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Declining Academic Fields in U.S. Four-Year Colleges and Universities, 1970–2006

Historically, many new academic fields were added to colleges and universities without requiring the elimination of older fields (Frank & Gabler, 2005; Veysey, 1965). Beginning in the 1990s, however, scholars began to speak about university retrenchment involving the reduction and elimination of programs (Gumport, 1993; Slaughter, 1993). Improvements in the economic circumstances of colleges and universities during the later 1990s temporarily eased pressures for program reductions (Geiger, 2004), but state fiscal crises and increasing competition of the higher education marketplace have led to many program eliminations since that time (see, e.g., Fain, 2009; Glenn & Schmidt, 2010; Selingo, Fogg, & Smallwood 2005). Case studies have focused on the specific criteria that institutional leaders use in making reallocation and termination decisions (Eckel, 2002; Morphew, 2000), the strategies adopted by threatened programs (Reinardy & Halter, 1994), and issues that often emerge during the process of program closures (Hardy, 1990; Melchiori, 1982). Yet no studies have measured the decline of academic fields over a sufficiently long time span and a sufficiently large sample of institutions to allow scholars definitively to identify the most vulnerable fields or to understand the types of schools that drop them.

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In this paper, we identify 22 academic fields that declined over a 35-year period, 1970–1 through 2005–6. We define academic fields as degree-granting disciplines recognized in the federal government's classifications of instructional programs. We focus on fields that were represented in at least 5% of four-year colleges and universities in 1970-1, thereby eliminating many small fields that were marginal to academe at the beginning of our study period. We consider two types of decline: (a) decline in absolute numbers and (b) relative decline, or declining prevalence. Because the higher education system expanded during the period, it was possible for fields to grow in absolute numbers and nevertheless decline in prevalence. We also show that fields decline in several distinct ways, and we show the characteristics of institutions that are most and least likely to drop declining fields.

The study provides evidence relevant to fundamental issues in the political economy of U.S. higher education institutions, including the oft-suggested shift from "professional" to "market" logics of development (see, e.g., Geiger 2004; Gumport, 2000, 2002; Kirp, 2003; Slaughter & Silva, 1985) and concerns about the extent to which the arts and sciences have become "endangered species" in a system increasingly oriented to applied knowledge (see, e.g., Brint, Riddle, Turk-Bicakci, & Levy, 2005; Turner & Bowen, 1990; Zammuto, 1984).

Theoretical Background

Organizational sociologists have studied deinstitutionalization, the processes by which categories and practices weaken or disappear in the structure of organizations, as a contrast to institutionalization, or the processes by which categories and practices become embedded in the taken-for-granted assumptions of organizations. Deinstitutionalization occurs in established organizations, as institutional leaders make decisions about activities they no longer wish to support. Studies of deinstitutionalization have provided a theoretical framework for understanding these phenomena (Oliver, 1992) or have focused on specific cases for purposes of identifying background conditions, triggers, and mechanisms of change (Dacin & Dacin, 2008; Lebelici, Salancik, Copay, & King, 1991). In contrast to deinstitutionalization, decline can be the result not only of formal decisions by institutional leaders to end programs, but also of nonparticipation by organizational members in nominally active programs. Thus, it is possible, for example, for a Russian Studies program to remain on the books at a university even though no students participate in it. In addition, declining prevalence can be due to the failure of new institutions to adopt programs that have not declined

in older organizations. Decline therefore includes a larger number of processes than deinstitutionalization.

We argue that decline is not a single process, but rather several distinct processes involving (a) differential propensities to offer fields among new schools as compared to schools that fail during a period, (b) the number of new as compared to failed schools, and (c) the number of drops and adoptions of fields among schools that persist throughout a period. Because we recognize these distinct processes, including the important fact that schools can adopt as well as drop fields that are in decline, we are able to measure the sources of decline more precisely than has been attempted so far. In particular, our method for decomposing change represents an improvement over measurement of change based solely on births and deaths (Carroll & Hannan, 2000) or on conformity or lack of conformity with ascendant models in an organizational field (DiMaggio & Powell, 1983).

We also examine the characteristics of colleges and universities that dropped and adopted declining fields during the period. In previous work (Brint, Proctor, Murphy, Mulligan, Rotondi, & Hanneman, 2011), we compared four theoretical perspectives for their capacity to identify locations of the early adopters of growth fields. These four perspectives are: (a) organizational ecology, (b) interinstitutional stratification, (c) demographic composition, and (d) historical traditions. In this study, we draw on the same four perspectives, but use them to develop expectations about the characteristics of colleges and universities that drop and adopt declining fields.

