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Descriptive evidence on school leaders' prior professional experiences and instructional effectiveness

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Descriptive evidence on school leaders' prior professional experiences and instructional effectiveness

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Abstract

Despite empirical evidence suggesting the important influence school leaders have on learning conditions and student outcomes in schools, relatively little is understood about the professional pathways they take into their roles. In this descriptive paper, we document the professional experiences, personal characteristics and instructional effectiveness of Oregon's principals and assistant principals between 2006 and 2019. We highlight the diversity of roles educators assume prior to entering school leadership. We find that school leaders who have prior teaching experience in tested grades and subjects do not raise student achievement at substantively or statistically meaningful higher rates than their peers. We document that female principals and assistant principals have become more representative of the teaching workforce, but that there have been almost no changes in the racial/ethnic composition of school leaders in Oregon. Finally, we observe minimal differences in female and non-White assistant principals' time-to-entry into the principalship. Our findings provide insights on potential points of intervention during the educator career trajectory to attract and develop more effective and demographically representative school leaders.

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1 Professional pathways to school leadership

School principals play a central role in promoting student learning and supporting teacher development. Despite methodological difficulties in measuring school leaders' impact on student learning (Grissom et al., 2015; Chiang et al., 2016), credibly causal evidence suggests that principals are important factors in the variability of student learning gains (Branch et al., 2012; Coelli and Green, 2012; Dhuey and Smith, 2014), student attendance rates (Bartanen, 2020), and teacher working conditions (Burkhauser, 2017). However, much remains to be understood about principals' professional pathways into the role, how they influence teacher, school and student outcomes, and how their influence might vary across different types of students and teachers (Liebowitz and Porter, 2019).

For policy makers and educational system leaders interested in attracting and developing more effective and representative school leaders, it is critical to understand the professional experiences and personal characteristics of those who currently become assistant principals and principals.[1] Despite the attractiveness of multi-faceted strategies to improve the pipeline of school leaders, in contexts of limited resources, system leaders would benefit from an understanding of potential high-leverage moments of intervention during the educator career trajectory. For instance, whether or not incoming principals have extensive administrative experience at the school building level has important implications for their pre-service training, induction and ongoing professional development. Similarly, the prior instructional effectiveness of school leaders may have implications for the development of current school leaders and the recruitment of future ones.

In this brief descriptive paper, we study the professional pathways educators take into school leadership roles and how these interact with their personal characteristics and their prior instructional effectiveness. Leveraging comprehensive student and staff data from the state of Oregon between 2006-07 and 2018-19, we describe the sequence of professional positions educators hold prior to entering the principalship, their prior efficacy in improving students' test score outcomes as teachers, and how entry into the principalship varies by educators' observable characteristics.

Most other empirical studies on school leadership have focused on different moments in the career trajectory than ours. A small, but growing, body of work examines the effects of university-based (Grissom et al., 2019b) and alternative principal pre-service preparation programs (Clark et al., 2009; Corcoran et al., 2012; Gates et al., 2019a, 2014). Other work examines the benefits to experience in the principalship (Bartanen, 2019), the negative effects of principal turnover (Bartanen et al., 2019; Grissom and Bartanen, 2019), the sorting of principals to particular schools or communities (Grissom et al., 2019a; Loeb et al., 2010), and the labor market for practicing principals (Béteille et al., 2012; Cullen et al., 2016). Still others have evaluated comprehensive efforts to reform the identification, recruitment, selection, coaching and evaluation of principals (Gates et al., 2019b). Collectively, this evidence highlights the importance of designing pre-service preparation, recruitment, selection and ongoing development of school leaders with an

[1] In this study, we use the term school leader to describe assistant principals and principals. When we examine these positions separately, we describe them by their specific titles.

understanding of their prior professional experiences and instructional effectiveness.

The unifying purpose of this study is to provide university and school system administrators insights to improve the pre-service training, recruitment and selection of prospective school leaders and their efforts to develop skills in current leaders. In so doing, we seek to answer the following descriptive questions:

1. What professional experiences do educators have prior to becoming school principals?
2. Are teachers who become school leaders differentially effective at improving student test score outcomes?
3. Does the probability that assistant principals will become a principal depend on their observable characteristics?

To preview our results, we find that while the assistant principalship (AP) is a frequent stepping stone into the principalship, educators pursue many different pathways to the principal's office. We do not find that school leaders who have prior teaching experience in tested grades and subjects raise student achievement at higher rates than peer teachers who do not enter school leadership. Our estimates are relatively precise, and we can confidently rule out effectiveness differences for principals greater than 0.02 and 0.04 standard deviations in language arts and math, respectively. Finally, we document, that conditional on entering the assistant principalship, female and non-White APs have an equal probability of becoming school principals in the six years after first becoming assistant principals, even when adjusting for their age, experience, district of employment and observed measures of instructional effectiveness. However, seven years after first becoming an assistant principal and onward, non-White APs have a substantively meaningful (though imprecisely estimated) lower probability of becoming principals than their White counterparts.

Our first two research questions answer topics most aligned with Austin et al. (2019) and Goldhaber, Holden and Chen (2019). Austin et al. examine the professional trajectories of educators across six states. They observe wide variation in the prior positions that principals hold across these geographies. Our results indicate that Oregon mirrors states like Massachusetts, Missouri and Washington in Austin et al. in that many school leaders move into the principalship without ever serving as an assistant principal. Like Goldhaber and co-authors, we observe small magnitude and insignificant positive selection into the principalship (and, in our case, the assistant principalship) by instructional effectiveness.

Our third question addresses issues similar to Bailes and Guthery (2020) and Davis, Gooden and Bowers (2017). In contrast with both of these Texas-based studies, we find less evidence in Oregon that female and non-White individuals in the school leadership pipeline are systematically less likely to enter the principalship, at least in the early stages of their career. Oregon's teaching and assistant principal workforce is substantially more White and male than Texas's is. Barriers to entry, thus, appear to play an important role earlier in the principal pathway in Oregon than in Texas. Our study complements this previous work by highlighting that strategies to recruit and select more representative school leaders will vary by the context of the

system.

In the sections that proceed, we briefly describe our data and descriptive characteristics of our sample. Next, we describe our analytic strategy. We then present our results before concluding with recommendations for policy and practice.

2 Data

We draw our data from the full student and staff administrative records of the Oregon Department of Education (ODE) from the 2006-07 through the 2018-19 school years. The staff records include information on all positions educators held in Oregon public schools and districts, their FTE in these positions, their demographic details, and their years of experience. The student data contain demographic information, course-taking patterns, attendance rates, and test score outcomes through 2017-18. For the 2013-14 school year and onwards, the data include a set of linking identifiers between students, classes and teachers.[2]

The state of Oregon operates approximately 1,250 public schools, depending on the year. As such, each year we observe around 1,200 school principals after accounting for some small schools that share principals. In total across the 13 years of our study, we observe 3,180 principals and 2,004 APs. Our estimates of teacher effectiveness draw on 1,631,646 student-subject-year observations from 2013-14 to 2017-18.

We begin with graphical evidence on the composition of principal workforce in Oregon. In Panel A of Figure 1, we note the nearly monolithically White, non-Hispanic school leader workforce in Oregon. Oregon is similar to many other states during this time period insofar as it experienced substantial growth in its non-White population (almost entirely driven by increases in Hispanic/Latinx students), with minimal corresponding changes in either its teaching or principal workforce. Despite these broad similarities with other states, Oregon lags its peers: NCES documents that 77.7 percent of principals nationwide were White in 2017-18, which represented a 3.2 percentage point decline since 2007-08. Oregon's assistant principals have become slightly more racially and ethnically diverse during this time. Between 2013-14 and 2018-19, the assistant principal workforce became around 3 percentage points more non-White.

In Panel B of Figure 1, we highlight the sizeable increase in female principals in Oregon, such that they now represent a clear majority of school leaders (54.5 percent). Oregon's proportions of, and increases over time in, female principals are nearly identical to national patterns. The gender balance shifts are even more dramatic for Oregon's assistant principals: the proportion of female APs increased by 16 percentage points during this time period.

In Table 1, we present additional professional and demographic characteristics of individuals who ever serve as principals (Panel A) and assistant principals (Panel B) over our full panel of 13 years. The average principal is 48 years old and has a total of 19 to 20 years of experience.

[2]During the time that we study, there were important shifts in Oregon's testing regime. We discuss these issues and describe our data in more detail in Appendix B. Importantly, if we restrict our estimates that leverage teacher effects to 2014-15 and onwards (thereby excluding one year from our sample) during which time all students took the Smarter Balanced Assessment Consortium (SBAC) test, our results are identical.

Principals accrue most of their experience within the state of Oregon; however, educators frequently move to different schools and districts around Oregon when assuming school leadership positions. In Appendix Figure A1, we present the proportion of APs and principals who enter their new role as AP or principal after having worked the prior year in the same school (Panel A) or district (Panel B). Over 80 percent of new principals assume their role in a different school than the one in which they were previously employed; over 60 percent move to a new district. Give the benefits of school-specific experience for principals that Bartanen (2019) documents, these hiring practices may create additional challenges to principals when first assuming their new positions. We present additional detail on educators' prior experience in and out of the state, in their district, and overall, when assuming the principalship in Appendix Figure A2.

