ESSAYS ON THE ECONOMICS OF HIGHER EDUCATION

by

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A DISSERTATION

Presented to the Department of Economics
and the Graduate School of the University of Oregon
in partial fulfillment of the requirements
for the degree of
Doctor of Philosophy

June 2012

DISSERTATION APPROVAL PAGE

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Title: Essays on the Economics of Higher Education

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Degree awarded June 2012

DISSERTATION ABSTRACT

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Doctor of Philosophy

Department of Economics

June 2012

Title: Essays on the Economics of Higher Education

This dissertation is comprised of two essays that broadly consider the role human capital plays in the matching process between individuals and institutions and builds on prior education literature that has found growing evidence that economic choices and opportunities are inextricably linked to human capital investment. The essays in this dissertation also build on the labor-economic tradition of bringing to bear new data sources that involve both collecting new data and combining these data with previously existing data sources in new ways so as to permit the study of interesting issues that could not have been addressed in the absence of these data.

Using recent institutional data from the oldest stand-alone honors college in the country, Chapter II of this dissertation studies how the application and enrollment decisions of honors college students differ from the general population of students considering a large public university. Overall, the results suggest that honors college applicants and enrollees are drawn from the right-tail of its host institution's ability distribution, independent of residency status. Nonetheless, honors college applicants are still more likely to enroll in selective and liberal arts institutions than the general pool of admits to a large public university, which is only partially offset by the effect of honors college admission.

Chapter III exploits the attributes of the higher education industry to examine the role of training and ability in the placement of university presidents within the hierarchy of U.S. institutions. The empirical analysis uses two data sets, the American College President Survey conducted by the American Council on Education and a digitized sample of 2009 curriculum vitae for presidents at 212 top U.S. universities, to model the factors that determine who among the pool of university presidents place at Carnegie-classified research institutions. The findings suggest that the rise to the presidency of a research institution depends on the investments in research-specific human capital over the entire course of a career, which is consistent with prior evidence that the knowledge of the research enterprise is critical to the success of such institutions.

This dissertation includes both previously published and unpublished, co-authored materials.

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ACKNOWLEDGMENTS

I am indebted to Professor Larry D. Singell for his unflagging guidance and support and the invaluable experience of our co-authorship. I also sincerely appreciate Professors Glen R. Waddell, Benjamin C. Hansen, and Dennis R. Howard for their generous and helpful comments and suggestions. I thank Dean David Frank and Paula Braswell of the Robert D. Clark Honors College at the University of Oregon and Young Kim at the American Council on Education for providing the data that were essential to the research of this dissertation.

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CHAPTER I

INTRODUCTION

The economics of education began with the study of wage differential among individuals with different levels of human capital investment. However, the scope of the field has expanded with the growing evidence of the essential role of human capital in economic opportunities and outcomes and the greater availability of new sources of data. Specifically, in addition to the continued interest in the returns to education, recent work have begun to study a wide range of topics from the role of specific educational institutions in economic outcomes to the function of markets in determining educational opportunities. This dissertation is comprised of two essays that study two distinct aspects of American higher education. The first essay uses institution-specific data to study how honors college students differ from the larger population of students attending a large public university, which provides insights into the role of increasingly present honors colleges in the U.S. educational system. The second essay uses individual-level survey data for presidents of U.S. colleges and universities to study the factors that determine who among the pool of university presidents match with research versus non-research institutions, which provides evidence of the role of human capital acquired throughout a career in determining how leaders place within the qualitative hierarchy of an industry.

While the topics of these two studies are distinct, both examine the role that human capital plays (conditioned on various observable attributes) in the matching process, whether it be students within and between institutions or administrators among the hierarchy of higher educational institutions. Thus, this dissertation continues in the

tradition of the education literature that has found growing evidence that economic choices and opportunities are inextricably linked to human capital investment. The essays in this dissertation also build on the labor-economic tradition of bringing to bear new data sources that involve both collecting new data and combining these data with previously existing data sources in new ways so as to permit the study of interesting issues that could not have been addressed in the absence of these data.

Honors programs did not formally begin to be offered by U.S. public universities until after World War II when the influx of high ability students into the higher education sector began to outstrip university's ability to properly educate them. However, over the last 50 years these programs have become nearly ubiquitous at flagship public universities who are increasingly trying to compete for the best students with private universities. In fact, the rising presence of honors colleges can be considered part of a broader trend of universities competing for high ability students by dedicating relatively greater resources towards these students. However, there are no previous studies that systematically examine how the students enrolled in an honors college differ from the larger population of students in a large public university. Chapter II makes use of the institutional data from the oldest stand-alone honors college in the country from 2007 to 2009 to empirically study the role of an honors college within a large public university in attracting high-performing students. Overall, the empirical results suggest that honors colleges improve the academic profile of public universities by enrolling "above-average" students. At the same time, the analysis that pools the institutional data with National Clearinghouse data suggests that honors programs at large public flagship

universities still lose the best applicants to otherwise-preferred selective and liberal arts institutions.

The importance of leaders in the success of organizations is well documented and prior work has also shown that human capital investment of these leaders is critical to this success. Nonetheless, there is relatively little evidence regarding the role of human capital in determining the matching process among leaders and organizations. Chapter III uses the attributes of the higher education industry where institutions can be compared based on well-observed research metrics and the career profile of the head of a university is relatively transparent (including their measured ability in research), which can be exploited to study the matching process among universities and the presidents who lead them. This essay makes use of two new data sources. First, the analysis makes use of three editions of *American College President* survey conducted by the American Council on Education over a 30-year period that was not previously available to researchers. These data include detailed information about the career of presidents across the majority of U.S. higher educational institutions over several decades. Second, the curriculum vitae of sitting presidents in 2009 are digitized for 212 top institutions that provides detailed personal histories of these institutional leaders including their observed research productivity. These two data sets are used to study who among the pool of university presidents place at Carnegie-classified research institutions. In general, the results suggest that human capital investment over the course of a career is critical to determining the match within the research-hierarchy of institutions. Thus, while leaders may be born with certain innate abilities, it is the systematic investment in human capital over the course of a career that determines where they lead.

Chapter II is previously published at the *Research in Higher Education*, co-authored with Professor Larry D. Singell at the Indiana University. Chapter III is co-authored with Professor Larry D. Singell at the Indiana University and is currently submitted for publication at the *Economics of Education Review*. Chapter IV concludes the dissertation.

CHAPTER II

AN ANALYSIS OF THE HONORS COLLEGE APPLICATION AND ENROLLMENT DECISION FOR A LARGE PUBLIC UNIVERSITY

This chapter is a manuscript currently accepted for publication at the *Research in Higher Education*, co-authored with Professor Larry D. Singell at the Indiana University. My contribution to this manuscript includes data collection, research on background information, literature survey, data analysis, and preparing the executive summary of findings. I also constantly involved in the setting of research question and manuscript revision.

1. Introduction

Although the first honors college housed in a public university was not founded until 1960 at the University of Oregon, *Peterson's Guide to Honors Programs and Colleges* (2005) indicates that there are now nearly 600 honors-type programs at both two-year and four-year institutions. Sederberg (2008) indicates that the origin of the honors phenomenon began after World War II when the upsurge in highly qualified students seeking a college education outstripped the ability of elite private schools to accommodate the demand; yet, his survey of National Collegiate Honors Council members also indicates that much of this growth is recent, with over 60% of honors programs having been established since 1994. While demand-side factors are important, Long (2002) suggests that the proliferation of honors programs stems in large part from state-level, supply-side incentives of public institutions to compete for high-achieving

students by offering a unique, high-quality experience at a lower cost relative to their selective and liberal arts alternatives. Despite the growth in the number and importance of honors programs within public higher education sector, this chapter is the first to empirically examine the application and enrollment decisions of honors college students and how they differ from the general population of students who are considering a large public university.

The rising presence of honors colleges is part of a broader trend towards dedicating institutional and state-level merit-based aid towards academically able students (e.g., McPherson & Schapiro, 1994; Singell, Waddell, & Curs, 2006). For example, Heller (2008) uses National Postsecondary Student Aid Study data from 1995 to 2004 to show that institutionally based merit grants increased by 212% as compared to a 47% increase for need-based grants. Similarly, Dynarski (2000) describes the growing trend of state-level merit-based programs such as the Georgia HOPE Scholarship that are now available in nearly two dozen states and that annually fund hundreds of thousands of students. Honors programs with their smaller class sizes and more personalized attention yield costs per student credit hour that significantly exceed both the costs per student credit hour of non-honors students and the typical fee honors college students pay to participate (e.g. Sperber, 2000; Samuels, 2001). Thus, this chapter builds on the merit-aid literature by modeling and testing empirically the mechanism that determines who among the pool of applicants to a large public university apply and enroll in an honors college.

This chapter proceeds as follows. The next section describes the market for honors colleges in the U.S. and how the Robert D. Clark Honors College (CHC) at the

University of Oregon (UO) represents a typical honors college. Section 3 develops a discrete choice model of the application, admission and enrollment decision to the CHC among UO applicants. Section 4 describes the individual CHC and UO applicant data that are used to estimate the empirical model derived in the previous section. In Section 5, the empirical results for the application, admissions, and enrollment decisions are discussed, including a multinomial analysis that uses the National Clearinghouse data to examine how application and admission into the CHC affect the enrollment choice of UO applicants between the UO and its competing types of institutions. The final section discusses the policy implications of our findings where an honors college at a public university appears to fill a selectivity gap between that of its regular, non-honors college population and those students who typically attend more selective institutions.

2. Background

Prior work shows that high ability students can generate peer effects for classmates and appeal to faculty such that they can be a relatively valued type of institutional input; while their greater measured success in the labor market and potential as future donors are tangible university outputs (Rothschild & White, 1993; Ehrenberg, 2002). Monks and Ehrenberg (1999) contends that these incentives to attract and retain high ability students have been enhanced by the greater integration of the higher education market arising from the development of standardized tests (i.e., ACT and SAT) and college rankings systems (e.g., U.S. News and World Report). As a result, Hoxby (1997) suggests that universities' power over their factors of production have declined and their input prices, including those for high ability students, have increased. Thus, the

growth in honors colleges is part of an industry-wide movement to attract high ability students by dedicating greater resources and providing academic enrichment.

There is evidence that students benefit from a selective type environment. For example, a number of papers have found that, controlling for selection effects, there is a significant economic return to being admitted and/or attending an elite private college (e.g., Dale & Krueger, 2002; Brewer, Eide, & Ehrenberg, 1999). Such returns could be generated by peer effects from interactions with more able peers that, while often found to be small, are often positive and significant (e.g., Sacerdote, 2001; Carrell, Fullerton, & West, 2009). Thus, it is not surprising that Hoxby (1998) finds a student quality multiplier effect where a rise in admission standards, holding price constant, yields a greater number of high-achieving applicants.

Honors college studies have primarily focused on student outcomes, examining whether greater access to resources and stronger peers enhance performance (Winston 2003). For example, Cosgrove (2004) models the academic performance, retention, and degree completion rates of honors-college students, partial honors students, and high-ability, non-honors students who began as freshman at three universities in the Pennsylvania State System in 1997. His findings indicate that all three measures of academic performance are higher for honors college students than for other high-ability students with comparable precollege academic performance. Consistent with this quantitative evidence, qualitative studies suggest that honors college students experience greater cognitive development in the early years of college (e.g., Seifert, Pascarella, & Colangelo, 2007) and heightened educational and career aspirations (e.g., Rinn, 2005).

Thus, prior work suggests that exposure to an honors college treatment improves both college and post-college outcomes.

Although there is significant variation in the types of honors colleges and programs in the U.S., Long (2002) uses data for 500 honors programs detailed in Peterson's Honors Programs (1997 and 1999) as well as Barron's Profiles of American Colleges and finds that more than half of the honors colleges and programs are at competitively ranked, four-year, public colleges (with one-fifth of honors offerings located in honors colleges).[1] Her empirical analyses show that honors programs and colleges at four-year, public universities are, on average: (1) housed in good institutions that operate at the margin of attracting high ability students; (2) part of a "stratum of colleges" that are facing growing competition; (3) located in states where brain drain of top students is of particular concern; and (4) under constraints not to change the overall mission of the school while still trying to attract high ability students. Each of these conditions broadly applies to the CHC, the UO, and the state of Oregon.

The CHC was founded as an honors program in 1949 and, in 1960, was established as the first honors college that offered a personalized liberal arts education housed within a large public research university.[2] The application and admissions procedures for honors colleges differ among institutions. Specifically, for the UO, prospective CHC students must submit a separate application and extra materials that include an essay and two letters of recommendation. CHC applicants must be admitted

[1] Long (2002) finds that nearly all honors colleges are located in institutions classified as "Highly Competitive", "Very Competitive", or "Competitive" and that, similar to CHC, most have a separate, selective admissions process, offer special living arrangements (i.e., separate dorm or wing of a dorm), have special forms of financial aid, and make up approximately 5% of the student population.

[2] In July 1975, the college was named Robert D. Clark Honors College to honor the vision and dedication of a UO speech professor who led the founding of the Honors College.

to the UO, but are not required to be admitted into the CHC to enroll at the UO. CHC admission is determined by a full-file review where points are assigned by several reviewers based on high school record, standardized tests, essays, letters of recommendation, and contributions towards institutional diversity. To be admitted, a student must score no less than 15 points out of 28 possible points, but the number of qualified applicants exceeds the number of slots such that students are not solely admitted based on their scored points. For example, in the 2009 sample, 620 of the 1,141 of CHC applicants were admitted and 159 ultimately chose to enroll.[3]

CHC enrollees pay a separate per-term resource fee over and above regular UO tuition as long as they are enrolled in the college.[4] CHC students are required to take both CHC-specific courses that have enrollments capped at 25 and general UO courses that contribute towards their major, which can be in any of six other colleges. CHC courses are taught both by one of 16 tenure-track honors college faculty and faculty from the other colleges who have been selected to teach by the CHC Dean. The CHC maintains additional graduation requirements that include a specific CHC curriculum, a second-language requirement, a senior thesis, and a minimum cumulative GPA of 3.0 both during the course of study and for graduation. It follows that the CHC is a separate, relatively selective college in comparison to its UO host. The empirical model in the following section examines the application, admissions, and enrollment decision in the context of the alternative institutional choices to the UO and the CHC.

[3] The admittance rate for the general population of UO applicants is 90% with an enrollment rate of 34%, comparing to an average admittance and enrollment rate of 66% and 50%, respectively, for all 4-year, BA and above, degree granting institutions in the country in 2009.

[4] The resource fee in 2009 was a $1000 per term in the first year and slightly lower amount for each term after the first year until graduation.