Organizational ecology explanations assume that the behavior of individual organizations is shaped by opportunities and constraints in their environment and by the differential capacities of individual organizations to exploit opportunities and survive challenges (Hannan & Freeman, 1989). One key insight of organizational ecology is that the founding (and failure) rates of organizations are density dependent. In the case of declining fields, relatively high levels of saturation at the beginning of the period should be associated within geographical areas with reduced adoption during the period, and perhaps also with more frequent dropping of fields (Carroll & Hannan, 2000, pp. 222–7).

The capacity of an organization to exploit new niche space, or to succeed despite competition in a crowded one, can be a function of individual organizational characteristics as well. For higher education institutions, size is a primary adaptive characteristic of interest (Blau, 1973/1994, Chapter 3). From an ecological perspective, size is an indicator of organizational carrying capacity. Larger organizations have the capacity to organize faculty in ways that allow for the preservation of

existing fields, because they have a heightened opportunity to generate effective demand for courses and majors from their larger student bodies. We therefore expect larger institutions to be less likely to drop and more likely to adopt declining fields.

Explanations based on *interinstitutional stratification* grow out of Veblen's (1899) recognition that status goods are not judged by utilitarian criteria but rather by perceptions of quality and refinement. For Collins (1977), lower-status institutions tend to focus on practical training in courses of study closely connected to jobs and occupations, while higher-status institutions tend to focus on esoteric fields of study associated with intellectuality and distance from the labor market (see also Bourdieu, 1988). Drawing on this work, we expect financially more secure and socially more elite institutions to preserve vulnerable arts and sciences fields, while less secure and less elite institutions will be more likely to drop them.

Highest degree offered is another, more functional source of status differentiation. Doctoral-granting universities have historically shown a particularly strong emphasis on fields connected to science and technology (Graham & Diamond, 1997), and they also provide training for future faculty in other disciplines. We consequently expect doctoral-granting universities to be strongly associated with the preservation of science and technology fields and to be associated, perhaps less strongly, with the preservation of other basic fields as well.

Perspectives emphasizing *demographic composition* as a source of curricular change are typically based on elective affinities between the life circumstances of types of students and the market conditions of types of fields (Conrad & Haworth, 1990). Three categories of students—racial-ethnic minorities, women, and international students—are of particular interest, because each one increased significantly as a proportion of the undergraduate student body in U.S. four-year colleges and universities during the study period (U.S. Department of Education, 2008, Table 226). The demographic approach has linked the life experiences of lower-SES students to preferences for more practical, job-relevant curricula (see, e.g., Cross, 1971; Trow, 1974). Because members of racial-ethnic minorities more often come from working-class backgrounds, we would expect that higher proportions of racial-ethnic minority students should be associated with a greater emphasis on job-relevant curricula and therefore with a turn away from arts and sciences fields. Similar arguments have linked the life experiences of female students to preferences for study in the humanities, social services, and other historically sex-segregated fields (Jacobs, 1996). We therefore expect institutions enrolling higher proportions of female students to be

less likely to drop traditionally female fields. A cognate argument can be made about international students. In so far as these students come mainly from relatively privileged backgrounds, they should be more likely to indicate interest in business and technical fields based on the earnings expectations for these fields (Arcidicano, 2003). We therefore expect institutions enrolling higher proportions of international students to be less likely to drop and more likely to adopt business and technology fields.

Historical traditions are often cited as encouraging the reproduction of existing structures and consequently acting as restraints on change. To explain the force of historical traditions, social scientists have emphasized the communication of values by organizational leaders (Selznick, 1957), the construction of "organizational sagas" as reference points for identity (Clark, 1970), and "ritual categories" embedded in organizational structures (Meyer & Rowan, 1977). Two institutional types expressing distinct historical commitments—liberal arts colleges and land-grant universities—are particularly important in U.S. higher education. Liberal arts colleges educate the "whole person" and have been closely connected to the training of elites from the time of the colonial colleges (Baltzell, 1964). Today, not all institutions with commitments to the liberal arts are high-status; instead, small religiously-affiliated colleges are among the most likely to maintain these commitments (Brint, Proctor, Murphy, Turk-Bicakci, & Hanneman, 2009). Accordingly, we expect institutions with historical commitments to the liberal arts model, whether elite or nonelite, to be more likely to preserve the basic arts and sciences fields. Public universities in the land-grant tradition have had the opposite orientation from liberal arts colleges; they were constituted to provide practical training for men and women in agricultural and industrial occupations and were intended to be open to students from all social strata (Nevins, 1962). The land-grant philosophy spread beyond the original land grants, as it influenced other public universities to present themselves as addressing the needs of the state and the economy for scientifically and technically trained labor (Geiger & Sa, 2008). We consequently expect public universities to be more likely than private colleges and universities to preserve science and technology fields.