Oregon's assistant principals are, on average, somewhat younger (44 years old) and have less experience (15 to 16 years) than principals. Table 1 also highlights that the majority of APs in Oregon work in secondary settings and most elementary schools do not have an AP.

3 Methods

We examine our first question about school leaders' professional pathways through a series of displays that rely on simple counts and proportions.

Our second question requires us to estimate teacher effects on student outcomes. A wide variety of such approaches exist (Koedel et al., 2015). While a full exploration of these nuances falls outside our scope, we highlight the attention researchers have paid recently to the perils of relying on unadjusted variation in teacher effects using fixed effects estimation strategies, which are biased upwards as a result of yearly estimation error (Bitler et al., 2019). We draw on an approach similar to Cohodes, Setren and Walters (2019) in which we estimate teacher effects via restricted maximum likelihood estimation. Formally, we fit:

$$\begin{aligned} Y_{igt} =& \Gamma_g + \Pi_t + \alpha(f(Y_{i(g,t-1)})) + \mathbf{X}_{i(g,t)}\gamma + \bar{Y}_{i(c,g,t-1)} + \bar{\mathbf{X}}_{i(c,g,t)}\theta + \\ & (\sigma_{s(i,g,t)} + \tau_{j(i,g,t)} + \epsilon_{it}), \end{aligned} \tag{1}$$

in which we regress student i's test score Y in year t on fixed effects of grade (Γ_g) and year (Π_t). We include a cubic function of students' prior-year achievement ($f(Y_{i(g,t-1)})$) as well as vectors of student demographic characteristics ($\mathbf{X}_{i(g,t)}$) and the average of these characteristics taken at the classroom level ($\bar{Y}_{i(c,g,t-1)}$ and $\bar{\mathbf{X}}_{i(c,g,t)}$, respectively). The demographic characteristics include indicators for a student's gender, age, race, low-income (FRPL) status, English proficiency status, receipt of special education services, receipt of Section 504 services, participation in Indian or migrant education programs, and prior absences. We allow for a three-level error structure where $\sigma_{s(i,g,t)}$ indexes students' school s, $\tau_{j(i,g,t)}$ indexes their teacher j, and ϵ_{it} is an idiosyncratic student-level error term.

Our maximum likelihood estimates of this function return random effects for teachers that approximate the true variance of their effects. Our primary results are derived from models

in which we nest students within grade- and year-fixed effects, allow for random school- and teacher-disturbances, and adjust for classroom characteristics.[3] This strategy is essentially identical to Empirical Bayes estimates in which we would calculate the teacher effect variance via a fixed effects approach and then correct for estimation error using the ratio of true teacher effects to observed teacher variance.

Operationally, we are able to estimate teacher effects from 18,481 teacher-year observations in grades 4-8 between 2013-14 and 2017-18 (Appendix B provides details on the construction of this sample). 154 of these unique teachers ever become principals and 156 ever become APs. We conduct a simple educator-level bivariate regression to compare the mean teacher effects of teachers who become school leaders with those who do not.

Our third question, seeks to understand whether pathways into the principalship are different for educators of different backgrounds. In particular, we explore whether the time it takes for APs to become principals varies by their gender and race/ethnicity. We restrict our analyses to individuals who reveal an interest in school leadership by entering into the assistant principal role, and we follow them over time whether or not they remain in the AP role. Using this sub-sample of 2,004 APs, we fit a linear probability model for assistant principal i in time t that takes a general form of:

$$PRIN_{it} = \Pi_{it} + \beta_1 FEMALE_i + (FEMALE \times \Pi_{it})\Upsilon_{it} + \mathbf{X}_{it}\theta_i + \beta_2 LEVEL_{it} + \epsilon_{it}, \quad (2)$$

where $PRIN_{it}$ is a binary indicator of whether (1) or not (0) educator i is a principal in year t. t is defined as an index of the number of years greater than or equal to 0 since an individual first assumes the role of AP. Π_{it} represents a series of dummy variables assuming a value of 1 if the educator is t years away from having first become an AP and zero otherwise. The coefficients on each of the values of Π_{it} represent the marginal probability in year t of becoming a principal for men. The linear combination of these coefficients with the coefficients on the main effect of $FEMALE_i$ and the interaction $FEMALE \times \Pi_{it}$ represents the corresponding marginal probability for women. The vector of staff covariates ($\mathbf{X}_{it}$) includes educator age, total years of experience, and the educator's race/ethnicity. We swap this last predictor with gender and its interactions with time to estimate differences in principal probability by race. Ideally, we would like to have some measure of assistant principals' effectiveness in their roles as this may influence their likelihood of selection into the principalship. As a rough proxy, in some models, we use their effectiveness at increasing students' test scores when they were teachers, for those APs for whom we have this data.[4] $LEVEL_{it}$ is a set of indicators for the school-level at which the AP serves (elementary, middle or high) which are important given the different

[3] We fit additional models in which we allow for a four-level error structure, including the random effect of classroom ($\kappa_{c(i,j,g,t)}$). These estimates are correlated with our primary teacher effects at 0.98 and 0.99 in math and reading, respectively. Our results for selection into the principalship remain unsurprisingly, therefore, unchanged.

[4] Our data are ultimately too sparse to support models that condition on teacher effectiveness by race as they rely on just over 150 assistant principals, of whom only 20 are non-White. Thus, we present these results only by gender.

prevalence of assistant principal positions and principal job opportunities at each level. We test our results to the robustness of the inclusion district fixed effects to restrict our comparison of time-to-entry into the principalship to within-district peers.

Our research design attempts to capture some of the endogenous differences in interest in school leadership by restricting our analysis to those who have entered the assistant principalship. As a result of this restriction, we are unable to explore the career progression of those who never enter an AP role. Further, some assistant principals have no interest in the principalship. We are unable to distinguish group-level differences in preferences for leadership roles from bias in the hiring process (or, for that matter, any other mechanism). Rather, we provide descriptive information on the career trajectories of school leaders which may serve as motivation for future research designs that can tease out these causal questions.

4 Results

4.1 What professional experiences do educators have prior to becoming school principals?

While many educators enter the principalship from an assistant principal position or directly from teaching, sizeable proportions do so via other routes. In Figure 2, we present an alluvial flow of the pathways that the 1,205 principals who were serving in this role in 2018-19 took into their current position over the 13 years for which we are able to observe their experience. The most common pathway into the principalship entails moving from teacher to assistant principal to principal. Another common path involves moving from a teaching or teaching plus other responsibility role directly into the principal's office. Still others, however, take meandering roles in and out of district- and school-based supports.[5]

A large proportion of schools in Oregon, particularly small schools and those at the elementary level, do not have assistant principals; thus the pathway to the principalship must necessarily include alternate routes. In Appendix Figure A3, we categorize the roles that principals held immediately prior to the first entry into the principalship that we observe. We are first able to determine this in 2007. Of the total entrants into the principalship over these 12 years (n=1,571), only 48 percent enter immediately from the assistant principalship. An additional 23 percent enter the principal's office directly after a year of teaching, either as a full-time teacher or as a teacher with additional job responsibilities.

Given the diverse roles from which educators ascend to the principalship, we present in Appendix Table A1 descriptive statistics on all educators who hold a leadership role, broadly defined. These educational leaders occupy diverse roles, ranging from superintendent to school psychologist. Nevertheless, the demographic characteristics of these educators are quite similar to those of principals and assistant principals.

Of course, our observations are left-censored as we do not observe educators' experiences prior to

[5]District support roles include positions such as Instructional Coordinator and Teacher on Special Assignment (TOSA), whereas school-based support represents a broad category encompassing a wide variety of positions ranging from Guidance Counselor to School Psychologist.

the 2006-07 school year. While we have a record of their total years of experience, we are unable to observe the positions they held prior to the start of our panel. Additionally, we are unable to observe prior positions for educators who enter Oregon public schools from private schools, out of state, or internationally. Nevertheless, there is substantial turnover in the principalship which generally permits us to observe the prior position of most principals in our panel. For the cohort of school leaders serving as principals in 2018-19 that we observe in Figure 2, we observe minimally one position prior to assuming their current principalship for 77 percent.

4.2 Are teachers who become school leaders differentially effective at improving student test score outcomes?

Consistent with prior studies, we estimate the standard deviation of our teacher effects to be between 0.11 and 0.16 *SDs* in magnitude in language arts and mathematics, respectively. We present the results of our maximum likelihood estimates of teacher effects from Equation 1 in Appendix Table A2.

The most generous interpretation of our findings is that school leaders are modestly positively selected for their instructional effectiveness. In Table 2, we document the relative effectiveness of individuals who become school (and other) leaders and for whom we observe at least one measure of their effectiveness at increasing student test score outcomes. Teachers who later become principals increase their students' test scores by 0.015 and 0.005 standard deviations in math and language arts, respectively. Teachers who ever become assistant principals increase their students' test scores by a corresponding 0.02 and 0.015 *SDs*. However, we are unable to reject the null in all cases despite relatively small confidence intervals.