3. Empirical Model

The matriculation decision to the UO and the CHC can be thought of as a multi-stage process where each subsequent decision is conditioned on the decision in the previous stage. Specifically, the enrollment decision consists of three discrete decisions: (1) the decision of the student to apply to the CHC (and the UO) based on his or her attributes; (2) the decision of the CHC to admit a student based on the student attributes and conditional on the student applying; and (3) the decision of the student to enroll based on his or her attributes and condition on being admitted. The final decision to enroll in (3) can be thought of a binary decision to enroll or not in the CHC or a multinomial decision where the alternatives to the UO and the CHC can be grouped into logical sets of alternative institutions. Thus, the empirical analyses examine the binary application, admission, and enrollment decision to the CHC as well as the multinomial choice of the UO versus several groups of alternative institutions that might be expected to compete for students in relation to the application and admission decision to the CHC.

Students who apply to the CHC must apply to the UO. Although CHC applicants are self-selected from the pool of UO applicants, the empirical analysis focuses on the CHC application decision, independent of the UO application decision, because the data are drawn exclusively from UO applicants. Nonetheless, the choice to apply to the CHC clearly relates to the fact that it is housed in a large public university. It is also possible that some students might not choose to apply to a large public university like the UO in the absence of an honors college, but this hypothesis cannot be tested in the absence of multi-institution data and variation in the honors college option within and across institutions. Thus, our analysis focuses on who among the self-selected pool of

applicants to a specific public university find it in their best interest (i.e., a utility maximizing decision) to apply to an honors college and the results most directly apply to institutions like the UO that typifies the U.S. honors college experience.

Although the net utility for applying to the CHC by student i is not observed, the decision to apply (AP) to the CHC is observed and is modeled as a linear index function:

$$AP_{ijt} = \alpha X_i + \pi_j + \lambda_t + \varepsilon_{ijt} \quad (2.1)$$

where the net utility for student i for applying to the honors college depends on observable attributes X_i, fixed effects for high school j, π_j, fixed effect for entry year t, λ_t, and an error term, ε_{ijt}. Equation (2.1) forms the basis for a linear probability model where the dependent variable is a binary variable that equals one if the student applies to the CHC and zero if not.

We estimate linear probability and logistic (logit) models throughout, which permits the presence of fixed effects. Our results subsequently show that the use of linear-probability versus discrete-choice models and/or the exclusion of fixed effects can affect the explanatory power of the model and the magnitude, but not the sign, of the coefficients. Thus, the discussion of the results focuses on the sign of the coefficients and not the magnitude, which is appropriate for a single-institution study that is, in any case, best suited to speak to general patterns of behavior that might well be similar for honors colleges housed in large public universities (Singell, 2004).

The CHC admits students from the pool of applicants based on a set of well-specified criteria (e.g., high school GPA, standardized test scores, letters of recommendation, etc.). Although each of these factors figures directly into the admissions decision through a points system, admittance is not purely formulaic simply

because the number of qualified applicants significantly exceeds the number of available slots. Thus, similar to the random utility approach above, the actual CHC objective function is not observed, but the decision to admit (AD) to the CHC is observed and is modeled as a linear index function:

$$AD_{ijtr} = \beta Y_i + \delta_j + \zeta_t + \upsilon_r + \eta_{ijtr} \quad (2.2)$$

where the net benefit from admitting student i to the honors college depends on observable attributesY_i, high school, entry year, and reviewer-specific fixed effects, δ_j, ζ_t, and υ_r, and an error term, η_{ijtr}, respectively.

Equation (2.2) forms the basis for a linear probability model where the dependent variable is a binary variable that is equal to one if the student is admitted to the CHC and zero otherwise. The model includes high school and entry-year fixed effects because the admissions pattern may differ systematically across high school and year, which relates to the relative supply of students from a particular high school or in a particular year. Likewise, several models include reviewer-specific fixed effects when the data used permit identification of the reviewers involved in the file, which control for the possibility of systematic reviewer heterogeneity. It is important to note that, because the admissions process of the CHC resembles that of other selective-type programs, with its full file review, letters or recommendation, and other requirements, the analysis provides some useful insights into how such processes work. On the other hand, one must be careful regarding the generalization of the admissions process across institutions. Thus, the primary role of the admissions analysis is to facilitate an understanding of the selection process as it relates to the enrollment decision.

If admitted, the CHC applicant must decide whether or not to enroll. The student will choose to enroll if the utility from selecting the CHC exceeds that of the other alternatives. Again, the net utility for enrolling in the CHC (UO) by student i is not observed, but the decisions to enroll (EN) is observed and also is modeled as a linear index function:

$$EN_{ijt} = \gamma Z_i + \tau_j + \theta_t + \mu_{ijt} \quad (2.3)$$

where the net utility for student i enrolling in the CHC depends on observable student attributes, Z_i, a high school and entry-year fixed effects, τ_j and θ_t, and an error term, μ_{ijt}, respectively. The model conditions on unobserved heterogeneity across high schools because again variation in enrollment behavior across high schools may reflect fixed differences in the enrollment pipeline established between high schools and particular higher educational institutions.

Equation (2.3) serves as the basis for a linear probably model if the choice is limited to a binary one between enrolling in the CHC versus not. However, Equation (2.3) does not answer the question if an affiliation with the CHC, either through the application or admittance decision, affects the decision to enroll at the UO versus its competing alternatives for UO applicants. To examine this issue, the enrollment decision can be specified as multinomial logit model where the choice can be specified as one of several competing alternative types of institutions relative to the UO and when the error term is assumed to be Weibull:

$$EN_{ik} = \rho CHC_{ik} + \gamma Z_{ik} + \mu_{ik} \quad (2.4)$$

where the net utility for student i enrolling in institution k depends on a vector of two binary variables, CHC_{ik}, that each equals one if the student applies to the CHC and if the

student is admitted (conditioned on applying) by the CHC, observable student attributes, Z_{ik}, and a random error term, μ_{ik}. The honors college is expected to compete differently with selective institutions, other private liberal arts institutions, and public universities located in the West versus other regions. Thus, equation (2.4) is estimated using several alternative groupings of institutions to test the sensitivity of the results to the assumptions regarding the direct competitors with the CHC. It is important to note that, whereas equation (2.3) and (2.4) do not explicitly model the possible non-random selection of enrollees that could arise through both the admissions process, the empirical discussion considers how the admissions process might impact the coefficients in the enrollment model.

4. Data

The primary data for the empirical analyses are student-level records drawn from the University of Oregon (UO), which is a public, research university in a medium-sized, upper-middle class city of Eugene, Oregon. The UO is organized into eight schools and colleges, including the Robert D. Clark Honors College (CHC). The data set is constructed from three sources for academic years 2007 through 2009: the UO admission office; the CHC admission committee; and the National Student Clearinghouse (NSC). The time period for the analysis arises naturally from the fact that the CHC only began retaining CHC application profiles starting in 2007.

The UO admission office provides information on personal attributes, academic performance, and financial aid offers for 33,158 UO applicants between 2007 and 2009. These data are supplemented by data on the admission status for all 3,070 CHC

applicants over the period and student scoring sheets from the CHC admission committee for 1,341 applicants.[5] The scores sheets rate students on their academic profile, letters of recommendation, and diversity background (i.e., experience with distinct ethic, social, economic, or geographic group that are under-represented in the student body and distinct accomplishments), which yields an admission score on a 28-point scale.[6] Finally, the NSC data tracks students who do not enroll at the UO, which permits us to examine the enrollment pattern for CHC applicants both at the UO and in competing institutions.

The random utility models developed in the previous section demonstrate that the matriculation process into the CHC can be characterized as a series of discrete choices related to the application, admission and enrollment decisions into the CHC and in comparison to alternative institutions. Thus, the empirical models estimate a series of discrete choice models that include a binary or a multinomial dependent variable that characterizes the discrete choice under consideration. In particular, the empirical analysis considers: (1) the binary CHC application decision for all UO applicants; (2) the binary admission decision of the CHC for all CHC applicants; (3) the binary CHC enrollment decision for all CHC admits; and (4) the multinomial choice among the UO and alternative institutions for both applicants and non-applicants to the CHC who were admitted to the UO.

[5] The student scoring sheet data from the CHC include all applicants from 2009 and all enrollees during the three academic years. Unfortunately, two boxes of alphabetically listed applicant files were inadvertently discarded by the CHC. Thus, data for 2007 include only applicants who were denied by the CHC and whose last names begin with L to Z; whereas the 2008 data include only applicants who declined the admission offer and whose last name initials A to M. We demonstrate subsequently in Table 2.3 columns 1 and 2 that the alphabetically generated missing data are not systematic in nature. In fact the estimates that rely exclusively on the 2009 data are qualitatively equivalent to those that include the full three years. Thus, we use all three years of data that increase the statistical power of our estimates and generally focus on the sign and not the magnitude of the coefficients. These data limitations only apply to the applicant analysis in Table 2.3 that rely on the student scoring sheets in addition to other UO data sources that do not have missing data.

[6] The total admission score possible was 30 in 2007 and became 28 in 2008 and 2009.

The explanatory variables in each of these four specifications can broadly be categorized into demographic, academic ability, and financial aid attributes. Demographic attributes include binary variables that equal one for Oregon residents, female students, and for non-white students. Academic ability is measured by the student's math and verbal scores on the Scholastic Aptitude Tests (SATs) and high school Grade Point Average (GPA).

The empirical specifications also include several controls for measured financial need, which prior work has found to be important in the application and enrollment decisions of students (e.g., St. John, 2003). In order to be eligible for financial aid, students must complete the Free Application for Federal Student Aid (FAFSA) form that provides detailed information on their parents' financial status. It follows that the model includes a binary variable that equals one if an applicant files a FAFSA. The financial information contained in a FAFSA permits the financial aid office to estimate the financial eligibility for aid if attending the UO, which is based on College Board and federal guidelines.

Financial eligibility is negative for those students whose expected family contribution exceeds the cost of attending the UO, whereas positive financial eligibility is an indicator of the amount of financial aid the student is eligible to receive. The empirical model includes a binary variable that equals one if the student is deemed needy by the eligibility formulas such that he or she is eligible for financial aid. In addition, this binary variable is interacted with financial eligibility, which yields a measure of the amount of aid a needy student is eligible to receive in the form of grants, loans, and workstudy. Whereas the level of financial eligibility is not known with certainty at the

time the student applies and is admitted, the eligibility amount is included in all specifications because families can obtain a reasonable estimate of their expected financial need from the Department of Education at the time they apply for aid.

The empirical model also includes the amount of several categories of financial aid, which are included only at the time they become known to the student. Specifically, the UO has an institutional "dean's" scholarship program that is based on high school GPA; this program is detailed in all of its printed and electronic financial aid material such that the student can know the level of scholarship aid at the time they apply to the UO. Thus, each of the empirical models includes the level of "dean's" scholarships. The remainder of the financial aid package (e.g., grants or diversity scholarships) is not known until after the application and admissions decision, but is known before the enrollment decision. Thus, grant, loans, workstudy, and other scholarships are included in the enrollment models, but are omitted from application and admissions models.

Descriptive statistics in Table 2.1 show that relative to the general population of UO students, CHC applicants, admits, and enrollees have higher high school GPAs and SAT scores and are more likely to be residents, white, and female. However, Table 2.1 also shows that CHC students typically have lower GPAs and SAT scores than those CHC admits who enroll in selective and liberal arts institutions. Thus, CHC enrollees tend to be academically stronger than the typical UO students, but academically weaker than those CHC applicants who enroll at selective and liberal arts institutions for whom the CHC hopes to compete.

Table 2.1. Summary Statistics for UO enrollees and CHC Applicants in 2007-2009

	UO Enrollee	CHC Applicant	CHC Admit	CHC Enrollee	CHC Non-Enrollee	
					Selective Lib. Arts	Others
Demographic Variables:						
Resident (=1)	0.618	0.504	0.559	0.744	0.516	0.451
	(0.486)	(0.500)	(0.497)	(0.437)	(0.500)	(0.498)
Non-White (=1)	0.229	0.247	0.250	0.234	0.250	0.266
	(0.420)	(0.431)	(0.433)	(0.424)	(0.433)	(0.442)
Female (=1)	0.519	0.638	0.645	0.609	0.642	0.680
	(0.500)	(0.481)	(0.479)	(0.489)	(0.480)	(0.467)
Ability Variables:						
SAT Verbal Score	5.503	6.430	6.777	6.684	6.874	6.743
	(0.874)	(0.823)	(0.666)	(0.668)	(0.648)	(0.671)
SAT Math Score	5.572	6.374	6.674	6.541	6.769	6.678
	(0.842)	(0.747)	(0.609)	(0.602)	(0.601)	(0.606)
High School GPA	3.508	3.874	3.972	3.954	3.985	3.972
	(0.362)	(0.259)	(0.194)	(0.189)	(0.184)	(0.208)
Financial Aid Variables:						
FAFSA (=1 if apply FAFSA)	0.704	0.745	0.762	0.852	0.738	0.713
	(0.457)	(0.436)	(0.426)	(0.355)	(0.440)	(0.453)
Eligible (=1)	0.420	0.375	0.362	0.367	0.329	0.395
	(0.494)	(0.484)	(0.481)	(0.482)	(0.470)	(0.489)
FAFSA*Eligible* Eligibility	0.624	0.572	0.517	0.519	0.462	0.580
	(0.901)	(0.919)	(0.852)	(0.845)	(0.811)	(0.900)
Scholarship Amount	0.239	0.433	0.521	0.644	0.474	0.470
	(0.416)	(0.346)	(0.351)	(0.452)	(0.273)	(0.304)
Grant Amount	0.087	0.049	0.044	0.059	0.036	0.039
	(0.212)	(0.161)	(0.152)	(0.186)	(0.136)	(0.136)
Loan Amount	0.500	0.527	0.505	0.485	0.498	0.530
	(0.619)	(0.672)	(0.617)	(0.479)	(0.624)	(0.707)
Work-Study Amount	0.020	0.014	0.013	0.014	0.011	0.014
	(0.051)	(0.043)	(0.042)	(0.044)	(0.039)	(0.043)
Observations	10,135	3,070	1,725	488	665	572

Note that SAT scores are in hundreds and all financial aid amounts are in thousands. Standard deviations are in parentheses.

5. Empirical Results

The models with a binary dependant variable (i.e. CHC application model, CHC admission model and CHC enrollment model) are estimated using both ordinary least squares (OLS) and logit. In general, the results are robust across the two approaches and yield qualitatively equivalent signs, marginal effects, and levels of statistical significance.

