Entry Costs and the Supply of Public School Teachers

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Abstract: This paper examines the impact of entry costs on the likelihood that recent college graduates become public school teachers. I combine Barron's ratings of college selectivity, data on the types of teacher certification programs offered by colleges, and NELS data that tracks members of the high school class of 1988 into college and into the workforce. Restricting the sample to individuals who were not considering teaching careers when they were high school seniors, I estimate the marginal effect of the availability of undergraduate teacher certification programs on the likelihood that these individuals become teachers. The results suggest that graduates from highly selective colleges are very sensitive to entry costs related to the number of years of schooling required for certification, while graduates from less selective colleges are not marginally influenced by these costs.

1. Introduction

There is a growing cry for more meaningful, continuous professional development of U.S. public school teachers. The *No Child Left Behind Act* forces states to work towards having all teachers be "highly qualified," meaning that they have bachelor's degrees and are fully certified to be a public school teacher. Middle school and high school teachers must also demonstrate competency in each subject area they teach. States may allow teachers to demonstrate this competency by passing an exam, majoring in the subject, taking an equivalent number of courses in the subject as a major, or obtaining an advanced certificate or graduate degree in the subject. Previously employed teachers may also meet this standard simply by a subjective review of their experience.

At the same time that training requirements are tightening, researchers and educators are arguing for the need to create pathways so that talented people can more easily enter teaching. While previous research demonstrates that salaries influence the supply of teachers,[1] far less is known about the impact of teacher certification requirements.

This paper examines how the supply of teachers is influenced by the availability of undergraduate teacher certification programs, those that may be completed concurrently with a four-year Bachelor's degree. The presence of these certification programs significantly reduces entry cost into public school teaching jobs. If an individual wants to become a public school teacher but did not obtain a teaching certification as an undergraduate, then he or she would have

[1] Using an extensive data set concerning school teachers in New York State, Boyd et. al (2002) find evidence that first-year public school teachers prefer higher paying districts. Loeb & Page (2000) and Figlio (1997) find that teachers in higher paying districts are more likely to possess desirable characteristics. Other studies (Hanushek, Kain, and Rivkin 2004; Imazeki 2005) find that teachers are less likely to switch school districts or exit the profession if their district pays relatively high salaries, though individuals who exit the profession may not experience an immediate increase in pay (Podgursky, Monroe, and Watson 2004).

to either complete a post-baccalaureate program or enter an alternative certification program. The costs of attending a post-baccalaureate program are substantial, typically twelve months of forgone income and tuition, including paying for the opportunity to work as a student-teacher. There are also high costs associated with most alternative certification programs, usually involving tuition costs for classes or training during weekends, weekday evenings, and/or the summer. Furthermore, these alternative routes are only available in certain states and cities.

Selective colleges[2] are much less likely than other colleges to offer teacher certification programs. Previously, Reback (2004) found that the presence of undergraduate certification programs at certain competitive colleges significantly increases the fraction of graduates from these colleges who become public school teachers. Due to data limitations, this previous study was limited to finding lower bound point estimates for the causal impact of certification programs on teacher entry rates. Using newly available data (1988 National Education Longitudinal Survey [NELS] 2000 Follow-up) which allows one to track students from high school to college and then to the workforce, I find actual point estimates. In addition, I analyze how undergraduate certification programs influence the rate at which recent college graduates become "highly qualified" teachers as defined by the *No Child Left Behind* criteria. The results reveal that the addition of an undergraduate teacher certification program at a highly selective college may more than double graduates' rate of entry into public school teaching. Programs at these colleges also appear to increase the rate at which graduates become highly qualified teachers, whereas undergraduate programs at less selective colleges appear to decrease the supply of highly qualified teachers. Greater entry into teaching among graduates of selective colleges may be particularly desirable because previous researchers suggest that students earn

[2] In this paper, "colleges" refers to all colleges and universities offering four-year Bachelor's degree programs.

higher test scores when their teacher is a graduate of a selective college (Ehrenberg & Brewer 1994) or has strong verbal abilities (Ferguson 1991; Ehrenberg & Brewer 1995; Coleman et al. 1966).[3]

A common misconception is that demand-side behavior systematically deters academically talented individuals from teaching. In "Do Public Schools Hire the Best Applicants?" Ballou (1996) finds that graduates of highly selective colleges are less likely to (1) get certified, (2) apply for teaching jobs once certified, and (3) gain employment when applying for teaching jobs. However, this third result was not statistically significant and was based on a proxy variable for an individual failing to receive any teaching offers. As shown in Table 1, direct estimation of individuals' application success using more recent data reveals that graduates from more selective schools are slightly more successful than others, especially if the analysis controls for the number of applications. Furthermore, both Table 1 and Ballou's analysis may understate the labor market value of a degree from a selective college because academically talented individuals might be relatively likely to apply for very selective public school jobs. Examples of public school districts' ineptitude in effectively recruiting qualified candidates are common (see for example, Goodnough 2001). However, there is little reason to believe that academically talented candidates will fare worse than others when pursuing teaching jobs.