Out of concern that our estimates of educators' relative effectiveness may be biased by different experience levels for those who enter leadership roles, we re-estimate all of the coefficients in Table 2 while including a continuous measure of total years of experience. None of these estimates are different from those reported in Table 2 by more than one-thousandth (0.001) of a standard deviation.[6]

We estimate other types of leaders' effectiveness even more precisely, given the larger pool of this category of educators, and we are able to rule out all but the smallest differences in their average effectiveness from those of their peer teachers who do not take on leadership roles.

4.3 Does the probability that assistant principals will become a principal depend on their observable characteristics?

In Figure 3, we plot the marginal estimated probability that educators who have entered the assistant principalship will later become principals for each year after they first became APs.

[6] An alternative approach to describing the relative effectiveness of school leaders is to compare them with non-school leaders using the magnitude of the teacher-level value-added standard deviation as the scale. This is equivalent to dividing the coefficients in Table 2 by the standard deviations in Table A2. The appeal of this approach is that it compares individuals to the average teacher. Such an approach increases the magnitude of the coefficients in Table 2: principals are 0.091 and 0.040 teacher-level standard deviation units more effective than their non-principal peers. However, we argue that this obscures the key substantive interpretation: the instructional effectiveness of school leaders in improving student test scores does not differ in a substantively meaningful way from their non-leader peers.

In Panel A, we compare White APs with non-White APs. We observe no difference in the first six years after the groups first become assistant principals. However, beginning in year seven and afterwards, we consistently observe that White APs are more likely to become principals than non-White APs with yearly differences between 5 and 15 percentage points; though we acknowledge the imprecision of many of these yearly estimates.

In Panel B, we plot the probability of becoming a principal for men and women who enter the assistant principalship. Across all years after beginning the AP role, we see no differences in their probability of becoming principals.[7]

In Appendix Figure A4, we plot the marginal probability conditioning on the additional variable of assistant principals' effectiveness at increasing students' test scores.[8] Though we stress caution in interpreting these results as they rely on only 481 educator-year observations and all of our estimates are noisy, there is some suggestion that once we condition on prior effectiveness that male APs are more likely to be selected into the principalship, at least in the first three years after first assuming the assistant principalship. If these estimates are to be believed, they would imply that female APs must demonstrate higher levels of instructional effectiveness in order to have the same probability of moving into the principalship.

5 Discussion and Conclusion

The lower rate of representation in school leadership, as well as the differential rate of progression into the principalship, for non-White educators has substantial implications for both the teacher workforce and student bodies. A small literature highlights the possible bias that White educators bring to the hiring and evaluation of non-White teachers (Chi, 2019; Bartanen and Grissom, 2019). To the extent that the benefits of student-teacher race matches (Lindsay and Hart, 2017; Gershenson et al., 2018; Egalite et al., 2015) extend to the benefits of same-race principals, students may also directly benefit from addressing this under-representation in school leaders. Our results suggest that more is needed to recruit and select aspiring non-White educators into assistant principal and other school- and district-support roles. Additionally, policy makers and system administrators might attend to long-tenured, non-White assistant principals who are not progressing in their careers to better understand the cause of these bottlenecks.

Oregon has experienced rapid growth in its proportion of school leaders who are female. Overall, once women ascend into an assistant principal role, they have the same likelihood of becoming a principal as their male peers. However, an important caveat is that among women with measures of their prior instructional effectiveness, they appear less likely to enter the principalship

[7]The estimation of standard errors for marginal predictions with large numbers of fixed effects swept out requires computationally intensive bootstrapping. For simplicity, we present results without district fixed effects. However, the coefficients on the marginal effects of each year of AP experience interacted with White in models with district fixed effects are substantively identical to those without; none differ by more than 0.5 percentage points. Similarly, the marginal effects of each year of AP experience interacted with female in models with district fixed effects are substantively identical to those without; none differ by more than 0.1 percentage points.

[8]We assign APs the mean of their prior mathematics and language arts teacher effect scores if they have both. Otherwise, we assign them the value of the one they do have.

than men with the same contribution to student learning. Husain, Matsa and Miller (2018) highlight one mechanism through which women's leadership opportunities might be stymied in school: male teachers are more likely to transfer away from women principals and towards male principals. We are unable to determine whether this difference in probability of becoming principals stems from preferential differences, bias in the hiring process or some other causal factor. Nevertheless, Oregon's educational leaders might benefit from attention to this stage of the human resource process to prevent "glass ceiling" effects.

Oregon is, of course, imperfectly generalizable to other contexts. The combination of rural and remote settings with a handful of mid- to large-sized school districts is a distinctive feature of the state as is the virtual absence of Black students and educators. Further, all analyses relying on teacher effectiveness estimates generalize to only a small fraction of the school leadership workforce. Additionally, this study explores only part of the career trajectory. Principal training as well as ongoing development and retention are crucially important, particularly as they relate to creating supportive environments for members of historically marginalized groups.

Nevertheless, university preparation programs and school systems interested in building educator pipelines into school leadership positions might gain insight from our findings. First, we document missed opportunities to recruit highly effective teachers. The role of school leader encompasses far more than the ability to increase students' test scores. Additionally, teacher effectiveness at improving test-score outcomes is imperfectly correlated with their effectiveness at improving other outcomes. Further, there may be negative consequences of systematically removing highly effective teachers from the classroom to take on administrative roles. Nevertheless, to the extent that such measures serve as reasonable proxies for instructional skill and to the extent that instructional skill is a helpful tool to coach others to improve their own instructional skills, school systems could do more to recruit instructionally effective teachers. Further, coaching to improve instructional leadership skills for school leaders should account for the fact that current school leaders in Oregon have not demonstrated substantially stronger skills in improving student outcomes.

Second, we highlight that principals enter their roles from multiple positions besides the assistant principalship. These patterns are suggestive of the types of on-the-job learning opportunities which principals may, and may not, have experienced prior to assuming their role. Principals with different prior professional experiences may benefit from different types of early-career supports. Furthermore, given the high degree of cross-school and cross-district moves, policy makers may be interested in providing greater supports to principals entering new contexts given the potential lack of portability of principal skills across institutional settings. System leaders interested in diversifying the school leadership workforce should focus attention on recruitment into both the AP role and these other positions. To build a pipeline of school leaders who better represent their student bodies, priority should be placed on recruitment of racially and ethnically diverse candidates into these mid-tier leader positions.

Finally, a secondary focus on ensuring the transition from the assistant principalship to the principalship is free of racial, ethnic and gender bias could clear obstacles for more experienced non-White educators and level the playing field for female candidates.

References

Austin, W., Chen, B., Goldhaber, D., Hanushek, E. A., Holden, K., Koedel, C., Ladd, H. F., Luo, J., Parsons, E., Phelan, G., Rivkin, S. G., Sass, T. R., and Turaeva, M. (2019). Path to the principalship and value-added: A cross-state comparison of elementary and middle-school principals. CALDER Working Paper No. 213-0119-1, CALDER, Washington, DC.

Bailes, L. P. and Guthery, S. (2020). Held down and held back: Systematically delayed principal promotions by race and gender. *AERA Open*, 6(2):1–17.

Bartanen, B. (2019). Identifying principal improvement. EdWorkingPaper 19-136, Annenberg Institute at Brown University, Providence, RI.

Bartanen, B. (2020). Principal quality and student attendance. *Educational Researcher*, 49(2):101–113.

Bartanen, B. and Grissom, J. A. (2019). School principal race and the hiring and retention of racially diverse teachers. EdWorkingPaper 19-59, Annenberg Institute at Brown University, Providence, RI.

Bartanen, B., Grissom, J. A., and Rogers, L. K. (2019). The impact of principal turnover. *Educational Evaluation and Policy Analysis*, 41(3):350–374.

Béteille, T., Kalogrides, D., and Loeb, S. (2012). Stepping stones: Principal career paths and school outcomes. *Social Science Research*, 41(4):904–919.

Bitler, M., Corcoran, S., Domina, T., and Penner, E. (2019). Teacher effects on student achievement and height: A cautionary tale. NBER Working Paper No. 26480, National Bureau of Economic Research, Cambridge, MA.

Branch, G., Hanushek, E. A., and Rivkin, S. (2012). Estimating the effect of leaders on public sector productivity: The case of school principals. NBER Working Paper No. 17803, National Bureau of Economic Research, Cambridge, MA.

Burkhauser, S. (2017). How much do school principals matter when it comes to teacher working conditions? *Educational Evaluation and Policy Analysis*, 39(1):126–145.

Chi, O. L. (2019). *A classroom observer like me: The effect of demographic congruence between teachers and raters on observation scores*. PhD thesis, Harvard University Graduate School of Education.

Chiang, H., Lipscomb, S., and Gill, B. (2016). Is school value added indicative of principal quality? *Education Finance and Policy*, 11(3):283–309.