Data and Methods

Study Time Frame

We begin our coverage in 1970–1. This is an appropriate year in which to begin the study, because it represents a high point in the devel-

opment of the U.S. higher education system along conventional disciplinary lines. In spite of rapid expansion of the system in the 1950s and 1960s (Trow, 2000), the proportion of students studying arts and sciences fields reached a peak in 1969–70 (Brint et al., 2005). In the period following 1970, the system continued to expand in numbers of students and institutions, but colleges and universities faced the beginning of frequent periods of financial pressure (Geiger, 2004, Chapter 2). In the wake of straitened resources and increasing student demand for higher education credentials, corporate management techniques were introduced into the administration of colleges and universities (see, e.g., Coopers & Lybrand, 1995), and higher education institutions engaged in intense competitive marketing campaigns to attract students and donors (Kirp, 2003). Trends toward an increasing emphasis on "practical," applied knowledge fields were reported (Brint et al., 2005; Turner & Bowen, 1990), even in some institutions that had been historically identified with the liberal arts tradition (Kraatz & Zajac, 1996).

Study Population

In this paper, we examine "core institutions" in the U.S. higher education system. We define core institutions as four-year colleges and universities that offer a range of baccalaureate degrees, rather than degrees in only a small number of related programs. We do not include specialized institutions, such as art schools, business colleges, and seminaries. We also do not include for-profit institutions. In addition, some accredited four-year colleges and universities failed to report data to the U.S. Department of Education in either 1970–1 or 2005–6. We treated these organizations as missing. The number of colleges and universities in our study population increased by 12% during the 35-year period, from 1,263 to 1,416, while the number of baccalaureate degrees these institutions awarded annually increased from nearly 800,000 to more than 1.3 million.

The federal government collected higher education data through the Higher Education General Educational Statistics (HEGIS) system in the first year of our study and through the Integrated Postsecondary Education Data System (IPEDS) in the last year. Our academic field classifications are based on HEGIS Subject Codes and IPEDS Classification of Instructional Program (CIP) codes. In the process of degree differentiation during the period, the number of fields represented at the bachelor's level grew from 319 to 935. Many fields retained the same classificatory title throughout the period. However, in some cases, accuracy required aggregating categories from later periods to match as closely as possible those used in earlier periods, with the aid of HEGIS and

IPEDS crosswalks. Thus, where geology was the sole code in 1970–1, by 2005–6 some institutions had begun using the label earth sciences, while others retained geology. In a few cases, we aggregated related fields to allow for more robust statistical analyses. For example, we aggregated degrees offered in Spanish, French, and Italian into a Romance languages and literatures code, and we aggregated degrees offered in German, Dutch, and Scandinavian into a Germanic languages and literatures code.

We excluded fields represented at fewer than 5% of institutions in 1970–1 from the analysis, because these fields were, even in the first year of the study period, uncommon in U.S. colleges and universities. These fields included some highly specialized applied majors, such as special education and actuarial science, as well as several trades fields found more often in two-year colleges. We also excluded very general umbrella classifications, such as "physical and biological sciences" and "social sciences," because they failed to identify commonly recognized academic fields. Most fields either grew in prevalence during the period or held stable. However, 22 experienced declines in institutional prevalence.

Measuring Decline

Social scientists have measured decline in both absolute and relative terms. Absolute decline is straightforward to measure; if a field existed in fewer colleges and universities in 2005–6 than in 1970–1, it experienced absolute decline. Relative decline is a slightly more complex concept. Even if the absolute number of organizations in which a field is represented grows over time, the field can be in relative decline if its representation does not keep up with the rate of growth in the number of organizations in the system. Relative decline, or declining prevalence, is computed by subtracting the proportion of colleges and universities offering the field in T2 from the proportion offering it in T1. We believe that both measures are important. Prevalence is a stronger measure for social scientists who are interested in the condition of fields in historical time, taking into account the changing number of organizations in the system. The clearest cases of decline, of course, combine both absolute decline and declining prevalence.