Thus, for brevity, we focus on the OLS results that retain a greater number of observations in the instances where the model includes multiple fixed effects.[7]

5.1. CHC Application Model

The empirical model presented in the first column of Table 2.2 examines the factors that relate to whether a UO applicant applies to the CHC. Most of the coefficients are significant at traditional levels and, while the fixed effects significantly contribute to the explanatory power of the model, they do not greatly impact the qualitative conclusions of the model. The high school fixed effects do, however, eliminate the significant effect of residency status, suggesting that residency tends to affect choice through the pipeline established with specific high schools.

The empirical model generally suggests that demographic attributes affect whether a UO applicant also applies to the CHC. Specifically, the positive coefficient (although not statistically significant with high school fixed effects) on resident suggests that the CHC is relatively likely to attract graduates of in-state high schools from the pool of UO applicants. This is not necessarily surprising because a stated role of the CHC is to provide an in-state (low-cost) alternative to out-of-state selective and liberal arts institutions for high-performing residents. In addition, the coefficients on non-white and female are positive and significant, indicating that the CHC also tends to attract non-white and female UO applicants. Thus, CHC applicants are not randomly drawn from the

[7] The inclusion of fix effects in the logit model can significantly reduce the sample size because there are 0.6% of resident students and 8% of non-resident students that are the only applicant from a particular high school. To test the sensitivity of the results to the distributional assumption of the dependent variable (i.e., OLS versus logit) and the presence of fixed effects, OLS and logit models are estimated without fixed effects and compared to the presented OLS specification with fixed effects. In general, the qualitative conclusions are robust across these three alternative specifications for the significant explanatory variables.

Table 2.2. Linear Probability CHC Application Regressions by Residency Status

	Dependant Variable: Applied to CHC		
	All	Resident	Non-Resident
Demographic Variables:			
Resident (=1)	0.012		
	(0.018)		
Non-White (=1)	0.024***	0.039***	0.007
	(0.004)	(0.007)	(0.005)
Female (=1)	0.021***	0.026***	0.013***
	(0.004)	(0.006)	(0.004)
Ability Variables:			
SAT Verbal Score	0.052***	0.063***	0.036***
	(0.003)	(0.004)	(0.003)
SAT Math Score	0.026***	0.030***	0.013***
	(0.003)	(0.005)	(0.003)
High School GPA	0.112***	0.094***	0.039***
	(0.009)	(0.012)	(0.007)
Financial Aid Variables:			
FAFSA (=1 if applied FAFSA)	0.035***	0.037***	0.028***
	(0.004)	(0.008)	(0.005)
Eligible (=1)	-0.022***	-0.040***	-0.001
	(0.008)	(0.012)	(0.010)
FAFSA*Eligible* Eligibility	-0.001	0.009	-0.007*
	(0.003)	(0.007)	(0.003)
Dean's Scholarship Amount	0.014***	0.069***	0.021***
	(0.001)	(0.007)	(0.001)
High School and Year Fixed Effects	yes	yes	yes
Observations	33,158	12,568	20,590
Adjusted R-squared	0.137	0.200	0.107

SAT scores are in hundreds and all financial amounts are in ten thousands. Since dean's scholarship is the only type of financial aid that students aware of when they decide to apply or not, it is the only one been included in the table. Robust standard errors are in parentheses. *** denotes $p<0.01$ and * denotes $p<0.10$.

pool of UO applicants, which is consistent with the presence of an honors college affecting who chooses to apply to a large state university.

Not surprisingly, the empirical results indicate that the CHC applicants are stronger academic students than the typical UO applicant. In particular, the results show that UO applicants with higher math and verbal SAT scores and those with higher high-school GPAs are significantly more likely to apply to the CHC. Thus, the honors college does appear to attract relatively strong UO applicants, which could improve the institution's academic profile to the extent that some students apply to the UO due to the presence of the honors college. However, the coefficient on the verbal SAT score is markedly larger than that of math SAT score in the CHC application model, which is consistent with the relative concentration of the CHC faculty in the humanities that emphasize verbal acuity.

Access is a significant concern of honors-based programs because their exclusive admissions process tends to favor those students who are not limited by financial considerations. However, the coefficient on FAFSA is positive and significant suggesting that students who complete a FAFSA are more likely to apply to the CHC, whereas the coefficient on those with positive financial need is negative and significant. On net, the results indicate that persons with positive financial need who complete a FAFSA are more likely to apply than those who do not complete a FAFSA. As we demonstrate subsequently, the CHC competes for UO applicants with private selective and liberal arts schools that require applicants to complete a FAFSA: thus, these findings suggest that it is the needy students among the FAFSA filers that are less likely to apply to the honors college. It follows that access still may be an issue of concern for honors

colleges housed in public universities. Alternatively, students receiving dean's scholarships are more likely to apply to CHC, suggesting merit aid encourages good student to apply to honors-type programs when applying to a large public university.

The second and third columns of Table 2.2 presents separate estimates for resident and non-resident applicants, following prior work that suggests that their behavioral response differs across demographic, academic, and financial aid factors (e.g., Curs & Singell, 2002). In general, the coefficients on the explanatory variables are of the same sign for in-state and out-of-state students, but smaller in absolute magnitude for out-of-state students relative to their in-state counterparts. The financial aid variables also suggest that the CHC plays a slightly different role in attracting in-state versus out-of-state students. Specifically, the three FAFSA-related coefficients jointly suggest that in-state students whose demonstrated need exceeds $3,400 are more likely to apply to CHC. It follows that CHC is relatively attractive to needy, academically able in-state students. On the other hand, the joint effect of FAFSA completion and observed need is positive up to about $41,000 of eligibility (i.e., the majority of out-of-state applicants). Thus, the CHC appears to provide a relatively inexpensive alternative to private schools for all but the neediest out-of-state students who apply to the UO and often receive relatively generous institutional need-based aid packages from private institutions.

5.2. CHC Admission Model

The student behavioral models in Section 2 aim to understand the types of students who apply and then enroll in an honors college. However, because a significant portion of students who apply to the CHC fail to be admitted, the decision to enroll is

determined in part by the admissions decisions made by the CHC. Thus, this section examines the factors that determine the admission into the CHC. For brevity, Table 2.3 focuses exclusively on the regressions that pool resident and non-resident students, because the CHC admission results are found not to differ significantly by residency status.

The CHC, because it is a selective college within a less selective university, attempts to compete for stronger students who have better alternatives and are more likely to attend college out-of-state than the typical UO applicant.[8] Thus, the first specification in Table 2.3 estimates a linear probability model for the likelihood a CHC applicant is admitted conditioned on the same set of explanatory variables in the application model to provide a sense of how the application process relates to admissions decision. The results indicate that academic ability is the strongest predictor of admission, but other non-academics factors also matter. For example, non-white students are more likely to be admitted conditioned on the academic performance measures, reflecting the role diversity plays in the admissions process. Financial aid variables, however, do not significantly affect the admission decision, which suggests the admissions process is need blind. It follows that to understand the admissions process it is useful to look more carefully at the methodology employed by the CHC in admitting students.

The CHC has a formalized admissions process whereby students are assigned a score out of possible 28 points and points are awarded towards admission for verbal and

[8] Descriptive statistics (available upon request) show that, whereas the admissions rate into the UO is approximately 90%, only 62 (50)% of in-state (out-of-state) CHC applicants are admitted to the honors college even with their stronger academic background. On the other hand, approximately 38 (16)% of CHC applicants enroll, which is lower than that of the UO that is 54 (21)% for in-state (out-of-state) students.

Table 2.3. Linear Probability CHC Admission Regressions using CHC Review Sheets

	Dependant Variable: Admitted to CHC		
	(1)	(2)	(3)
Demographic Variables:			
Resident (=1)	0.022	0.291	0.251
	(0.159)	(0.233)	(0.204)
Non-White (=1)	0.063***	0.038	-0.011
	(0.018)	(0.028)	(0.024)
Female (=1)	0.046***	0.052**	0.004
	(0.017)	(0.025)	(0.024)
Ability Variables:			
SAT Verbal Score	0.178***	0.174***	0.052***
	(0.013)	(0.019)	(0.019)
SAT Math Score	0.179***	0.192***	0.065***
	(0.013)	(0.024)	(0.022)
High School GPA	0.865***	0.794***	0.324***
	(0.062)	(0.119)	(0.110)
Financial Aid Variables:			
FAFSA (=1 if applied FAFSA)	-0.026	-0.010	-0.016
	(0.021)	(0.037)	(0.032)
Eligible (=1)	-0.028	0.018	-0.019
	(0.029)	(0.045)	(0.044)
FAFSA*Eligible* Eligibility	0.024	0.016	0.035
	(0.017)	(0.028)	(0.026)
Dean's Scholarship Amount	-0.003	-0.009	0.005
	(0.009)	(0.015)	(0.013)
Additional Control:			
Assigned Total Score	-	-	0.084***
			(0.006)
High School and Year Fixed Effects	yes	yes	yes
Reviewer Fixed Effect	no	no	yes
Observations	3,070	1,341	1,341
Adjusted R-squared	0.449	0.441	0.556

SAT scores are in hundreds and all financial amounts are in ten thousands. Since dean's scholarship is the only type of financial aid that admission committee observes when making admission decisions, it is the only one been included in the table. Sample size in analysis is narrowed to those with complete admission scoring information. Robust standard errors are in parentheses. *** denotes $p<0.01$ and ** denotes $p<0.05$.

math SAT score, high school GPA, rigor and breadth of curriculum, letters of recommendation, the essay, and how the student contributes to the diversity of the class. In order to be admitted, students must have a score above 15, but students above a 15 are awarded admission based on a full-file review. The remaining specifications in Table 2.3 explore the relative importance of other factors that could be considered important to the admissions process.

The number of observations declines from 3,070 to 1,341 for columns 2 and 3 of Table 2.3 because the CHC, while retaining all the evaluations sheets in 2009, inadvertently discarded some of the 2007 and 2008 evaluation sheets based on the alphabetical order of the applicant's last name as described in footnote 5. Column 2 of Table 2.3 replicates the specification in the first column using the smaller sample and yields consistent findings, except for the loss of some statistical significance. Thus, the sampling of the scoring sheets appears sufficiently random to not impact the qualitative conclusions of the application model such that the scoring data can be used to speculate how the enrollment decision relates to the more holistic admissions process.

The specification in columns 3 of Table 2.3 introduces reviewer-specific fixed effects to control for potential unobserved variation in the admissions evaluations across CHC reviewers and the total score assigned to each CHC applicant. The results generally suggest that, other than reducing the relative favoritism towards female applicants that appears to be reviewer specific, controls for the potential heterogeneity in the reviewer evaluations of CHC applicants do not affect the general CHC admissions patterns. However, as expected, the introduction of the total score greatly reduces the magnitude and significance of the attributes observed by the UO admissions office. Nonetheless, the

academic performance measures remain positive and significant suggesting that students get a "double bump" towards admissions based on their academic ability from the CHC's own internal evaluation rankings. Thus, the full-file review of the CHC appears to further benefit the strongest academic students in admissions.[9]

5.3. CHC Enrollment Model

The enrollment decision completes the sequence that follows the application and admissions decisions. Table 2.4 presents the results from a linear probability model for all CHC admits as well as separate estimates by residency status, where each specification controls for high school and entry year fixed effects. The results generally suggest that, for students who choose to apply both to the CHC and the UO, the CHC competes well for good, but not the best, students.

The results indicate that academic ability is most important determinant of CHC enrollment, and that demographics play a relatively small role in the enrollment decision. Specifically, the specification in column 1 of Table 2.4 that includes all CHC admits yield relatively small coefficients on the demographic variables, but negative and significant coefficients on all of the ability controls. In other words, the CHC tends to lose its strongest academic applicants to competing institutions.[10] On the other hand, the coefficients on the SAT score controls are small and insignificant for non-resident

[9] Separate estimates of the admissions model by residency status yield very similar findings as those for the full population. However, the coefficients on the SAT scores and high-school GPA are not significant for out-of-state students. This suggests that the CHC follows their formal admissions guideline more carefully for non-resident students than for their in-state counterparts.

[10] Similar to these findings, enrollment estimates in Curs and Singell (2002) that use all UO applicants finds that the institution tends to lose the best students to competing institutions.

Table 2.4. Linear Probability Enrollment Regressions for CHC Admits by Residency Status

	Dependant Variable: Enrolled in CHC		
	All	Resident	Non-Resident
Demographic Variables:			
Resident (=1)	0.186**		
	(0.093)		
Non-White (=1)	-0.040	-0.031	-0.057
	(0.028)	(0.033)	(0.051)
Female (=1)	-0.066**	-0.078**	-0.031
	(0.031)	(0.037)	(0.049)
Ability Variables:			
SAT Verbal Score	-0.059***	-0.068***	-0.023
	(0.020)	(0.025)	(0.031)
SAT Math Score	-0.101***	-0.124***	-0.016
	(0.028)	(0.035)	(0.035)
High School GPA	-0.513***	-0.538***	-0.710***
	(0.082)	(0.108)	(0.119)
Financial Aid Variables:			
FAFSA (=1 if applied FAFSA)	0.091***	0.110***	0.029
	(0.032)	(0.040)	(0.055)
Eligible (=1)	-0.124**	-0.125*	0.005
	(0.053)	(0.068)	(0.086)
FAFSA*Eligible* Eligibility	0.035	0.023	-0.025
	(0.032)	(0.057)	(0.045)
Scholarship Amount	0.390***	0.373***	0.821***
	(0.039)	(0.041)	(0.156)
Grant Amount	0.136	0.163	0.118
	(0.137)	(0.151)	(0.401)
Loan Amount	0.007	-0.021	0.041
	(0.034)	(0.055)	(0.043)
Work-Study Amount	-1.000**	-1.005*	-0.296
	(0.486)	(0.585)	(1.076)
High School and Year Fixed Effects	yes	yes	yes
Observations	1,725	964	761
Adjusted R-squared	0.126	0.132	0.174

Note that SAT scores are in hundreds and all financial amounts are in ten thousands. Robust standard errors are in parentheses. *** denotes p<0.01, ** denotes p<0.05, and * denotes p<0.10.

students, suggesting that the CHC competes relatively well for non-resident applicants to the CHC who apply to the UO. The choice behavior of non-enrolling students, examined subsequently, speaks to the relative tendency of strong academic students to attend out-of-state schools (whether they originate in Oregon or not).

Most of the financial aid variables are insignificant in the enrollment model. However, the findings do suggest that resident students are more likely to enroll if they complete a FAFSA form, which may suggest that perceived need may lead the best students to select an honors college in their home state rather than attending a selective institution in another state. On the other hand, the coefficient on positive eligibility is negative, significant, and of a similar magnitude to the FAFSA coefficient in the full sample and for residents. This suggests that the significant and positive enrollment effect for FAFSA filers is being driven by students who ultimately do not qualify for federal financial aid. Jointly, these results suggest that it may well be the middle class who find the CHC relatively attractive and complete a FAFSA hoping to qualify for aid at selective out-of-state institutions while not qualifying for federal aid at the UO.