Clark, D., Martorell, P., and Rockoff, J. (2009). School principals and school performance. CALDER Working Paper No. 38, CALDER, Washington, DC.

Coelli, M. and Green, D. A. (2012). Leadership effects: school principals and student outcomes. *Economics of Education Review*, 31(1):92–109.

Cohodes, S., Setren, E., and Walters, C. (2019). Can successful schools replicate? Scaling up Boston's charter school sector. NBER Working Paper No. 25796, National Bureau of Economic Research, Cambridge, MA.

Corcoran, S. P., Schwartz, A. E., and Weinstein, M. (2012). Training your own: The impact of New York City's Aspiring Principals Program on student achievement. *Educational Evaluation and Policy Analysis*, 34(2):232–253.

Cullen, J. B., Hanushek, E. A., Phelan, G., and Rivkin, S. (2016). Performance information and personnel decisions in the public sector: The case of school principals. NBER Working Paper No. 22881, National Bureau of Economic Research, Cambridge, MA.

Davis, B. W., Gooden, M. A., and Bowers, A. J. (2017). Pathways to the principalship: An event history analysis of the career of teachers with principal certification. *American Educational Research Journal*, 54(2):207–240.

Dhuey, E. and Smith, J. (2014). How important are school principals in the production of student achievement? *Canadian Journal of Economics*, 47(2):634–663.

Egalite, A. J., Kisida, B., and Winters, M. A. (2015). Representation in the classroom: The effect of own-race teachers on student achievement. *Economics of Education Review*, 45:44–52.

Gates, S., Baird, M., Master, B., and Chavez-Herrerias, E. (2019a). *Principal Pipelines: A Feasible, Affordable, and Effective Way for Districts to Improve Schools*. RAND Corporation, Santa Monica, CA.

Gates, S. M., Baird, M. D., Doss, C. J., Hamilton, L. S., Opper, I. M., Master, B. K., Tuma, A. P., Vuollo, M., and Zaber, M. A. (2019b). *Preparing School Leaders for Success: Evaluation of New Leaders' Aspiring Principals Program, 2012–2017*. RAND Corporation, Santa Monica, CA.

Gates, S. M., Hamilton, L. S., Burkhauser, S., Heaton, P., Pierson, A., Baird, M. D., Vuollo, M. A., and Gu, K. (2014). *Preparing Principals to Raise Student Achievement: Implementation and Effects of the New Leaders Program in Ten Districts*. RAND Corporation., Santa Monica, CA.

Gershenson, S., Hart, C. M., Hyman, J., Lindsay, C., and Papageorge, N. (2018). The long-run impacts of same-race teachers. NBER Working Paper No. 25254, National Bureau of Economic Research, Cambridge, MA.

Goldhaber, D., Holden, K., and Chen, B. (2019). Do more effective teachers become more effective principals? CALDER Working Paper No. 215-0119-1, CALDER, Washington, DC.

Grissom, J. A. and Bartanen, B. (2019). Principal effectiveness and principal turnover. *Education Finance and Policy*, 14(3):355–382.

Grissom, J. A., Bartanen, B., and Mitani, H. (2019a). Principal sorting and the distribution of principal quality. *AERA Open*, 5(2).

Grissom, J. A., Kalogrides, D., and Loeb, S. (2015). Using student test scores to measure principal performance. *Educational Evaluation and Policy Analysis*, 37(1):3–28.

Grissom, J. A., Mitani, H., and Woo, D. S. (2019b). Principal preparation programs and principal outcomes. *Educational Administration Quarterly*, 55(1):73–115.

Husain, A., Matsa, D. A., and Miller, A. R. (2018). Do male workers prefer male leaders? An analysis of principals' effects on teacher retention. NBER Working Paper No. 25263, National Bureau of Economic Research, Cambridge, MA.

Koedel, C., Mihaly, K., and Rockoff, J. E. (2015). Value-added modeling: A review. *Economics of Education Review*, 47(August):180–195.

Liebowitz, D. D. and Porter, L. (2019). The effect of principal behaviors on student, teacher, and school outcomes: A systematic review and meta-analysis of the empirical literature. *Review of Educational Research*, 89(5):1–43.

Lindsay, C. A. and Hart, C. M. D. (2017). Exposure to same-race teachers and student disciplinary outcomes for Black students in North Carolina. *Educational Evaluation and Policy Analysis*, 39(3):485–510.

Loeb, S., Kalogrides, D., and Horng, E. L. (2010). Principal preferences and the uneven distribution of principals across schools. *Educational Evaluation and Policy Analysis*, 32(2):205–229.

Tables and Figures

Statistic	All	w/ Teacher Effects
Panel A. Principals		
Pct. Female	0.49	0.52
Pct. White, Non-Hisp	0.90	0.90
Pct. Hispanic	0.04	0.08
Pct. Asian-PI	0.02	0.01
Pct. Black	0.02	0.01
Pct. Am. Indian/NA	0.01	0.00
Pct. Multi-racial	0.02	0.00
Age (yrs)	48.26	43.84
SD	[8.27]	[7.64]
Tot Yrs. Experience	19.39	14.53
SD	[8.79]	[6.91]
Tot Yrs Experience (no 0s)	19.89	14.81
SD	[8.32]	[6.67]
School incl. gr. K-5	0.62	0.75
School incl. gr. 6-8	0.40	0.48
School incl. gr. 9-12	0.28	0.19
N	3,180	154
Panel B. Assistant Principals		
Pct. Female	0.43	0.56
Pct. White, Non-Hisp	0.85	0.87
Pct. Hispanic	0.07	0.08
Pct. Asian-PI	0.02	0.04
Pct. Black	0.04	0.01
Pct. Am. Indian/NA	0.00	0.00
Pct. Multi-racial	0.02	0.00
Age (yrs)	44.44	40.76
SD	[8.27]	[7.04]
Tot Yrs. Experience	15.56	12.50
SD	[8.18]	[6.64]
Tot Yrs Experience (no 0s)	15.94	12.88
SD	[7.91]	[6.37]
School incl. gr. K-5	0.19	0.40
School incl. gr. 6-8	0.38	0.47
School incl. gr. 9-12	0.57	0.37
N	2,004	156

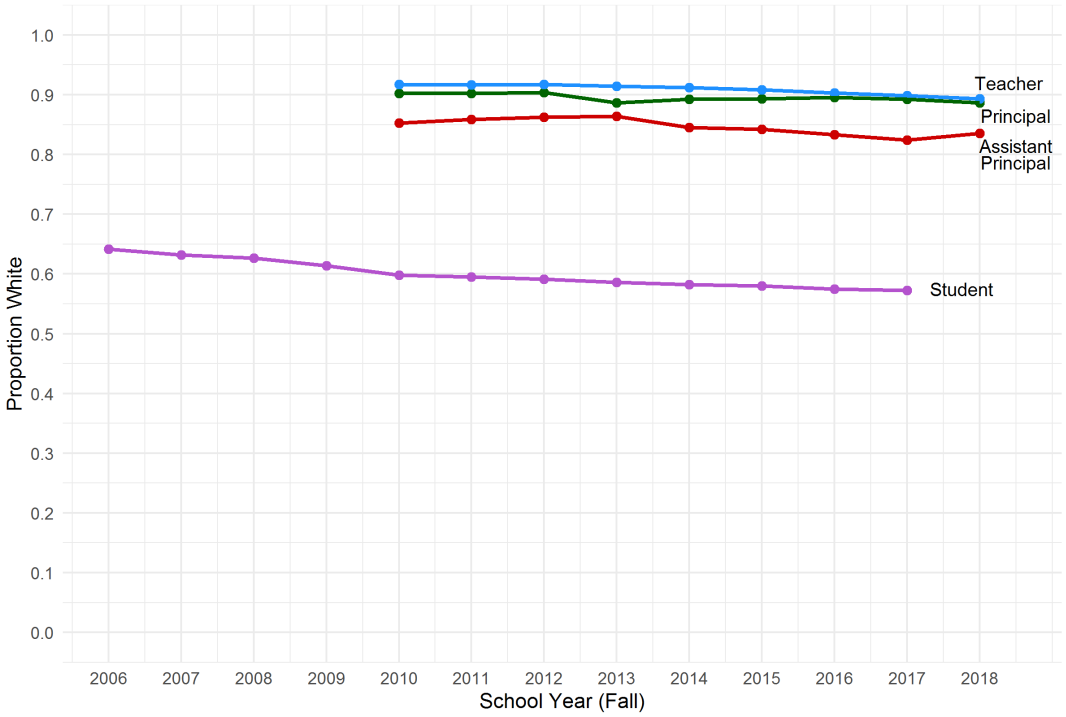
Notes: Cells report means and SD in square brackets. *N*s are unique observations. Means and *SD*s of time-varying statistics represent educator-year averages when in role of principal/AP. Race/ethnicity categories are non-overlapping, so differ from public ODE reporting. See Appendix B for more details on measures and sample construction.