The absence of a field can be measured in more than one way. One measure is through counts based on lists of degree offered. Such lists are available in college guides, such as the College Blue Book (Romaniuk & Thompson, 2006). Another measure is the absence of degrees awarded in a field over a period of time. The latter encompasses inactive as well as formally disestablished fields.

In our view, absence of degrees awarded is a more encompassing measure than official lists of degrees offered, and is therefore a more appropriate measure for our purposes.[1] This conclusion reflects our view that decline can be the result not only of formal decisions to terminate programs, but also of nonparticipation by students in nominally active programs. The process of formally eliminating academic fields is lengthy and conflict-prone. In some cases, institutional leaders are therefore content to let fields drift toward nonexistence through their failure to generate sufficient student demand for their courses and degrees.

In this paper, we measure nonexistence of fields using data on degrees awarded, specifically, the absence of any degrees awarded during the last two years of our study period. Thus if no degrees were awarded in a field at a particular institution during the last two years of the period, we counted the field as no longer active at the institution. The two-year interval we use in this paper is virtually interchangeable with the three year interval as a measure of inactivity. We found a correlation of 0.98 between nonexistence of degrees in two and three year consecutive periods, and discrepancies in just 1% of cases.[2]

Decomposing Sources of Decline

In the system of U.S. four-year colleges and universities, decline can be due to the replacement of failed organizations with new organizations that have a lower propensity to offer the field. It can also be due to a higher number of eliminations than adoptions of the field in organizations that continue throughout the entire time span of a study. Finally, in cases of absolute stability or growth but declining prevalence, it can be due to the system expanding faster than the net of new adoptions of the field.

No summary statistic exists to describe the proportion of decline due to these sources of change. However, a clear picture of the sources of decline can be developed through decomposition using category counts. We decomposed change by reporting counts for eight conditions that, when taken together, account for changes in field prevalence. These conditions are (a) failed schools that offered the field, (b) failed schools that did not offer the field, (c) new schools that offered the field, (d) new schools that did not offer the field, (e) continuing schools that never offered the field, (f) continuing schools that always offered the field, (g) continuing schools that adopted the field, and (h) continuing schools that dropped the field. We define failed schools as those that died or were disestablished during the period. We define new schools as those that were founded during the period. We define continuing schools as those that persisted throughout the period.

As we will show, declining prevalence can result from several distinct patterns in the composite of counts associated with these eight conditions. In some cases, such as geography, fields were more prevalent in new organizations than they had been in failed organizations, but changes were not significant enough to offset absolute declines within continuing organizations. In other cases such as mathematics, adoptions and drops in continuing organizations were nearly identical, but the field was notably less prevalent in new organizations as compared to failed organizations.

Identifying Locations of Drops and Adoptions

Our last analyses investigated the characteristics of colleges and universities that dropped and adopted declining fields. By "dropped," we mean no longer awarded degrees, either due to formal termination or lack of student interest. We focus on the 1,120 colleges and universities that existed continuously throughout the period, because they form a large majority (72%) of the total number of organizations in the sample, and because they are the only ones in which data on drops and adoptions can be constructed from data coded at the beginning and end of the time period. In these analyses we concentrate on fields that existed at more than 20% of colleges and universities in 1970–1. This is a meaningful cutoff, both because it identifies fields that were relatively common at the beginning of the period and because, from a statistical point of view, a lower cutoff would increase the size of standard errors, thereby reducing the reliability of parameter estimates.

Independent variables. For purposes of identifying the types of colleges and universities prone to drop and adopt declining fields, we measured variables derived from each of the four theoretical perspectives described above.

We measured two organizational ecology variables. *N w/Field in Region 1970* is a measure of niche coverage at the beginning of the study period. The term "core based statistical area" (CBSA) became effective in 2000 and refers collectively to metropolitan and micropolitan statistical areas (U.S. Bureau of the Census, 2009). We use CBSAs to define boundaries of the geographical space in which higher education organizations compete. We coded the number of institutions adopting a program based on IPEDS data on degrees awarded in our target fields. We coded the number of institutions in each CBSA by locating institutions within counties covered by CBSAs. We used counties as the referent in cases in which colleges or universities were not located in a CBSA.[3] The second organizational ecology variable, *log enrollment,* is a measure of an organization's carrying capacity based on potential student

and faculty support for fields. We measured total headcount enrollment from HEGIS/IPEDS enrollment data and logged this total to normalize the distribution.

