

“‘Why Some and Not Others?’ The Determinants of the Quality and
Prestige of Public Graduate Research Universities”

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Abstract

We offer the first systematic assessment of the factors thought to account for the quality and prestige of public research universities in the United States. We take account, too, of those potential causal factors identified in both contemporary and early descriptive research on these institutions. Our findings indicate that attributes of universities and their states from the first half of the twentieth century as well as some of their contemporary attributes are powerful predictors of their success in National Research Council peer evaluations of their research programs. The results provide a foundation for efforts to account systematically for the research achievements of these universities *and* evidence on state public policy influences on those research achievements.

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The character and the quality of U.S. graduate universities are matters of notable scholarly and public policy concern. These concerns arise because such institutions provide the leadership for all U.S. higher education *and* for the nation’s scholarly, scientific, and technological eminence in the world (Berelson 1960, 39; Jones, Lindzey, and Coggeshall 1982, v). A research literature in history and social science traces the evolution of these universities from their origins (e.g., Geiger 1986) to their present status and future prospects (Cole 2009). Periodic evaluations of research programs in these institutions from prestigious organizations like the American Council on Education (Cartter 1966) and the National Research Council (e.g., Goldberger, Maher, Flattau 1995; National Research Council 2010a) have charted their achievements and progress.

There is particular concern today, however, over the plight of public research universities. Many in the academic community fear that the general public does not understand the character of such institutions, their contributions to the nation, or their need for public and governmental support. Of course, similar fears have marked the modern history of these institutions (e.g., Berdahl 1971, 4-5). Even more troubling is the fact that state government support for these institutions has dropped notably since the 1970s, with demonstrably negative effects on their quality and their competitiveness with private institutions (Kane and Orszag 2003). And the recession that began in 2008 has further – and in some instances quite sharply – eroded state support for public institutions (Cole 2009, 478-480).

The academic community and the nation have good reason to be concerned for the contemporary and long-term quality of public research universities. Yet the optimal path forward for these institutions is not clear. Some see that path as dependent on significant changes in U.S. federal government policies about and financial support for university research programs (e.g., Committee on Prospering in the Global Economy of the 21st Century 2007, 162-181 and 342-356). Others make equivalent pleas for greater state government support for public research universities (e.g., Cole 2009, 470-471). Still other observers either applaud or worry about the “privatization” of public universities, which Morphew and Eckel (2009, vii) characterize as where “private funds replace public dollars, governance and oversight are loosened in favor of market forces, and competition among institutions reigns.”

To know the strategies that would best enhance the future of these institutions, we need, but do not have, a firm knowledge of the path that led to the modern system of public research institutions. That is, we do not know systematically the causal forces that have shaped this system. One could also say – in other words – that we need a basic-science theoretical understanding of how quality has been achieved in public universities as one foundation for sound, applied policy recommendations. We have no basic-science theory, however, and the goal of this paper is to begin the development of one.

Our theory search is shaped in part by a common observation and an implied, but rarely stated question in the voluminous descriptive research on these institutions. The common and longstanding observation is that research universities vary considerably in their quality and prestige (Berelson 1960, 96; Cole 2009, 109-144; Graham and Diamond 1997, 144-173). The often implicit and rarely stated question is posed directly by

Jonathan R. Cole (2009, 109). In describing the evolution of graduate research universities in the last half century, he observes that many U.S. institutions “were able to transform themselves into world-class institutions. But why some and not others? Which universities were able to rise to the top ranks, and how did they manage it?”

The historical and social science literature on U.S. universities offers abundant description, too, of the evolution of the university system in the United States. That literature also poses a number of answers to Cole’s question, some of which have been modestly researched and some of which are only untested speculations. Thus we summarize and test the most common hypotheses from this scholarship about why some graduate universities have achieved high scholarly status while others have not. We also argue, however, that the most common hypotheses about the success of these universities are incomplete. Thus we test additional possible causes of quality variations. We restrict our assessment to *public* universities because of the distinctiveness of the likely causes of their success and for their prominence in government policy. Our findings have implications both for the social scientific understanding of these institutions and for public policy efforts to sustain and advance them.

The Rise to Prominence of Public Research Universities and Explanations for Their Individual Stature

The modern U.S. university system is largely the product of the immediate post-World War II era. The creation of this system has been widely discussed (e.g., Berelson 1960, 6-43; Cole 2009, 45-74; Graham and Diamond 1997, 9-50), but a few observations from that history are important background for this paper.

For the first half of the twentieth century American universities held an unremarkable position in the world (Graham and Diamond 1997, 9-12). Yet by the 1960s they had assumed world leadership, and especially in scientific research. This transformation is commonly attributed to the facts that the United States came out of World War II with a robust economy, attracted a number of notable émigré scholars from other nations, enjoyed remarkable post-war economic growth for several decades, and because the federal government promulgated extensive support for the educational and research missions of colleges and universities during the Cold War.

Yet important changes occurred, as well, *within* the system of higher education. As Berelson (1960, 39) first observed, graduate research institutions assumed the leadership of this system. Resources and prestige flowed disproportionately to such universities, and they became the elite that many others still aspire to join. Second, *public* graduate research institutions rose to a prominence they had never before held. Doctoral education and advanced research had been heavily dominated by private universities as late as the 1940s. By 1958, however, more doctoral degrees were awarded in public than in private institutions (Berelson 1960, 95-96). The best universities in the new post-war system, finally, also excelled “across the academic spectrum of the sciences, the social sciences, and humanities” (Graham and Diamond 1997, 167). Yet since 1933, when the American Council on Education sponsored its first comparative assessment of graduate research departments, every such professional study has demonstrated considerable variation in the quality of academic departments and, hence, graduate universities overall. To reiterate Cole’s principal question, then, what accounts for this variation in quality?