Table 1: Descriptive statistics on Oregon school leaders, 2006-07 through 2018-19

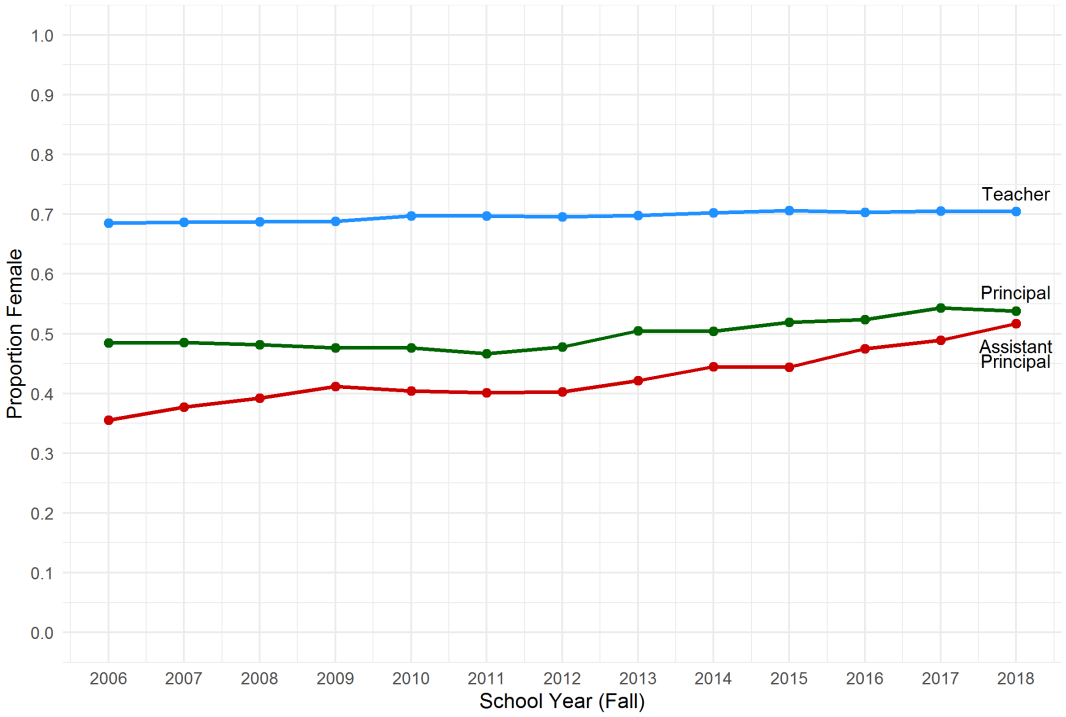
	Dependent variable:					
	Math			Language Arts		
	(1)	(2)	(3)	(4)	(5)	(6)
Principal	0.015			0.005		
	(0.012)			(0.009)		
Asst. Principal		0.020			0.015	
		(0.012)			(0.009)	
Other Leader			0.001			0.004
			(0.003)			(0.002)
Observations	9,278	9,278	9,278	9,203	9,203	9,203

Notes: $^{*}p$ <0.05; $^{**}p$ <0.01; $^{***}p$ <0.001. Cells present coefficients and standard errors in parentheses. Regressions estimated on all educator with teacher effects observed in 2013-14 through 2017-18 in positions observed in 2013-14 through 2018-19. One observation equals one educator. n principals = 154, n APs =156, n other leaders = 4,480. Teacher effects estimated following Eq. 1.

Table 2: Bivariate regression estimates of teacher effects for principals, assistant principals and other educational leaders



(a) White, non-Hispanic



(b) Female

Figure 1: The demographics of Oregon's public school educators and students, 2006-07 to 2018-19

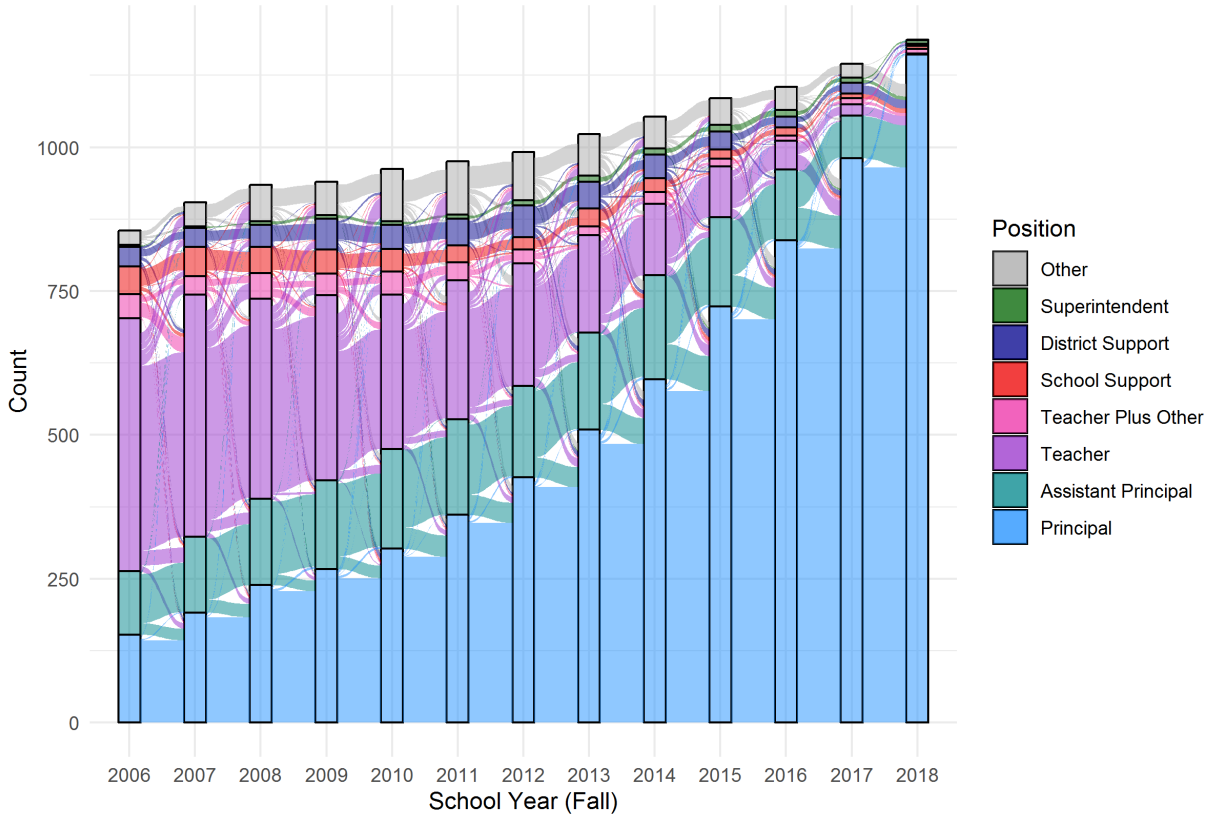
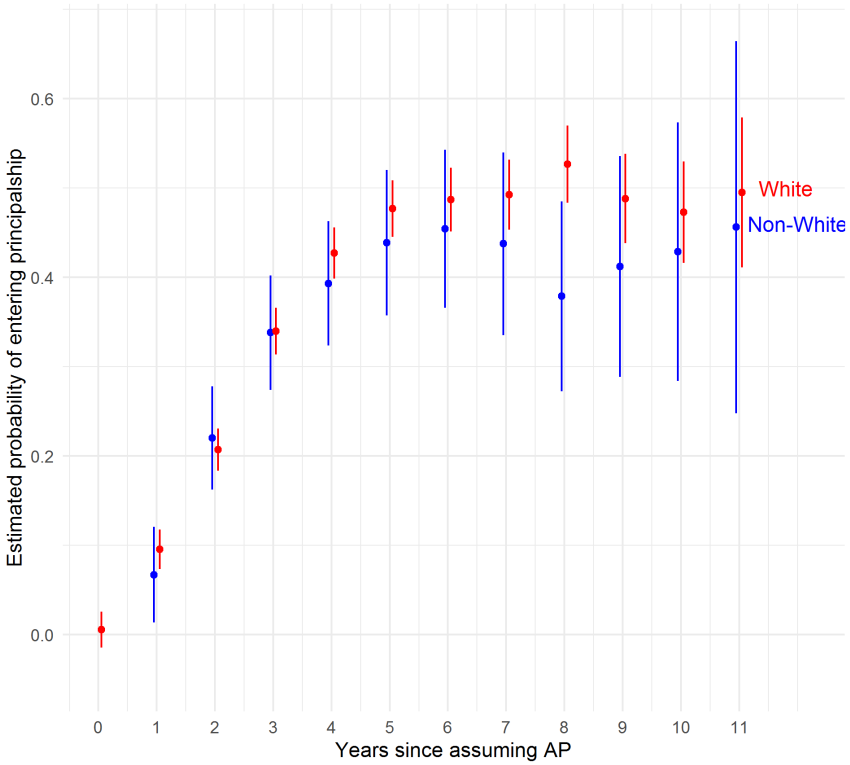
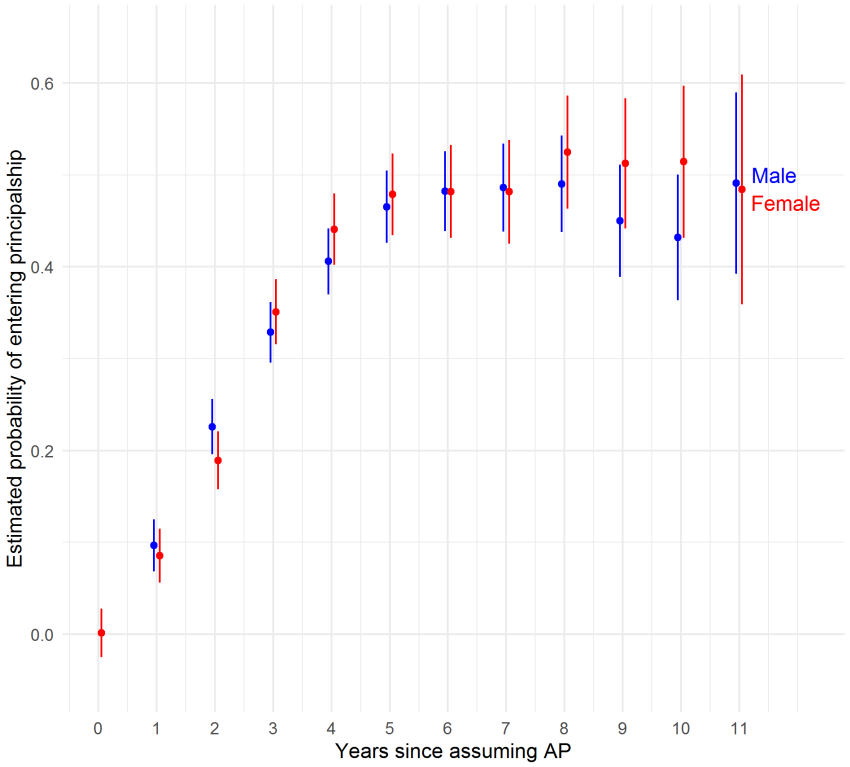