We measured three interinstitutional stratification variables. The *organizational status index* is an additive, z-scored index based on three status variables that were highly correlated and factored together. The three status variables are (a) operating budget/student, (b) selectivity, and (c) six-year graduation rate. Operating budget per student is computed from HEGIS/IPEDS financial data, divided by headcount enrollment.[4] We removed hospitals and independent operations from operating expenditures so as to focus on expenditures more closely connected to the quality of the undergraduate experience. Selectivity is measured from the Barron's admissions selector index. We assigned numeric values to these labels for the purpose of analysis, with one denoting the least selective and six denoting the most selective colleges and universities. Six-year graduation rates are correlated with the socioeconomic profile of undergraduate students, as well as consumer judgments of educational value (Zemsky, Shaman, & Iannozi, 1997). We obtained six-year graduation rates from HEGIS/IPEDS data. These three variables loaded together in a principal component analysis. They produced a single factor with an eigenvalue of 2.23. This factor accounted for 74% of the variance among the variables. Varimax rotation yielded rotated factor scores for operating budget per student of 0.785, selectivity of 0.905, and six-year graduation rates of 0.892

The other interinstitutional stratification measures are dummy coded classifications by highest degree awarded. *Doctoral-granting* institutions are defined as institutions awarding at least 30 doctoral degrees in a year. The 30 doctorate cutoff is adapted from Snyder & Hoffman's (2005) approach to identifying doctoral-granting institutions, given variations in the Carnegie Classification definitions over time. *Master's-granting* institutions are defined as institutions awarding at least 30 master's degrees in a year and serve as our reference category. *Baccalaureate-granting* institutions comprise the remaining institutions in the sample. They offer fewer than 30 master's degrees a year, again following Snyder & Hoffman (2005).

We measured three demographic characteristics of student bodies from HEGIS/IPEDS enrollment data. *Percent minority* is a continuous variable measured as non-White students as a proportion of total enrollment. *Percent female* is a continuous variable measured as women students as a proportion of total enrollment. *Percent international* is a continuous variable measured as proportion of international students to total enrollment.

We measured two variables identifying historical traditions. *Percent Liberal Arts 1970* is a measure of an organization's commitment to the traditional arts and sciences in the first year of the time series. This is a continuous variable coded from HEGIS/IPEDS degree data measured as the proportion of total degrees awarded in the arts and sciences, as opposed to occupational-professional fields, in the first year of our time series. We identify colleges and universities awarding high proportions of degrees in arts and sciences as historically connected to the liberal arts tradition. *Public* is a categorical variable measuring form of control and coded from HEGIS/IPEDS institutional characteristics.

Method of analysis. We report results on two sets of logistic regressions. In the first set the dependent variable is defined by institutions that could have dropped the field (i.e., the field existed at the institution in 1970–1) and did drop the field during the study period. These institutions are compared against those that could have dropped the field but did not drop it during the study period. In the second analysis the dependent variable is defined by institutions that could have adopted the field (i.e., the field did not exist at the institution in 1970–1) and did adopt the field during the study period. These institutions are compared against those that could have adopted the field but did not adopt it during the study period. We include this second set of regressions, because study of adoptions of declining fields provides additional evidence on the institutional characteristics associated with the preservation of vulnerable fields.

Although some variables in our models (notably, log enrollment and public sector) were correlated ($r = 0.62$), variance inflation factors were within tolerable ranges. The model generated good fits for the great majority of fields, and key variables achieved statistical significance despite collinearity. For example, log enrollment achieved statistical significance for drops and adoptions in all fields included in the analyses, and public sector location also showed statistically significant results for most fields. All relationships must, of course, be interpreted net of covariates; coefficients represent the influence of variables among schools that are otherwise equal.