My analyses suggest that entry costs are a major hurdle faced by policymakers who would like to attract academically talented individuals to enter teaching. While the analyses focus on the impact of adding undergraduate certification programs at selective colleges, this is only one possible way to reduce these entry costs. In the next few sections I discuss the data,

[3] In addition, Rivkin, Hanushek, and Kain (2005) find that teacher quality significantly influences students' test score gains.

methodology, and results, and in the final section I discuss the policy implications of my findings.

2. Data

I analyze restricted-use data from the National Center for Education Statistics' National Education Longitudinal Study (NELS), which tracks the progress of a high school senior (class of 1992) in college and then in the workforce. During their senior year of high school, students report what type of career they are most interested in pursuing and report which college major they plan to pursue. By dropping students who reported teacher as their preferred profession or education as their preferred major, I limit the sample to college students whose college enrollment decisions were probably not marginally influenced by their interest in a teaching career. This ensures that the analysis reveals the causal effect of certification programs, rather than the sorting of individuals into college based on their pre-existing interest in teaching. Of the graduates from selective colleges in the NELS dataset who ultimately become public school teachers, about 60% do not reveal an interest in a teaching career during high school.[4] This is consistent with Hanushek and Pace's (1995) estimate that approximately 60% of recent college graduates teaching during the mid-1980s reported an interest in a teaching career when they were enrolled in high school. Since the majority of teachers develop interest in teaching after enrolling

[4] Based on the NELS, 58.6% of certified teachers who graduated from a college in one of Barron's top three selectivity groups did *not* choose teacher as their intended career or education as their intended major when questioned during their senior year of high school. Among all certified teachers this rate was lower (49%).

in college, the addition of a certification program at a certain college could significantly affect the supply of teachers.[5]

I combine the NELS data with previously-used data concerning college's certification programs (Reback 2004). The certification program data include whether the college offers any elementary or secondary certification programs. In addition, the data specify whether students are able to receive certification within their four undergraduate years without spending any extra semesters, summer semesters, or other extra time pursuing this certification. I refer to this type of program as an undergraduate teacher certification program (or UTCP). The certification program data pertain to 2000, but individuals in the NELS sample enrolled in college in 1992. Therefore, unobserved changes in certification program offerings between 1992 and 2000 are a potential source of measurement error.

Since almost all non-selective colleges offer undergraduate teacher certification programs, the college certification program data focus on all colleges in Barron's (1998) top three selectivity rating groups. These groups individually compose about 2.5, 7.4, and 17.7% (from most to third-most selective) of all undergraduates,[6] and compose even larger shares of all college graduates. Table 2 contains information about the fraction of undergraduates within each rating group attending colleges that offer various types of teacher certification programs.

Ideally, one would be able to estimate the impact of a college adding a teacher certification program when one was not previously offered. However, there are simply not enough individuals attending colleges that do not offer any certification programs (only about

[5] The addition of a certification program could also affect college enrollment decisions among students with a pre-existing interest in teaching and could possibly change the likelihood that these students become teachers.

[6] Percentages are based on National Center for Education Statistics' IPEDS (Integrated Post-secondary Education Data System) data for enrollments in all non-military colleges during the 1992-93 school year

8% of the sample) for this to be identified based on cross-sectional analyses. The small sample size for this group is particularly problematic considering that only a small minority of individuals become teachers. As a consequence of this data limitation I drop graduates from colleges without any certification programs from the sample. The analyses thus focus on the effects of adding undergraduate certification programs at colleges that previously offered only post-baccalaureate certification programs.

3. Empirical Methods

This analysis exploits cross-sectional variation in certification offerings to determine the effect of entry costs on teacher supply. However, if the availability of certification programs is influenced by the net demand for teachers, then cross-sectional estimates might not measure the causal effect of these programs. For instance, states with high levels of demand for teachers might place these programs in public colleges and pressure private colleges to offer them as well. It is also possible that strong teachers' unions discourage colleges from offering these programs because the unions would like to ensure that the demand for existing teachers remains strong enough to sustain teachers' salaries and benefits.