Previous research offers a number of possible answers to this question based principally on contemporary attributes of individual universities, the states in which they exist, or their state political systems. The most obvious and widely cited explanation for variations in institutional quality is that better research universities have more financial resources (see, among others, Blau 1973, 237-8; Bowen, Kurzweil, and Tobin 2005, 67-68; Cole 2009, 113; Volkwein 1989, 149). Thus the first hypothesis we will test is that the higher the financial resources of a research university, the higher its scholarly achievements and prominence.

A second common explanation for variations in quality is the size of the institution, usually expressed as total student enrollment or total faculty size (Berelson 1960, 105; Blau 1973, 239; Bowen and Rudenstine 1992, 68-70; Cole 2009, 113; Graham and Diamond 1997, 158; Volkwein 1989, 149). Some of this research relates the size of individual academic departments to their academic achievements, but the general expectation is that larger universities have larger departments and thus better achievements and reputations. Various reasons are advanced for this expectation, but they all comport with Graham and Diamond's (1997, 158) observation that public research universities are especially dependent on large enrollments "to build the critical mass of faculty and graduate students necessary to support ambitious programs of research and graduate study." Yet public institutions are also heavily dependent on their home-state populations for the bulk of their enrollments. Larger population size in the state is, then, potentially a resource that public universities might draw on to achieve large enrollments. These observations imply two testable hypotheses. The first is that the larger the size of the student body of a research university, the higher its scholarly

achievements and prominence. The second hypothesis is that the larger the population of the state in which a university exists, the higher its scholarly achievements and prominence.

Graham and Diamond (1997, 154-155) and Volkwein and Malik (1997, 36) provide evidence, next, that so-called flagship universities generally have especially high research achievements. This expectation is plausible because of the distinctive prominence of such institutions in their own states. Further, the success of flagship universities should be in part a consequence of state policy commitments to higher education generally and to these leading institutions particularly. Yet not all flagship institutions appear to have research prestige that extends far beyond the borders of their states. Indeed, some states may lack the resources or the motivation to advance notably the quality of their flagship universities. Land-grant institutions, in contrast, while they may not be as richly endowed with state resources as the typical flagship one, can benefit from many federal government programs and from a distinctive status and research niche. Thus they may generally constitute another distinctive category of quality institutions.

This discussion implies two hypotheses. The first is that flagship institutions will, on average, demonstrate higher scholarly achievements and prominence than other ones. The second hypothesis is that land-grant institutions will, on average, also demonstrate higher scholarly achievements and prominence than other ones. Further, because both flagship and land-grant institutions exhibit considerable variation in research prestige, tests of these hypotheses allow us to isolate whatever distinctiveness they do share from the effects of other likely causes of research prestige.

Another expected cause is advanced by Cole (2009, 114): that institutions “situated in areas of the country or in cities that are highly attractive to scholars and scientists have a decided advantage in recruiting and retaining the most talented faculty members.” How to rate localities for their attractiveness is controversial, but this expectation resonates with common folklore in academic circles. Thus we hypothesize that the more attractive the geographic locale of a university is to the likely tastes of scholars and their families, the greater its scholarly achievements and prominence.

Cole (2009, 115) and Graham and Diamond (1997, 211-214) also argue that either exceptional individual leaders, such as university presidents, or exceptionally motivated individual states can notably advance the quality of individual institutions or of sets of institutions. We know of no measure of leadership for individual institutions or whole state-wide systems that can be employed with our large sample of universities. But we can provide some related evidence about selected state- and region-wide distinctions in research prestige.

Various scholars have suggested that there might be patterns in the character and quality of research universities that are widely shared within specific regions of the country (Graham and Diamond 1997, 154; Knott and Payne 2004, 27; McGuinness, Epper, and Arredondo 1994, 8; Salisbury 1965). The most precise of these discussions is that of Salisbury (1965, 361), although his ideas are compatible with those in the rest of this literature. Salisbury hypothesizes, first, that Northeastern Atlantic seaboard states will have relatively underdeveloped public university systems because of the presence of many strong private institutions in that region. He hypothesizes, second, that the former Confederacy Southern states will also have relatively underdeveloped public universities

as a legacy of widespread poverty and conflictual race relations. Finally, he proposes that Midwestern and West Coast states that enjoyed strong Progressive era political movements will have especially well developed public universities. Thus we also test these three hypotheses.

Others have hypothesized that states' political cultures shape the character and quality of their public university systems (e.g., Knott and Payne 2004, 27; McGuinness, Epper, and Arredondo 1994, 8). This expectation echoes Elazar's (1994, 229-239) observations about how state political cultures might affect public policies generally. Thus we test two hypotheses relevant to this expectation. One is based on Elazar's characterization of the moralistic political culture – that more moralistic states will especially enhance the quality of research universities because of their general “commitment to active government intervention in the economic and social life” of the state (Elazar 1994, 234). The second hypothesis is based on discussions of political culture which suggest that public preferences about and support for higher education vary across individual states (McGuinness, Epper, and Arredondo 1994, 8). Thus we hypothesize that states with greater citizen support for public universities will have especially successful research institutions.

Only one hypothesis about the relevance of state public policy for the success of research universities has been the subject of systematic research. Several studies have tested the hypothesis, linked either to organizational or management theory, that more modest state regulatory systems allow universities to pursue more successfully “the academic values of research, publication, and external grants” (Knott and Payne 2004, 17). In contrast, states with stricter regulation are generally thought to force universities

to place higher priority on undergraduate education and relatively open access to university admission over graduate education and selectivity. Empirical tests of this hypothesis have produced mixed results (Knott and Payne 2004; Volkwein 1986, 1989; Volkwein and Malik 1997). Yet testing it simultaneously with those discussed above is necessary for a systematic examination of state policy effects. Thus we hypothesize that the more modest the state regulatory restrictions on the autonomy of institutions of higher education, the greater the scholarly achievements and prominence of those institutions.