Finally, the coefficient on scholarships is positive and significant for both resident and non-resident students indicating that scholarships raise the probability of enrolling in the CHC. This result is not surprising since many selective schools for which the CHC hopes to compete do not provide merit-based aid. Overall, however, the magnitude and significance of the coefficients on the financial aid variables suggest that admitted students to the CHC are not overly responsive to need or the financial aid packaging process as whole. The fact that the UO tends to lose the best students to competing institutions, but can "purchase back" students using merit-based aid indicates that

modeling where non-enrollees go is crucial to understanding where the CHC fits within the portfolio of higher educational institutions.

5.4. Decision on Destination Institution by Admitted UO Applicants

The CHC provides a relatively selective, liberal-arts environment in the context of a large public university with the explicit mission to attract students that might otherwise attend selective or top liberal arts schools or to effectively compete with other public universities that either do not have an honors college or that do not have the long-standing honors tradition like the UO. Using data from 2007 to 2009, we find that about 30% of CHC applicants enroll in the UO. This compares to an enrollment percentage of CHC applicants at the best institutions, using the 2009 U.S. and World Report categories, of nearly 17% at selective universities and 17% at top-100 liberal arts institutions. The respective enrollment percentage of CHC applicants at 4-year publics in the West and other 4-year publics is 10 and 7%.[11] Thus, a large percentage of CHC applicants apply to and enroll in the best (private) universities in the country, while a smaller percentage enroll at competing public institutions.

The empirical model in equation (2.4) demonstrates how a multinomial logit model can be used to examine the choice among the various alternatives, where the UO provides the excluded-category for students who consider the CHC. To keep a manageable number of alternatives, the analysis initially focuses on selective and liberal

[11] For UO applicants who do not apply to the CHC, approximately 8 and 7% respectively enroll in selective and top-100 liberal arts institutions as defined by the 2009 U.S. and World Report, and 15 and 7% respectively enroll in 4-year publics in the West and other 4-year publics. Descriptive statistics (not presented) show UO admits who choose to enroll in selective or top-100 liberal arts institutions have higher average SAT scores and high school GPA than those who choose to enroll UO and other 4-year public institutions.

arts institutions, where all other institutions are pooled to the remaining category. Subsequent analyses examine the sensitivity of results to alternative school-type groupings. To focus on UO enrollment choice (and not opportunity) differences between CHC applicants and admits and the general population of UO students, our enrollment analysis focuses exclusively on UO admits who can choose whether or not to enroll at the UO. Specifically, our analysis examines whether the destination institutions of CHC applicants and admits differs from the general population of admitted UO applicants.

The specification in Table 2.5 includes two binary variables that each equals one if the admitted UO student applied to the CHC and, conditioned on applying, was admitted to the CHC. The coefficient on the application variable is positive and significant for both selective and liberal arts institutions in Table 2.5 indicating that UO admits who apply to the CHC are more likely to enroll in these institutions relative to the UO, conditioned on personal attributes and ability. On the other hand, the coefficient on all other institutions is significantly negative reflecting the fact that comparable CHC applicants are less likely to enroll at other alternative institutions.

The coefficient on admittance to the CHC in Table 2.5 is insignificant except for institutions in the "other" category. Thus, the results indicate that admittance into the CHC conditioned on the applying to the CHC does not offset the apparent preference of such students for the best selective schools. On the other hand, the significantly negative coefficient on CHC admits for the other category suggesting that admittance into the CHC does attract students to the UO and away from less selective and public schools. In other words, the results suggests that the CHC improves the ability of the UO to attract strong students that are considering comparable or less selective schools to the UO, but

Table 2.5. Marginal Effects of Multinomial Logit Estimates

(Base Group: Enrolled in UO; Sample comprised of 29,945 UO admits. The marginal effects are calculated using the instantaneous rates of change for continuous variables and a discrete change for categorical variables from 0 to 1, holding all other variables constant at their means.)

	Destination Institution Types		
	Selective	Liberal Arts	Others
CHC Variables:			
Apply CHC	0.016**	0.049***	-0.051***
	(0.007)	(0.009)	(0.015)
Admit CHC	0.009	-0.008	-0.035*
	(0.009)	(0.008)	(0.021)
Demographic Variables:			
Resident (=1)	-0.089***	-0.001	-0.260***
	(0.003)	(0.004)	(0.007)
Non-White (=1)	0.008**	-0.001	0.062***
	(0.003)	(0.004)	(0.007)
Female (=1)	0.006**	0.018***	0.027***
	(0.003)	(0.004)	(0.007)
Ability Variables:			
SAT Verbal Score	0.025***	0.032***	-0.020***
	(0.002)	(0.002)	(0.004)
SAT Math Score	0.026***	0.009***	0.022***
	(0.002)	(0.003)	(0.005)
High School GPA	0.067***	0.072***	0.239***
	(0.006)	(0.008)	(0.013)
Financial Aid Variables:			
FAFSA (=1 if apply FAFSA)	-0.031***	0.016***	-0.103***
	(0.004)	(0.004)	(0.008)
Eligible (=1)	-0.023***	-0.005	-0.017
	(0.007)	(0.007)	(0.013)
FAFSA*Eligible* Eligibility	0.007*	-0.003	0.034***
	(0.003)	(0.004)	(0.007)
Scholarship Amount	-0.017**	-0.084***	-0.393***
	(0.008)	(0.010)	(0.018)
Grant Amount	-0.013	-0.026	-0.044
	(0.022)	(0.018)	(0.032)
Loan Amount	0.001	0.009***	0.027***
	(0.003)	(0.003)	(0.006)
Workstudy Amount	-0.046	0.080	0.096
	(0.069)	(0.063)	(0.112)

Note that SAT scores are in hundreds and all financial amounts are in ten thousands. Institution type "Others" contains all institutions other than UO, Selective and Liberal Arts, including UO applicants who did not appear in Clearinghouse dataset. Standard errors are in parentheses. *** denotes $p<0.01$, ** denotes $p<0.05$ and * denotes $p<0.1$.

that the type of high achieving student who would apply to the CHC generally will choose a more selective alternative over the UO if given the opportunity.

The coefficients on resident in the several columns of Table 2.5 are negative and significant, whereas the coefficients on non-white and female are positive for most comparator institutions. Thus, the UO is relatively attractive to white, male, Oregonians. It is not surprising that the UO does relatively better with resident students, who pay relatively less than what otherwise a selective school would have cost them. Moreover, because the UO is located in a relatively white, medium-sized city, the UO might also be expected to experience relative difficulty in attracting non-white students. The strong positive effect for women at competing institutions is not easy to explain because it suggests that the UO does poorly against selective institutions that tend to have a stronger technical mix, liberal arts institutions that generally focus on a less-technical education, and a wide variety of largely public institutions that have a similar mix of majors.

The coefficients on the ability measures are positive and significant for selective and liberal arts institutions, which builds on the prior findings that suggest the UO tends to enroll students with relatively lower academic ability in comparison to these schools. In general, the findings broadly suggest that the likelihood an admitted UO applicant will be admitted and enroll in a selective or liberal arts institution increases with observed academic ability. Given the consistent high academic quality of the enrollees at selective and liberal arts schools, it is not surprising that the UO attracts relatively fewer of these top students. However, the coefficient on SAT math is positive and significant for other (largely public 4-year) institutions, indicating that the UO fails to compete for the best

students who might be expected to do well in scientific and technical fields even with institutions that might be expected to be comparable.

The coefficients on financial aid variables are also frequently significant suggesting that both need- and merit-based aid are important. In particular, the coefficient on completing a FAFSA is negative and significant for selective and others categories, suggesting that UO admits who file for federal aid are more likely to enroll at the UO or liberal arts institutions. Moreover, those students with positive eligibility are also more likely to enroll at the UO. Although increases in actual level of eligibility lower the probability an admitted applicant enrolls at the UO, the joint effect implied by the Eligibility Positive and Eligibility coefficients yield a negative overall enrollment effect for the vast majority of observed eligibility levels of UO admits. Thus, the UO is relatively attractive to needy UO admits, but it does best with those students who have modest need. Scholarships, on the other hand, unambiguously improve the probability that a UO admit will end up enrolling at the UO and the CHC.

The observed impact of the CHC application and admission decision is relatively robust to alternative specifications of the model. For example, Table 2.6 presents the marginal effects of being a CHC applicant and admit for specifications estimated separately by residency status for the original grouping and for two alternative grouping that: (1) pool selective and liberals institutions and that pulls out 4-years public institutions from the Other Institutions category; and (2) that pool selective and liberal arts institutions and that pulls out only 4-year public institutions in the West from the Other institutions category.

Table 2.6. Marginal Effects of Multinomial Logit Estimates with Alternative Groupings by Residency Status

(Base Group: Enrolled in UO; Sample comprised of 29,945 UO admits. The marginal effects are calculated using the instantaneous rates of change for continuous variables and a discrete change for categorical variables from 0 to 1, holding all other variables constant at their means.)

Categories: Selective, Liberal Arts, and Other Institutions

	Resident (Obs.: 11,480 UO admits)			Non-Resident (Obs.: 18,465 UO admits)		
	Selective	Liberal Arts	Others	Selective	Liberal Arts	Others
Apply CHC	0.012**	0.058***	-0.046**	0.018	0.033***	-0.041**
	(0.005)	(0.013)	(0.021)	(0.012)	(0.011)	(0.019)
Admit CHC	-0.003	-0.017*	0.062*	-0.001	-0.003	-0.077***
	(0.003)	(0.009)	(0.032)	(0.015)	(0.011)	(0.028)

Categories: Selective/Liberal Arts, 4-year Public, and Other Institutions

	Resident (Obs.: 11,480 UO admits)			Non-Resident (Obs.: 18,465 UO admits)		
	Selective & Liberal Arts	4-year Public	Others	Selective & Liberal Arts	4-year Public	Others
Apply CHC	0.072***	-0.020	-0.026	0.050***	-0.030*	-0.011
	(0.014)	(0.015)	(0.017)	(0.016)	(0.017)	(0.017)
Admit CHC	-0.017	-0.015	0.073**	-0.008	-0.093***	0.023
	(0.010)	(0.021)	(0.029)	(0.019)	(0.022)	(0.027)

Categories: Selective/Liberal Arts, 4-year Public in West, and Other Institutions

	Resident (Obs.: 11,480 UO admits)			Non-Resident (Obs.: 18,465 UO admits)		
	Selective & Liberal Arts	4-year Public in West Coast	Others	Selective & Liberal Arts	4-year Public in West Coast	Others
Apply CHC	0.072***	-0.031**	-0.015	0.049***	-0.030**	-0.009
	(0.014)	(0.013)	(0.018)	(0.016)	(0.014)	(0.019)
Admit CHC	-0.016	-0.007	0.058**	-0.010	-0.095***	0.030
	(0.011)	(0.021)	(0.028)	(0.019)	(0.015)	(0.029)

Institution type "Others" contains all institutions other than UO and those in previous two columns, including UO applicants who did not appear in Clearinghouse dataset. Standard errors are in parentheses. All specifications control for Demographic, Ability and Financial Aid variables as shown in Table 2.5. *** denotes $p<0.01$, ** denotes $p<0.05$, and * denotes $p<0.10$.

Irrespective of residency status, the results continue to suggest that the students who apply to the CHC are relatively likely to enroll in selective and liberal arts institutions, while admittance to CHC significantly reduces the likelihood of enrolling in other alternative institutions. On the other hand, the results now provide some weak evidence that admittance to the CHC conditioned on applying to the CHC provides a slight offset to the negative application affect for resident students considering selective and liberal arts institutions. Nonetheless, the coefficient on CHC admit is relatively small in magnitude and not consistently significant. Thus, the sensitivity tests in Table 2.6 support the findings in Table 2.5 that CHC applicants and admits have a relative preference for the best selective schools.

The results in Table 2.6 do provide some refinements to the broad conclusions regarding the UO's position in the market visa vie other public universities. Specifically, the coefficients on binary variable measuring CHC application and admittance status indicate that the CHC competes well for high performing UO admits who might otherwise attend other publics, especially those on the West Coast. In addition, the residency specific estimates also show that out-of-state applicants to the CHC are relatively less likely to choose other 4-year public institutions over the UO in comparison to students from Oregon. Thus, the presence of an honors college may improve the overall ability of a large public university to compete for high-performing students, particular those from out of state.

6. Concluding Remarks

This chapter is the first to empirically study the application and enrollment decisions of honors college students who apply to a large public university and how the application and admissions decision to an honors college relates to their institutional choice. Specifically, the empirical analysis uses 2007 to 2009 academic year data from the Robert D. Clarke Honors College (CHC) at the University of Oregon (the oldest public stand-alone honors program) to examine the application, admission, and enrollment decisions of university applicants and the enrollment choice of honors college applicants among selective, liberal arts colleges, and other public universities. The empirical results broadly show that honors colleges, like the CHC, tend to attract better-than-average applicants from the pool of students in its home institution, but tend to lose its best honors applicants to other private and public schools that are otherwise preferred. Thus, consistent with their stated mission, honors colleges may improve the academic profile of a public university by offering talented students a potentially lower-cost, selective alternative to private schools, but the measured ability of its enrollees will fall in between the best students attending selective schools and the typical student attending a large public university.

The CHC also appears to attract a relatively different demographic mix from the pool of UO applicants. For example, perhaps because the CHC is able to conduct a full-file review that is not possible for the regular university-wide applicants and offer a relatively more intimate college experience, the honors college tends to enroll relatively more non-white students relative to its UO host. In addition, the CHC is also relatively attractive to non-resident applicants to the UO, perhaps because it offers a public

selective alternative to private schools for those (middle-class) students who are interested in attending college outside their home state. Interestingly, however, the relative attractiveness of the honors college also varies systematically with need such that able but relative needy in-state, UO applicants tend to select the CHC. These results are consistent with the CHC providing a viable, lower-cost choice to students who cannot afford to attend high quality schools located in other states or private institutions. In other words, a large public university may be able to strategically use the full-file review that is available for a smaller program such as an honors college (i.e., that is otherwise impractical for the school as a whole) to attract a more diverse talent pool.

Overall, the results suggest that the honors college in a public university may well benefit its host institution by attracting an academically stronger and more diverse student population, while at the same time providing a unique niche in the higher education market between the general opportunities available in a large public university and those offered by relatively selective alternatives. Our results are consistent with the possibility that honors colleges fill the selectivity gap between large public universities and their more selective counterparts for high performing students who choose to stay closer to home for a variety of reasons. However, the causal role of an honor college on outcomes has not been established, and would require further investigation. For example, data across institution, including variation in the honors college option could provide insight into the role of honors colleges on the talent pool of their home institution. This means that our results do support the notion of an honors college's appealing to high-achieving students, yet they can not provide direct evidence and prediction of its impact on students' application and enrollment behavior. Moreover, unlike the measurable costs

per student credit hour for honors enrollees, which is around three folds higher than other schools and colleges in the UO, the benefits of housing an honors college, such as the experience of academic enrichment and peer effects for students, require further research to quantify.