To address these potential issues, each of my models includes either state fixed effects or regional fixed effects plus a state-level control variable capturing teacher labor market characteristics. These fixed effects are based on the location of the individual's college. State fixed effects should help control for the endogenous variables affecting the supply of teachers, such as the relative size of the K-12 population, teacher salaries relative to other salaries, teachers' working conditions and benefits, and the various state requirements for obtaining teacher certification. In the models without state fixed effects, I include regional fixed effects

and the percentage change in the number of K-12 students in the state between 1985 and 1995. This change serves as a plausibly exogenous measure of schools' demand to attract new teachers in the early 1990s. Growth in the number of K-12 students between 1985 and 1995 may be positively related to the salaries and benefits that schools must offer to new teachers and/or negatively related to changes in the number of certification requirements so that schools may attract the preferred number of teachers. When one runs a state-level regression controlling for regional effects and for the average salaries of teachers with 20 years of experience, state enrollment growth over this period is not significantly related to average starting teaching salaries but it is positively related to looser certification requirements such as emergency certification programs.[7] Although direct measures of teacher salaries and certification requirements are available, these measures are endogenous because they are influenced by unobserved, supply-side characteristics of the teacher labor market.

The key independent variable in the analyses is a dummy variable describing whether an individual's college offered UTCP. The UTCP dummy variable equals one if the college offers an elementary-level UTCP, secondary-level UTCP, or both; otherwise this variables equals zero. Ideally, one would be able to separately analyze the impact of elementary and secondary certification programs, but this is difficult to identify because of the low rate of entry into teaching. Even with the chosen specification, the low number of teachers in the sample leads to large standard errors of estimated coefficients.

[7] Emergency certification programs are alternative certification programs that allow an individual to teach in a public school while concurrently taking classes to meet regular teacher certification requirements. Typically, a school district may only hire teachers with emergency certification if the district demonstrates historical difficulties hiring enough certified teachers. NASDTEC (2000) provides state-level information concerning the presence of emergency certification programs, degree requirements for elementary or secondary certification, and the number of required training courses for elementary or secondary certification.

The inclusion of various control variables in the analyses helps to isolate the effect of the presence of a UTCP on entry into teaching. Controls for individual characteristics include standardized scores on reading and math tests administered to NELS participants. In cases where individuals are missing these test scores, I impute their scores using available scores from SAT or ACT exams. Test scores are important control variables because they are indicators of ability to gain admission to colleges, potential academic success in college, and earning potential after graduation. Dummy variables that interact race with gender are also included because these may be related to one's interest in teaching.[8] Characteristics of an individual's parents may also influence the individual's interest in teaching and his or her academic success. Measures of parental income and family structure are included, as well as indicators for whether a foreign language was spoken at home and whether either parent was a teacher.[9] Finally, I add institutional control variables to some models. Although enrolling in a college with certain characteristics may only be mildly related to whether one wants to teach, these variables are often highly correlated with whether the college offers a UTCP. In particular, private colleges and small, liberal arts colleges are relatively likely to offer UTCPs. The inclusion of institutional controls is thus important as a robustness check to ensure the observed impact of UTCPs is not actually due to individuals who have unobserved preferences for teaching and who sort into colleges based on some characteristic that is positively correlated with UTCPs. Institutional controls include dummy variables for whether the college is public, whether it is religiously affiliated, and whether it offers a Ph.D. in any subject. The other

[8] Although I initially interacted non-white racial status with both genders, there was not enough variation in non-white male teaching outcomes to continue to differentiate non-white males from white males.

[9] Using parental education measures in addition to or instead of parental income measures does not alter the results.

institutional controls are cubic terms for the college's total undergraduate enrollment. Table 3 displays estimates of population means and standard deviations for all of these variables, calculated using sample probability weights.

Let P_{ij} be a dummy variable concerning whether individual i graduating from college j becomes a public school teacher. Define X_{1i} as a vector of individual and parental control variables, X_{2j} as a vector of institutional control variables, X_{3j} as a dummy variable for whether the college offers an undergraduate teaching program, D_j as a vector of regional or state dummy variables for the location of the college, and Z^*_i as a variable capturing individual i's interest in a teaching career before enrolling in college. The discrete choice model for individual i graduating from college j would thus be:

$$P^*_{ij} = \beta_0 + X_{1i}\beta_1 + X_{2j}\beta_2 + \beta_3 X_{3j} + D_j\beta_4 + \beta_5 Z^*_i + \varepsilon_{ij}$$
$$P_{ij}=1 \text{ if } P^*_{ij}>=0, \qquad P_{ij}=0 \text{ if } P^*_{ij}<0. \tag{1}$$