There are reasons to be skeptical of some of these hypothesized causes of institutional quality in the contemporary research literature despite their plausibility. Cole (2009, 535) admits that many of these attributes may be only “correlated with great universities.” Thus more fundamental and perhaps temporally prior causes may account for university achievements *and* some of these possible correlates. A few studies hint at what some of these fundamental causes might be. Berelson (1960, 98) observes that over the first half of the twentieth century the relative rankings of many institutions were remarkably stable. Systematic assessments of whole graduate universities and of academic departments in individual doctoral fields that make comparisons to past studies also find much overtime continuity (e.g., Bowker 1965; Hartnett, Clark, and Baird 1978; Jones, Lindzey, and Coggeshall 1982, 201-209). Recalling, too, that the creation of the modern American university system is largely a product of the period after World War II, some institutions may have benefited from the fact that their home states were especially well endowed with financial or other resources at that time.

These observations imply that some of the causes of quality variations today may have arisen in the first half or so of the twentieth century. The assessments of individual

departments and of whole universities early in that period also suggest that select public institutions were early entrants into graduate education *and* achieved enduring and high scholarly prestige. This line of thought suggests four additional hypotheses that we will test. The first is that the earlier in time that a university began issuing research doctorate degrees, the greater that institution's contemporary scholarly achievements and stature. Second, it is plausible that the contemporary success of public universities was shaped in part by public support for higher education in their home states in the formative period after the end of World War II.

The third hypothesis arises in part from Graham and Diamond's observation, cited earlier, that public research universities are especially dependent on large enrollments to justify and support the "critical mass" of faculty and facilities necessary for prestigious research programs. Yet, as we observed above, public institutions are dependent on their home-state populations for the bulk of their enrollments. Thus we hypothesize that universities in states with larger populations at the end of World War II were able to achieve higher contemporary research reputations.

The fourth additional hypothesis offers a test of explicit state public policy over higher education parallel to the contemporary test explained above. The hypothesis we cited earlier was that contemporary levels of state regulation of universities might shape their research success. Yet such regulation could have been important in the formative period after World War II, as well. Thus we test the hypothesis that universities in states with less strict state regulation of institutions of higher education about 1950 will demonstrate greater contemporary research success.

We also derive and test several hypotheses from the large body of scholarship that investigates the determinants of state government policy efforts generally or of the liberalism or conservatism of such policies. Numerous studies in this vein, going back at least to Dye (1966, 74-114), demonstrate that levels of state wealth are highly correlated with the scope of state policy efforts generally and of education policy specifically. Thus we test the hypotheses that levels of state wealth both contemporaneous with our measures of university quality and for the period immediately after World War II might influence those quality ratings.

Second, Putnam (2000, 296-306) provides evidence that levels of social capital in individual states are highly associated with desired educational outcomes in elementary and secondary education. Thus it is plausible that levels of social capital also shape the quality of university level institutions. Third, Berry, Ringquist, Fording, and Hansen (1998, 341), among many others, demonstrate that the liberalism of the electorates in individual states is highly associated with the liberalism of state public policy. Thus it is plausible to hypothesize that the more liberal the citizenry of a state, the higher the research achievements of its research universities.

But what of the *politics* of state support for higher education, as indicated in partisan and policymaking dynamics? Many contemporary portrayals, as well as ones from the period after World War II, characterize these political processes as non-partisan ones that are driven by local, distributive politics concerns of state legislators; competition also of a distributive politics sort among individual educational institutions or classes of institutions; efforts by educational leaders to encourage support based on professional considerations; and occasional, idiosyncratic efforts by governors to increase

or hold back state support generally (Knott and Payne 2004, 27; Lewis and Maruna 1999, 402-403; Millett 1965; Moos and Rourke 1959, 227-287; Salisbury 1965). In political processes of this sort we suspect that variations in state support will be especially driven by how professional the political institutions are, and thus how well they are able to transcend local considerations in favor of professional education ones. Therefore we hypothesize that the level of state legislative professionalism that is either contemporary with our measures of university quality or from the period after World War II will especially shape the levels of state support for educational institutions and thus their prospects for high achievement.

Other contemporary political assessments, however, take account of the limited support for government spending and services among Republican party elected officials and their mass co-partisans, and at all levels of government. Doyle (2007, 369-371) characterizes the relatively conservative education policy positions among Republicans, and McLendon, Hearn, and Mokher (2009) provide time series evidence from 1984-2004 that higher Republican party state legislative strength is associated with lower state spending on higher education. Thus we include a test for the effect of Republican legislative representation on the success of public research universities.

Empirical Methods

Our sample includes virtually all of the 150 institutions that were in the Carnegie Foundation (1994) classifications of Research I and II *and* Doctoral I and II universities at 1993, the time point for the measure of research stature that is used in our analyses. Thus these are all Ph.D. granting institutions that had been awarding notable numbers of

such degrees before 1993.¹ We have complete data for our hypothesis tests on 145 institutions.

The dependent variable for our analyses is a measure of the scholarly prestige of all the programs in these institutions that were evaluated and ranked in the 1993 National Research Council's (NRC) assessment of research-doctorate programs (Goldberger, Maher, Flattau 1995). This is the most recent such assessment for which unambiguous graduate program ranking data are available for scholarly research. This NRC evaluation assessed the quality of such programs in 41 academic disciplines. Academic programs at individual universities qualified for inclusion in the study primarily by having produced at least four doctoral degrees over the period 1988 – 1991 or because they earned a quality rating above a minimal threshold in the 1982 NRC evaluations.