From a broad policy perspective, our results indicate that the distributional effects related to the expansion of honors college programs at public universities are likely to be subtle. For example, our results suggest that the growth in honors colleges would benefit both non-needy out-of-state students and relatively needy in-state students by providing them an alternative enrollment choice. In addition, the upward trend in the number of honors programs has been coupled with relative increases in merit-based aid that have been consistently found to benefit relatively well-to-do students. Since our results also suggest that merit-based aid improves honors college enrollments even relative to selective alternatives, which likely reflects the fact that many selective schools might not provide as generous merit-based aid, further work must be done to study the changing landscape in public higher education and its interaction with the direct resource outlays provided by honors programs in order to holistically evaluate the social merits of honors programs.

The next chapter also studies the role played by human capital in matching process, yet it turns the focus from students matching with higher educational institutions to administrators matching among the qualitative hierarchy of institutions in American higher education.

CHPATER III

UNIVERSITY PRESIDENTS AND THE ROLE OF HUMAN CAPITAL IN DETERMING WHO LEADS U.S. RESEACH INSTITUTIONS

This chapter is a manuscript currently submitted for publication at the *Economics of Education Review*, co-authored with Professor Larry D. Singell at the Indiana University. My contribution to this manuscript includes data collection, literature survey, and data analysis. I also regularly participated in the research design and manuscript revision.

1. Introduction

There is a generally held view that leaders matter and recent work has confirmed that those who hold top posts are critical to the success of organizations from small firms to large countries (e.g., Coates & Humphreys, 2002; Jones & Olken, 2005; Dasgupta & Sarafidis, 2009). Empirical studies of successful leaders also show that leadership qualities manifest themselves early in a career and are supplemented throughout a career through strategic investment in human capital (e.g., Kuhn & Weinberger, 2005; Caligiuri & Tarique, 2009; Dreher, Lamla, Lein, & Somogyi, 2009). Nonetheless, only a few studies have empirically examined the role human capital plays in the executive matching process (e.g., Singell, 1991; McDowell, Singell, & Stater, 2009). Given the evidence that senior executives are critical to institutional success and that leadership relates to both innate and acquired skills, it is of both scholarly and practical interest to understand how

human capital acquisition over the course of career determines who takes the helm of premier organizations.

In this study, we focus on the factors that determine who leads U.S. research institutions, which constitute one of the most important global sources for knowledge generation and successful U.S. industries. In particular, the analysis uses two unique data sets for sitting university presidents to study how the human capital acquired over a president's career affects where he or she places within the research hierarchy of colleges and universities. The empirical findings provide some of the first formal evidence that observed academic outcomes and administrative background over a career significantly affect where an administrator places within the U.S. higher educational system, which suggests that human capital is important in determining who becomes a leader and where this leader ultimately leads.

University presidents operate in an industry particularly well suited to study the human capital factors that determine the ascension into top leadership positions within the profession. First, unlike many industries, the U.S. higher education system has a relatively well-defined and stable hierarchy of institutions that can be ranked by a reliable and easy-to-observe set of research metrics. Our analysis uses a discrete threshold approach that distinguishes between research versus non-research institutions using quantifiable research metrics developed by the Carnegie Foundation. Prior work has shown that other professions, including legal and medical fields, have qualitative hierarchies, while harder to quantify, parallel those in higher education (e.g., Kolpin & Singell, 1997). Thus, our findings regarding the role of human capital in determining who takes the helm of the best organizations may well extend beyond high education.

Second, unlike most "firms" within a given industry, the internal leadership hierarchy within U.S. higher education is remarkably consistent across most universities such that it is relatively straightforward to compare the career trajectory of university presidents. Specifically, although there may not necessarily be proscribed pathway to the presidency, most schools offer common entry points that include academic oversight positions such as Department Head, Dean and Provost and functional oversight positions such as the Vice Provost (President) of Research and Academic Affairs. While other industries do not have the same hierarchical structures across firms, prior work has demonstrated the importance of hierarchies within organizations such that our findings provide insights into the role they might play in the leadership determination process (e.g., Cornell, 2004; O'Connell, 2005).

Finally, academic jobs provide a relative unique opportunity to observe and measure ability through documented scholarly and administrative achievements. Specifically, beyond the observation of prior administrative experience, our data permit us to observe specific academic milestones that occur over a career by tracking a president's undergraduate and graduate placements, measured academic research output, and movement into and experience in various administrative posts. Prior work has theoretically demonstrated the role research plays as university output (e.g., Rothschild & White, 1993) and has empirically demonstrated how an understanding of the research mission is important in executing the managerial function of a university (e.g., Goodall, 2006). Thus, research productivity and a broad understanding of the research enterprise are likely to be critical to leadership ability in knowledge-based industries.

The next section provides an overview of the literature on human capital as it pertains to leadership in higher education, which provides the background for a discrete choice model of presidential placement within the research university hierarchy that is developed in Section 3. Section 4 describes the two data sources that are used in Section 5 to estimate a base empirical specification and several extensions that exploit the unique attributes of the two data sources and test the sensitivity of the results to alternative institutional rankings. The final section concludes.

2. Background

Prior research has examined the pay, placement, and productivity of university administrators generally and for university presidents in particular (e.g., Sammons, Hillman, & Mortimore, 1995; McFarlin & Ebbers, 1998; Sala, 2003). Early work on university presidents focused primarily on compensation (e.g., Pfeffer & Ross, 1988; Tang & Tang, 1996). For example, Ehrenberg, Cheslock, & Epifantseva (2001) use total compensation panel data for presidents at private institutions in the mid-1990s to show that presidential pay is positively associated with enrollment, endowment levels, and entering-student test scores, but find weak evidence that pay increases relate to fund raising success and increases in freshmen test scores.

Generally, there is little evidence of rewards for on-the-job performance, but ample evidence that institutional attributes (e.g., private) and presidential attributes (e.g., gender and race) affect presidential pay (e.g., Monks & Robinson, 2000; Monks & McGoldrick, 2004). In addition, Pheffer and Davis-Blake (1992) use data for 10,000 administrators at 821 U.S. universities and colleges to show that greater salary dispersion

reduces the turnover of administrators with higher-than-average pay. Thus, there are clearly systematic aspects to the matching process between successful presidential candidates and higher educational institutions that depend on both individual and institutional attributes.

Although no studies have quantitatively accessed the factors that determine the placement of university presidents, a number of papers have examined who self-selects into lower level administration (e.g. Siegfried, 1997; Moore, Newman, & Turnbull, 2003). For example, McDowell et al. (2009) use American Economic Association data over more than three decades to show that research-specific human capital reduces the probability of becoming an administrator at all institutions (although by a lower amount at research-oriented institutions), whereas general human capital (e.g., years of experience) increases the probability of selecting into administration. In a related paper, McDowell, Singell, & Stater (2011) use data for economists at top research departments in the postwar era to study the timing into and out of department chair and its relation to subsequent administrative positions. Their results show that the rate at which research productivity depreciates reduces the entry and exit hazards for the chair position and that prior service as chair raises the hazard of moving into upper-level administrative positions. Jointly, these findings suggest that administrators are, to some extent, made not born and that the growing specialization and technical nature of many professions could affect who chooses administrative careers and when these career choices are made.

Overall, there is a growing body of literature that suggests who places in leadership positions is important and that the incentive structures for administrators do not always lead to the best decisions or to the best persons rising to the top (e.g., Oswald,

2006; Vroom, 2007; Cunningham, 2009; Dasgupta & Sarafidis, 2009). Goodall (2006) argues that the stakes for the selection into administration within higher education are important as she finds a positive correlation between the lifetime citations of university presidents and the ranking of the university. In a follow up study, Goodall (2009) provides evidence that US universities are more successful in the academic enterprise than their British counterparts because they install presidents who were successful scholars and that there is a direct correlation between the number of citations of a president and the subsequent research productivity of their university. Thus, our analysis examines whether the role human capital plays in the matching process between U.S. universities and their presidents is consistent with its observed benefits to an institution's research mission. More broadly, this chapter exploits the relatively stable (research) hierarchy and common internal leadership hierarchy across higher education institutions to examine how variation in observed (research) productivity and other career attributes among top executives affect their qualitative placement within the industry. Such executive matching mechanisms are not well understood and are likely to be critical to the success of a wide set of industries where the head of the organization are promoted up through the ranks of the current or similar organizations.

3. Empirical Model

The empirical analysis examines factors that determine who among the pool of presidents at U.S. higher educational institutions place at research institutions as measured by their Carnegie classification. The use of the Carnegie classification system is critical. First, although Carnegie is an established, well-regarded research

classification system for higher educational institutions, prior work has shown that such rankings are sensitive to what research metrics are used and how they are weighted (McCormick & Zhao, 2005). To reduce the impact of selecting the Carnegie research ranking over its alternatives, our empirical model adopts a discrete dependent variable that divides presidential placement within the higher education hierarchy into broad categories of research versus non-research institutions, which does not exhibit a high degree of sensitivity to the research classification system selected.[12]

Second, prior work has also shown that research rankings of higher educational institutions differ distinctly from alternative rankings that use, for example, a model of a students' revealed preference found in Avery, Glickman, Hoxby, & Metrick (2004). We purposely uses a research ranking as opposed to alternative metrics because the academic job market that determines the pool of administrative candidates has been shown to be driven primarily by scholarly output (e.g., McDowell et al., 2011). Nonetheless, to test the sensitivity of our results to the assumed relevance of research versus other quality metrics, we also use the Avery et al. (2004) ranking of top academic institutions to show that presidential attributes more closely correlate with the research quality of the institution than student assessments of institutional quality.

Prior work has documented the presidential search process in U.S. universities are national in scope with many applicants, several finalists, and where the eventual president is selected by a rigorous review process involving multiple constituencies (e.g., McCormick & Zhao, 2005). A match is observed in our data when the individual and

[12] Research rankings of higher education institutions, although vary in the placement of schools within a given research hierarchy, yield a significant overlap in the institutions that are classified as research versus non-research. For example, the top 150 universities ranked by the 2011 U.S. News National University Rankings include 144 of the institutions classified as a "Research University" by the most recent Carnegie classification.

institutional terms are mutually agreeable to the candidate and the university. In other words, because the actual search process is not observed, our analysis speaks to the attributes that affect the reduced-form, market-clearing match between successful presidential candidates and research institutions as opposed to the structural supply and demand factors that determine who becomes a president or not.

A reduced-form approach limits the interpretation of the empirical results. For example, suppose non-whites are observed to be less likely to serve as a president of a research institution. This finding is consistent with a relatively lower demand for non-white presidents at research institutions, but could also result from such institutions rewarding non-white scholars relatively more in faculty versus administrative positions such that supply of viable non-white presidential candidates is relatively small. Nonetheless, although caution must be taken when interpreting the results, our findings do indicate how market pressures work to determine who is observed in positions of leadership.

Following prior work, we classify a presidential placement in a research institutions as a binary variable (R) that equals one for those presidents that lead institutions that are categorized as "Research Universities I", "Research Universities II", "Doctoral Universities I", or "Doctoral Universities II" in the IPEDS Carnegie Classification (e.g.,Wessel & Keim, 1994; Ehrenberg, 2002). Specifically, the probability a president i has the combination of attributes that would allow them to place in R is modeled as a function:

$$R_i = X_i\beta + \varepsilon_i \qquad (3.1)$$

where X is a vector of variables that include demographic attributes and measures of innate ability and human capital, β is a vector of parameters, and ε is assumed to be a Weibull distributed error term.[13] Equation (3.1) forms the basis of a logit model that describes the probability a president with a given set of attributes is observed to be placed in a research institution. In other words, the empirical analysis models job placement within the hierarchy of institutions as threshold condition where the set of presidential attributes and qualifications collectively contribute towards the likelihood that this observed president was able to secure a position in a "top research institution."

The specification of the empirical model follows prior work that demonstrates how the movement of faculty into administrative jobs depends on their demographic and human capital attributes (e.g., McDowell et al., 2011). Our empirical analysis makes uses of the demographic and human capital information available in two data sources described in the data section, which include human capital measures for academic background, the length and type of experience, and direct measures of academic productivity that might be expected to affect placement. Our empirical approach first estimates a specification using the explanatory variables that are common to both data sets to examine whether each yield consistent findings and then exploits the unique aspects of each of the data sources in order to draw broader conclusions regarding the role of human capital in presidential placement.

The empirical specification includes several demographic variables that measure the president's age, gender, and race. Age may affect a president's placement in the research hierarchy, particularly conditioned on other administrative experience measures,

[13] We assume a Weibull distribution among the class of "bell-shaped" distributions because it permits the use of fixed effects that are useful in controlling for unobserved variation across time periods.

because research faculty and institutions may differentially value time spent as a faculty member versus in administrative posts. For example, faculty constituents in research institutions might be expected to prefer a president who has spent more time among the research faculty because it signals an appreciation and understanding of the research enterprise. Likewise, McDowell et al. (2011) find evidence that the opportunity cost of going into administrative work is higher for research-active faculty who tend to make themselves available for administrative posts later in their academic career.

The vector of demographic controls also includes binary variables that equal one for nonwhite and female presidents and several specifications examine whether possible gender and racial differences vary over time. These controls may reflect demand-side factors. For example, prior work has found that non-white and female academics face binding glass ceilings that have limited their upward mobility within the administrative structure of a university and that such gender and racial differences in opportunities have changed over time (e.g., Monk & McGoldrick, 2004; McDowell, Singell, & Ziliak, 2001). However, possible race and gender biases that differ across the institutional hierarchy have also been found at earlier stages in the hiring and promotion of university faculty, which could yield a relatively differences in the supply of female and non-white presidential candidates (Kolpin & Singell, 1997). Thus, the race and gender of the presidential candidate may correlate with the probability of placing in a research institution, but the sign of the effect is an empirical question that relate to a complex set of demand- and supply-side factors.