Since one cannot measure the continuous variable, Z^*_i, there is concern that β_3 may be biased when Z^*_i is omitted from Equation (1). One may express the college selection equation as:

$$X^*_{3ij} = \alpha_0 + X_{1i}\alpha_1 + \alpha_2 Z^*_i + u_{ij}$$
$$X_{3j}=1 \text{ if } X^*_{3ij}>=0, \qquad X_{3j}=0 \text{ if } X^*_{3ij}<0. \tag{2}$$

Define Z_i as a dummy variable equal to zero if $Z^*_i<k$ for some arbitrary constant k, with $Z_i=0$ if and only if an individual did not report teaching as their intended career or education as their intended major. For these individuals with $Z_i=0$, (the level of interest is sufficiently low that one does not report an interest in a teaching career or education major), I assume that interest in teaching is unrelated to whether one enrolls in a college with a certification program. Formally, if one rewrites Equation (2) with Z^*_i omitted and restricts the sample to individuals with $Z_i=0$, then the assumption is that $E[u_{ij} \mid Z^*_i]=0$.

Therefore, one may find an unbiased estimate of β_3 for individuals not reporting a preexisting interest in teaching:

$$P^*_{ij} = \beta_0 + X_{1i}\beta_1 + X_{2j}\beta_2 + \beta_3 X_{3j} + D_j\beta_4 + \varepsilon_{ij}$$
$$P_{ij}=1 \text{ if } P^*_{ij}>=0, \quad P_{ij}=0 \text{ if } P^*_{ij}<0 \qquad (3)$$
$$\text{conditional on } Z_i=0.$$

I conduct maximum likelihood estimation of the probit model represented in equation (3) using the NELS data. The dependent variable, P^*_{ij}, equals one if the individual possessed teacher certification in 2000 and taught in a K-12 school either during 2000 or during the individual's latest period of full-time employment. Teacher certification in this context helps to create a dependent variable which proxies for teaching in a public school. Even if the individual began teaching through an emergency certification or alternative certification program, it is likely that by 2000 (4 years after the majority of the sample graduated from college), the individual would possess at least a probationary teaching certificate. This dependent variable comes close to picking up which individuals teach in public schools, though some certified K-12 teachers might actually be working in private schools.

4. Results

Before discussing the regression results, it is interesting to examine the mean rates of entry into teaching sorted by individuals' interest in teaching careers prior to college enrollment, their college's selectivity rating, and whether their colleges offer a UTCP. Table 4 displays these rates. As expected, individuals without a prior interest in teaching who attend the most selective colleges are more likely to become certified teachers if these colleges offer a UTCP. At less selective colleges, individuals are not more likely to become certified teachers if

their college offers a UTCP.[10] Note that the sample sizes in Table 4 are slightly larger than the corresponding samples in the regression analyses because some geographic regions either did not produce any teachers in the sample or did not contain colleges in the sample that differed in whether they offered an undergraduate certification program.

The regression results are generally similar to these non-parametric findings. Table 5 displays the probit estimation results for Equation (3) for individuals who graduated from a college rated in Barron's top two selectivity groups (Table 5a) or in Barron's third-highest selectivity group (Table 5b). This version includes the full set of control variables listed in Table 3, as well as state fixed effects. The results for the top two selectivity groups (Table 5a) are consistent with the predictions that the presence of a UTCP should increase the likelihood that graduates become public school teachers. The coefficient of the UTCP variable, presented in the first row, equals 1.94 and is statistically significant at the .01 level (standard error of 0.58). This coefficient is associated with an average marginal effect of .115, which implies that the presence of an undergraduate teacher certification program at the college more than triples the likelihood of an individual becoming a certified teacher. This is consistent with the previous study (Reback, 2004), which found a lower bound marginal effect estimate of .03 for individuals graduating from colleges in the second highest selectivity category.[11]

The results for the third-highest selectivity group, shown in Table 5b, are also consistent with the other main finding of the previous study: UTCPs do not appear to increase entry rates

[10] For individuals who indicated an interest in a teaching career when they were high school seniors and went on to attend a college in the third-highest rating group, the presence of a UTCP is associated with a greater likelihood of becoming a teacher. Since many of these individuals with pre-existing interest in teaching may be selecting their college based on the availability of certification programs, it is difficult to determine how much of this last result is due to the direct impact of the certification program and how much is due to selection bias.

[11] When similar control variables are used as those in the specification of Reback (2004), the estimated marginal effect using this data is .067.

into teaching among this group. The estimated coefficient of the dummy variable for whether the college offers a UTCP is not statistically different from zero and is actually negative.

