περιμένατε στη λίστα αναμονής--όταν τελικά διοριστήκατε σε κάποιο σχολείο;

- Ναι,
Παρακαλώ προσδιορίστε το είδος της δουλειάς:
- Όχι

Μέρος 6 : Αξιολόγηση των δεξιοτήτων

6.1 Όσο χρόνο περιμένατε στους πίνακες/λίστες αναμονής, θεωρείται ότι χάσατε κάποιες από τις δεξιότητες που είχατε αποκτήσει;

- Ναι, θεωρώ οτι έχασα
- Όχι, θεωρώ οτι δεν έχασα
- Κανένα από τα παραπάνω

6.2 Αν ναι, ποιο τύπο δεξιοτήτων;

6.3 Όσο χρόνο περιμένατε κάνατε κάποια ενέργεια ώστε να διατηρήσετε τις δεξιότητες σας; Αν ναί, τι κάνατε;

- Ναι, έκανα.
Παρακαλώ συμπληρώστε τι ενέργειες κάνατε :
- Όχι, δεν έκανα
- Κανένα από τα παραπάνω

Μέρος 7 : Διάφορες Ερωτήσεις Ανοιχτού Τύπου

7.1 Θεωρείτε ότι η ποιότητα της διδασκαλίας διαδραματίζει ρόλο στα αποτελέσματα των μαθητών στις Πανελλήνιες εξετάσεις;

7.2 Θεωρείτε σημαντικά τα διαγωνίσματα στο τέλος της χρονιάς;

7.3 Ποια ήταν τα κίνητρα που σας ώθησαν να αποδώσετε καλύτερα στον ρόλο σας ως εκπαιδευτικός;

7.4 Οτιδήποτε άλλο που θεωρείται σημαντικό για το σύστημα και θα θέλατε να γνωρίζουμε;

D Construction of Instrument

In this appendix we provide more details on how we construct our instrument, as it varies across our individual- and district-level specifications. We also assess the robustness of our main results to different ways to construct the instrument.

We start by introducing some notation. As before, teacher j is in risk set m. Let n^D_{jt} be j's actual waitlist position on the deputy (D) list in year t and n^H_{jt} be j's actual waitlist position on the hourly (H) list in year t.[9] This waitlist position is an integer, where the teacher with position 1 is the next to be assigned. Let $\tau(j)$ be teacher j's first year on the waitlists. Based on the institutional rules, we know – and verify – that in this year, $n^D_{j\tau(j)}$ and $n^H_{j\tau(j)}$ are ordered lexicographically in the date in which j earned her degree and her degree mark.

We face three research design choices in constructing an instrument: 1) how to scale the waitlist position in predicting time to assignment; 2) how to combine information from the deputy and hourly lists; and 3) what sample to use. As our individual- and district-level analysis relies on different types of data, with different sampling frameworks, we make slightly different research design decisions and then assess robustness. Even though it reverses the paper's order, here we start with the district-level instrument as it is derived from the larger sample.

D.A Instrument for District Analysis

For the district-level analysis, we can use all teacher assignments in Greece, so we have a large number of recent graduates. This helps in two ways. First, recent graduates have all faced a similar waitlist process (and have had a similar amount of time elapsed since graduating) such that differences in initial waitlist position have a somewhat similar effect across cohorts on years not in formal employment. This relative homogeneity in the first stage allows us to have more precision than if we were combining teachers from cohorts from different decades. Second, we observe these recent graduates' initial waitlist positions in our waitlist data, which start in 2003. This allows us more flexibility on how to scale the waitlist position and in combining deputy and hourly list data. In the district-level analysis, we thus construct our instrument, z_j, as follows. Let $\bar{n}^D_{\tau(j)}$ and $\bar{n}^H_{\tau(j)}$ be the list lengths of the deputy and hourly lists,

[9] For simplicity, we describe teachers in a single subject and thus suppress notation for subject.

respectively, in j's first year on the waitlists. This length is the highest waitlist position, across all risk sets, on the inexperienced teachers' list in that year. We then convert j's waitlist position into a list percentile by dividing by the list length:

$$z_j^D = n_{j\tau(j)}^D / \bar{n}_{\tau(j)}^D \tag{1}$$

and

$$z_j^H = n_{j\tau(j)}^H / \bar{n}_{\tau(j)}^H. \tag{2}$$

Converting position to percentiles is a specific choice of how to scale the waitlist variation. We choose this scaling because the main source of list length heterogeneity is subject, and subjects with longer waitlists tend to assign more teachers annually. Thus, by normalizing by list length, we control for such differences and isolate the useful variation. But because there are other ways to scale the variation, we include robustness checks below.

With these two measures, we combine them into a single instrument by taking the minimum: $z_j = \min\{z_j^D, z_j^H\}$. We do this because a teacher may accrue experience from either type of assignment and thus the "better" waitlist position is the one that matters for accruing any experience. We considered other choices such as the mean, the max, and the deputy list value. We show below that our results are robust to these choices.

Finally, in the district-level analysis, we include all teachers but only contract teachers who ever appear on an inexperienced list 2003 or later have non-singleton risk sets. We focus on variation among these teachers in identifying our causal estimates because these are the teachers for whom we can use the waitlist information for scaling and combining hourly and deputy positions, two design choices that yield statistical power. We aggregate across teachers, each with instrument z_j, to get to the district-level instrument.

D.B Instrument for Individual Analysis

For the individual-level analysis, our sample of contract teachers is much smaller and dominated by more experienced teachers.[10] We thus run out of statistical power if we restrict our sample to teachers who appear on an inexperienced list 2003 or later, which means that we cannot exploit the waitlist information for scaling and hourly-deputy combining purposes. Instead, we construct our instrument as follows. For each year t, let $\check{n}_{jt}$ be teacher j's waitlist position on a pseudo-waitlist made up only of the teachers who are on the actual waitlist in year t (denoted by $\mathscr{J}_t$). As with the actual inexperienced teacher waitlist, we determine $\check{n}_{jt}$ lexicographically based on date of degree conferral.[11] We then calculate the highest pseudo-waitlist position for each risk set:

$$n^*_{mt} = \max_{m(j)=m} \check{n}_{jt} \tag{3}$$

and form our instrument as:

$$z_{jt} = \check{n}_{jt}/n^*_{mt}. \tag{4}$$

The instrument is thus normalized by the highest waitlist position in a risk set, where the risk set is composed of all teachers in the same degree conferral year-month and subject who are still teaching in year t.

Several research design choices are worth further comment. First, while we use a "pseudo-waitlist," it is ordered identically to how the actual waitlist is ordered (up to the inconsequential tie-breaking). Provided our assumption of no selective attrition holds, the pseudo-waitlist position contains the exact same ordinal information as the actual waitlist position. The use of an imputed waitlist position thus primarily matters for (1) scaling purposes and (2) our inability to combine information from deputy and hourly lists. Both of these issues are primarily about combining extra information to generate a more powerful first-stage. But because

[10]The small sample is in part driven by our ability to match teachers between datasets. Some schools record only teachers' first name initial, which leads to many cases where we cannot uniquely link the teacher to the waitlist data.

[11]We could also incorporate degree mark to break degree conferral date ties, as the actual waitlists do. Because degree mark could be related to teacher ability, we choose to break ties randomly in our pseudo-waitlist, but results are very similar when we incorporate degree mark.

our individual-level analysis has outcomes at the teacher level, the link between a teacher's (pseudo-)waitlist position and experience is much stronger than the one in the aggregated district-level analysis. Thus, the missing information is potentially not as important to the individual-level analysis. Second, we still make a specific scaling choice by normalizing by the risk set maximum position. The full set of teachers still teaching in t includes many whose degrees came well after some of our focal teachers and thus were not relevant for initial assignments. Incorporating these teachers into the list length would therefore just add noise. We can test whether this decisions matters in our district-level analysis and will show our results are robust to normalizing by highest waitlist position on the full list or within risk set. We implement each research choice uniformly for inexperienced and experienced teachers.

Before showing the robustness checks, we confirm that ordering teachers by degree conferral date produces a similar assignment process as ordering by actual waitlist position. In Appendix Figure A.1 we take the 2003 mathematics waitlists and show binscatter plots for the year of first assignment. In Panel A we use the actual waitlist position (in the data) for the x-axis and in Panel B we use the order implied by degree conferral date. We see very similar patterns of time until first assignment across the two panels.

D.C Robustness to Research Design Choices

We now explore the robustness of our results to the research design choices. As the district-level analysis uses more waitlist information (the actual list length and the combination of hourly and deputy lists), we conduct most robustness checks using the district-level specification.

We first investigate how the scaling of the waitlist variation affects the results. We specify several variations of our instrument. "Baseline" is our baseline model's instrument, which normalizes waitlist position by waitlist length and takes the minimum across deputy and hourly lists. "Mean across Lists" and "Max across Lists" make the same normalization but take the mean and maximum, respectively, across deputy and hourly lists. "Deputy Position" also uses the same normalization but takes the value from the deputy list, ignoring the hourly list. These instruments vary how we combine the variation from the two waitlists a teacher may be assigned from.

We show how the instruments affect the student test scores in percentiles (Appendix Table

A.9) and standard deviation units (Appendix Table A.10) where we do not control for teacher prior experience. We then present the results for student test scores in percentiles, where we control for teacher prior experience (Appendix Table A.11). We find that in the first four columns the estimates are very stable across instrument choices.

We then examine how the scaling of the waitlist position affects the estimates. "Risk Set Norm" normalizes the waitlist position by the highest waitlist position in the same risk set. This scaling matches how we construct our individual-analysis instrument and thus demonstrates whether this scaling matters for the results. "Raw Position" uses the actual waitlist position, without any normalization. "Log Position" takes the log of the waitlist position rather than normalizing by list length. We see in the tables that these research design choices make minimal difference for our qualitative conclusions.

Finally, we investigate the importance of sample selection by estimating our individual-level model on deputy teachers only. We present the results in Appendix Table A.12 and find that the estimates are nearly identical. This is unsurprising as the non-deputy teachers contributed no variation in the instrument and thus were valuable for their effect on the controls. We also show that are results are stable to restricting to the small set of teachers for whom we have the most confidence in our matching procedures across data sets (columns 3 and 6).

E Robustness Checks

In this appendix we provide a variety of robustness checks around our individual- and district-level estimates of the causal effect of a year without formal employment on student outcomes.

E.A Individual-Level Estimates

E.A.1 Controls

In Appendix Table A.13, we present our main results without any lagged GPA controls (column 1). We find similar point estimates to our baseline regression, but with reduced precision. In column 2 we estimate the baseline specification but instead of controlling for lagged GPA, we control for demeaned lagged GPA where the teacher-year mean is removed (column 2). Because we do not observe students' lagged GPA for every teacher in the country, we cannot demean the control by risk set, as would be consistent with our model. But we find that demeaning by a finer level – the teacher-year mean – leaves our main point estimate essentially unchanged.