While our dependent variable only directly assesses research prowess, it is associated with other performance criteria that have especially high salience for the general public and policy makers. Comparable graduation rate data are not available for our sample of institutions for the period of the 1993 NRC ratings, but present-day data show that these institutions *collectively* have generally higher first-year student retention rates and six-year graduation rates than most public masters degree and baccalaureate

¹ We exclude from the sample Middle Tennessee State University because representatives of that institution informed us it was not a research-doctorate granting one in 1993. The University of California—San Francisco and the SUNY College of Environmental Science and Forestry are also excluded because they have specialized missions that do not make them comparable to the institutions in our data set.

institutions (U.S. News & World Report 2009, 88-118). (Multiple causes, of course, influence these rates. Besides the innate quality of teaching in these institutions, they attract especially capable students and fewer part-time students.) Further, contemporary graduation rates *within* the sample of research universities (for which there is a more restricted range than across all categories of institutions) are notably correlated with their NRC research ratings. The six-year graduation rates of the institutions in our sample for the student cohort that entered in 2002 are correlated with our measure of research prestige in 1993 at $r = 0.69$. Thus more prestigious research institutions demonstrate high performance on multiple criteria and merit public and public policy support for that reason.

In the Fall of 2010 the NRC released its evaluation of research-doctorate programs for 2005-2006, yet the data from this assessment are not suitable for the analyses in this paper. The 2005-2006 assessment did not provide “point estimate” rankings of individual programs, but instead reported what one might call confidence intervals within which their rankings on several latent trait quality measures might lie. Thus these data cannot support systematic analyses of the causes of quality variations across disciplines or institutions (National Research Council 2010a, 73-79). Further, the methodology for this assessment may prove controversial on several points, such as for the use of different methods to collect objective data on individual graduate research programs in the humanities versus the sciences, the methods for the replacement of missing data, and the use of several weighting procedures to produce the final program confidence intervals (National Research Council. 2010b 8-9 and 11-13; see also Glenn 2010).

The program quality rating used as our dependent variable from the 1993 NRC assessment, in contrast, is based on peer-scholar evaluations within each discipline. Representatives of every institution included in the assessment proposed names of appropriate graduate faculty in the various disciplines, from which panels of evaluators were chosen by the NRC. The latter scholars were surveyed by mail and asked to rate, for each program in their discipline, the quality of the faculty and of the effectiveness of the program in educating research scholars.²

The peer evaluations of program faculty quality *and* of program educational quality are generally correlated at Pearson's $r > 0.94$. Thus our dependent variable is based on the faculty quality rating alone. The dependent variable is an overall score of the quality of research doctorate programs in each institution, derived by summing all the individual field rankings that the institution earned in the NRC assessment. Thus all the fields in which an institution had a program that qualified for NRC evaluation are included, and institutions are rewarded in this measure for their achievements in all their programs that met those criteria. This also means that the distinctive educational profiles and emphases of institutions – in terms of the mix of rankable and well ranked programs they exhibit – are respected. As a validity check for our dependent variable, we created a more selective measure, summing the rankings for all institutions in the two natural science disciplines with the largest number of ranked programs (biology and chemistry), the two humanities disciplines with the most ranked programs (English and history), and

² For more details on the design and implementation of the peer-review data collection, see Goldberger, Maher, and Flattau (1995, 16-29 and 115-142).

the two social science disciplines with the most ranked programs (economics and psychology). This selective measure of institutional graduate program quality was correlated with the dependent variable based on all ranked programs at $r = 0.94$.³

Some observers have raised doubts about the quality of peer evaluations of academic programs like those of the 1993 NRC assessment. Yet the validity of such evaluations has been supported in numerous studies that find they are very highly correlated with objective measures of the quality of faculty, the research productivity of faculty, and the quality of academic departments more generally. Such validation research extends to peer evaluation data from other entities than the NRC (see, among many others, Hartnett, Clark, and Baird 1978) and includes analyses of the NRC ratings in several of the individual academic disciplines in the data employed here (e.g., Dusansky and Vernon 1998; Goldberger, Maher, and Flattau 1995, 427-468; Jackman and Siverson 1996; Jacobs 1999).

To indicate the financial resources of universities for a test of our first hypothesis, we employ three alternative measures based on three alternative considerations. The first is the measure suggested by Blau (1973, 237-8) for total restricted and unrestricted institutional revenues per student. It is plausible, however, that revenues per full time faculty member are an equally good indicator of financial, and perhaps research-relevant, resources, and we include this alternative measure in our analyses. Further, some research universities have access to endowment funds over and above their conventional

³ Our dependent variable has a mean of 40.8, a minimum of zero, a maximum of 156.9, is reasonably normally distributed, and has only 7 cases at zero.

revenues – that provide them unusually flexibility in funding research initiatives. Thus we test the effects on overall research prestige of the market value of such endowments per full time faculty member at 1993. These three measures are taken from the data files for 1993 in the Integrated Postsecondary Education Data System (IPEDS) maintained by the U.S. Department of Education’s National Center for Education Statistics. The IPEDS data can be accessed at <http://nces.ed.gov/ipeds>.⁴

Our measure of institution size for a test of the second hypothesis is the total number of enrolled students in the Fall, 1993 semester, again from the IPEDS data.

To test the hypothesis that larger contemporary state population size is associated with higher university research achievements, we employ a measure of total populations of states at 1990 (U.S. Bureau of the Census 1995, 28).

We include a dummy variable for flagship institutions to test the fourth hypothesis. There exists no universal definition or agreed upon list of such institutions, some states do not designate a flagship, and some research does not explain how it identifies such campuses (e.g., Volkwein 1986, 513). We generally adopt the operational method of Knott and Payne (2004, 21) and the Journal of Blacks in Higher Education Research Department (2003, 119) that designates the single, leading institution in each state (that Knott and Payne also label “the premier institution” that is usually named the

⁴ The Rutgers State University-New Brunswick and Rutgers State University-Newark campuses are excluded from our analyses because they do not have values for institutional revenues in the IPEDS data volume used in our data set.

“University of” the relevant state name), as its flagship campus.⁵ Our dummy variable for land-grant institutions designates those which are listed as having that status by the Association of Public and Land-Grant Universities but that are not also flagship institutions by the preceding measure. This information on land-grant institutions is available at www.aplu.org.