Due to the low overall frequency of entry into teaching, one might need a larger sample size in order to find estimates with smaller standard errors. Table 6 displays how the estimated effect of UTCPs varies with different specifications of Equation (3). Including fewer control variables or using regional rather than state dummies often allows the sample size to increase because fewer observations have missing values and fewer variables are collinear or perfectly predict failure to enter teaching. Column (4) of Table 6 corresponds with the specification presented in Table 5. The results are qualitatively similar for other specifications that also use state fixed effects. The magnitudes of the UTCP coefficients for graduates of the most selective colleges are positive, with marginal effects ranging from .044 to .115. In the models using regional fixed effects plus a state-level control variable capturing exogenous demand for new teachers (columns 5-8), the marginal effects of the UTCP variable are smaller in magnitude but are generally statistically significant. When institutional controls are omitted, these marginal effect estimates are about .03, but this increases to about .05 when institutional controls are included. As shown in the second row of Table 6, for most of the specifications using the sample of graduates from the most selective colleges, the size of the marginal effects imply that the presence of a UTCP can more than double the rate of entry into teaching.

For graduates of colleges in the third-highest selectivity rating group, none of the specifications reveals a statistically significant effect due to the presence of an undergraduate teacher certification program. The estimated effects are negative and are generally small in magnitude. One explanation for this result is that many of these students take more than four years to graduate from college, regardless of their field of study. If this explanation is important

then other types of barriers to entry, such as the requirement of a major in the appropriate field, might reduce the supply of teachers from these colleges. Another explanation for the unimportance of UTCP availability is that these graduates face lower opportunity costs associated with the loss of a year's income and lower opportunity costs associated with choosing teaching over other careers. Choosing a teaching career might yield relatively high returns for these students even if it requires a full additional year of schooling. This second explanation implies that, on the margin, certification requirements are only a significant barrier to entry for graduates from very selective institutions.

Additional analyses examine whether UTCPs influence the rate at which recent college graduates become certified teachers who have majored in a relevant subject area. As discussed earlier, *No Child Left Behind* suggests that highly qualified public school teachers have a Bachelor's degree, possess certification, and have demonstrated competency in their subject area. The most common way that middle school and high school teachers demonstrate competency is by having majored in their subject area. While undergraduate certification programs may encourage higher rates of entry into teaching, they may actually lead to lower rates of highly qualified teachers because participants in some of these programs major only in education.

Table 7 presents estimated marginal effects from probit models similar to those in Table 6 but with the dependent variables changed to equal one only if an individual is a certified teacher who majored in something other than secondary education. Unfortunately, the data do not reveal teachers' subjects or grade levels; thus secondary education is the only kind of major that would definitely fail to help a person become a highly qualified teacher. Table 7 uses similar controls as the most extensive models in Table 6 but omits parental characteristics in

order to obtain a sufficiently large sample size to find estimates. The estimates suggest that UTCPs at highly selective colleges continue to have a positive influence on teacher supply when the focus is on certified teachers who are potentially highly qualified in their subject area. For less selective colleges, the relationship between UTCPs and entry into this type of teaching status is negative and slightly greater in magnitude than the estimates from Table 6. Whereas the most selective colleges rarely offer majors in education, less selective colleges are more likely to offer certification programs that allow students to major in secondary education. These types of programs appear to be at odds with increasing the supply of teachers that are considered highly qualified under *No Child Left Behind*.

5. Conclusions

My results imply that entry costs play an important role in deterring graduates of highly selective colleges from becoming public school teachers. The opportunity to obtain certification without any post-graduate study may more than double the likelihood that undergraduates later become teachers. This finding applies to graduates from approximately 135 colleges and universities in the United States that have the most competitive admissions policies, though it is probably not relevant at the most selective of these institutions.[12] On the other hand, entry costs do not appear important for graduates of colleges that are less selective. While the focus of this paper is to examine the availability of undergraduate teacher certification programs, one might

[12] One might not expect entry costs to marginally influence whether graduates from the 10 most selective colleges in the country enter teaching, because these individuals would be sacrificing so much income by entering teaching that this decision is likely dominated by non-pecuniary factors. The sample size in this study is too small to find separate estimates for extremely competitive institutions, (i.e., colleges in Barron's top selectivity category). Although the non-parametric analysis in Table 4 suggests that the availability of UTCPs might increase entry rates among graduates of these colleges, previous analysis using a larger sample failed to find any impact for this group or for college students with extremely high SAT scores (Reback 2004).

expect similar patterns when examining other entry costs that are highly related to time commitments. For example, greater certification coursework requirements or fewer alternative certification programs may deter graduates of highly selective colleges from teaching, but have little impact on other individuals. Other types of barriers to entry, such as testing requirements, would likely have stronger effects on individuals at less selective colleges.