Figure 2: Prior educator roles for Oregon educators serving as principals in 2018-19

Notes: This figure represents all those who hold the principal position in 2018-19 (n=1,205), and every position we observe them holding in the Oregon education system between 2006-07 and 2018-19. The difference in the height of the bars between 2006 and 2018 reflects the number of educators who enter the Oregon education system, who we observe accumulate professional experiences in our data and who are principals in 2018-19. Across all those who assume the principalship in this figure, we do not observe prior positions for 22.0 percent (n=265). The majority of those for whom we do not observe prior positions started in the 2006-07 school year (n=157), and we do not have data on their prior positions. Some principals have secondary roles as teachers, assistant superintendents or superintendents which explains the additional categories stacked at the top of the 2018-19 school year.



(a) By race/ethnicity



(b) By gender

Figure 3: Probability of assuming principalship by time after entering AP, conditional on becoming AP, experience, age, demographics and school level

Notes: Coefficients and confidence intervals derived from Eq. 2 and represent full marginal effects compared to the non-White or male reference category in Year 0. Estimates based on 8,530 educator-year observations.

A Appendix Tables and Figures

Statistic	All	w/ Teacher Effects
Pct. Female	0.80	0.69
Pct. White, Non-Hisp	0.87	0.91
Pct. Hispanic	0.08	0.05
Pct. Asian-PI	0.02	0.02
Pct. Black	0.01	0.01
Pct. Am. Indian/NA	0.01	0.01
Pct. Multi-racial	0.02	0.02
Age (yrs)	46.38	40.73
SD	[11.34]	[10.04]
Tot Yrs. Experience	4.64	9.88
SD	[8.40]	[8.65]
Tot Yrs Experience (no 0s)	13.01	12.13
SD	[9.43]	[8.03]
School incl. gr. K-5	0.33	0.50
School incl. gr. 6-8	0.15	0.49
School incl. gr. 9-12	0.24	0.36
N	95,877	4,480

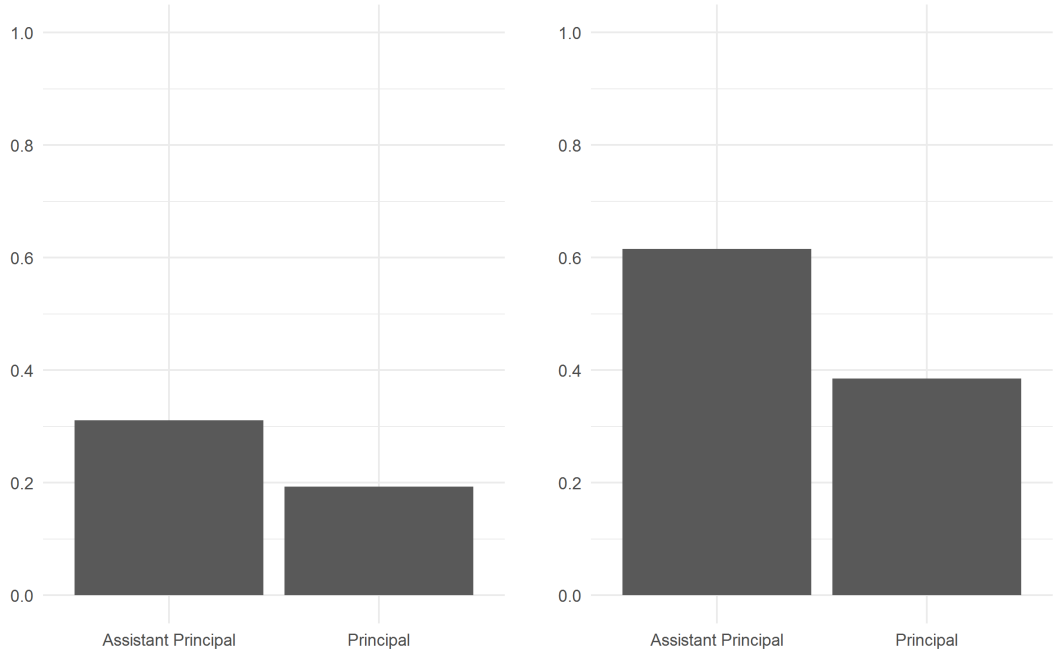
Notes: Cells report means and SD in square brackets. Ns are unique observations. Means and SDs of time-varying statistics represent educator-year averages when in role of leader. Race/ethnicity categories are non-overlapping, so differ from public ODE reporting. See Appendix B for more details on measures and sample construction.

Table A1: Descriptive statistics on educators in Other Leadership roles, 2006-07 through 2018-19

	Dependent variable:			
	Math		Language Arts	
	(1)	(2)	(3)	(4)
SD of Teacher Effects	0.165^{***}	0.140^{***}	0.125^{***}	0.107^{***}
School REs	Yes	Yes	Yes	Yes
Teacher REs	Yes	Yes	Yes	Yes
Class REs	No	Yes	No	Yes
Observations	821,241	821,241	810,405	810,405

Notes: $^{*}p$ <0.05; $^{**}p$ <0.01; $^{***}p$ <0.001. Cells report standard deviation of teacher effects. All models include grade and year fixed effects. All models adjust for cubic polynomials of students' prior achievement, gender, age, race, disability status, 504 plan designation, participation in migrant or Indian education program, prior absences and the class averages of the preceding characteristics.

Table A2: Maximum likelihood estimates of teacher effects on Oregon state assessments



(a) Same school

(b) Same district

Figure A1: Proportion of newly hired school leaders employed in prior year in same school or district, 2007-08 through 2018-19