The vector of controls also includes academic ability measures that are likely to be particularly important in the matching process within the research hierarchy of

institutions. We use a number of indirect measures of academic ability that include a president's academic lineage (i.e., holding a prior position in the same institution and the quality of the undergraduate or graduate school attended), the age when the Ph.D. is obtained, the field of study, the holding a tenured academic position, and being entrusted with a presidential position at a prior institution. Placement in a good undergraduate school, earning a degree in a timely fashion, earning a tenure-track job at a good academic institution, or being selected over other candidate for a previous administrative post are likely to correlate with a set of requisite skills that are broadly necessary for success in these endeavors (e.g., speaking and writing skills, drive and motivation). Thus, a finding that these variables matter to presidential placement provides (indirect) evidence that the portfolio of skills associated with this academic outcome figure both into the willingness of the individual to serve as president and interest of the institution in hiring the individual.

The analysis also examines whether direct measures of productivity such as the number of articles and books published in a career affect placement. On net, it might be reasonable to expect that research institutions would be more likely to demand and attract research active faculty. But, the opportunity cost of becoming an administrator in terms of foregone research is also likely to be greater for scholars at research institutions, which would work against observing large differences in observed research output of presidents presiding over research versus non-research schools. In addition, research productivity also likely to correlate with a broader set of skills such as temperament and ability to communicate that are not easily observed (or included in the model) that might be the actual factors that matter in the placement of presidents. Thus, a finding that research

productivity matters in the model is consistent with, but not proof of, the fact that the observed scholarship is important in determining presidential placement.

The model also includes measures of the length and type of prior experience. Years of experience is measured for the current position, the previous position, and the position prior to the previous position. Administrative experience, although it might be expected to raise the overall likelihood of becoming president, might well be inversely correlated with the probability of placing in a president's job at a research versus a non-research school, depending on the relative importance of administrative versus research experience for these institution types. Indeed, the both demand and supply for experienced administrators might be expected to be lower at research versus non-research schools, such that the expected sign of these experience measures cannot be anticipated.

Finally, the model includes whether the president was promoted in prior positions (e.g., from Dean to Provost) and whether the person held a presidential post in a previous position. To the extent that these prior experience controls indicate a higher quality candidate who was previously rewarded with a promotion or already held a presidential post, these controls might be expected to be positively related to holding a presidency at a research institution since administrative quality might be relatively important at an institution that is seeking to maintain research excellence and more qualified candidates might be expected to prefer research-oriented institutions that tend to carry higher prestige.

4. Data

The discrete choice model described in equation (3.1) above is estimated separately using two data sources: (1) the American College President Survey conducted by the American Council on Education (ACE) and; (2) the curriculum vitae of presidents collected by contacting 572 top U.S. universities in 2009. The National Presidents Study was first conducted by ACE in 1986 with the aim of collecting and maintaining data to document and track the attributes of all college presidents in the United States. The basic structure of the questionnaire has been maintained in follow-up surveys conducted in 1995 and 2006, but additional questions have been added such that later surveys include more detailed questions regarding the president's background as well as characteristics of search and the job.[14]

The analysis exploits common information across the three surveys on the Carnegie classification, demographic attributes, measures of prior academic experience, and measures of the administrator's academic lineage. Our analysis focuses exclusively on comprehensive 4-year institutions that share a similar mission and have a relatively high response rate. This approach yields a sample of 3,030 presidents across the three samples years.[15]

[14] The title *American College President Survey* is used in 2006, with prior years titled *National Presidents Study*.

[15] The American Council on Education, Center for Leadership Development published six editions of *the American College President* on each of their surveys conducted in 1986, 1990, 1995, 1998, 2001, and 2006. Because institutions and presidents are not identifies in the ACE data (i.e., we cannot control for institution- or president-specific fixed effects), we rely on the surveys that are separated by approximately a decade to insure a relative small overlap in the president-institution pairing, while maintaining the useful time dimensions of the data. The typical term of a president is about 6.5 years such that almost 80 percent of presidential posts turn over in decade. Survey-year fixed effects are introduced to control for possible differences in the degree of overlap.

The ACE data, while providing a very comprehensive survey of the population of college presidents in the United States over time, provides incomplete administrative background data and limited documentation of the pre-administrative career including information on research productivity. Thus, because the placement of university presidents in research versus non-research positions is also likely to depend on the non-administrative career that generally pre-dates administrative service, a second data set is developed by collecting and digitizing the curriculum vitae (CV) of 212 sitting university presidents in 2009.[16] The CV data include all the demographic, administrative experience, and academic lineage controls in the base specification that are available in the ACE data. Moreover, these data also include more detailed information about both the administrative and pre-administrative career of the president including research productivity, which is used to examine the sensitivity of the base specification to this more detailed list of controls.

Table 3.1 summarizes the variables that are available in both the ACE survey data and CV data that are included in a base empirical specification and examines the factors that are used to predict who among sitting university presidents serve in a research institution. The descriptive evidence illustrates the different data collection methodologies described in the data section such that the CV data include a greater proportion of research institutions relative to the ACE data that surveys the full

[16] The 212 curriculum vitas were collected by making an initial email request followed by a personal phone call to 572 sitting presidents in March through December of 2009. The list of 572 presidents was developed by including all Tier I research institutions and all Masters granting institutions. This initial list was expanded to include all institutions in their "conference", which is a common reference group. In addition, the liberal arts institutions in the Consortium on Financing Higher Education (COFHE) that were not part of the Tier I research institutions are also included because of their status within higher education. While the overall response rate was just over 37 percent, the response rate was much higher among research institutions. For example, the response rate for COFHE institutions was 73.4 percent, whereas the response rate for Master's institutions was 24.4 percent. Thus, relative to the ACE data, the C.V. data over-represents research institutions.

Table 3.1. Summary Statistics for ACE and CV Data on Presidents by Carnegie Classification

	ACE Survey Data Institution Research Type[a]			C.V. Data Institution Research Type		
	R=1 (1)	R=0 (2)	Mean Diff (1) – (2)	R=1 (3)	R=0 (4)	Mean Diff (3) – (4)
Demographic Variables:						
Age	57.65 (6.904)	56.14 (7.268)	1.512***	61.73 (5.151)	60.48 (6.562)	1.247
Female (= 1)	0.093 (0.291)	0.174 (0.379)	-0.081***	0.150 (0.359)	0.174 (0.381)	-0.024
Non-white (= 1)	0.062 (0.240)	0.104 (0.306)	-0.043***	0.083 (0.278)	0.065 (0.248)	0.018
Administrative Experience:						
Years working at current position	6.185 (5.477)	7.153 (5.971)	-0.969***	5.867 (4.933)	7.326 (7.003)	-1.459*
Years worked at prior position	5.585 (3.974)	5.794 (4.081)	-0.209	4.550 (2.907)	4.848 (2.793)	-0.298
Years worked at 2nd prior position	5.499 (4.282)	5.512 (4.326)	-0.012	4.708 (4.184)	4.109 (3.192)	0.600
Promoted from prior positions[b] (= 1)	0.427 (0.495)	0.350 (0.477)	0.077***	0.550 (0.500)	0.413 (0.495)	0.137**
President in prior position (= 1)	0.281 (0.450)	0.184 (0.388)	0.097***	0.367 (0.484)	0.326 (0.471)	0.041
President in 2nd prior position (= 1)	0.093 (0.291)	0.063 (0.243)	0.030***	0.108 (0.312)	0.109 (0.313)	0.000
Academic Lineage:						
Prior position in the same institution (= 1)	0.279 (0.449)	0.237 (0.426)	0.042***	0.242 (0.430)	0.185 (0.390)	0.057
2nd prior pos. in the same inst. as prior pos. (= 1)	0.206 (0.405)	0.201 (0.401)	0.005	0.417 (0.495)	0.500 (0.503)	-0.083
Number of Observations	569	2,461		120	92	

[a] Research institutions include those been classified as "Research Universities I", "Research Universities II", "Doctoral Universities I", and "Doctoral Universities II" in IPEDS Carnegie Classification.

[b] This binary variable equals to 1 when a president moved up the administrative hierarchy from either prior position to current presidency or 2nd prior position to prior one, or both.

population of U.S. 4-year institutions. Nonetheless, with only a few exceptions, both data sets yield a similar pattern of attribute differences between presidents' serving at research-oriented versus non-research-oriented institutions.

The descriptive evidence in Table 3.1 also confirm the historical and well-know demographic makeup of the university president population that is generally comprised of older (late 50, early 60s) white males across all institution types. Nonetheless, there are some differences between presidents at research versus non-research institutions. In particular, presidents at research institutions tend to have less experience in the current position, are more likely to be promoted from a prior position (e.g., from Dean to Provost), and are more likely to have been a president in their prior positions. In addition, presidents at research institutions are more likely to be promoted from inside their present institution. Nonetheless, these mean differences may not remain once they are conditioned on the variation in other correlated attributes. Thus, the empirical analysis uses a discrete choice framework to examine the attributes that predict who place at research versus non-research institutions holding other attributes constant.

5. Empirical Results

5.1. Base Specification

The first two columns of Table 3.2 present the marginal effects and the standard errors from a logit model estimated using ACE and CV data, respectively, where the dependent variable is a binary variable that equals one for presidents who serve at universities classified as research institutions in the Carnegie classification system.[17] The

[17] Although the ACE data do not include individual nor institution identifiers, we cluster the standard errors on all demographic attributes in each of the specifications estimated with the ACE and CV data.

results are remarkably consistent in the signs of the coefficients across the two data sets, although they do differ somewhat in magnitude and significance at least in part due to the difference in the research composition on the institutions and size of the

Table 3.2. Marginal Effects Estimates for a Discrete Choice Model of Serving as President at a Research Institution

	ACE - Logit	CV - Logit	ACE - Multinomial Logit[a]	
	Research	Research	Research	Master's
Demographic Variables:				
Age	0.0088***	0.0235***	0.0089***	0.0023
	(0.0011)	(0.0073)	(0.0012)	(0.0016)
Female (= 1)	-0.0940***	-0.1320*	-0.0955***	0.0152
	(0.0140)	(0.0770)	(0.0154)	(0.0252)
Non-white (= 1)	-0.0741***	0.1160	-0.0744***	0.0809***
	(0.0184)	(0.1090)	(0.0193)	(0.0312)
Administrative Experience:				
Years working at current position	-0.0098***	-0.0233**	-0.0099***	0.0016
	(0.0016)	(0.0091)	(0.0014)	(0.0018)
Years worked at prior position	-0.0061***	-0.0183	-0.0062***	-0.0044*
	(0.0019)	(0.0143)	(0.0018)	(0.0024)
Years worked at 2nd prior position	-0.0045**	0.0007	-0.0044**	-0.0056**
	(0.0019)	(0.0107)	(0.0018)	(0.0024)
Promoted from prior positions (= 1)	0.0375**	0.214**	0.0386**	-0.1130***
	(0.0177)	(0.0971)	(0.0190)	(0.0235)
President in prior position (= 1)	0.0508**	-0.0835	0.0462**	0.0885***
	(0.0214)	(0.0856)	(0.0232)	(0.0303)
President in 2nd prior position (= 1)	0.0330	0.0376	0.0367	-0.0314
	(0.0309)	(0.141)	(0.0318)	(0.0387)
Academic Lineage:				
Prior position in the same institution (= 1)	0.0664***	0.135	0.0666***	0.0338
	(0.0184)	(0.1050)	(0.0197)	(0.0232)
2nd prior position in the same inst. as prior pos. (= 1)	0.0335	-0.0605	0.0334*	0.0395
	(0.0219)	(0.0871)	(0.0198)	(0.0241)
Time Trend	yes	no	yes	
Survey Year Fixed Effect	yes	no	no	
Number of Observations	3,030	212	3,030	
Pseudo R^2	0.0515	0.0794	0.0411	

Robust standard errors are in parentheses. *** denotes p<0.01, ** denotes p<0.05, and * denotes p<0.1.

[a] The base group of the multinomial logit analysis is BA institutions. Master's institutions include those been classified as "Master's Comprehensive I" and "Master's Comprehensive II"; while BA institutions include those been classified as "BA Liberal Arts Colleges I" and "Baccalaureate Colleges I" in IPEDS Carnegie Classification.

samples. Thus, for brevity, the initial discussion of the results will primarily focus on the findings using the ACE data that yield qualitatively similar, but generally more precise estimates than those found using the CV data.

The demographic variables indicate that presidents at research institutions are typically older than those who serve at non-research institutions. Specifically, in the pool of observed presidents, the probability that the president is observed in a research institution increases by 0.9 percentage points for each additional year. However, the descriptive evidence indicates that presidents at research institutions typically have less administrative experience. It follows that presidents at research institutions are older once they reach the presidency relative to their counterparts at non-research institutions because they spend more time in the professorate. In other words, spending relatively more time in the faculty is important in comparison to time in administration for presidents at research institutions, which likely reflects that having a direct knowledge of the research enterprise is important for successfully leading a research institution.

The coefficients on female and non-white are both significantly negative in the specification using the ACE data and indicate the probability of observing a female and non-white president at a research university is 9.4 and 7.4 percentage points lower, respectively, than at non-research universities. This result indicates that women and minorities are less likely to be observed as presidents at research universities conditioned on a relatively detailed set of controls for administrative experience and academic lineage. This result is consistent with a demand-side glass ceiling for women and minorities at research institutions, but this finding is not definitive. For example, prior work has also shown gender and racial differences in placement, productivity, and promotion at these

institutions have been changing over time (McDowell et al., 2001). Thus, the differences in female and non-white representation in the presidencies of research institutions could be related to potential bias at earlier stages in the career and not necessarily in the presidential hiring process that relate to the supply-side depth of the pipeline of potential presidential candidates. The subsequent sensitivity analysis examines some of these possibilities by introducing controls for attributes of the president's academic career available in the CV data and allowing for variation in gender and race over time that is possible in the ACE data.

The empirical results indicate that the length and type of administrative experience also differ with the research mission of the institution. Interestingly, the coefficient on years in the current position and years in the previous position respectively indicate that for each additional year there is a 1 and 0.6 percentage point reduction in the probability of the president holding the office at a research institution. The negative coefficient on current experience may simply reflect that the complexities associated with managing a university with a greater research mission could yield a shorter tenure on the job, particularly since it is relatively easy to compare research success across institutions (e.g., grant funding, national research awards, publications). On the other hand, the negative coefficient on prior experience suggests that it may be more than just shorter tenure for administrative jobs at research institutions. In particular, the quantifiable nature of research productivity may also allow research institutions to more quickly identify and promote talent. Finally, prior work by McDowell et al. (2011) also suggests that research-oriented faculty may require a faster rate of promotion because they face a

higher opportunity cost of administrative service in terms of depreciation of their human capital.

Research institutions also appear to place a relatively high value on serving and moving up the ranks in prior administrative posts. Specifically, the coefficient on observed promotions in prior positions (e.g., dean to provost) and holding a previous presidential post (i.e., a previous institution was willing to entrust them with a presidential post) are both significant and equal 0.038 and 0.051, respectively. It follows that presidents at research institutions are relatively more likely to be promoted up the administrative ranks into the presidency and to have served as a president in the past. These results are consistent with the findings for administrative experience in the sense that, if the research enterprise is more complex to manage (but easier to observe), it may be more important to groom candidates for the job of president in a prior administrative post.