A reduction in time-intensive entry costs would probably lead to an improvement in the average academic skills of individuals who become teachers, and a slight increase in the total number of individuals interested in becoming teachers. Reductions in these entry costs are not likely to have perverse general equilibrium effects on the supply of teachers. Ballou and Podgursky (1995) theorize about perverse general equilibrium effects when policies increase teacher salaries due to greater entry and deferred retirements among less able teachers. The current findings suggest that entry costs related to certification requirements only influence graduates of highly selective colleges, therefore it is doubtful that other types of individuals would alter their labor supply decisions because of a policy that reduces these entry costs. In addition, it is highly unlikely that an outward shift in the teacher supply curve among graduates of selective colleges would lead to perverse, general equilibrium effects on the total supply of teachers. These types of individuals currently represent only 9.1% of the recent college graduates who become public school teachers and they would likely continue to compose a small fraction of this pool, thus, there would be no large effects on equilibrium salaries and working conditions.

Whether the large impact of entry costs on the supply of academically talented teachers implies that traditional certification programs should be started earlier in college, shortened, eliminated, or replaced with additional in-service training depends on individuals' personal

judgments about the relative effectiveness of various types of teacher training programs. We currently know very little about the relative effectiveness of these programs because nonrandom sorting of different types of individuals into various types of teacher training programs and then into various types of workplaces limits inferences about the causal effects of various training programs. Ideally, one would also like to know whether the amount of in-service training for teachers has a positive or negative effect on labor supply. If in-service training does not discourage entry into teaching and if in-service training can be at least as productive as pre-service training, then it may be worth shifting the timing of some components of teacher training. For example, a state could possibly offer a certification program similar to the New York City Teaching Fellows program, which begins with summer coursework and continues as the individual receives mentoring while teaching in the fall. This type of program could encourage more graduates from highly selective colleges to become teachers.

While this study focuses on entry of graduates from selective colleges into the teaching force, another important question for future research is the cost effectiveness of programs at four-year colleges that streamline community college transfer students into teacher certification programs. Although these transfer students did not initially attend selective colleges, they may be more likely to remain in teaching for long periods of time and may be more likely to work effectively in a community where there is a dire need for teachers (RNT 2002). Increasing the potential supply of various types of teachers by reducing barriers to entry may give schools the opportunity to hire more desirable candidates.

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Table 1: Percent of Certified Applicants Receiving at Least One Teaching Offer, by Number of Applications and Barron's Rating

Barron's Rating	Overall	Number of Applications			
		1	2-4	5-10	11 or more
Top Two	92%	87%	95%	86%	95%
Third Highest	93%	98%	90%	92%	94%
Below Third Highest	89%	85%	93%	91%	87%

Notes to Table 1: Sample consists of college graduates from the class of 1994 who obtained teacher certification and applied to at least one public school teaching job by 1997. Although each applicant was certified to teach in a public school and applied to teach in at least one public school, it is possible that an applicant's offers came solely from private schools.
Sources: Baccalaureate & Beyond Data (NCES); Barron's Profiles of American Colleges (1998).

Table 2: Undergraduate Enrollment Breakdowns by Barron's College Selectivity Rating and the Types of Teacher Certification Programs Offered

Types of Teacher Certification Programs Offered	Most Competitive or Highly Competitive (highest and second highest ratings)	Very Competitive (third highest rating)
Number of Colleges	133	245
4-year Certification Program (Either Elementary or Secondary or Both)	71%	81%
<u>Elementary Certification</u>		
Any	77%	91%
4-year	48%	74%
< 5 year	56%	75%
Joint M.A.	46%	61%
<u>Secondary Certification</u>		
Any	90%	98%
4-year	52%	72%
< 5 year	61%	79%
Joint M.A.	62%	69%
<u>Elementary/Secondary Combinations</u>		
4-year Elementary, Any Secondary	54%	73%
4-year Elementary, 4-year Secondary	44%	65%
Any Elementary, Any Secondary	71%	91%
Any Elementary, 4-year Secondary	47%	66%

Notes to Table 2: Example of Interpretation: 91% of undergraduates enrolled at Very Competitive Colleges are enrolled at colleges offering any elementary teacher certification program. Percentages are based on IPEDS enrollment data for all non-military colleges. "<5 year" includes all schools with 4-year programs, as well as others that require less than a full fifth year. For example, some programs require nine semesters or require eight regular semesters plus summer classes.