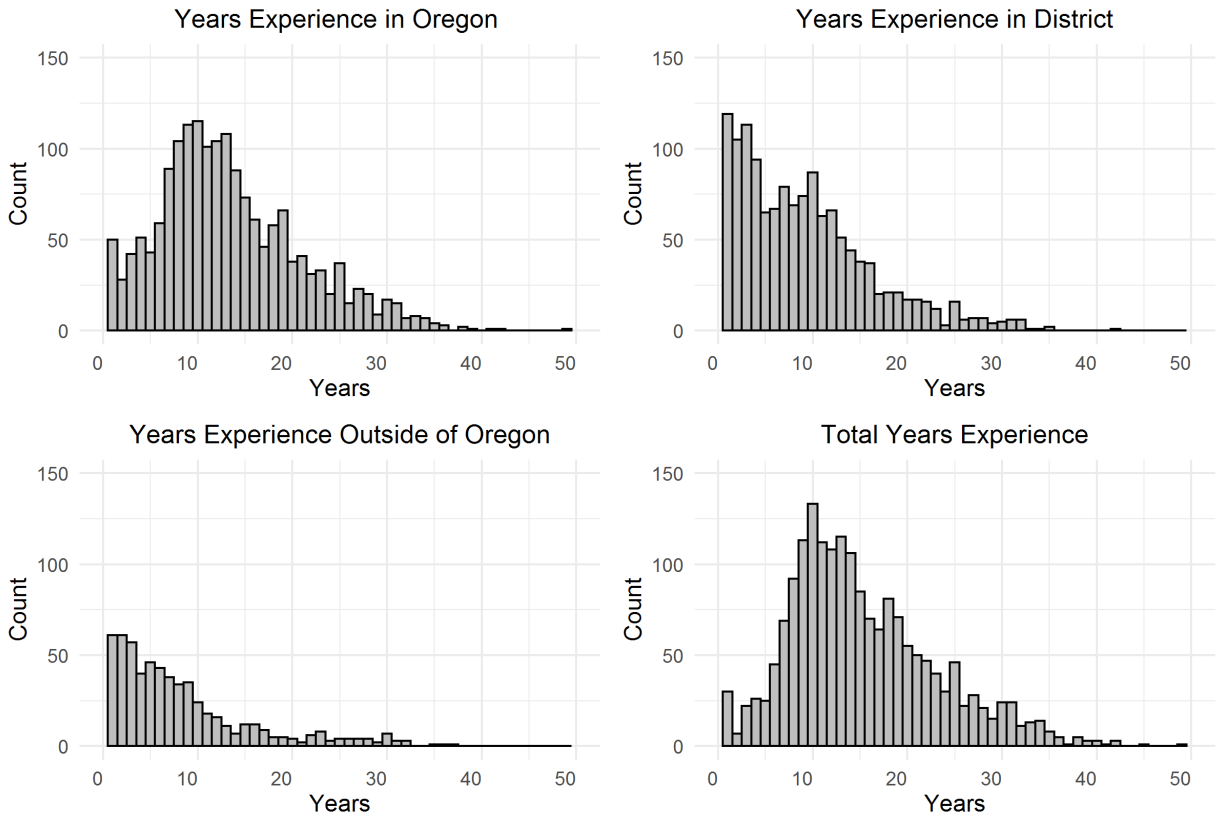


Figure A2: Years of experience in public education when first assuming principalship for Oregon principals, 2007-08 through 2018-19

Notes: 7.6 percent of principals are coded as having 0 years of prior experience when first assuming the principalship even after correcting for those for whom we can observe full experience. Some of these values may reflect principals with experience outside of the education sector, but we interpret it largely as inaccurate data. Those values are omitted in this figure.

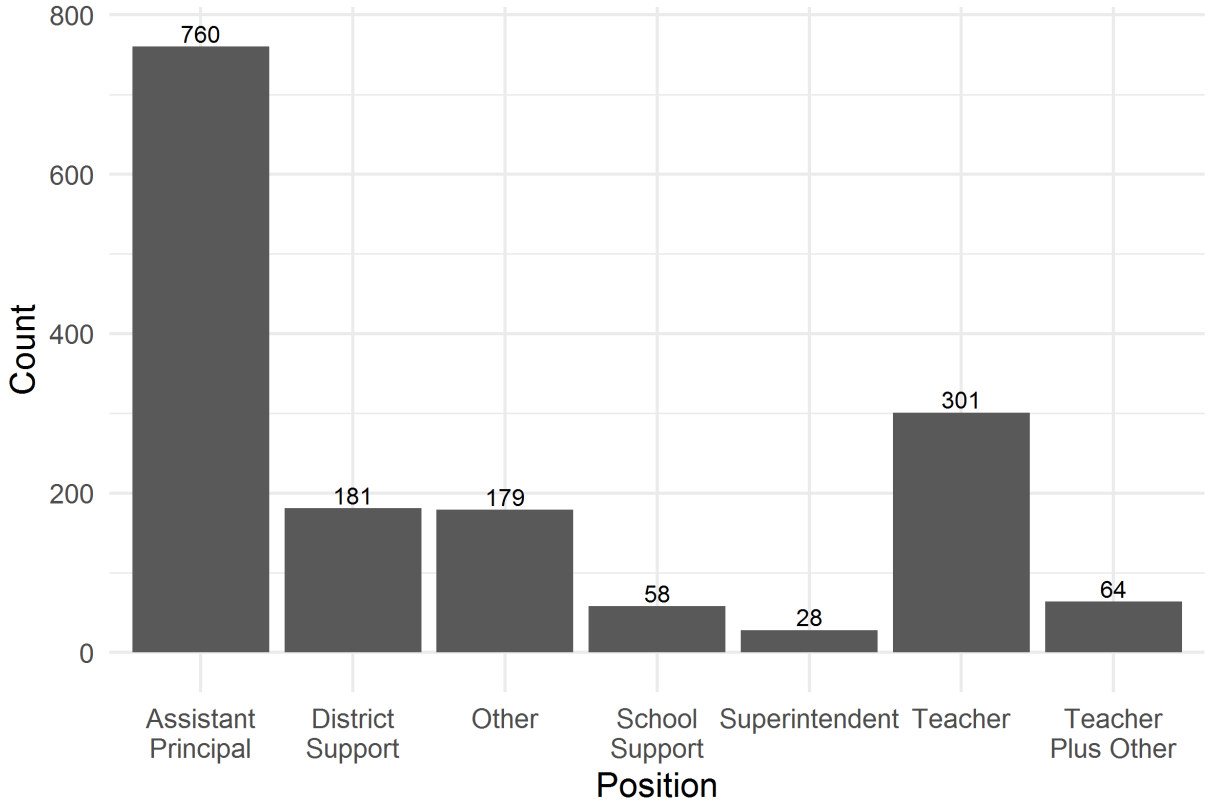


Figure A3: Educational role principals held immediately prior to becoming principal, 2007-08 through 2018-19

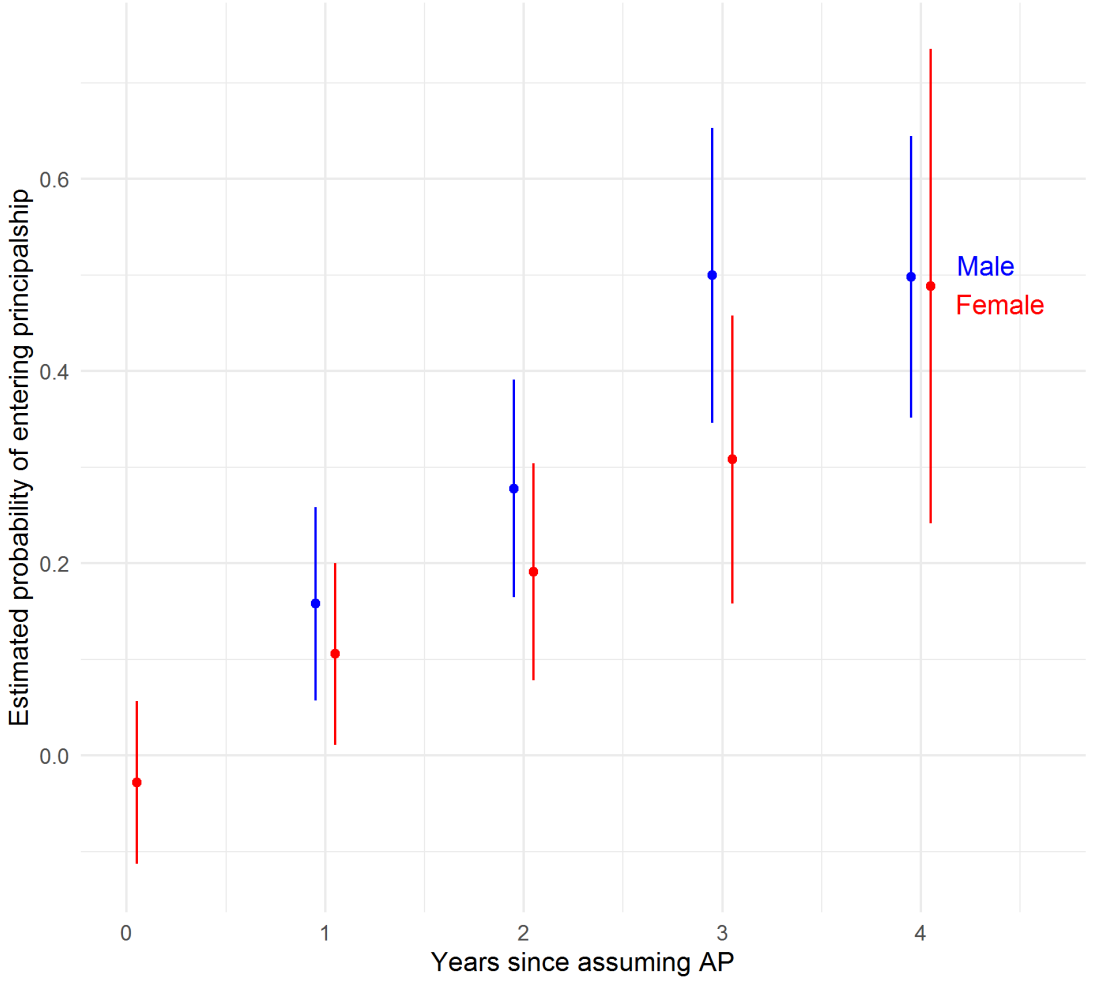


Figure A4: Probability of assuming principalship by time after entering AP by gender, conditional on becoming AP, experience, age, prior instructional effectiveness and school level

Notes: Coefficients and confidence intervals derived from Eq. 2 and represent full marginal effects compared to the male reference category in Year 0. Estimates based on 481 educator-year observations.