E.A.2 Functional Forms

As discussed in Section III, the economics of education literature sometimes argues that returns to experience are declining at higher levels of experience. Further, test score units do not have a standard conversion rate to teacher human capital measures. We thus offer variations on our main specification where we include log test scores and log years without formal employment. We present the results in Appendix Table A.14. We find strong effects regardless of the functional form. One year waiting leads to a 2.5% drop in students' test scores (column 2), while a 10% increase in time waiting corresponds to a 0.08σ effect on students' test scores (column 3). For the log-log specification, we estimate an elasticity of student test scores with respect to years waiting of -0.41 (column 4).

E.A.3 Sample

We argue that within-month variation in degree conferral is orthogonal to teacher type and plotted the distribution in Figure 1. But the distribution is not uniform either, with a peak on the 30th of the month. We also see a peak in within-year degree conferral in July. We confirm that our results are not sensitive to these degree months and days by dropping teachers with degree conferrals on the 30th of the month and then by dropping teachers with degree conferrals in the month of July. We present the results in Appendix Table A.15.

E.A.4 Outcomes

The results are robust to different functional forms of our outcomes. In Appendix Table A.16 we show causal effects on unstandardized test scores, log test scores, and raw university score. We also include several variations in calculating an institution-program's selectivity. In the main analysis, we calculated selectivity based on enrollees' mean university scores. Here we show selectivity based on enrollees' mean national exams scores, which are a different weighting than the university admissions scores. In both cases, these selectivity measures are means across multiple years, including years in our sample. To avoid any concerns of our sample affecting the selectivity measures, we also include selectivity measures derived from 2003 admissions outcomes only.

E.A.5 Full-Time versus Part-Time Employment

The main results include years of part-time work in the experience measure. We can instead define a year of experience as working and accruing above-median work credits. We rerun our main analysis with this alternate definition of years without formal *full-time* employment and present the results in Appendix Table A.17. The estimated effects are very similar to our main results.

E.A.6 Standard Errors

When we demean using risk sets, the mean has a sampling distribution. We do not account for this in our main estimates because risk sets are large enough that sampling variation in the mean is likely to be second order. Here we incorporate such sampling variation by bootstrapping our estimates. First, we sample from the full sample of teachers, to calculate risk set means. Then we run 500 wild clustered bootstrap iterations, where we sample in the instrumental variable analysis according to the Rademacher distribution and use the same draw for all observations in a cluster and for first stage and second stage residuals. We construct a bootstrapped standard error estimates for the estimates in Tables 5 and 6 and present them in Appendix Table A.18. We find that the sampling error from the risk set means is tiny, as 8 of the 13 estimates have smaller bootstrapped than non-bootstrapped standard errors, and the average ratio of bootstrapped to non-bootstrapped standard errors is 1.01.

E.B District-Level Estimates

E.B.1 Controls

We present estimates that vary our use of controls in Appendix Table A.19. In the first column, we show estimates where we residualize all fixed effects by risk sets. The point estimate is very similar to our main result. The second and third columns add additional (demeaned) district-level controls. The point estimates are similar and move closer to our individual-model estimates.

E.B.2 Functional Forms

As with the individual-level analysis, we vary the functional forms and present the results in Appendix Table A.20.

E.B.3 Sample

In Appendix Table A.21, we present the results dropping teachers with degree conferrals on the 30th of the month and then dropping teachers with degree conferrals in the month of July.

E.B.4 Outcomes

In Appendix Table A.22, we show the causal effects on the other test or selectivity outcomes.

E.B.5 Scaling and Weighting

In the district-level model, we use an aggregation matrix, which included all deputy teachers, regardless of whether we observe them on an inexperienced list in our sample period. For these teachers, we consider them part of their own risk sets so that their years not working do not identify the causal estimates. In Appendix Table A.23, we explore the sensitivity of our results to including these additional deputy teachers. We find similar estimates that are slightly smaller in magnitude to our main estimates. Given all deputy teachers factor into a district's teaching, the attenuation toward zero is consistent with this specification including classical measurement error.

As the aggregation of an individual-level model, we estimate our district-level model weighting by the number of students in each district-year. In Appendix Table A.24, we show how the results change with different weightings. The alternate weightings lead to somewhat more negative point estimates.

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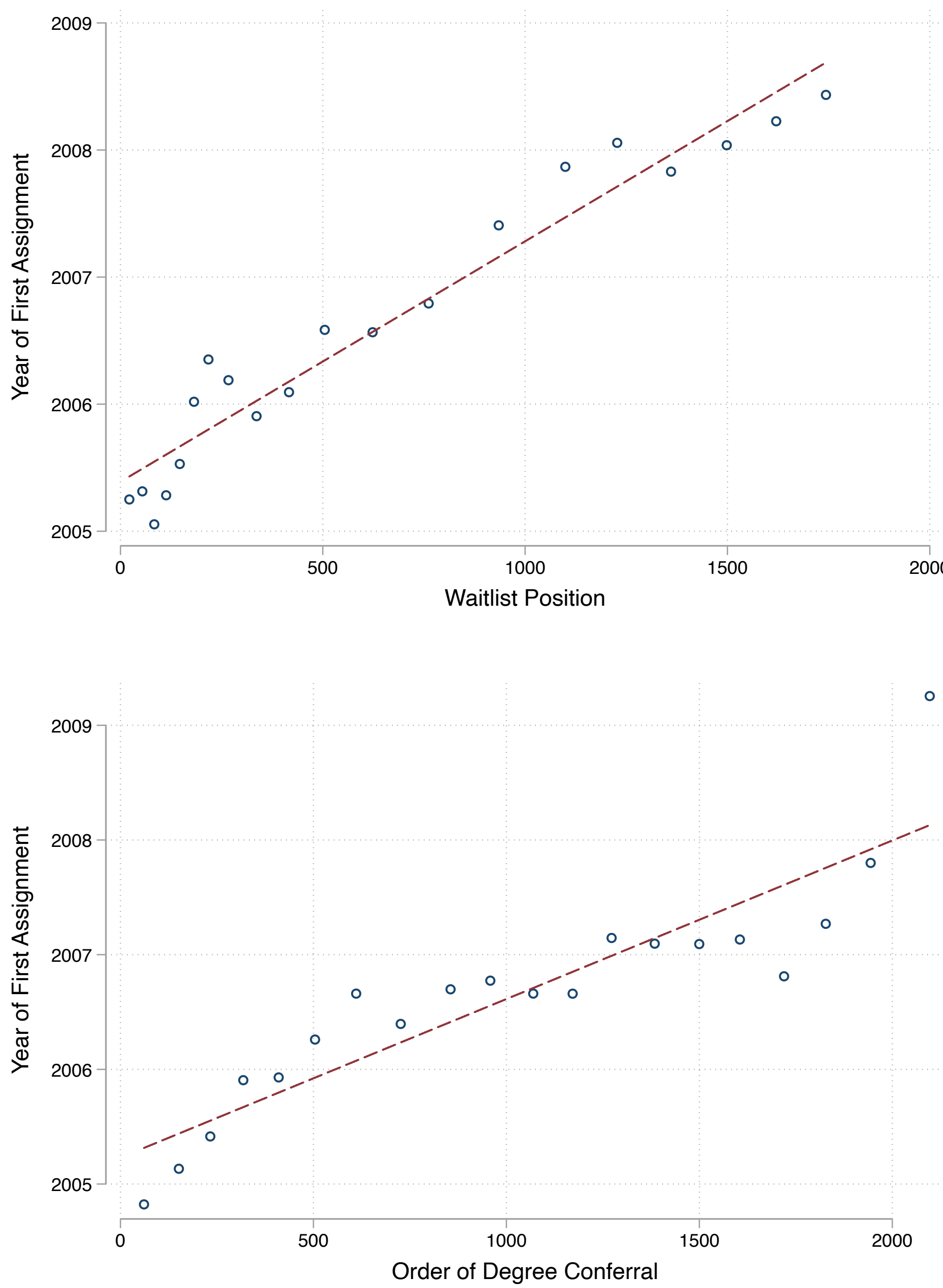
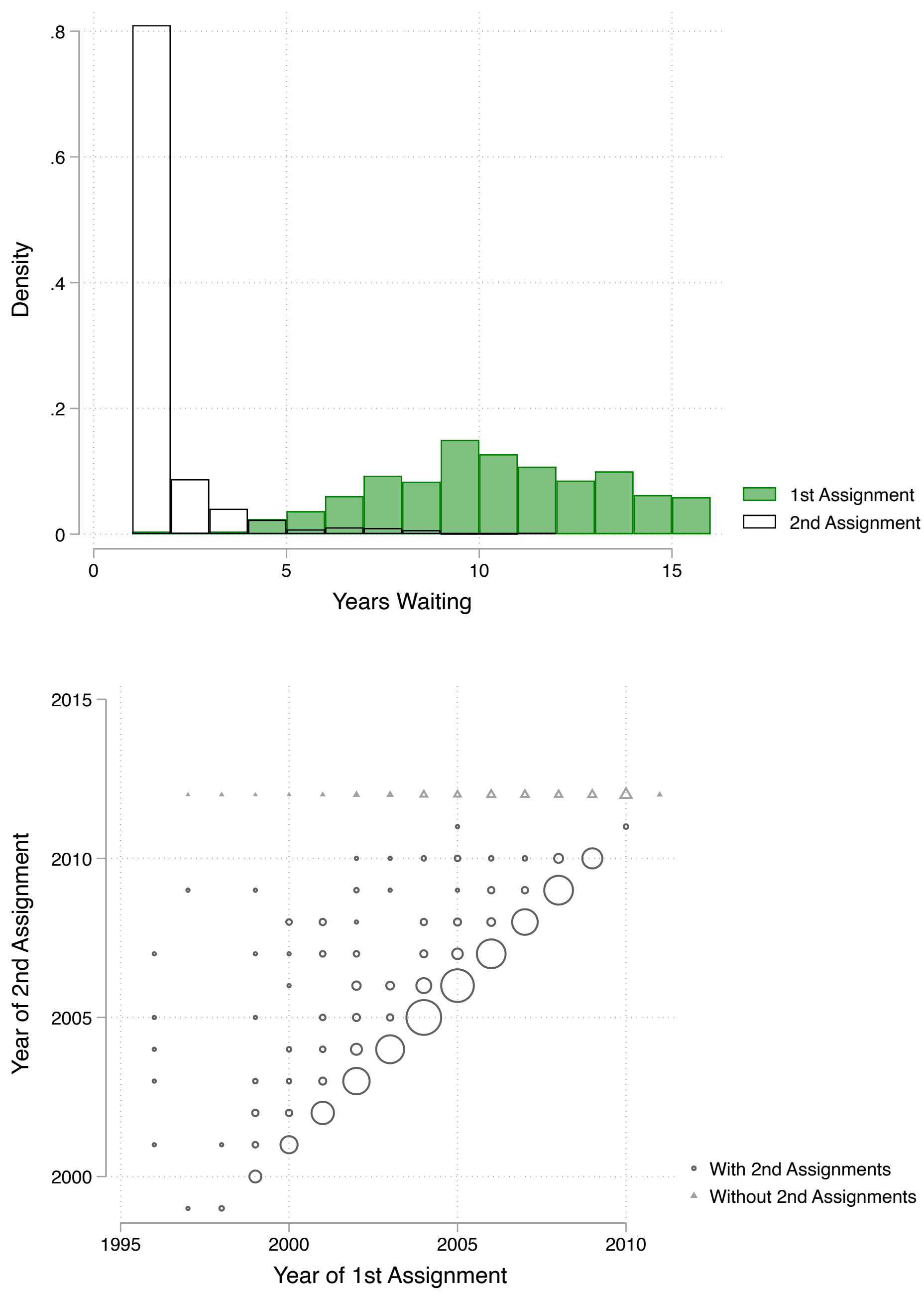
Figure A.1: Assignment Year by Waitlist Position