For an indicator of whether universities are “situated in areas of the country that are highly attractive to scholars” (Cole 2009, 114) we rely on Cole’s expectation that such attractiveness is based heavily on the quality of local education resources, employment prospects for dual-career couples, and cultural facilities. Thus we employ measures of the educational resources (across all levels of formal education) and of the arts resources (including art museums and galleries, artistic performances, and public libraries) of communities from the *Places Rated Almanac* (Savageau and Loftus 1997). 119 of the institutions in our sample have scores for their specific communities on these two attributes in *Places Rated*. For another 19 communities we use the *Places Rated* data from a geographically larger community within commuting distance (60 miles or less) of the location of the university. For the remaining communities we created scores by

⁵ We also analyzed the regression models we report in this paper with different definitions of flagship campuses, for example, counting UCLA as well as UC-Berkeley as a flagship institution since both are identified as such in some State of California information and altering how we identify flagships in selected other states, such as New York. None of the results of these alternative estimations differed materially from those we report in the paper.

replicating as closely as possible the measurement procedures used by *Places Rated* with data from the same original sources.

Because overall community attractiveness is likely to be a composite latent trait that partakes both of educational and arts opportunities, and because there is likely some error in the *Places Rated* data on both the latter specific traits, we factor analyzed the two sets of scores and employ the resulting factor score as our measure of the underlying latent trait of community attractiveness (that is purged, too, of error unique to each of the two separate observed measures).⁶

Our dummy variables for testing Salisbury's (1965) hypotheses about shared regional distinctiveness in the quality of universities are: (1) for the Eastern seaboard states including those from Maryland north, (2) for the former Confederacy southern states, and (3) for those states whose U.S. presidential vote share for the Progressive Party in 1912 was more than one standard deviation above the mean of all states.⁷

To test whether the moralism of a state's political culture implies more support for higher education, we use the Elazar-Sharkansky (1969) measure of the degree to which the state-wide political culture reflects a traditionalistic vs. moralistic orientation.

⁶The two separate measures of community attractiveness loaded highly on a single underlying dimension. The eigenvalue for that dimension was 1.71, and the dimension accounted for 85 percent of the variance in the two observed indicators.

⁷These states are California, Maine, Michigan, Minnesota, Pennsylvania, South Dakota, Vermont, and Washington. Other versions of this dummy variable that included more states based on more generous or alternative criteria produced comparable findings.

To test the hypothesis that cultural preferences might be reflected in public support for higher education, we use the proxy measure, both for 1950 and 1990, of the percentage of each state's population over the age of 25 that had earned at least a bachelors degree (U.S. Bureau of the Census 1995, 159 and earlier years). The validity of this proxy is supported by individual-level survey data that indicate higher levels of formal education are strongly associated with higher support for the importance of, and state financial assistance to, public education, and by various measures (e.g., Elam 1978, 18-19, 172).

Our measure of the degree of state government regulation of public educational institutions circa 1993 is a seven-point ordinal scale from McGuinness, Epper, and Arredondo (1994, 10) of how highly regulated these institutions are by centralized state authorities. The strongest such regulations are in states with Consolidated Governing Boards with broad regulatory powers for all senior institutions such as those in our sample. The weakest regulations are in states with only Planning Agencies with limited oversight powers. Larger numbers on our scale indicate weaker regulation and thus more autonomy for educational institutions to pursue their own policy preferences.

To measure state regulation of educational institutions circa 1950, we employ Berdahl's (1971, 18-36) measure for 1949. Such regulatory structures were less elaborately articulated in that era than they are presently, but Berdahl presents a five-point ordinal scale of the scope of state government regulation over the substantive autonomy of public universities and colleges that assesses the degree of regulation in the same general way that our 1993 scale does. Once again, larger scores on the scale indicate weaker state regulation.

To measure how long individual universities have been engaged in relevant graduate education, we conducted a survey of all the institutions in our sample to learn when their first research-doctorate degree was granted. Either an archivist, library official, or graduate school official at all of the institutions in our sample responded with this information. The earliest such degree for an institution in our sample was awarded in 1876. The most recent was awarded in 1992. We scaled the measure for our analyses to indicate the number of years to 1993 since the first such degree was awarded.

To assess whether universities in more populous states after World War II were especially able to enhance the quality of their contemporary research programs, we use a measure of the population of the state in which each institution resides from the 1950 Census (U.S. Bureau of the Census, 1954, 18 and 939). We also test for whether greater percentage growth in state population between 1950 and the date of the NRC rankings for our dependent variable contribute to the quality of research programs.

To test for the effects of state wealth on university prestige, we employ measures of state median family income in 1993 and 1950 (U.S. Bureau of the Census 1995, 473, and earlier years).

For a test of the effects of state-wide social capital on research prestige, we use Putnam's (2000, 290-291) multi-indicator measure for which he provides considerable validating evidence. The measure and the individual component indicators for it are available at <http://bowlingalone.com>.

To test the effects of state citizen liberalism on the quality of research universities, we use the Berry, Ringquist, Fording, and Hanson (1998) measure of that concept for

1993 from their “revised 1960-2010 citizen ideology series,” for which they provide considerable validating evidence.

We also employ Berry, Berkman, and Schneidermann’s (2000, 865) measure of legislative professionalism – for the state legislature’s operating budget per member, in the 1949-50 biennium and the 1991-1992 biennium. The expenditure data for this measure come from U.S. Bureau of the Census (1993; 1951, and earlier volumes in these two series). Data on numbers of state legislators are from Council of State Governments (1990 and earlier volumes).

To measure the strength of the Republican party in state legislatures, we use data on state party representation in those bodies from Bibby and Holbrook (1996, 105) for the period 1989-1994.

Hypothesis Tests for Flagship Institutions Alone

We present two sets of analyses. The first is for flagship institutions alone, that are frequently analyzed separately in comparable research and for which there may be distinctive causes for research success. Because there is only a single flagship in those states that designate one, this is a kind of elite institution. Yet they cannot all be considered elite *research* institutions because many of them have undistinguished scores on our dependent variable. Indeed, 30 percent of them have scores below the mean score for all non-flagship institutions. Thus this first set of analyses explores the factors that account for the wide variation in research prestige among flagship institutions. The findings for this first set of analyses provide valuable perspective, as well, on those in the second set for all the institutions in our sample.