The results for academic lineage build on the prior findings because they further suggest that internal promotion is a prevailing practice at research institutions. Specifically, the coefficients on holding a prior and a second prior position at the same institution are both positive and the effect for the prior position is significant with a 6.6 percentage point higher probability of observing the president sitting at a research institution. These findings suggest that a president's knowledge of the institution may occur directly through prior administrative service at the current institution or indirectly through administrative service at a "similar type" of institution and that this type of knowledge is relatively important at research institutions. In general, the results suggest

that the attributes of a university president significantly correlated with the research status of his or her institution.

5.2. Sensitivity Tests on the Dependent Variable

The discrete nature of the empirical approach suggests a more stark difference in the research-orientation of universities than is actually present in the data. Moreover, the focus on relationship between presidential attributes and the research quality of the university may beg the question whether there are other factors such as student assessment of institutional quality that relate to the matching process between presidents and the institutions they lead. Thus, we examine whether the results are sensitive to using a multinomial dependent variable that uses the Carnegie ranking to generate three (rather than two) institution types and to the use of an alternative binary dependent variable that ranks institutions on student-based (as opposed to research-based) assessments of quality.

To examine if the results are sensitive to the division of the research comparison group, the last two columns of Table 3.2 present the marginal effects from a multinomial logit model where Master's institutions in the Carnegie classification are separated from BA institutions that now comprise the excluded group.[18] The results from the multinomial logit model suggests that marginal effects for research institutions relative to BA institutions are comparable in sign and magnitude from the comparison group of both Master's and BA institutions. However, the response of Master's institutions to presidential attributes does appear to differ from their BA counterparts in comparison to

[18] Master's institutions include those been classified as "Master's Comprehensive I" and "Master's Comprehensive II"; while BA institutions include those been classified as "BA Liberal Arts Colleges I" and "Baccalaureate Colleges I" in IPEDS Carnegie Classification.

how research institutions differ from BA institutions. It follows that the discussion of the multinomial logit model will focus exclusively on the relative difference in the responsiveness between Master's and BA institutions for brevity.[19]

The coefficient on age is positive and smaller than that found for research schools and insignificant for Master's granting institutions. This finding suggests that presidents at Master's granting institutions are older than those serving at BA institutions. Thus, consistent with prior findings and the lower research profile of Master's institutions, a president from a Master's institution does not require as much time spent in the faculty as for a research institution. The coefficients on both gender and race are positive for Master's institutions and significantly so for non-whites. This finding indicates that women and minority faculty are more to be found at Master's institutions than their less research-oriented BA counterparts. Nonetheless, although these data are insufficient to distinguish between several possible explanations for this finding, this result does indicate that relative research orientation does not necessarily provide an ever lower glass ceiling on minority and female faculty.

Unlike for research institutions, the coefficient on years working at the current position is positive (although insignificant). Thus, tenure does not appear to be relatively shorter for Master's versus BA institutions. On the other hand, the coefficient on years worked at the prior and 2nd prior positions are negative and significant for Master's institutions relative to BA institutions, suggesting relatively shorter early careers in administration at Master's institutions. It follows that similar forces appear to be at work

[19] We also estimate the ordered probit model that treats the three institution types as an ordered hierarchy, which yield qualitatively similar results to the multinomial logit model. For brevity, we only present the multinomial logit model that does not depend on the relatively more restrictive assumption that the dependent variables are rank ordered.

in Master's institutions as in research institutions in the sense that they have shorter job tenure, but the shorter tenure occurs earlier and slows for those who reach the president's office in Master's institutions.

Our findings also suggest that presidents at Master's granting institutions are less likely to be promoted from prior position in the administrative hierarchy than BA granting schools, whereas those at research institutions are more likely promoted from their prior posts. On the other hand, similar to research institutions, serving as a president in a prior institution increases the likelihood of getting president's job at a Master's institution. Collectively these findings may suggest that presidents can and do move up the research hierarchy in a subsequent presidential position.

The coefficients on the binary variable that equals one if the sitting president held a prior and 2nd prior position in the same institution are positive but not significant at Master's granting institutions, whereas the coefficient on a prior position is both positive and strongly significant for research institutions. This result, combined with the results on the "promotion" binary variable, suggests that research institutions are relatively willing to promote from the last administrative post (e.g., from Provost to President) into the presidency and that presidents at Master's institutions have relatively heterogeneous administrative experience. It follows that research institutions may have to balance the benefits from internal knowledge of the research mission with the pressure for external validity.

Although faculty tend to ascribe research as the coin of the realm in assessing university quality, students often evaluate higher educational institutions on a broader set of metrics that might also provide some insights into the matching process for university

presidents. Thus, instead of the binary dependent variable based on the Carnegie Research ranking, we define an alternative binary dependent variable that equals one if the institution is defined as a top 105 university using the revealed preference ranking of higher educational institutions developed by Avery et al. (2004).

The Carnegie classification of the institution for each president is included in the ACE data. However, the institution name necessary for construction the top 105 dependent variable can only be uniquely determined for 1449 of the 3030 observations using the institution's founding date, state and other institutional characteristics available in the ACE data. Thus, Table 3.3 includes four models that replicate the specification in Table 3.2 Column 1 and use: (1) the original 3030 observations and the Carnegie dependent variable; (2) the 1449 observations and the Carnegie dependent variable; (3) the 1449 observations and the Carnegie dependent variable with institution size fixed effects; and (4) the Top 105 dependent variable and institution size fixed effects.

The results in columns 1 through 3 in Table 3.3 that use the original Carnegie dependent variable demonstrate that the reduction in the number of observations and the introduction of institution-specific fixed effects that is possible with the availability of institution name do not affect the qualitative conclusions drawn from Table 3.2. Nonetheless, the comparison of column 3 and 4 in Table 3.3 that respectively use the Carnegie and Top 105 dependent variable show that the results are distinctly different. In particular, the coefficients on the explanatory variables remain significant in the Carnegie dependent variable specifications with comparable signs and magnitudes despite the reduction in sample size and the introduction of fixed effects, but the coefficients on the explanatory variables in the Top 105 specification are generally insignificant. In other

words, whereas there does appear to be a systematic relationship between presidential attributes and the research orientation of the institution where they place, there does not appear to be a similar relationship with regard to this broader quality measure based on student assessments. Broadly speaking, these findings suggest that the presidential

Table 3.3. Marginal Effects Estimates for a Discrete Choice Model of Serving as President at a Research Institution or at a Student-preferred Institution with ACE Data

	Research	Research	Research	Top 105
Demographic Variables:				
Age	0.0088***	0.0133***	0.0012***	-0.0008
	(0.0011)	(0.0017)	(0.0004)	(0.0011)
Female (= 1)	-0.0940***	-0.1310***	-0.0179***	0.0496**
	(0.0140)	(0.0196)	(0.0039)	(0.0217)
Non-white (= 1)	-0.0741***	-0.111***	-0.0153***	-0.0623***
	(0.0184)	(0.0222)	(0.0037)	(0.0129)
Administrative Experience:				
Years working at current position	-0.0098***	-0.0137***	-0.0014***	0.0002
	(0.0016)	(0.0023)	(0.0004)	(0.0014)
Years worked at prior position	-0.0061***	-0.0119***	-0.0012**	0.0016
	(0.0019)	(0.0026)	(0.0005)	(0.0014)
Years worked at 2nd prior position	-0.0045**	-0.0050*	-0.0001	0.0027**
	(0.0019)	(0.0030)	(0.0005)	(0.0012)
Promoted from prior positions (= 1)	0.0375**	0.0168	0.0013	0.0018
	(0.0177)	(0.0246)	(0.0049)	(0.0135)
President in prior position (= 1)	0.0508**	0.0556*	-0.0018	-0.0036
	(0.0214)	(0.0307)	(0.0052)	(0.0158)
President in 2nd prior position (= 1)	0.0330	-0.0667**	-0.0112**	-0.0071
	(0.0309)	(0.0288)	(0.0046)	(0.0248)
Academic Lineage:				
Prior position in the same institution (= 1)	0.0664***	0.0729***	0.0075	-0.0053
	(0.0184)	(0.0256)	(0.0058)	(0.0149)
2nd prior position in the same inst. as prior pos. (= 1)	0.0335	0.0312	-0.0015	0.0172
	(0.0219)	(0.0234)	(0.0046)	(0.0147)
Time Trend	yes	yes	yes	yes
Survey Year Fixed Effect	yes	yes	yes	yes
Institution Size Fixed Effect	no	no	yes	yes
Number of Observations	3,030	1,449	1,449	1,449
Pseudo R^2	0.0515	0.0935	0.468	0.0746

Robust standard errors are in parentheses. *** denotes p<0.01, ** denotes p<0.05, and * denotes p<0.1.

matching process relates more directly to the preferences of faculty that report to and are managed by a president than those of students whom the president represents.

5.3. Specification Tests using the ACE Data

The base specification establishes that, where significant, the ACE and CV data yield qualitatively similar results. However, the ACE and CV data include other and unique pieces of information that permit us to examine the sensitivity of the findings to several meaningful extensions of the base specification. The results in Table 3.4 rely on the ACE data and introduce to the base specification controls for: (1) time interactions with gender and race; (2) central administrative experience in prior positions; (3) tenured faculty status in prior positions; (4) the area or type for the advanced degree (i.e., Ed.D., M.D., etc.). The coefficients on the variables included in the base specification do not change qualitatively with the introduction of these new controls, and thus Table 3.4 includes the marginal effects only from the newly introduced controls.

The coefficient on the trend is negative and significant in most of the specifications presented and its interaction with both gender and race are positive and significant in all specifications with a comparable magnitude of approximately 5 to 7 percentage points. The negative trend mechanically reflects the fact that the ACE data includes a relatively greater number of non-research institutions over time. However, the positive coefficient of the interaction with gender and race is suggestive of improving presidential opportunities for female and non-white candidates at research institutions. The magnitude of the coefficients is such that female and nonwhite presidents are actually significantly more likely to be observed in research institutions by the last period

Table 3.4. Marginal Effects Estimates for a Discrete Choice Model of Serving as President at a Research Institution using Additional Controls Unique to the ACE Data

Note: The estimated specification includes, in addition to the variables listed, the same set of explanatory variables as those in Table 3.2 (including survey year fixed effect). The coefficients on these variables are not listed because the sign and magnitude of the coefficients in the base specification are not qualitatively affected by the introduction of these additional controls.

	Dependent Variable: Research Institution (Number of Observations: 3,030)			
Demographic Variables:				
Trend	-0.0163*	-0.0152*	-0.0134*	-0.0082
	(0.0085)	(0.0086)	(0.0074)	(0.0132)
Female * Trend	0.0628***	0.0629***	0.0481**	0.0500***
	(0.0239)	(0.0238)	(0.0195)	(0.0190)
Non-white * Trend	0.0693**	0.0716**	0.0483*	0.0522**
	(0.0328)	(0.0330)	(0.0261)	(0.0258)
Administrative Experience:				
Prior position as central administrator (= 1)	-	-0.0436*	-0.0554**	-0.0502**
		(0.0249)	(0.0243)	(0.0233)
2nd prior position as central administrator (= 1)	-	0.0130	-0.0152	0.0017
		(0.0249)	(0.0236)	(0.0231)
Tenure Status:				
Currently hold tenured faculty position (= 1)	-	-	0.1840***	0.1820***
			(0.0168)	(0.0165)
Hold tenured faculty position in prior position (= 1)	-	-	0.0451***	0.0374**
			(0.0167)	(0.0170)
Hold tenured faculty position in 2nd prior position (= 1)	-	-	0.0687***	0.0716***
			(0.0159)	(0.0154)
Types of Advanced Degree[a]:				
Ed.D. (= 1)	-	-	-	-0.0637***
				(0.0144)
M.D. (= 1)	-	-	-	0.6070***
				(0.0704)
Law (= 1)	-	-	-	0.2140***
				(0.0420)
Other Degrees Outside Ph.D.s in Arts and Sciences (= 1)	-	-	-	-0.0220
				(0.0209)
Pseudo R^2	0.0545	0.0556	0.178	0.209

Robust standard errors are in parentheses. *** denotes p<0.01, ** denotes p<0.05, and * denotes p<0.1.

[a] The excluded group is Ph.D. in traditional divisions (three divisions of Sciences, Social Sciences, and Humanities in the College of Arts and Sciences).

of the data (i.e., 2006) than in their less research-oriented counterparts. In other words, there appears to be a marked improvement in the representation of women and nonwhites to head America's leading research universities.[20]

The second column of Table 3.4 introduces two controls for whether a prior or second prior position were in non-academic, administrative position, including service as a Vice President (Provost) of Research, Academic Affairs or Diversity. The coefficients on the central administrative experience controls are generally negative and significant for the last prior position with a magnitude between -0.04 and -0.05. It follows that central administrative positions that are not directly related to the academic mission of the university are less likely to be promoted into the position of president at research institutions. This is consistent with research institutions placing a relatively higher value on direct experience with the academic mission of the institution.

The third column of Table 3.4 introduces three controls that identify whether the candidate had a tenured faculty position in the current or past two prior positions. The coefficient on each of these controls is positive and significant with large magnitudes that range from approximately 0.04 to 0.18 percentage points. This result may simply suggest that administrators in research institutions are generally granted tenured faculty position when hired. However, most research institutions also require that the holder of the administrative position be qualified to hold a tenured position on the faculty. Thus, this result suggests that research institutions are more likely to require documented academic successes for their administrators, including presidents.

[20] We also examine potential race- and gender-specific differences by disciplines in the likelihood of serving as president at a research university (not presented), which predict race and gender do not affect presidential placement differentially by field.

The final column of Table 3.4 introduces four binary variables that equal one for an advanced Ed.D., M.D., J.D. and other non-College-of-Arts-and-Science degrees (e.g., Divinity), where the excluded group hold a Ph.D. in the College of Arts and Sciences (i.e., a science, social science, or humanities). The results indicate that presidents with an Ed.D. degree are 6.37 percentage points less likely to head of a research institution relative to a College of Arts and Science Degree, whereas presidents who have a M.D. or J.D. are approximately 60 and 21 percentage points more likely to be a president at a research institution. Broadly, this finding suggests that professional degrees, particularly those that may have some direct practical application in running a university, are relatively favored by research universities. However, it also likely indicates that medical and law schools typically are housed in research-oriented institutions.