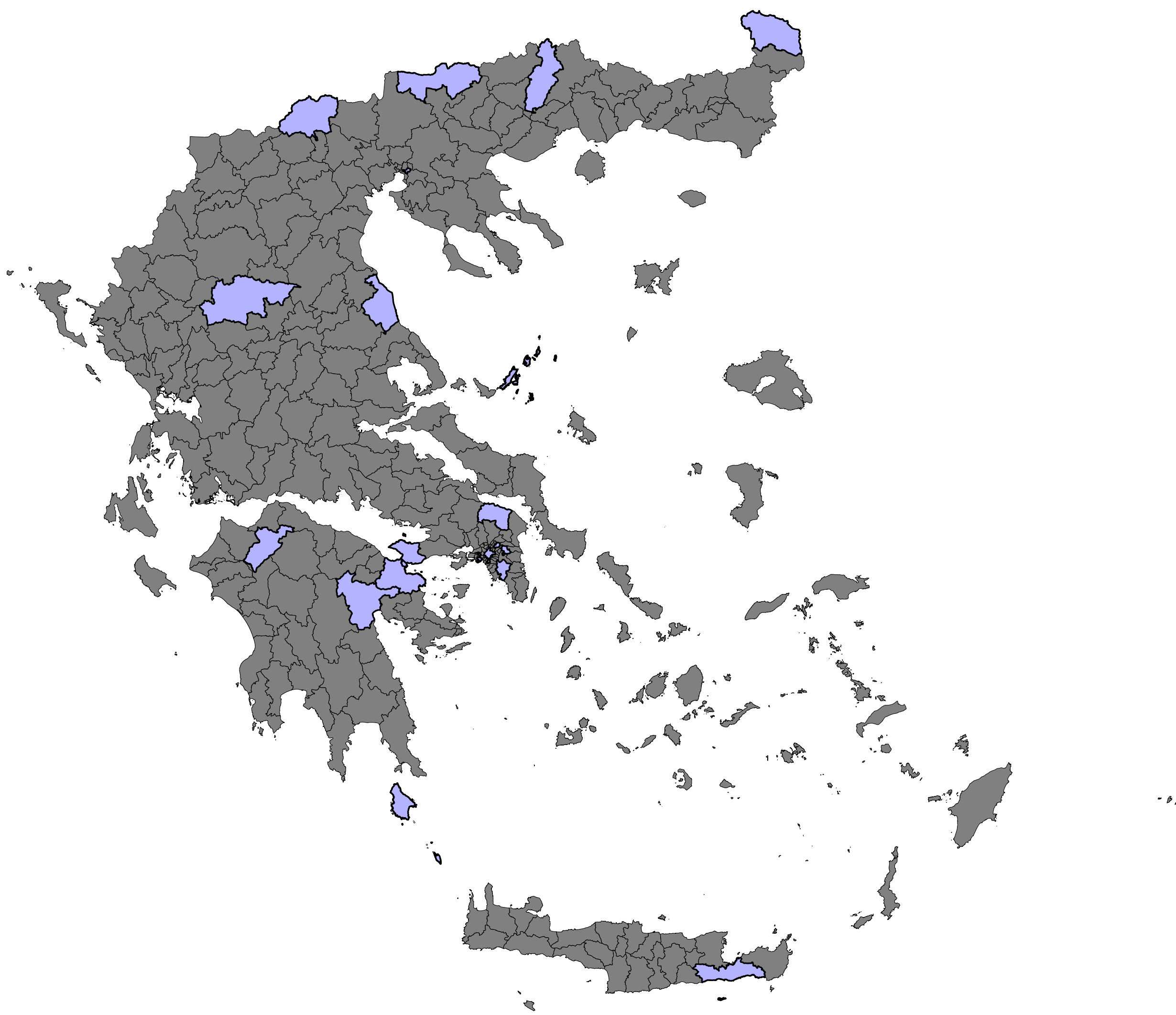
Notes: The top figure is a binscatter showing a teacher's 2003 waitlist position on the mathematics list (x-axis) and the year of first assignment (y-axis). The bottom figure is a binscatter with the same sample but changing the x-axis to the imputed order of degree conferral we use in the individual-level empirical model.

Figure A.2: Timing of First and Second Assignments



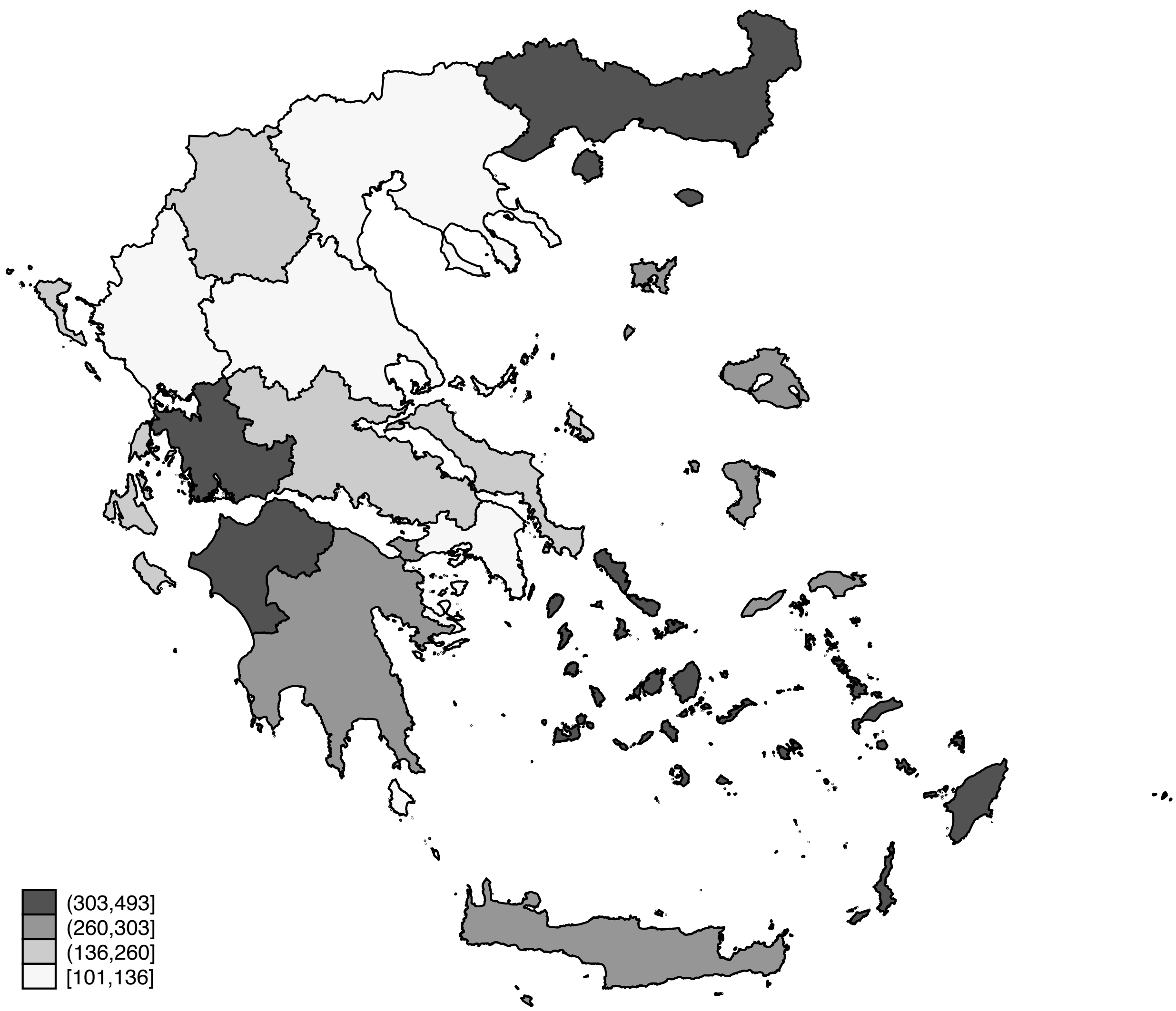
Notes: The figures show the relationship between first and second assignments for teachers in the 1995 degree conferral cohort. The top figure shows the distribution of wait times prior to first (solid) and second (clear) assignments. The bottom figure is a scatterplot with the year of the first assignment on the x-axis and the year of the second assignment on the y-axis. The size of the dots are proportional to the number of teachers in each group. The triangles at the top of the y-axis indicate teachers who never received a second assignment.