We have a relatively large number of independent variables compared to the number of flagship institutions, although the full sample analyses have more statistical power for the larger number of cases. For both sets of institutions we begin by estimating models that include all the hypothesized explanatory variables. We guard against the inclusion of irrelevant predictors (“overfitting”) by imposing a conservative standard for rejecting a null hypothesis, investigating additional models that take account of high collinearity between predictors, and considering the time-order logic for when we have essentially comparable measures at two different times. The latter procedures also allow us to reduce the number of predictor values and thus enhance the statistical power of our tests.

Table 1 reports two models for the commonly designated single flagship institutions in our data. The first model includes OLS estimates for all the hypothesized explanatory variables, and it accounts exceptionally well for the observed variation in research prestige in this set of institutions. For only three predictors, however, can we reject the conventional null hypothesis based on this model: the size of the student body at the time of the NRC evaluation, total revenues per student at the same time, and the number of years since the first Ph.D. was granted. The easiness of state regulations in 1990 (for which past research offers mixed findings) is negatively associated with research prestige. This result accords exactly with findings in Volkwein (1989) and more generally with those in Volkwein and Malik (1997) – all of whom conclude that such state regulations are generally irrelevant to university quality.

[Table 1 About Here]

Yet Model 1 includes several predictors with Variance Inflation Factors greater than 10, implying that the estimates for them are notably affected by collinearity with other predictors (Gujarati and Porter 2009, 340). Coincidentally, virtually all the latter variables are one or both of a pair that measure the same attribute at two times (e.g., state legislative professionalism at 1992 and at 1950). Recall that we have such pairs of predictors because, while they are commonly cited as having contemporary influence, there is reason to suspect that their influence goes back to the period immediately after World War II. Based on this expectation about *time-order* effects, we produced Model 2 in Table 1 that excludes all the later-in-time measures in such a pair where at least one of the two had a high Variance Inflation Factor.

Model 2 demonstrates notable findings relevant to our time-order considerations. Wealthier states and ones with larger college educated populations circa 1950 have flagship institutions with greater prestige in 1993. State population size in 1950 is also highly correlated with state wealth and college education level, and it would be significant in the model if one or both of these other two variables was not in it. Further, legislative professionalism in this early period has a comparable, positive relationship. These 1950s predictor variables may even have influenced the two significant contemporary attributes of university student body size and revenue per student – as implied by Cole’s comment that some contemporary university attributes may only be correlates and not causes of prestige.⁸

⁸The only other notable finding that differs from those in Model 1 is that the dummy variable for Northeastern states is positive and significant, contrary to the common

The size of the Republican party delegation in the state legislature in the period leading up to the NRC assessment is also *positively* associated with research prestige in Model 2. This finding is contrary to expectations in other recent literature, but it may reflect the distinctiveness of the period under study here from analyses of more contemporary times or the fact that no prior research has investigated the effect of GOP delegation size on university prestige. The existing research literature on the latter topic offers no rationale for this finding, thus it begs for further investigation and validation.

In summary, Table 1 provides ample evidence that the research quality of flagship institutions was heavily shaped by a small number of causal factors, most of which were already operating in the late 1940s and early 1950s. In particular, the size, wealth, and educational levels of states along with how long they had been producing doctoral degrees especially shaped their research profiles. Yet the effects of these state resources are complimented by that of legislative professionalism in this early period. Thus our expectation that more professional governance would better transcend local and idiosyncratic forces in favor of professional considerations about higher education is supported here.

Hypothesis Tests for the Full Set of Institutions

Table 2 presents regression models for the full set of research institutions. These analyses are justified because virtually all the hypotheses are meant to apply to all these

expectation in the case study literature on regional effects. Because this finding is not duplicated in any of our other models, however, it might not be dependable.

institutions. The only hypotheses that do not are the two that anticipate especially high research prestige scores for flagship and land-grant institutions. It is also valuable to recognize that this full set of institutions is quite diverse – in age, size, and stature within their states. Yet all of them grant graduate research degrees and presumably have scholarly ambitions compatible with the mission implied by that degree granting status.

Because, finally, there are multiple institutions in some states, these analyses report robust standard errors clustered by states to control for intracluster correlations (that is, among institutions in the same state). Our data are especially appropriate for this estimation method because the intracluster correlation in our data is low (with $\rho = 0.085$); we have sufficiently numerous clusters (states) to overcome the limited success of this method when the number of clusters is small; and the numbers of cases in our clusters (states) is relatively small, whereas large n 's within clusters increase the bias in estimation of standard errors (Arceneaux and Nickerson 2009, 180-181; Cameron, Gelbach, and Miller 2008, 425; Green and Vavreck 2008, 143-144).⁹

Model 1 in Table 2 includes all the hypothesized explanatory variables, which collectively account for over 80 percent of the variance in prestige scores across this large and diverse set of institutions. The dummy variables for flagship and land-grant institutions are both highly significant as anticipated, but other predictors in the model

⁹Among the alternative estimation strategies, multi-level modeling is not appropriate for our data because we do not have sufficient numbers of observations within each state (e.g., Mass and Hox, 2005). The use of bootstrapped standard errors is not appropriate for the same reason (Chernick 2008, 173-174).

suggest important causal factors similar to and different from those for these institutions alone. Yet this model includes five explanatory variables with very high Variance Inflation Factors, and those five are part of three pairs of explanatory variables each measured at two different times. Thus we adopt here the same time-order logic employed in Table 1. Model 2 in Table 2 excludes the later-in-time measures for these three pairs, has no predictors itself with high Variance Inflation Factors, and thus should offer more satisfactory interpretations of the important explanatory variables.