The ACE data also have sufficient degrees of freedom to estimate the model separately for public and private universities, which examines if the requirements for president at research institutions differ between sectors. The results presented in Table 3.5 generally suggest that the differences across sector in the coefficients are a matter of magnitude and not sign. Moreover, specifications that are estimated using an interaction between a public binary variable and the other explanatory variables (not presented) yield coefficients on the interactions that are generally insignificant. Thus, the presidential matching process does not appear to differ qualitatively for public versus private higher educational institutions.

Table 3.5. Separate Public-Private Marginal Effects Estimates for a Discrete Choice Model of Serving as President at a Research Institution using the ACE Data

	Public (Obs.: 1,179)	Private (Obs.: 1,851)
Demographic Variables:		
Age	0.0086***	0.0028***
	(0.0029)	(0.0008)
Female (= 1)	-0.1110*	-0.0652***
	(0.0642)	(0.0145)
Non-white (= 1)	-0.2580***	-0.0362**
	(0.0424)	(0.0184)
Administrative Experience:		
Years working at current position	-0.0117***	-0.00147
	(0.0032)	(0.0010)
Years worked at prior position	-0.00831**	-0.00084
	(0.0040)	(0.0013)
Years worked at 2nd prior position	-0.0045	-0.0030**
	(0.0032)	(0.0013)
Promoted from prior positions (= 1)	0.0105	0.0354
	(0.0524)	(0.0256)
President in prior position (= 1)	-0.0306	-0.0164
	(0.0732)	(0.0268)
President in 2nd prior position (= 1)	0.0794	0.0030
	(0.0990)	(0.0352)
Academic Lineage:		
Prior position in the same institution (= 1)	0.0351	-0.0269**
	(0.0349)	(0.0108)
2nd prior position in the same inst. as prior pos. (= 1)	-0.0176	-0.0135
	(0.0340)	(0.0120)
Demographic Variables:		
Trend	-0.0321	-0.0016
	(0.0333)	(0.0114)
Female * Trend	0.0456	0.0253
	(0.0530)	(0.0214)
Non-white * Trend	0.1360**	-0.0014
	(0.0581)	(0.0230)
Administrative Experience:		
Prior position as central administrator (= 1)	-0.1780***	-0.0224
	(0.0569)	(0.0209)
2nd prior position as central administrator (= 1)	-0.0774	0.0139
	(0.0582)	(0.0171)
Tenure Status:		
Currently hold tenured faculty position (= 1)	0.2290***	0.1030***
	(0.0285)	(0.0183)
Hold tenured faculty position in prior position (= 1)	0.0283	0.0198
	(0.0388)	(0.0147)
Hold tenured faculty position in 2nd prior position (= 1)	0.129***	0.0370**
	(0.0343)	(0.0149)

Table 3.5. (Cont.) Separate Public-Private Marginal Effects Estimates for a Discrete Choice Model of Serving as President at a Research Institution using the ACE Data

	Public (Obs.: 1,179)	Private (Obs.: 1,851)
Types of Advanced Degree:[a]		
Ed.D. (= 1)	-0.169***	-0.0298**
	(0.0311)	(0.0128)
M.D. (= 1)	0.6640***	0.4990***
	(0.0688)	(0.1250)
Law (= 1)	0.1970***	0.1620***
	(0.0649)	(0.0516)
Other Degrees Outside Ph.D.s in Arts and Sciences (= 1)	0.0171	-0.0140
	(0.0579)	(0.0176)
Pseudo R2	0.186	0.180

Survey year fixed effect included. Robust standard errors are in parentheses. ***, **, * denote $p<0.01$, $p<0.05$, $p<0.1$, respectively.

5.4. Specification Tests using the CV Data

The results in Table 3.6 rely on the CV data that, while including presidents only in 2009 and for a limited set of institutions relative to the ACE data, include relatively detailed information on the academic career of the president. Thus, Table 3.6 introduces academic background controls to the base specification that are unique to the CV data: (1) total years of administrative experience; (2) counts for the number of articles and books; (3) qualitative measures of the institutions where presidents served in their prior and second prior posts, as well as president's degree institutions; and (4) two measures of age at the time of the B.A. and advanced degree. Again, the coefficients on the variables included in the base specification do not change qualitatively when these additional

controls are introduced; it follows that Table 3.6 includes the marginal effects only from the newly introduced controls.[21]

Because the ACE data only include information on the prior two positions, the prior specifications did not include that traditional quadratic in years of administrative experience. The CV data include a full career overview that permit a quadratic in total years of administrative experience to be introduced to the base specification in column 1 of Table 3.6. The results reveal a consistent quadratic patterns across the four specifications that suggests the probability of being a president at a research institution relate negatively to the first 18 years of administrative experience (an experience level that applies for about a half of the sample of presidents). This result supports the prior findings that suggest presidents at research institutions generally spend more time on research, which is likely necessary to credibly represent and manage the research enterprise at these institutions. However, this result is also generally insignificant, which may reflect the limited degrees of freedom in the sample.

Columns 2 through 4 in Table 3.6 introduce the number of published articles and the number of published books listed on the president's vitae. Measuring productivity across different fields is notoriously difficult, because the pace of publication differs substantively across fields, particularly as it relates to articles.[22] Nonetheless, in Table 3.6, the coefficient on the number of articles is positive and significant in column 2

[21] The CV data include the president's name and institution, which permit it to be merged with the 2009 Chronicle of Higher Education wage survey. We do not include specifications that control for total compensation in Table 3.2 Column 2 because the wage is likely to be endogenously determined with placement. Nonetheless, the coefficients on the wage for the specifications presented in Table 3.6 are positive and significant, indicating that research universities (and the more qualified individuals who hold these positions) pay (earn) more. In addition, the significant and qualitative conclusions regarding the significant explanatory variables in Table 3.2 Column 2 do not change with the inclusion of the wage.

[22] Goodall (2009) uses normalized citations by discipline as the measure of research productivity of a president, which she finds to correlate positively with the research productivity of their institution.

with a magnitude of 0.008, and the coefficient on number of books is both positive in column 3 and column 4 and significant in column 3 with a magnitude of approximately 0.05. Thus, despite a relatively coarse measure of research productivity, the results suggest that presidents at research institutions generally publish more than their counterparts at non-research institutions with books yielding approximately a 6.25 times larger effect than articles. In other words, leaders of research institutions must be relatively strong scholars, which is consist with our prior findings that suggest the knowledge and understanding of the research enterprise is important to obtain such posts.

The CV data also include information regarding the institutions where the president earned an undergraduate and graduate degree and if he or she previously served in prior academic posts. Specifically, columns 3 and 4 in Table 3.6 include binary variables that equal one if the prior academic post was in a research institution and if the BA and Ph.D. are from research institutions. The coefficients on these academic lineage measure are all positive, significant, and relatively large in magnitude, suggesting prior background in a research institution is important both because it may provide a deeper understanding of the institution under their supervision and because it signals sustained academic accomplishment. We also estimate the model with two separate binary variables for BA and a Ph.D. from a research institution (not presented), which shows it is the quality of the BA and not the Ph.D. that is a significant predictor of serving as a president of a research institution; nonetheless, the joint BA-Ph.D. term yields a higher pseudo R^2 than when each are included separately, suggesting that having a consistent research background is relatively important. Interestingly, the inclusion of the academic lineage measure increases the magnitude and significance of books and reduces the

Table 3.6. Marginal Effects Estimates for a Discrete Choice Model of Serving as President at a Research Institution using Additional Controls Unique to the CV Data

Note: The estimated specification includes, in addition to the variables listed, the same set of explanatory variables as those in Table 3.2. The coefficients on these variables are not listed because the sign and magnitude of the coefficients in the base specification are not qualitatively affected by the introduction of these additional controls.

	Dependent Variable: Research Institution			
Administrative Experience:				
Years of administrative experience	-0.0565	-0.0395	-0.0560	-0.0553
	(0.0367)	(0.0318)	(0.0402)	(0.0442)
(Years of administrative experience)^2	0.0012	0.0008	0.0014	0.0014
	(0.0009)	(0.0008)	(0.0011)	(0.0012)
Research Ability:				
Number of articles published	-	0.0075*	0.0032	0.0023
		(0.0039)	(0.0028)	(0.0019)
Number of books published	-	0.0231	0.0521*	0.0404
		(0.024)	(0.0274)	(0.0247)
Academic Lineage:				
Prior position in Research institution (=1)	-	-	0.4990***	0.4990***
			(0.1110)	(0.1090)
2nd Prior position in Research institution (=1)	-	-	0.2550*	0.2270*
			(0.1330)	(0.1340)
All degrees earned from Research institution[a] (= 1)	-	-	0.2150***	0.1910***
			(0.0710)	(0.0668)
Other Educational Background:				
Age when BA degree earned	-	-	-	-0.0064
				(0.0410)
Age when most recent advanced degree earned	-	-	-	-0.0224*
				(0.0124)
Number of Observations	212	212	212	212
Pseudo R^2	0.098	0.193	0.404	0.420

Robust standard errors are in parentheses. *** denotes p<0.01, ** denotes p<0.05, and * denotes p<0.1.

[a] Binary variable equals 1 when a president received both his/her Bachelor's degree and the most recent advanced degree from Research institution(s) as classified by Carnegie Classification.

magnitude and significance of articles, suggesting that pedigree correlates with and relates to the assessment of academic productivity.

The final specification examines the information communicated regarding ability from the timing of either the BA and/or advanced degree. The coefficient on age at BA

and advanced degree are both negative (significantly so for advanced degree), suggesting that persons who take longer to complete their studies are less likely to become president at a research institution. Because there is significant variation across fields in the length of time to an advanced degree, this result actually suggests that the specialty chosen can be important simply based on the time available to prepare for subsequent administrative service. In addition, the coefficients on the research productivity measures decline in magnitude and become insignificant when the two age-at-degree measures are included, suggesting that age at degree inversely correlates with subsequent observed academic success. Overall, the results in Table 3.6 support the contention that measured academic success is important for research institutions and that the attributes determining who is qualified to be in the pool of candidates for the presidency at a research institution are determined relatively early in a person's career.

6. Concluding Remarks

Although there is a generally held view that leaders matter in the success of any institution, relatively little is known empirically about the role human capital plays in determining who ultimately leads an organization. This chapter uses two unique data sets for sitting university presidents to study how the human capital acquired over a president's career affects where he or she places within the research hierarchy of colleges and universities. Our empirical findings provide some of the first formal evidence that intellectual and administrative ability demonstrated over the course of a career significantly affects where an administrator places within the U.S. higher educational

system, which is arguably one of the most important global sources for knowledge generation and successful U.S. industries.

In particular, our findings suggest that research institutions place a relatively heavy emphasis on observed research success throughout a career that begins with where the president attends undergraduate and graduate school, whether the individual held an academic position and was tenured at a research institution, and the quantity of research publications in either article or book format. Demonstrated administrative success is also relatively important in the sense of holding prior administrative positions as department head, dean, provost, or president at a prior institution. On the other hand, holding administrative positions that are outside of the academic track, such as a vice provost (president) of academic affairs lowers the likelihood of placing as a president of a research institution. Moreover, our findings show that presidents at research institutions tend to have shorter administrative careers even though they come to the presidency at a later age, confirming the descriptive evidence that they spend more time in the professorate. Thus, to rise to the presidency of a research institution requires continual acquisition of human capital associated with research enterprise consistent with prior evidence that such background contributes to the success of the institutions they lead.

Overall, the results suggest that the research-oriented universities favor presidents who have demonstrated consistent investments in human capital related to research and are relatively less concerned with years of administrative experience. On the other hand, these institutions are also predicted to hire a significantly lower number of female and non-white presidents in the mid-1980s, whereas interactive time trends indicate that these gender and racial differences not only disappeared but reversed by 2006. Thus, our

findings suggest that where presidents place within the research hierarchy of institutions may not be solely based on the ability to manage the research enterprise. However, without further information on the factors that determine the pool of presidential candidates, it is difficult to separate discrimination stories from those that depend on potential differences in the pipeline of qualified female and non-white presidential candidates. It follows that further work must be done to examine what factors determine the pool of presidential candidates and who among that pool is ultimately selected to head the institution.

CHAPTER IV

CONCLUSION

This dissertation is comprised of two essays that broadly consider the role human capital plays in the matching process between individuals and institutions. The two essays build on prior education literature that has found growing evidence that economic choices and opportunities are inextricably linked to human capital investment. They also build on the labor-economic tradition of bringing to bear new data sources that involve both collecting new data and combining these data with previously existing data sources in new ways so as to permit the study of interesting issues that could not have been addressed in the absence of these data.

Chapter II makes use of recent data from the oldest stand-alone honors college in the country, Robert D. Clarke Honors College (CHC) at the University of Oregon (UO), to study how the application and enrollment decision of honors college students differ from the general population of students considering a large public university. The empirical results broadly show that honors colleges like the CHC tend to attract better-than-average applicants from the pool of students in its home institution, but tend to lose its best honors applicants to other private and public schools that are otherwise preferred. The CHC also appears to attract a relatively different demographic mix from the pool of UO applicants. Overall, the results suggest that the honors college in a public university may well benefit its host institution by attracting an academically stronger and more diverse student population, while at the same time providing a unique niche in the higher

education market between the general opportunities available in a large public university and those offered by relatively selective alternatives.

The empirical findings are consistent with the possibility that honors colleges fill the selectivity gap between large public universities and their more selective counterparts for high performing students. However, further research is required with multi-institution data that include variation in the honors college option within and across institutions in order to establish the causal effects of honors colleges on the talent pool of their home institutions.

Chapter III uses two data sets, the American College President Survey conducted over the last three decades by the American Council on Education and a digitized sample of 2009 curriculum vitae for presidents at 212 top U.S. universities, to empirically analyze the factors that determine who among the pool of university presidents places at Carnegie-classified research institutions. The empirical results suggest that research institutions place a relatively heavy emphasis on observed research success throughout a career. While demonstrated administrative success is also important, the results show that presidents at research institutions tend to have shorter administrative careers, confirming the descriptive evidence that they spend more time in the professorate. Thus, to rise to the presidency of a research institution requires continual acquisition of human capital associated with research enterprise, which is consistent with prior evidence that such background contributes to the success of the institutions they lead.

Overall, the findings suggest that where presidents place within the research hierarchy of institutions may not be solely based on the ability to manage the research enterprise. However, without further information on the factors that determine the pool

of presidential candidates, it is difficult to untangle the demand- versus supply- side stories. It follows that further work must be done to examine what factors determine the pool of presidential candidates and who among that pool is ultimately selected to head the institution.

The two chapters provide some first formal empirical evidence on issues related to human capital investment in American higher education with currently available data. Yet, the findings can only speak to the extend within the data limitation. Further research requires the retention and shareability of institutional data, as well as the efforts to conduct and maintain thorough up-to-date surveys.

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