Figure A.3: Counties Containing Schools with Student Level Test Score Data



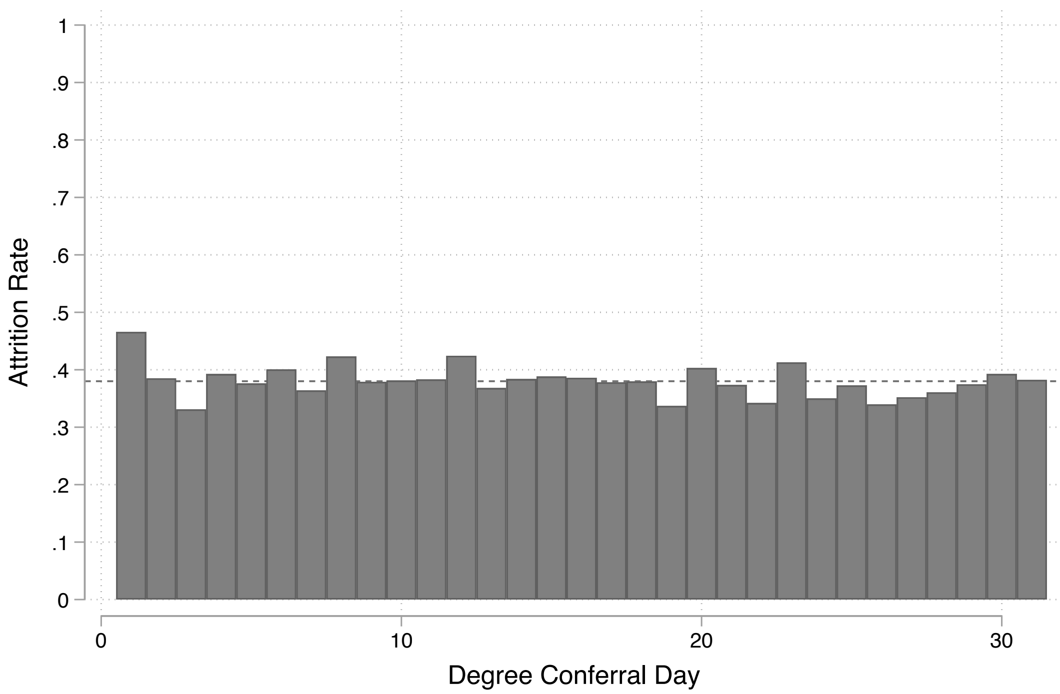
Notes: This figure shows the counties with schools for which we have individual student test score data.

Figure A.4: Number of Deputy High-School Teachers Assigned, 2006



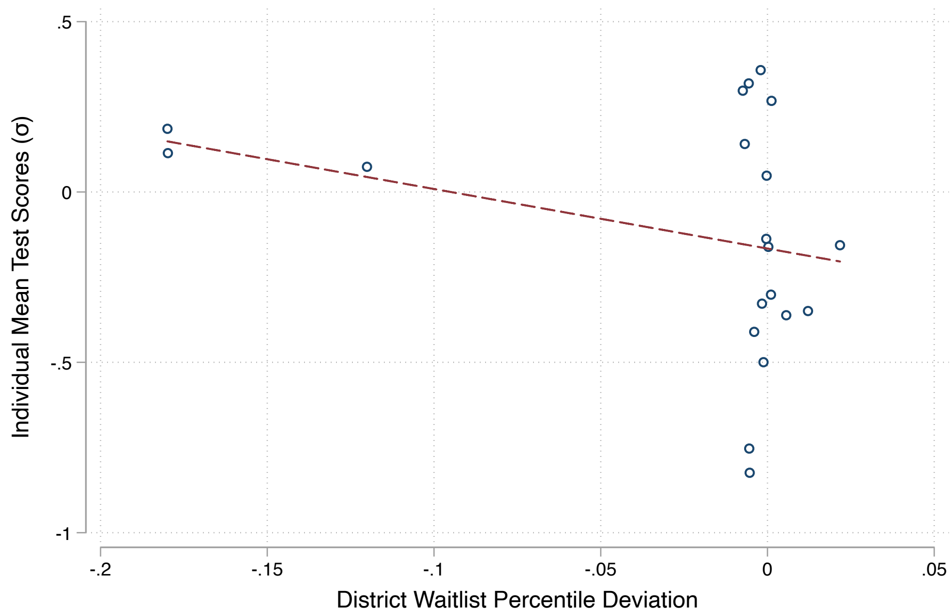
Notes: This figure shows the number of deputy high-school teachers assigned in each Greek region in 2006.

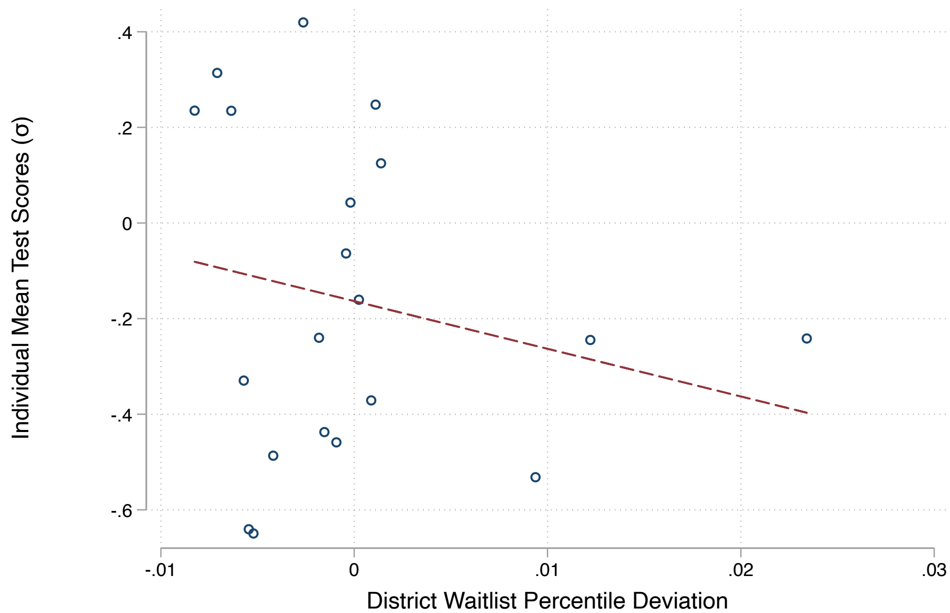
Figure A.5: Attrition and Degree Conferral Day



Notes: This figure shows attrition rates by the day of the month in which teachers' university degrees were conferred. This day of the month variation is our within risk-set timing variation that identifies our causal effects. Attrition is defined as leaving the waitlists before the end of our sample period and without ever having accrued experience.

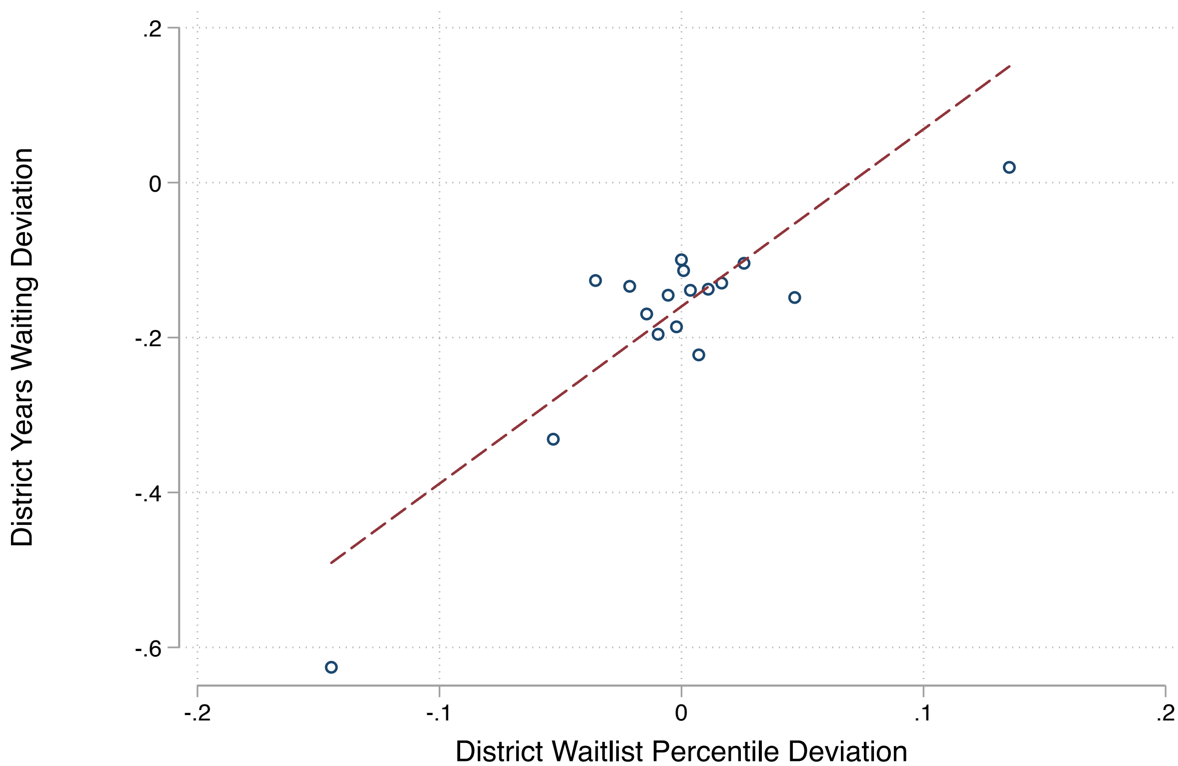
Figure A.6: Test Scores (σ) and Waitlist Position – Individual Level





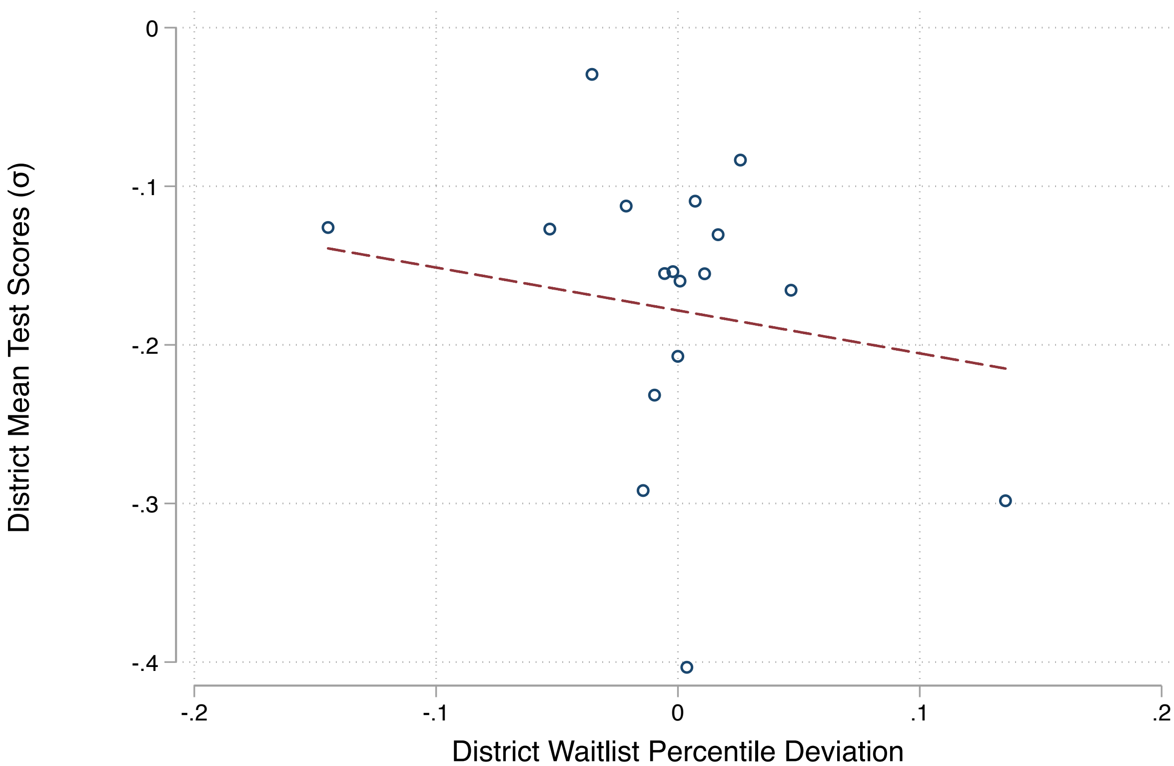
Notes: The binscatter figures show the relationship, at the teacher-year level, between demeaned waitlist percentile and student test scores (in student standard deviation units) where the demeaning is done by risk set-year. A risk set is a degree conferral year-month and subject combination. The binscatter also controls for student lagged grade-point-average. The top figure shows the full deputy teacher sample while the bottom figure zooms in on the middle of the distribution by excluding the points with instrument less than -0.05.