In Model 2, and not surprisingly, flagship and land-grant institutions remain generally distinguished for their research prestige. Institutions with larger enrollments, higher revenues per student, and that are in states with higher GOP legislative representation also have higher prestige as was the case among flagships alone. In addition, some of the early 1950s predictors of flagship prestige, but not all, are also significant here – state population size, legislative professionalism, and time since the first Ph.D. was granted, but not state wealth or the percent college educated. Yet two explanatory variables that capture later-in-time phenomena are distinctively influential here: for the growth of state populations after 1950 and for the size of the college educated population coincident with the NRC assessment in 1993. The latter two explanatory variables seem especially plausibly linked with the growth in prestige of institutions beyond the flagship. These other institutions typically are located in other metropolitan areas than is the flagship institution which usually grew especially in population after World War II. Particularly successful research institutions of this sort may, then, reflect the effects of the latter growth *and* of demand for high quality education in these areas of the states by a highly educated public.

Intriguingly, institutions in states with more traditionalistic cultures (and thus less moralistic ones) have relatively lower prestige scores *ceteris paribus*. Adopting some of Elazar's classic descriptions of these polar cultures, this finding could arise because more moralistic political cultures view government as "a positive instrument with a responsibility to promote the general welfare" (Elazar 1984, 117). Alternatively, the finding could arise because relatively traditionalistic political cultures seek to limit the role of government to the "maintenance of the existing social order" (Elazar 1984, 118) or because both of these effects are operating simultaneously. Whatever the exact interpretation, more moralistic states have supported greater enhancement of research universities generally.

Conclusions

We have provided the first systematic assessment of the major factors thought to cause variations in the quality of public research universities. Our results offer the triage of the many suspected causal factors that is typical of early theory building efforts. Future research must carry this effort forward, yet our analyses produce important findings that are typically not anticipated in contemporary literature. Those findings include the importance of temporally early positioning in research-doctorate education, a nexus of immediate post-World War II socio-economic attributes of institutions' home states that imply notable resources (or the lack thereof) for substantial research efforts, and professional state governance that might especially invest such resources in the creation of leading research institutions.

Future research to enhance our understanding of the underlying processes might include further investigation of which states or institutions took best advantage of propitious socio-economic or other circumstances (that might provide additional evidence of leadership and policy effects); the relevance of party control of government and political culture for research universities; the role of federal funding in the development of individual research universities; and the causal ordering among multiple, possible influential variables.

The policy implications of our findings, however, appear stark and in a sense limited. One might summarize our most important findings as indicating that leading public research institutions were advantaged by early positioning in graduate education and especially propitious state socio-economic and political circumstances after World War II. Less distinguished institutions enjoyed few of those advantages. These results imply that great research universities required a very long time and significant public resources to build. They also imply that there are today few easily manipulable policy “levers” to help sustain the success of existing or advance aspiring institutions of this sort.

The strictly political factors we uncover that are unambiguously relevant to the success of these institutions are few in number and of limited utility generally. Professional governance from the state legislature has a consistent, positive relationship to research prestige, but high professionalism of this sort is not the norm among the states. The influence of highly educated populations on research prestige in Table 2 coincident in time with the NRC assessment in 1993 suggests that general public support for high quality education can motivate government investment for that goal.

Universities in states with highly professional legislatures and highly educated populations, then, should have numerous, obvious allies in their pursuit of governmental support. In other states those allies are reduced to smaller numbers of legislators and members of the general public who individually carry these professional values.

There is one more policy concern that enlarges on the findings here. If great universities took a long time to build, one could wonder whether some of them could still be significantly harmed in relatively short periods of time. Many states have substantially reduced their financial support for higher education generally because of the contemporary economic recession. Numerous governors and state legislators have entertained, and in some cases adopted, educational reforms that appear intended to circumscribe the research missions of public universities. Proposals before the U.S. Congress also envision limiting federal research support to select scholarly fields or for select kinds of research. Thus what many research institutions achieved only over a long period of time and with long running public sector support could be jeopardized in a short period.

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Table 1. The Determinants of University Research Prestige
Rankings for Flagship Institutions

Independent Variable	Model 1	Model 2
Total Enrollment 1992	.002* (.0005)	.002* (.0005)
Revenues per Student 1992	.0012* (.0004)	.0015* (.0003)
Revenues per Faculty Member 1992	-.000002 (.00002)	-.000009 (.00002)
Endowment Value Per Faculty Member 1992	-.00007 (.00018)	-.000006 (.00002)
Political Culture Traditionalism	1.235 (2.871)	.360 (2.360)
GOP Control of	44.241	63.562*

Legislative Seats	(38.335)	(30.067)
Social Capital	3.629 (7.435)	2.282 (6.047)
Citizen Ideological Liberalism	-.301 (.369)	-.473 (.322)
Southern State Dummy	7.687 (13.292)	9.828 (9.678)
Northeastern State Dummy	6.759 (10.944)	15.839* (9.086)
Progressive State Dummy	1.249 (11.556)	1.947 (9.392)
Pct. of State Pop. With College Degree 1990	-.433 (1.818)	--
State Population 1990	-.003 (.003)	--
Ease of State Regulation 1990	-6.351* (2.428)	-7.066* (2.202)
Locational Attractiveness	-4.090 (4.544)	-3.708 (3.625)
Median Income 1993	.0018 (.0016)	--
Legislative Professionalism 1992	.018 (.029)	--
Years Since First Ph.D.	.340* (.153)	.455* (.123)
Pct. of State Pop. With College Degree 1950	1.878 (1.169)	1.903* (.926)
State Population 1950	.004 (.006)	-.001 (.003)
Pct. Change in State Population 1950-1990	4.626 (8.024)	4.203 (5.040)

Ease of State Regulation 1950	1.283 (1.914)	1.205 (1.726)
Median Income 1950	.0169 (.0146)	.031* (.010)
Legislative Professionalism 1950	2.014 (1.693)	2.457* (.929)
Constant	-166.64*	-160.58*
Adj. R ²	.90	.91
BIC	408.34	400.07