Table 3: Descriptive Statistics for Sample (Individuals without Interest in Teaching Career Prior to College Enrollment)
Population Means with Population Standard Deviations in Parentheses

	Barron's College Selectivity Rating at College where Student Enrolled	
Variable	Top 2 Rating Groups: Most/ Highly Competitive	3rd Highest Rating Group: Very Competitive
Dependent variable: Certified and taught in K-12 school in 2000, or for the last full- time job prior to 2000?	.018 (.132)	.030 (.169)
Key Independent Variable: College offers any undergraduate teacher certification program?	.467 (.499)	.789 (.408)
Individual Characteristics		
Male	.483 (.500)	.480 (.500)
Nonwhite AND Female	.093 (.290)	.061 (.239)
Test Score in Reading (standardized across all NELS observations to mean=5, s.d.=1)	6.00 (.669)	5.74 (.724)
Test Score in Math (standardized across all NELS observations to mean=5, s.d.=1)	6.26 (.646)	5.94 (.656)
Parental Characteristics		
1 parental income earner	.402 (.491)	.347 (.476)
Income under $35,000	.232 (.422)	.242 (.418)
Income above $75,000	.403 (.491)	.287 (.460)
1 earner and income above $75,000	.150 (.358)	.084 (.270)
Either parent was a school teacher?	.145 (.352)	.160 (.357)
Foreign language spoken at home?	.251 (.434)	.150 (.357)
Institutional Characteristics		
Public College?	.450 (.498)	.642 (.480)
Religiously Affiliated?	.144 (.351)	.264 (.441)
Ph.D. Offered in Any Subject?	.870 (.337)	.648 (.478)
Undergraduate Enrollment	14,659 (10,754)	16,160 (13,216)

Notes to Table 3: Statistics are based on NELS data, using sample probability weights. The sample is restricted to individuals who did not express interest in a teaching career or education major when surveyed prior to college enrollment, individuals who attended colleges that offered teacher certification programs at either the undergraduate or graduate level, and individuals with non-missing values for the dependent variable.

Table 4
Fraction of Graduates who Become Certified School Teachers,
Sorted by Pre-existing Interest, College Selectivity, and Program Availability

	Does College Offer an Undergraduate Teacher Certification Program?	
Barron's College Selectivity Rating Group	Yes	No
	Individuals *without* an interest in a teaching career prior to college	
Most Competitive (1)	0.7% N=179	0.3% N=121
Highly Competitive (2)	3.9% N=260	1.2% N=263
(1) and (2) Combined	2.8% N=439	0.9% N=384
Very Competitive (3)	2.6% N=670	4.2% N=177
	Individuals *with* an interest in a teaching career prior to college	
(1) and (2) Combined	25% N=31	25% N=18
Very Competitive (3)	25% N=75	16% N=8

Notes to Table 4: Teaching outcome is based on whether an individual in the NELS (high school class of 1992) had obtained teacher certification by 2000, and was a teacher in 2000 or during his or her most recent full-time job as of 2000. The percentages shown are based on means using sample probability weights.

Table 5a

Factors Influencing Entry into Teaching among Graduates from the Most Selective Colleges: Probit Estimates Using NELS Data for Graduates of Colleges in Barron's Top 2 Rating Groups

Dependent Variable: Dummy for whether graduate of high school class of 1992 was a certified K-12 teacher in his or her most recent fulltime job as of the year 2000

Independent Variables	Coefficient	Robust Standard Error
College offers any undergraduate teacher certification program? (X_{3j})	1.94	0.58
Individual Characteristics		
Male	-1.82	0.65
Minority AND Female	0.43	0.52
Test Score in Reading (standardized across all NELS observations)	-0.82	0.40
Test Score in Math (standardized across all NELS observations)	-0.55	0.40
Parental Characteristics		
1 parental income earner	-0.17	0.70
Income under $35,000	0.55	0.70
Income above $75,000	1.14	0.43
1 earner: income above $75,000	-0.74	0.63
Either parent was a school teacher?	0.54	0.49
Foreign language spoken at home?	-0.47	0.34
Institutional Characteristics		
Public College?	1.86	1.10
Religiously Affiliated?	0.10	0.62
Ph.D. Offered in Any Subject?	-1.25	1.10
Undergraduate Enrollment	$5.9*10^{-4}$	$3.7*10^{-4}$
(Undergrad. Enroll)^2	$-4.7*10^{-8}$	$2.1*10^{-8}$
(Undergrad. Enroll)^3	$8.6*10^{-13}$	$3.5*10^{-13}$
N = 364	Pseudo R-squared = 0.51	

Notes to Table 5a: Uses NELS data with sample probability weights and sample restrictions described in the Notes to Table 3. The regression also includes state fixed effects.