Figure A.7: Years without Formal Employment and Waitlist Position – District Level



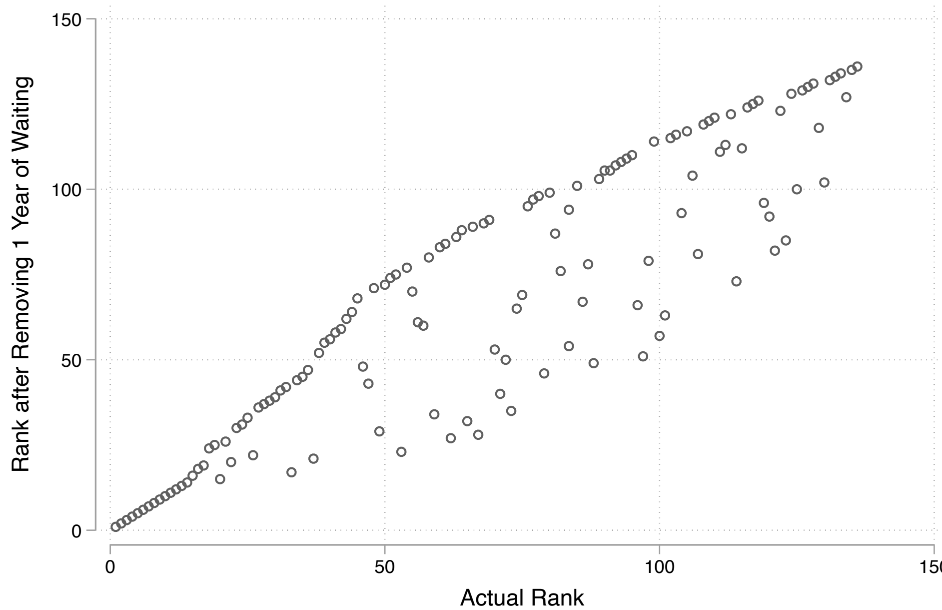
Notes: The binscatter figure shows the relationship, at the district-year level, between district demeaned waitlist percentile and district demeaned years without formal employment where the demeaning is done by risk set-year. A risk set is a degree conferral year-month and subject combination. The waitlist percentile is the initial position on the fresh graduates waitlist, normalized to vary from 0 to 1. The sample includes all teachers on a waitlist between 2003 and 2011 whose degree was conferred before 2006.

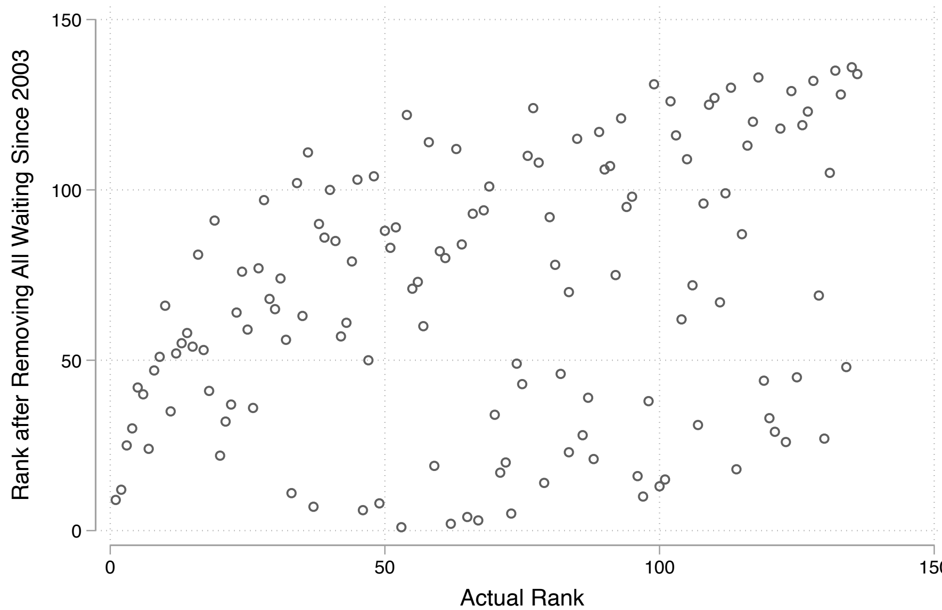
Figure A.8: Panhellenic Test Scores (σ) and Waitlist Position – District Level



Notes: The binscatter figure shows the relationship, at the district-year level, between district demeaned waitlist percentile and district Panhellenic test scores (in student standard deviation units) where the demeaning is done by risk set-year. A risk set is a degree conferral year-month and subject combination. The waitlist percentile is the initial position on the fresh graduates waitlist, normalized to vary from 0 to 1. The sample includes all teachers on a waitlist between 2003 and 2011 whose degree was conferred before 2006.

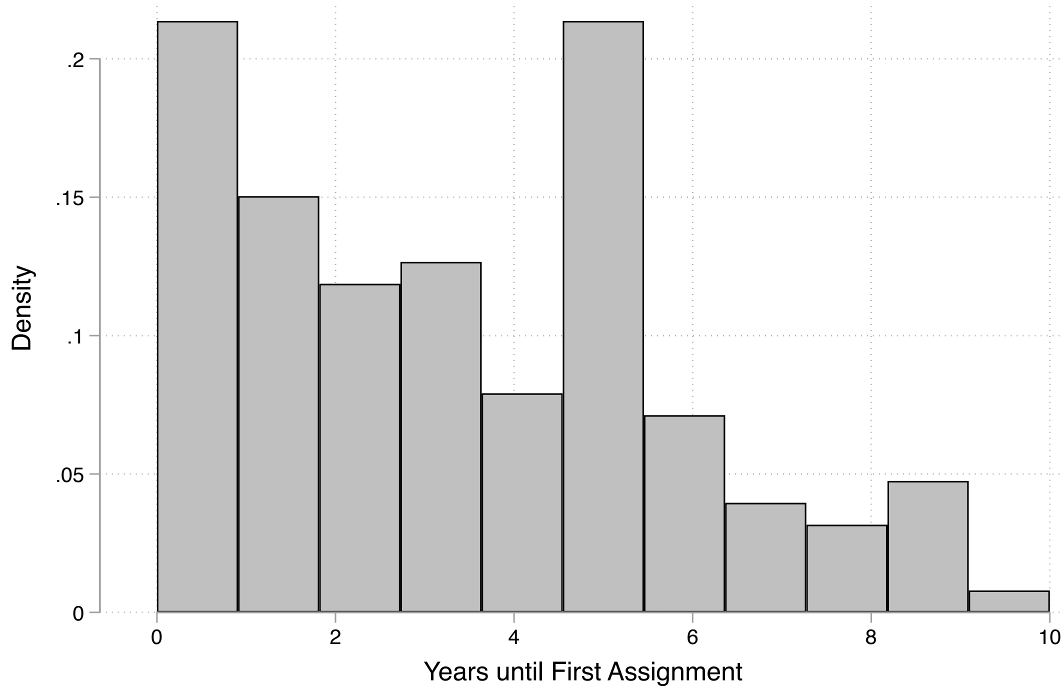
Figure A.9: Cross-District Effects of Eliminating Waiting





Notes: The figures show how changing the time out of formal employment affects districts' test score ranks. The top figure reduces the number of years deputy teachers wait without formal employment by 1 year; the bottom figure reduces the number of years deputy teachers wait to 0. We calculate each district's test score rank, under the actual scores and under counterfactuals, where the district with the lowest mean test scores has the rank 1. For each counterfactual, we take the absolute value of our point estimate from the district-level model, multiply by each district's heterogeneous exposure to the deputy assignment system, and then multiply by the number of years waiting reduced in the counterfactual.

Figure A.10: Years Waiting for First Assignment – Survey



Notes: This figure shows the distribution of the years spent waiting between degree conferral and first teaching assignment. The sample is the teachers who took our online survey. Responses with implied waiting times that are negative or more than 10 years have been excluded.

Table A.1: Activities while Waiting

	Fraction
Private Lessons	0.54
Further Studies	0.33
Started a Family	0.16
Non-Teaching Work in Education Sector	0.19
Work in Non-Education Sector	0.39
Other	0.19

Notes: This table shows the fraction of survey respondents in various activities during the time spent waiting for an assignment. Respondents in the online survey could choose multiple activities.

Table A.2: Teachers Working in Part-Time Jobs

	Part-Time Work while Teaching	Continued Part-Time Work while Teaching
Yes	0.28	0.33
Private Lessons	0.09	0.17
Private School	0.02	0.01
Tourism Industry	0.01	0.01
Work in Other Private Sector	0.04	0.03
Other	0.04	0.03
No	0.72	0.67
N	157	158

Notes: This table shows the part-time jobs teachers report having, while teaching, in the online survey. "Yes" indicates the teacher held a part-time job while teaching. "Part-Time Work while Teaching" is the distribution of part-time jobs while "Continued Part-Time Work while Teaching" is the distribution of part-time jobs that continue activities started while the teacher was waiting for an assignment. Respondents in the online survey could choose multiple responses.