B Data Appendix

B.1 Staff Data

We draw on staff data from the 2006-07 through 2018-19 school years from the Oregon Department of Education (ODE) administrative records. Our sample of ever-principals includes 3,180 individuals. Due to the dynamic nature of state-level data collection, however, there are limitations in what data we are able to use across years. We first describe how we construct the dataset we use to examine the prior positions held by those who ultimately become principals. Then, we describe how the data structure shapes our demographic analyses.

We only observe positions held by educator staff from 2006-07 onward. Therefore, we are unable to observe the positions held prior to assuming the principalship for those we observe as principals in 2006-07. While we do have data on their total years of experience, we do not know what positions they held prior to appearing in our data. Therefore, we are unable to include them in analyses of prior positions. We also observe a number of principals entering the data from outside the Oregon education system for whom we do not have data on their prior positions. This includes those who enter from private education settings, out of state, or internationally. Again, we do have reported data on their years of experience, but not on prior positions held. In our analyses, they appear as having no position prior, and entering directly into the principalship. Of the 3,180 ever-principals in our dataset, there are a total of 1,493 principals for whom we do not have prior positions. 1,183 or 79 percent are from 2006.

A further complication in our data is that some future principals hold multiple roles in each year, either within the same school or across schools. Of the 33,346 educator-year observations in the ever-principal dataset, 16.4 percent of observations held a role in a different school, and 5.6 percent held multiple positions within the same school. In analyses that examine the prior year position, we only allow for the construction of one multi-position category: those who were teachers in addition to another position. For all other persons who held multiple roles (either within or across a school), we assign them the position in which they hold the highest FTE. In the case of ties, we take a random first position. Thus, we do not exclude any educators during this step, but we do exclude positions. These restrictions exclude 244 additional positions held (distributed among 202 persons) from Figure A2, including 8 superintendent roles, 38 district support, 53 assistant principal roles, 27 school support roles, 69 other roles, and 49 additional "teacher plus other" roles.

In Figure A1, our sample includes only the principal's first year in their position and those who were not principals in 2006, for a total of 1,997 observations. We remove all "0" values for those with zero total years of experience. We do this because with the exception of the rare possible case of principals entering the position with experience outside the education sector, it is not possible for an individual to become a principal with no prior experience. We, therefore, assume these educators have inaccurately coded professional experiences. This removes 152 observations for total years of experience. For consistency and scale alignment, we also remove those with zero years of experience from the other three panels. This removes 264 observations with zero years of experience in Oregon, 637 observations with zero years in district experience,

and 1,406 observations with zero years of experience outside of Oregon.

ODE did not collect racial/ethnic data on staff until 2010-11; therefore we only report on those characteristics for that year onward. We create a stable race/ethnicity variable that takes the final, non-missing reported race/ethnicity for each educator observation and imputes that as their stable race/ethnicity across all their observations. In ODE data, the categorization "Hispanic" is used in addition to other racial/ethnic identifiers, not as a stand-alone identifier. We approach the construction of our race/ethnicity categories in the following way for both staff and student data. If an individual is categorized as "Hispanic," we assign them a value of one for Hispanic/Latinx and zeroes for all other racial/ethnic categories, even if they have multiple race/ethnicity categories in the original ODE data. We then create categories of White (where only one race/ethnicity was selected and that was White), Asian/Pacific Islander for those who either selected only Asian, those who selected only Pacific Islander, or those who selected both. We assigned the racial group Black to those who selected one race/ethnicity and that was Black, the group American Indian-Alaska Native for those who selected one race/ethnicity and it was American Indian/Alaska Native, and a multi-racial category for those who selected combinations other than the preceding. This leaves a total of six race/ethnicity categories (White, non-Hispanic, Hispanic/Latinx, Asian/Pacific Islander, Black, and American Indian-Alaska Native, and Multi-Racial).

For gender, we constructed a similar stable gender variable that used their last reported, non-missing binary gender identification.

B.2 Student, Course and Assessment Data

We draw student demographic, course-taking and assessment data from the 2006-07 through the 2017-18 school years from the same ODE records. The primary function of the student data in our analyses is for the purpose of calculating teacher effects. In order to do so, we must be able to identify students' classroom both to link them to a teacher of record and to identify peers who may contribute to their learning experiences. Oregon did not have a full census link between students, courses and teachers until the 2013-14 school year. As such, with the exception of Figure 1, we restrict our sample to school year 2013-14 onward.

Oregon experienced an important change in assessment regimes from the Oregon Assessment of Knowledge and Skills (OAKS) to the Smarter Balanced Assessment Consortium (SBAC) test in 2014-15. Oregon pioneered the use of computer-based testing for its statewide assessment and accountability system in the early 2000s. The OAKS assessment was unique in that it served both benchmarking and summative purposes. During the majority of the OAKS era, all students could be tested up to three times during the year at locally determined points in time. As a result, in our data which includes all instances in which a student took a state assessment, we observe that during the OAKS era (2006-07 through 2013-14), only between 48.1 and 71.8 percent of all ELA and Language Arts assessments ultimately counted as a student's best score.[9] Educators frequently re-administered the OAKS to students at all initial proficiency

[9]In contrast, in the first year of the SBAC assessment (2014-15) 98.5 percent of all scores were the final score and from 2015 onward 99.9 percent of scores are students' best score.

scores to offer students additional opportunities to demonstrate mastery and to improve school- and district-level averages that contribute to accountability ratings. In 2012, the state formally banned re-testing students once they earned a score corresponding to the level of "Exceeds" but still permitted re-testing students across all other levels. These practices compromise the analyst's ability to conduct cross-school comparisons. We standardize results within year to permit the comparison of outcomes across years. However, the unique assessment practices which permitted students to test at various times throughout the year, with varying and locally determined frequencies, mean that heroic assumptions are required in order to interpret model-based teacher effects as the causal contributions of a given teacher to a student's test score gains. To take advantage of the full range of the panel possible, we present results on teacher effects that include one year of the OAKS assessment and four years of SBAC. We re-estimate our models dropping 2013-14 and return substantively identical results. We focus on students scores in mathematics and language arts in grades 4-8, as these are the subjects and grades that permit us to calculate yearly teacher effects.

We assign students to courses and teachers of record based on the following procedures. We begin by focusing on self-contained grade level and subject-area Language Arts and Mathematics courses.[10] Our approach excludes courses such as English as a Second Language and Reading from being included as courses of record for the Language Arts assessment. Additionally, students who only have a course code for an advanced math course (e.g., 02072 or 52072: Geometry) and do not have an additional course code for Grade 8 Mathematics (52038) do not contribute to our estimates. However, students who only have an Algebra I course code do, either as a single- (02052 or 52052) or a two-part (02053 or 02054) course. We also exclude multiple reported sections of the same student-teacher-course code combination. We include students who transfer schools or teachers midway through the year when we standardize our test score outcomes, but we exclude them for the sake of estimating teacher effects. When students are enrolled in multiple courses, we assign them to their primary grade-level self-contained or subject classroom for value-added calculation purposes (e.g, Grade 4 or 7th grade math). After these corrections, we still are left with 27,792 course-student-year combinations for which we have irresolvable conflicts preventing us from assigning them to a particular classroom and teacher. For example, they are assigned both to Grade 6 (52036) and Grade 7 math (52037). We exclude these student-course-teacher observations (representing less than 0.9 percent of all observations).

In addition to the above student-course-teacher match exclusions, We restrict our teacher effect analyses to classrooms with more than 5 and fewer than 50 students and students whose test scores fall within ± 5 SDs; though after the above restrictions, these limits result in only an additional 193 student-subject-year observations being excluded.

We also exclude 3,788 student-subject-year observations that are missing current-year math assessment scores and 237,784 observations that are missing prior-year math. We similarly ex-

[10]Specifically, we select restrict our analysis to students in the following Oregon ODE course codes: 01010, 01034, 01035, 01036, 01037, 02002, 02036, 02037, 02038, 02039, 02051, 02052, 02053, 02054, 02135, 23007, 23008, 23009, 23010, 23011, 23012, 23041, 51007, 51034, 51035, 51036, 51037, 52002, 52003, 52036, 52037, 52038, 52039, 52051, 52052, 52061, 52132, 73034, 73035, 73036, 73037, 73038, 73039, and 73041.

clude 4,451 student-subject-year observations that are missing current-year reading assessment scores and 238,044 that are missing prior-year reading. 825 student-year math observations have missing prior absences and we impute these to the class mean for all but 99 student-year observations which also have missing prior-year class average absences and we drop these students and classes. In reading, the equivalent number of missing values of prior absences are 543 student-year observations and 33 for whom we are unable to impute prior-year class average absences.

After these restrictions, we are left with the student-subject year samples we report in Appendix Table A1: 821,241 observations in math and 810,405 observations in language arts.