Note: The dependent variable is the sum of the individual field ranking scores earned by an institution in the 1993 NRC assessment. Total enrollment is the number of students in 1992. Revenues per student is the total revenue from all sources divided by the number of students. Revenues per faculty member is the total revenue from all sources divided by the number of full time faculty. Endowment is the market value of monetary endowment assets divided by the number of full time faculty. Political culture is the score of each state on the Elazar-Sharkansky scale of traditionalism that runs from 1 to 9. GOP control is the percentage of state legislative seats held by the Republican party during 1989-1994. Social capital is the state's score on Putnam's (2000) state scale. Citizen ideological liberalism is the state score on the Berry et al. (1998) revised citizen ideology series. Southern state dummy is for former Confederacy states and is coded 0-1. Northeastern state dummy is for Atlantic Coast states from Maryland north and is coded 0-1. Progressive state dummy identifies states with especially high Populist party support in the 1912 Presidential election and is coded 0-1. Percentage of state population with a college degree for both 1950 and 1990 is for the population 25 years old and older. State population in 1950 and 1990 is the U.S. Census count. Ease of state regulation in 1990 is measured on a 1-7 scale. Locational attractiveness is a factor score for the latent dimension estimated from *Places Rated* observed educational and arts resources scores. Median income in 1950 and in 1993 are estimates from the U.S. Bureau of the Census. Legislative professionalism in both 1950 and 1993 is the legislature's budget divided by the number of members. Years since the first Ph.D. is the time since the first research doctoral degree was granted. Percentage change in population is based on the increase from 1950 to 1993. Ease of state regulation in 1950 is measured on a 1-5 scale.

N = 47.

*p < .05, one-tailed test.

Cell entries are the OLS regression coefficient and, in parentheses, the robust, state-clustered standard error.

Table 2. The Determinants of University Research Prestige Rankings for the Full Sample of Institutions

Independent Variable	Model 1	Model 2
Flagship Institution	16.102* (4.934)	15.124* (4.893)
Landgrant Institution	13.316* (5.063)	13.238* (4.569)
Total Enrollment 1992	.001* (.0002)	.001* (.0002)
Revenues per Student 1992	.0008* (.0002)	.0008* (.0002)
Revenues per Faculty Member 1992	.000022 (.000015)	.000019 (.000014)
Endowment Value Per Faculty Member	-.0001 (.0001)	-.00007 (.0001)

Political Culture Traditionalism	-1.503* (.918)	-1.976* (1.009)
GOP Control of Legislative Seats	24.284 (16.352)	25.127* (14.221)
Social Capital	-1.453 (4.781)	-4.196 (3.487)
Citizen Ideological Liberalism	-.179 (.178)	-.154 (.144)
Southern State Dummy	-2.394 (4.666)	-2.652 (5.150)
Northeastern State Dummy	-.468 (4.386)	-1.919 (4.315)
Progressive State Dummy	-10.089 (6.943)	-2.439 (5.434)
Pct. of State Pop. With College Degree 1990	.321 (.946)	1.246* (.411)
State Population 1990	-.0010 (.0010)	--
Ease of State Regulation 1990	-.976 (1.323)	-1.035 (1.590)
Locational Attractiveness	1.280 (1.310)	1.529 (1.259)
Median Income 1993	.0011 (.0007)	--
Legislative Professionalism 1992	.014 (.010)	--
Years Since First Ph.D.	.419* (.090)	.429* (.088)
Pct. of State Pop. With College Degree 1950	-.271 (.429)	-.493 (.418)

State Population 1950	.0029* (.0015)	.0016* (.0007)
Pct. Change in State Population 1950-1990	3.680* (2.163)	4.282* (1.563)
Ease of State Regulation 1950	-.600 (.766)	-.640 (.733)
Median Income 1950	-.003 (.005)	.002 (.006)
Legislative Professionalism 1950	.186 (.374)	.625* (.225)
Constant	-65.43*	-60.99*
Adj. R ²	.84	.84
BIC	1280.57	1269.07

Note: The dependent variable is the sum of the individual field ranking scores earned by an institution in the 1993 NRC assessment. Flagship is coded 0-1. Landgrant is coded 0-1. Total enrollment is the number of students in 1992. Revenues per student is the total revenue from all sources divided by the number of students. Revenues per faculty member is the total revenue from all sources divided by the number of full time faculty. Endowment is the market value of monetary endowment assets divided by the number of full time faculty. Political culture is the score of each state on the Elazar-Sharkansky scale of traditionalism that runs from 1 to 9. GOP control is the percentage of state legislative seats held by the Republican party during 1989-1994. Social capital is the state's score on Putnam's (2000) state scale. Citizen ideological liberalism is the state score on the Berry et al. (1998) revised citizen ideology series. Southern state dummy is for former Confederacy states and is coded 0-1. Northeastern state dummy is for Atlantic Coast states from Maryland north and is coded 0-1. Progressive state dummy identifies states with especially high Populist party support in the 1912 Presidential election and is coded 0-1. Percentage of state population with a college degree for both 1950 and 1990 is for the population 25 years old and older. State population in 1950 and 1990 is the U.S. Census count. Ease of state regulation in 1990 is measured on a 1-7 scale. Locational attractiveness is a factor score for the latent dimension estimated from *Places Rated* observed educational and arts resources scores. Median income in 1950 and in 1993 are estimates from the U.S. Bureau of the Census. Legislative professionalism in both 1950 and 1993 is the legislature's budget divided by the number of members. Years since the first Ph.D. is the time since the first research doctoral degree was granted.

Percentage change in population is based on the increase from 1950 to 1993. Ease of state regulation in 1950 is measured on a 1-5 scale.

N = 145.

*p < .05, one-tailed test.

Cell entries are the regression coefficient and, in parentheses, the robust, state-clustered standard error.