Table A.3: Relationship between Years Waiting and Activities during Teaching

	Activity while Teaching	Continued Activity
Years until First Assignment	0.00706	0.0126
	(0.0143)	(0.0147)
Constant	0.249	0.292
	(0.0598)	(0.0608)
Mean DV	0.273	0.333
N	132	132

Notes: This table shows regressions of activity while teaching on years spent waiting until first assignment. Years spent waiting is calculated as the difference between the year of the first teaching assignment and the year of degree conferral. "Activity while Teaching" is a dummy variable for whether the teacher participated in an extra activity – e.g., private lessons – while working as a public school teacher. "Continued Activity" is a dummy variable for whether the teacher participated in an extra activity, while working as a public school teacher, that had been started while the teacher was waiting for an assignment. The sample is the teachers responding to our online survey.

Table A.4: OLS and IV across Samples

	OLS	IV	OLS	IV
	Score (σ)	Score (σ)	Score (σ)	Score (σ)
Years Waiting	-0.0355	-0.0518	-0.0595	-0.0499
	(0.0312)	(0.0103)	(0.0211)	(0.0121)
Deputy	-0.0802	-0.0860	-0.0575	-0.0546
	(0.0555)	(0.0606)	(0.0513)	(0.0526)
Prior Year GPA	0.737	0.737	0.737	0.737
	(0.00887)	(0.00886)	(0.00888)	(0.00887)
Mean DV	0.0372	0.0372	0.0387	0.0387
Clusters	390	390	389	389
N	54370	54370	54282	54282
Risk Set	Yes	Yes	Yes	Yes
Sample	All Teachers	All Teachers	No Special Cases	No Special Cases

Notes: The table presents OLS and instrumental variable estimates. An observation is a student-subject-year. The dependent variable is the student's subject-specific test score, in standard deviation units. The instrument is the assigned teacher's imputed waitlist position (demeaned by risk set), normalized to run between 0 and 1 within a risk set. Risk sets are teachers in the same subject whose degrees were conferred in the same month-year. The sample includes all teachers ("All Teachers") or only teachers without special circumstances that affect waitlist position ("No Special Cases"). Special circumstances refer to factors that directly affect waitlist positions (having at least three children, having a special needs child, military service, and reading Braille). Permanent teachers each have their own risk set. Standard errors are clustered by teacher.

Table A.5: Effect of Years without Formal Employment on Students' Tests by Subject

	IV	IV	IV
	Score (σ)	Score (σ)	Score (σ)
Years Waiting	-0.0518	-0.0653	-2.206
	(0.0103)	(0.0173)	(6.968)
Deputy	-0.0860	-0.180	-0.376
	(0.0606)	(0.101)	(1.044)
Prior Year GPA	0.737	0.735	0.739
	(0.00886)	(0.0117)	(0.0129)
Mean DV	0.0372	0.0536	0.0265
Clusters	390	161	278
N	54370	21450	32920
Risk Set	Yes	Yes	Yes
Sample	All	STEM	Non-STEM

Notes: The table includes instrumental variable estimates with (demeaned) imputed waitlist position as the instrument. An observation is a student-subject-year. "Years Waiting" is the deputy teacher's years without formal employment, normalized by the risk set size to be in percentiles. "Years Waiting" and the instrument are demeaned by risk set, where a risk set is the cohort of teachers in the same subject with degrees conferred in the same month-year. The outcome is the student's average full-year score in student standard deviation units (σ). STEM fields are algebra, geometry, mathematics, biology, physics, technology, and science. Standard errors are clustered by teacher.

Table A.6: Effect of Years without Formal Employment on Students' Grade Point Average

	IV	IV	IV
	GPA (σ)	GPA	Log GPA
Years Waiting	-0.0402	-0.119	-0.00786
	(0.00543)	(0.0392)	(0.00291)
Deputy	-0.0926	-0.0400	-0.00413
	(0.0299)	(0.186)	(0.0136)
Prior Year GPA	0.930	2.589	0.178
	(0.00366)	(0.0147)	(0.00146)
Mean DV	-0.00171	14.95	2.686
Clusters	390	393	393
N	54099	74555	74499
Risk Set	Yes	Yes	Yes

Notes: The table includes instrumental variable estimates with (demeaned) imputed waitlist position as the instrument. An observation is a student-subject-year where the outcomes do not vary by subject but the teachers do. "Years Waiting" is the deputy teacher's years without formal employment, normalized by the risk set size to be in percentiles. "Years Waiting" and the instrument are demeaned by risk set, where a risk set is the cohort of teachers in the same subject with degrees conferred in the same month-year. The outcome is the student's grade-point-average (out of 20), expressed in student standard deviation units (σ), levels, or logs. Standard errors are clustered by teacher.

Table A.7: District (Demeaned) Waitlist Position and Mean Expected Years without Formal Employment

	Mean $\mathbb{E}$[Years Waiting]	Mean $\mathbb{E}$[Years Waiting]
Mean Waitlist Perc	-0.207	-0.760
	(0.644)	(0.635)
Mean DV	3.556	3.556
N	394	394
District FE	No	Yes
Reg-Yr FE	No	Yes

Notes: This table tests the identifying assumption behind our aggregation to a district-level model. An observation is a district-year. The dependent variable is the mean expected years without formal employment where the expected years without formal employment is the mean over a teacher's risk set and the first mean is taken over the teachers assigned to the district in a given year. The explanatory variable is the district-year's mean of its assignees' (demeaned) waitlist position.

Table A.8: Survey Responses

	Mean	Std. Dev.	Obs
Degree Conferral Year	2007	8	187
Year of First Assignment	2010	9	159
Num Schools Worked in	1.42	0.87	93
Aware of System when Choosing Teaching	0.34	0.47	184
Understand the Assignment Process	0.76	0.43	184
Knew Waitlist Position	0.73	0.44	184
Considered Attriting	0.49	0.50	200
Rejected an Assignment	0.12	0.33	185
Has Left Teaching	0.20	0.40	200
Believes Skills Depreciated while Waiting	0.18	0.38	187
Invested in Skill Maintenance	0.46	0.50	200

Notes: This table shows summary statistics for selected responses to the online survey of teachers. "Num Schools Worked in" indicates the number of different schools a teacher worked in at the same time.

Table A.9: District-Level Instrument Robustness: Test Percentiles

	Score (Percentile)	Score (Percentile)	Score (Percentile)	Score (Percentile)	Score (Percentile)	Score (Percentile)	Score (Percentile)
Years Waiting	-8.913	-10.03	-11.30	-9.702	-7.401	-11.75	-14.24
	(3.010)	(3.070)	(3.181)	(3.362)	(2.857)	(4.775)	(4.454)
Ln Class Size	8.006	7.999	7.990	11.15	8.016	11.39	7.971
	(2.034)	(2.137)	(2.260)	(2.926)	(1.902)	(3.140)	(2.571)
IV	Baseline	Mean across Lists	Max across Lists	Deputy Position	Risk Set Norm	Raw Position	Log Position
Per Class	-1.7825	-2.0059	-2.2595	-1.9404	-1.4803	-2.3494	-2.8471
AR LB	-18.1486	-18.8424	-20.4299	-20.0180	-20.6936	-38.6907	-33.1921
AR UB	-4.4435	-5.4708	-6.5740	-4.7105	-3.7250	-5.6016	-8.5045
Mean DV	49.07	49.07	49.07	49.28	49.07	49.28	49.07
N	390	390	390	337	390	337	390
District FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Reg-Yr FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Risk Set	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The table includes IV regressions. An observation is a district-year. “Years Waiting” is the deputy teacher’s years without formal employment. The different forms of the instruments are listed with labels indicating our baseline model (“Baseline”), an instrument using the mean position across deputy and hourly lists (“Mean across Lists”), an instrument using the maximum position (“Max across Lists”), an instrument using the position from the deputy list (“Deputy Position”), our baseline instrument scaled by risk set list length (“Risk Set Norm”), the actual waitlist position (“Raw Position”), and the log of the waitlist position (“Log Position”). All variables are demeaned by risk set, where a risk set is the cohort of teachers in the same subject with degrees conferred in the same month-year. Test score outcomes are student performance on the national twelfth grade exams, in percentiles (“Perc”). “Reg-Yr FE” are region-year fixed effects. “Per Class” indicates the per-class effect, which is the main coefficient divided by 5 for the 5 classes twelfth graders take in tested subjects. Standard errors are heteroskedasticity-robust. Anderson-Rubin weak instrument-robust 95% confidence intervals are reported in “AR LB” and “AR UB” (Anderson and Rubin, 1949).

Table A.10: District-Level Instrument Robustness: Test Score in Standard Deviations

	Score (σ)	Score (σ)	Score (σ)	Score (σ)	Score (σ)	Score (σ)	Score (σ)
Years Waiting	-0.342	-0.373	-0.408	-0.208	-0.242	-0.319	-0.419
	(0.121)	(0.121)	(0.123)	(0.115)	(0.102)	(0.164)	(0.161)
Ln Class Size	0.239	0.239	0.238	0.304	0.239	0.317	0.238
	(0.0985)	(0.101)	(0.104)	(0.144)	(0.0908)	(0.153)	(0.105)
IV	Baseline	Mean across Lists	Max across Lists	Deputy Position	Risk Set Norm	Raw Position	Log Position
Per Class	-0.0684	-0.0746	-0.0816	-0.0416	-0.0484	-0.0637	-0.0839
AR LB	-0.6903	-0.7200	-0.7373	-0.5377	-0.6768	-1.1470	-1.0402
AR UB	-0.1617	-0.1939	-0.2250	-0.0373	-0.0905	-0.1076	-0.1807
Mean DV	-0.0440	-0.0440	-0.0440	-0.0367	-0.0440	-0.0367	-0.0440
N	390	390	390	337	390	337	390
District FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Reg-Yr FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Risk Set	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The table includes IV regressions. An observation is a district-year. "Years Waiting" is the deputy teacher's years without formal employment. The different forms of the instruments are listed with labels indicating our baseline model ("Baseline"), an instrument using the mean position across deputy and hourly lists ("Mean across Lists"), an instrument using the maximum position ("Max across Lists"), an instrument using the position from the deputy list ("Deputy Position"), our baseline instrument scaled by risk set list length ("Risk Set Norm"), the actual waitlist position ("Raw Position"), and the log of the waitlist position ("Log Position"). All variables are demeaned by risk set, where a risk set is the cohort of teachers in the same subject with degrees conferred in the same month-year. Test score outcomes are student performance on the national twelfth grade exams, in student standard deviation units. "Reg-Yr FE" are region-year fixed effects. "Per Class" indicates the per-class effect, which is the main coefficient divided by 5 for the 5 classes twelfth graders take in tested subjects. Standard errors are heteroskedasticity-robust. Anderson-Rubin weak instrument-robust 95% confidence intervals are reported in "AR LB" and "AR UB" (Anderson and Rubin, 1949).