Table 5b
Factors Influencing Entry into Teaching among Graduates from Moderately Selective Colleges: Probit Estimates Using NELS Data for Graduates of Colleges in Barron's Third Highest Selectivity Group

Dependent Variable: Dummy for whether graduate of high school class of 1992 was a certified K-12 teacher in his or her most recent fulltime job as of the year 2000

Independent Variables	Coefficient	Robust Standard Error
College offers any undergraduate teacher certification program? (X_{3j})	-0.35	0.31
Individual Characteristics		
Male	-0.29	0.23
Minority AND Female	-0.07	0.33
Test Score in Reading (Z-score)	0.71	0.25
Test Score in Math (Z-score)	-0.28	0.23
Parental Characteristics		
1 parental income earner	-0.08	0.27
Income under $35,000	0.30	0.26
Income above $75,000	-0.21	0.40
(1 earner)*(income above $75,000)	1.31	0.56
Either parent was a school teacher?	-0.15	0.30
Foreign language spoken at home?	0.01	0.26
Institutional Characteristics		
Public College?	-0.64	0.58
Religiously Affiliated?	-0.11	0.44
Ph.D. Offered in Any Subject?	0.05	0.29
Undergraduate Enrollment	$9.1*10^{-5}$	$9.5*10^{-5}$
(Undergrad. Enroll)^2	$-4.8*10^{-9}$	$4.6*10^{-9}$
(Undergrad. Enroll)^3	$6.3*10^{-14}$	$6.0*10^{-14}$
N = 497	Pseudo R-squared = 0.18	

Notes to Table 5b: Uses NELS data with sample probability weights and sample restrictions described in the Notes to Table 3. The regression also includes state fixed effects.

Table 6: Alternative Probit Specifications Examining Entry into Teaching

Dependent Variable: Dummy for whether graduate of high school class of 1992 was a certified K-12 teacher in his or her most recent fulltime job as of the year 2000

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Graduates of Colleges in Top 2 Selectivity Rating Groups								
Average Marginal Effect	.044	.063	.102	.115	.026	.029	.030	.049
% Change	229%	325%	319%	362%	181%	203%	138%	228%
p-value of coefficient	.048	.067	.085	.001	.024	.013	.060	.003
# of observations	519	519	364	364	710	710	583	583
Graduates of Colleges in Third Highest Selectivity Rating Group								
Average Marginal Effect	-.0004	-.012	-.015	-.031	-.012	-.017	-.007	-.008
% Change	-1%	-28%	-30%	-63%	-28%	-41%	-17%	-21%
p-value of+ coefficient	.983	.557	.507	.266	.319	.192	.648	.597
# of observations	638	638	497	497	809	809	667	667
Control variables								
State fixed effects	X	X	X	X				
Regional fixed effects and State Labor Market Measure					X	X	X	X
Race/Gender		X	X	X		X	X	X
Test Scores		X	X	X		X	X	X
Parental Characteristics			X	X			X	X
Institutional Characteristics				X				X

Notes to Table 6: Uses NELS data with sample probability weights and sample restrictions described in the Notes to Table 3. The "% Change" equals the average marginal effect divided by the average entry rate among individuals in the relevant sample who attended colleges that did not offer undergraduate teacher certification programs. *Example of Interpretation*: Row (1) of Column (1) suggests that the presence of an undergraduate teacher certification program at a college in one of the top 2 ratings categories causes a graduate to be, on average, 4.4 percentage points more likely to become a certified, K-12 teacher by the year 2000.

Table 7: Probit Specifications Examining Entry into Teaching with a Major other than Secondary Education

Dependent Variable: Dummy for whether graduate of high school class of 1992 was a certified K-12 teacher in his or her most recent fulltime job as of the year 2000 and possessed a major in a field other than Secondary Education

	Model removing state fixed effects	Model removing regional fixed effects and controlling for exogenous increase in state-level demand for teachers
Graduates of Colleges in Top 2 Selectivity Rating Groups		
Average Marginal Effect	.103	.030
% Change	565%	130%
p-value of coefficient	.023	.020
# of observations	487	710
Graduates of Colleges in Third Highest Selectivity Rating Group		
Average Marginal Effect	-.031	-.036
% Change	-69%	-79%
p-value of coefficient	.244	.040
# of observations	638	809

Notes to Table 7: Uses NELS data with sample probability weights and sample restrictions described in the Notes to Table 3. The regressions also include control variables for race, gender, test scores, and characteristics of an individual's undergraduate institution. The "% Change" equals the average marginal effect divided by the average entry rate among individuals in the relevant sample who attended colleges that did not offer undergraduate teacher certification programs.