Table A.11: District-Level Instrument Robustness: Test Percentiles, Controlling for Experience

	Score (Percentile)	Score (Percentile)	Score (Percentile)	Score (Percentile)	Score (Percentile)	Score (Percentile)	Score (Percentile)
Years Waiting	-7.045	-7.714	-8.373	-7.306	-5.716	-4.742	-9.720
	(2.566)	(2.652)	(2.897)	(3.397)	(2.355)	(2.710)	(3.341)
Ln Class Size	5.832	5.713	5.596	8.089	6.068	8.416	5.357
	(1.608)	(1.621)	(1.643)	(2.076)	(1.621)	(2.080)	(1.706)
IV	Baseline	Mean across Lists	Max across Lists	Deputy Position	Risk Set Norm	Raw Position	Log Position
Per Class	-1.4089	-1.5429	-1.6747	-1.4611	-1.1433	-0.9484	-1.9439
AR LB	-13.3959	-14.2762	-15.5433	-16.3860	-11.0773	-10.9129	-17.9878
AR UB	-3.2339	-3.7771	-4.0715	-2.2610	-1.7538	-0.1808	-4.7588
Mean DV	49.07	49.07	49.07	49.28	49.07	49.28	49.07
N	390	390	390	337	390	337	390
District FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Reg-Yr FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Risk Set	Incl Exp	Incl Exp	Incl Exp	Incl Exp	Incl Exp	Incl Exp	Incl Exp

Notes: The table includes IV regressions that control for experience. An observation is a district-year. “Years Waiting” is the deputy teacher’s years without formal employment. The different forms of the instruments are listed with labels indicating our baseline model (“Baseline”), an instrument using the mean position across deputy and hourly lists (“Mean across Lists”), an instrument using the maximum position (“Max across Lists”), an instrument using the position from the deputy list (“Deputy Position”), our baseline instrument scaled by risk set list length (“Risk Set Norm”), the actual waitlist position (“Raw Position”), and the log of the waitlist position (“Log Position”). All variables are demeaned by risk set, where a risk set is the cohort of teachers in the same subject with degrees conferred in the same month-year and the same number of years of prior experience. Test score outcomes are student performance on the national twelfth grade exams, in percentiles (“Perc”). “Reg-Yr FE” are region-year fixed effects. “Per Class” indicates the per-class effect, which is the main coefficient divided by 5 for the 5 classes twelfth graders take in tested subjects. Standard errors are heteroskedasticity-robust. Anderson-Rubin weak instrument-robust 95% confidence intervals are reported in “AR LB” and “AR UB” (Anderson and Rubin, 1949).

Table A.12: Student-Level Analysis – Deputy Teachers Only

	IV	IV	IV	IV	IV	IV
	Score (σ)	Score (σ)	Score (σ)	Admitted	Admitted	Admitted
Years Waiting	-0.0518	-0.0518	-0.0652	-0.0183	-0.0184	-0.0169
	(0.0103)	(0.0103)	(0.0153)	(0.00752)	(0.00780)	(0.00534)
Deputy	-0.0860			-0.0105		
	(0.0606)			(0.0388)		
Prior Year GPA	0.737	0.735	0.718	0.293	0.296	0.305
	(0.00886)	(0.0225)	(0.0368)	(0.00405)	(0.0198)	(0.0202)
Mean DV	0.0372	-0.0675	-0.136	0.670	0.654	0.658
Clusters	390	42	23	391	42	23
N	54370	2686	1116	72879	3839	1565
Risk Set	Yes	Yes	Yes	Yes	Yes	Yes
Sample	All Teachers	Deputy Teachers	Confident Matches	All Teachers	Deputy Teachers	Confident Matches

Notes: This table shows IV regressions with (demeaned) imputed waitlist position as the instrument. We vary the sample across columns to show robustness to excluding non-deputy teachers. "Confident Matches" include only deputy teachers for whom the name match between the micro school data and the administrative waitlist data is unambiguous. An observation is a student-subject-year. "Years Waiting" and the instrument are demeaned by risk set, where a risk set is the cohort of teachers in the same subject with degrees conferred in the same month-year. Standard errors are clustered by teacher.

Table A.13: Student-Level Analysis, Varying Controls

	IV	IV
	Score (σ)	Score (σ)
Years Waiting	-0.0426	-0.0375
	(0.0247)	(0.0111)
Deputy	-0.111	-0.130
	(0.0469)	(0.0618)
Demeaned Prior GPA		0.746
		(0.0103)
Mean DV	-0.00708	0.0372
Clusters	466	390
N	82837	54370
Risk Set	Yes	Yes

Notes: The table presents instrumental variable estimates. An observation is a student-subject-year. The dependent variable is the student's subject-specific test score, in standard deviation units. The instrument is the assigned teacher's imputed waitlist position (demeaned by risk set), normalized to run between 0 and 1. Risk sets are teachers in the same subject whose degrees were conferred in the same month-year. Demeaned prior GPA is demeaned at the teacher-year level. The sample includes students taught by deputy and permanent teachers. Permanent teachers each have their own risk set. Standard errors are clustered by teacher.

Table A.14: Student-Level Analysis – Different Functional Forms

	IV	IV	IV	IV
	Score (σ)	Ln Score	Score (σ)	Ln Score
Years Waiting	-0.0518	-0.0255		
	(0.0103)	(0.0101)		
Deputy	-0.0860	-0.0462	-0.0961	-0.0512
	(0.0606)	(0.0424)	(0.0700)	(0.0448)
Prior Year GPA	0.737	0.204	0.737	0.204
	(0.00886)	(0.00450)	(0.00885)	(0.00450)
Ln Years Waiting			-0.834	-0.411
			(0.164)	(0.145)
Mean DV	0.0372	2.639	0.0372	2.639
Clusters	390	390	390	390
N	54370	54359	54370	54359
Risk Set	Yes	Yes	Yes	Yes

Notes: This table shows IV regressions with (demeaned) imputed waitlist position as the instrument. We vary the functional form of the test outcome (student standard deviation units or log scores) and the measure of years spent not working formally (levels or log). An observation is a student-subject-year. "Years Waiting" and the instrument are demeaned by risk set, where a risk set is the cohort of teachers in the same subject with degrees conferred in the same month-year. Standard errors are clustered by teacher.

Table A.15: Student-Level Analysis – Different Samples

	IV	IV	IV
	Score (σ)	Score (σ)	Score (σ)
Years Waiting	-0.0518	-0.0532	-0.0537
	(0.0103)	(0.0129)	(0.0126)
Deputy	-0.0860	-0.107	-0.0960
	(0.0606)	(0.0776)	(0.0701)
Prior Year GPA	0.737	0.737	0.737
	(0.00886)	(0.00896)	(0.00891)
Mean DV	0.0372	0.0376	0.0379
Clusters	390	376	386
N	54370	53430	53997
Risk Set	Yes	Yes	Yes
Sample	All	Month Not July	Day Not 30th

Notes: This table shows IV regressions with (demeaned) imputed waitlist position as the instrument. We vary the sample across columns to show robustness to excluding common degree conferral months (July) or days (the 30th). An observation is a student-subject-year. "Years Waiting" and the instrument are demeaned by risk set, where a risk set is the cohort of teachers in the same subject with degrees conferred in the same month-year. Standard errors are clustered by teacher.

Table A.16: Student-Level Analysis – Different Outcome Definitions

	IV	IV	IV	IV	IV	IV	IV
	Score	Ln Score	Univ Score	Selec (Adm)	Selec (Natl)	Selec (2003 Adm)	Selec (2003 Natl)
Years Waiting	-0.284	-0.0255	-233.7	-2.166	-2.100	-2.174	-2.080
	(0.112)	(0.0101)	(50.55)	(0.395)	(0.393)	(0.345)	(0.339)
Deputy	-0.490	-0.0462	-348.2	-3.523	-2.954	-3.825	-3.617
	(0.489)	(0.0424)	(265.7)	(2.032)	(2.035)	(1.819)	(1.790)
Prior Year GPA	2.737	0.204	3017.3	24.49	23.74	22.41	21.55
	(0.0471)	(0.00450)	(33.97)	(0.246)	(0.250)	(0.301)	(0.301)
Mean DV	14.60	2.639	14320.8	49.37	49.19	52.61	52.20
Clusters	390	390	370	370	370	370	370
N	54370	54359	48818	48818	48818	35345	35345
Risk Set	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This table shows IV regressions with (demeaned) imputed waitlist position as the instrument. We vary the functional form of the outcome across columns. An observation is a student-subject-year. "Years Waiting" and the instrument are demeaned by risk set, where a risk set is the cohort of teachers in the same subject with degrees conferred in the same month-year. "Score" is the student's average subject-specific test score during the year. This is the raw score that is not standardized to be in student standard deviation units. "Ln Score" is the natural log of the raw score. "Univ Score" is the student's university admissions score, in levels. For the selectivity measures ("Selec"), we order the university-programs according to their enrollees' mean statistic, defined below, and rank them from highest to lowest. The measure is the percentile of this ordering where 100 is the program whose admits have the highest mean score. "Adm" uses the university admissions score for ranking while "Natl" uses the national Panhellenica score, which is an alternate weighting. The "2003" measures use the 2003 cohort to construct the measures to avoid overlap with our analysis sample. Standard errors are clustered by teacher.

Table A.17: Effect of Years without Full-Time Formal Employment on Students' Subject Exam Scores

	OLS	RF	FS	IV	IV	IV	IV	IV
	Score (σ)	Score (σ)	Years Waiting	Score (σ)	Score (Perc)	First Sem (σ)	Second Sem (σ)	Exam (σ)
Years Waiting	-0.0209			-0.0459	-1.368	-0.0321	-0.0392	-0.0474
	(0.0383)			(0.00946)	(0.270)	(0.0102)	(0.0106)	(0.0105)
Deputy	-0.0793	-0.0786	-0.320	-0.0933	-3.000	-0.0662	-0.113	-0.0832
	(0.0562)	(0.0590)	(0.146)	(0.0629)	(1.835)	(0.0601)	(0.0664)	(0.0694)
Prior Year GPA	0.737	0.737	0.000996	0.737	21.90	0.599	0.643	0.703
	(0.00887)	(0.00887)	(0.00112)	(0.00886)	(0.225)	(0.0124)	(0.0139)	(0.00845)
Waitlist Perc		-1.439	31.36					
		(0.300)	(0.752)					
Mean DV	0.0372	0.0372	-0.0277	0.0372	51.06	0.111	0.0783	-0.0239
Clusters	390	390	390	390	390	390	390	388
N	54370	54370	54370	54370	54370	54360	54323	54068
Risk Set	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The table includes OLS, reduced form ("RF"), first stage ("FS"), and IV regressions. An observation is a student-subject-year. "Years Waiting" is the deputy teacher's years without *full-time* formal employment and "Waitlist Perc" is the imputed waitlist position, normalized by the risk set size to be in percentiles. Both variables are demeaned by risk set, where a risk set is the cohort of teachers in the same subject with degrees conferred in the same month-year. We define full-time formal employment as teachers who accrue above-median credits in a year. "Score" is the student's average subject-specific test score during the year. "First Sem" and "Second Sem" are the semester-specific test scores, and "Exam" is the end-of-year exam. This exam is a national exam for 11th graders before 2006 and 12th graders in all years; otherwise it is the school exam. Test results are expressed in student standard deviation units (σ) or percentiles. Standard errors are clustered by teacher.

Table A.18: Bootstrapped Standard Errors

	Point Estimate	Standard Error	Bootstrap Standard Error
OLS, Score (σ)	-0.0355	0.0312	0.0308
RF, Score (σ)	-1.4386	0.2997	0.3088
FS, Years Waiting	27.7715	1.1884	1.1518
IV, Score (σ)	-0.0518	0.0103	0.0113
IV, Score (Perc)	-1.5922	0.3414	0.3776
IV, First Sem (σ)	-0.0363	0.0111	0.0114
IV, Second Sem (σ)	-0.0443	0.0113	0.0110
IV, Exam (σ)	-0.0535	0.0117	0.0129
IV, Ln Univ Score	-0.0192	0.0041	0.0035
IV, List Length	1.2448	0.2835	0.2966
IV, Admitted	-0.0183	0.0075	0.0076
IV, Acad Univ	-0.0126	0.0056	0.0057
IV, Selectivity (Admissions)	-2.1662	0.3951	0.3697

Notes: The table shows non-bootstrapped and bootstrapped standard error estimates for our main individual-level analysis results. Standard errors are clustered by teacher. “RF” and “FS” indicate reduced form and first stage regressions, respectively. Bootstrapped standard errors are produced using 500 iterations of a wild clustered bootstrap with a Rademacher distribution. We bootstrap the entire process, including the calculation of the risk set means.

Table A.19: District-Level Analysis – Different Controls

	Score (σ)	Score (σ)	Score (σ)
Years Waiting	-0.374	-0.413	-0.414
	(0.160)	(0.157)	(0.158)
Ln Class Size	-0.712	-0.810	-0.806
	(0.184)	(0.198)	(0.198)
Num Teachers		0.0369	
		(0.0120)	
Num Students			0.00164
			(0.000559)
Per Class	-0.0748	-0.0827	-0.0828
AR LB	-0.7347	-0.7562	-0.7580
AR UB	-0.0891	-0.1330	-0.1321
Mean DV	-0.0442	-0.0442	-0.0442
N	394	394	394
District FE	Resid	Resid	Resid
Reg-Yr FE	Resid	Resid	Resid
Risk Set	Yes	Yes	Yes

Notes: This table shows IV regressions with (demeaned) imputed waitlist position as the instrument. The columns vary our use of controls. All columns use (demeaned) fixed effects. The second and third columns include additional district-level controls. An observation is a district-year. All variables are demeaned by risk set, where a risk set is the cohort of teachers in the same subject with degrees conferred in the same month-year. Standard errors are heteroskedasticity-robust. Anderson-Rubin weak instrument-robust 95% confidence intervals are reported in "AR LB" and "AR UB" (Anderson and Rubin, 1949).

Table A.20: District-Level Analysis – Different Functional Forms

	Score (σ)	Ln Score	Score (σ)	Ln Score
Years Waiting	-0.342	-0.129		
	(0.121)	(0.0478)		
Ln Class Size	0.239	0.131	0.270	0.143
	(0.0985)	(0.0353)	(0.0922)	(0.0334)
Ln Years Waiting			-0.712	-0.269
			(0.239)	(0.0992)
Per Class	-0.0684	-0.0258	-0.1424	-0.0537
AR LB	-0.7023	-0.2482	-1.3448	-0.5003
AR UB	-0.1545	-0.0439	-0.3244	-0.0918
Mean DV	-0.0440	2.504	-0.0440	2.504
N	390	390	390	390
District FE	Yes	Yes	Yes	Yes
Reg-Yr FE	Yes	Yes	Yes	Yes
Risk Set	Yes	Yes	Yes	Yes

Notes: This table shows IV regressions with (demeaned) imputed waitlist position as the instrument. We vary the functional form of the test outcome (student standard deviation units or log scores) and the measure of years spent not working formally (levels or log). An observation is a district-year. "Years Waiting" and the instrument are demeaned by risk set, where a risk set is the cohort of teachers in the same subject with degrees conferred in the same month-year. Standard errors are heteroskedasticity-robust. Anderson-Rubin weak instrument-robust 95% confidence intervals are reported in "AR LB" and "AR UB" (Anderson and Rubin, 1949).

Table A.21: District-Level Analysis – Different Samples

	IV	IV	IV
	Score (σ)	Score (σ)	Score (σ)
Years Waiting	-0.342	-0.192	-0.297
	(0.121)	(0.0845)	(0.104)
Ln Class Size	0.239	0.251	0.239
	(0.0985)	(0.0850)	(0.0924)
Per Class	-0.0684	-0.0384	-0.0594
AR LB	-0.7023	-0.3826	-0.5887
AR UB	-0.1545	-0.0482	-0.1369
Mean DV	-0.0440	-0.0440	-0.0440
N	390	390	390
District FE	Yes	Yes	Yes
Reg-Yr FE	Yes	Yes	Yes
Risk Set	Yes	Yes	Yes
Sample	All	Month Not July	Day Not 30th

Notes: This table shows IV regressions with (demeaned) imputed wait-list position as the instrument. We vary the sample across columns to show robustness to excluding common degree conferral months (July) or days (the 30th). An observation is a district-year. "Years Waiting" and the instrument are demeaned by risk set, where a risk set is the cohort of teachers in the same subject with degrees conferred in the same month-year. Standard errors are heteroskedasticity-robust. Anderson-Rubin weak instrument-robust 95% confidence intervals are reported in "AR LB" and "AR UB" (Anderson and Rubin, 1949).

Table A.22: District-Level Analysis – Different Outcome Definitions

	IV	IV	IV	IV	IV	IV	IV
	Score	Ln Score	Univ Score	Selec (Adm)	Selec (Natl)	Selec (2003 Adm)	Selec (2003 Natl)
Years Waiting	-1.352	-0.129	-1154.1	-5.647	-5.100	-3.693	-2.830
	(0.454)	(0.0478)	(455.2)	(2.577)	(2.655)	(2.974)	(3.142)
Ln Class Size	1.345	0.131	1723.1	9.129	9.530	7.788	8.039
	(0.331)	(0.0353)	(426.7)	(2.260)	(2.234)	(1.830)	(1.866)
Per Class	-0.2703	-0.0258	-230.8	-1.129	-1.020	-0.739	-0.566
AR LB	-2.5907	-0.2482	-2.3e+03	-12.6868	-12.3540	-12.7591	-12.4092
AR UB	-0.6153	-0.0439	-3.4e+02	-1.4645	-0.7898	0.6641	1.7727
Mean DV	13.10	2.504	14274.0	48.77	48.58	52.40	52.12
N	390	390	390	390	390	385	385
District FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Reg-Yr FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Risk Set	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This table shows IV regressions with (demeaned) imputed waitlist position as the instrument. We vary the functional form of the outcome across columns. An observation is a district-year. "Years Waiting" and the instrument are demeaned by risk set, where a risk set is the cohort of teachers in the same subject with degrees conferred in the same month-year. "Score" is the student's average subject-specific test score during the year. This is the raw score that is not standardized to be in student standard deviation units. "Ln Score" is the natural log of the raw score. "Univ Score" is the student's university admissions score, in levels. For the selectivity measures ("Selec"), we order the university-programs according to their enrollees' mean statistic, defined below, and rank them from highest to lowest. The measure is the percentile of this ordering where 100 is the program whose admits have the highest mean score. "Adm" uses the university admissions score for ranking while "Natl" uses the national Panhellenica score, which is an alternate weighting. The "2003" measures use the 2003 cohort to construct the measures to avoid overlap with our analysis sample. Standard errors are heteroskedasticity-robust. Anderson-Rubin weak instrument-robust 95% confidence intervals are reported in "AR LB" and "AR UB" (Anderson and Rubin, 1949).

Table A.23: Effect of Years without Formal Employment on Districts' Panhellenic Exam Scores without Scaling

	Score (σ)	Score (Percentile)	Ln University Score	Admitted
Years Waiting	-0.121	-3.159	-0.0579	-0.0442
	(0.0603)	(1.495)	(0.0458)	(0.0222)
Ln Class Size	0.105	2.174	0.0231	0.0102
	(0.0535)	(1.293)	(0.0412)	(0.0166)
Per Class	-0.0242	-0.6317	-0.0116	-0.0088
AR LB	-0.2764	-7.0074	-0.1612	-0.0961
AR UB	-0.0234	-0.7310	0.0272	-0.0045
Mean DV	-0.0440	49.07	9.518	0.818
N	390	390	390	390
District FE	Yes	Yes	Yes	Yes
Reg-Yr FE	Yes	Yes	Yes	Yes
Risk Set	Yes	Yes	Yes	Yes

Notes: The table include the main IV regressions without incorporating the deputies we lack inexperience waitlist positions for. An observation is a district-year and the IV outcomes are measures of student performance on the national twelfth grade exams, as mean level (in student standard deviation units) or mean percentile, and university admissions outcomes. Standard errors are heteroskedasticity-robust. Anderson-Rubin weak instrument-robust 95% confidence intervals are reported in "AR LB" and "AR UB" (Anderson and Rubin, 1949).

Table A.24: Effect of Years without Formal Employment on Districts' Panhellenic Exam Scores with Alternate Weighting

	Score (σ)	Score (σ)	Score (σ)
Years Waiting	-0.342	-0.454	-0.468
	(0.121)	(0.172)	(0.132)
Ln Class Size	0.239	0.502	0.598
	(0.0985)	(0.116)	(0.0883)
Per Class	-0.0684	-0.0908	-0.0937
AR LB	-0.7023	-0.9651	-0.8397
AR UB	-0.1545	-0.2021	-0.2646
Mean DV	-0.0440	-0.150	-0.178
N	390	390	390
District FE	Yes	Yes	Yes
Reg-Yr FE	Yes	Yes	Yes
Risk Set	Yes	Yes	Yes
Weighting	Num Students	Num Deputies	None

Notes: The table includes the main IV regressions using alternate weighting. An observation is a district-year and the IV outcomes are measures of student performance on the national twelfth grade exams, in student standard deviation units. Weighting is shown in the last row. Standard errors are heteroskedasticity-robust. Anderson-Rubin weak instrument-robust 95% confidence intervals are reported in "AR LB" and "AR UB" (Anderson and Rubin, 1949).