Results

Declining Academic Fields, 1970–2006

In Table 1, we identify 22 declining fields from the study period, each one of which existed in at least 5% of U.S. four-year colleges and universities in 1970–1 (see Table 1). Ten of these fields were found at more than half of all four-year colleges and universities in 1970–1. We char-

acterize these as "core fields." We observed both absolute and relative declines for five of these fields: Romance languages/literatures, sociology, economics, history, and physics. Absolute declines for the last four were minor, however. The remaining five fields—mathematics/statistics, English, chemistry, education, and biology—experienced relative but not absolute declines. We next report fields that were relatively widespread in 1970–1, existing at more than 20% but fewer than 50% of colleges and universities. We characterize these as "mass fields." Four of these five fields—Germanic languages/literatures, home economics, classics, and geography—experienced absolute as well as relative declines, while the fifth, geology/earth sciences, experienced relative decline only. Finally, we report results for seven "niche fields," those found at more than 5% but less than 20% of institutions in 1970–1. Each one of these fields experienced both absolute and relative declines, and four of the fields—administrative assistant/secretarial science, zoology, library science, and botany—experienced absolute declines of 50% or more during the study period. These four fields nearly became extinct during the period.

Altogether, 16 of the 22 declining fields (73%) were "pure," or basic, fields in the arts and sciences, and only six (education, home economics, administrative assistants, library science, agronomy/crop science, and industrial engineering) were applied occupational-professional fields. Thus a key finding in Table 1 is that many disciplines in the arts and sciences showed declining prevalence during the period. Notably, these data show that some mathematics-based disciplines (fields such as mathematics, physics, chemistry, and economics) have not kept pace in an expanding system. Many other pure disciplines (fields such as sociology, English, and history) have also not fared particularly well in an expanding system, or, in the cases of European languages and literatures, have fared poorly.

Five Types of Decline

In Table 2, we report results for our analysis of the sources of declining prevalence. Table 2 provides evidence of five forms of decline found in these data. The first and most dramatic form of decline combines many more drops than adoptions in continuing schools, with significantly lower prevalence in new as compared to failed schools. This form of decline was found in all fields that experienced the steepest absolute declines during the period, including administrative assistants/secretarial science, Germanic languages/literatures, romance languages/literatures, zoology, botany, library science, Slavic languages/literatures, home economics, and classics. The second form of decline consists of

TABLE 1
Absolute and Relative Declines in Degree Fields, 1971–2006

Field	*N* of Schools w/ Field			% of Schools w/ Field		
	1971	2006	Diff.	1971 (*N* = 1263)	2006 (*N* = 1416)	Diff.
Core Fields (Institutionalization > 50% in 1971)						
Romance Languages/Literature	955	830	-125	75.6	58.6	-17.0
History	1,157	1,155	-2	91.6	81.6	-10.0
Sociology*	974	959	-15	77.1	67.7	-9.4
Mathematics and Statistics	1,131	1,137	6	89.5	80.3	-9.3
English	1,196	1,218	22	94.7	86.0	-8.7
Chemistry	1,014	1,028	14	80.3	72.6	-7.7
Economics	707	699	-8	56.0	49.4	-6.6
Physics	672	671	-1	53.2	47.4	-5.8
Education: Teaching and Curriculum	1,005	1,066	61	79.6	75.3	-4.3
Biology/Life Sciences*	1,118	1,199	81	88.5	84.7	-3.8
Mass Fields (Institutionalization 20–49% in 1971)						
Germanic Languages/Literatures	558	377	-181	44.2	26.6	-17.6
Home Economics/Consumer Science	362	315	-47	28.7	22.2	-6.4
Classical Languages/Literatures	272	238	-34	21.5	16.8	-4.7
Geography	282	273	-9	22.3	19.3	-3.0
Geology/Earth Sciences	350	385	35	27.7	27.2	-0.5
Niche Fields (Institutionalization 5–19% in 1971)						
Administrative Assistant/Secretarial Science*	211	17	-194	16.7	1.2	-15.5
Zoology*	136	58	-78	10.8	4.1	-6.7
Library Science	83	10	-73	6.6	0.7	-5.9
Slavic Languages/Literatures	179	131	-48	14.2	9.3	-4.9
Botany*	100	45	-55	7.9	3.2	-4.7
Agronomy/Crop Science*	64	43	-21	5.1	3.0	-2.0
Industrial Engineering*	112	99	-13	8.9	7.0	-1.9

Sources. U.S. Department of Education, National Center for Education Statistics (1971, 2009).
Notes. * Denotes fields that have not been aggregated. See Appendix A for a listing of academic fields included in each category in 1971 and 2006.

lower prevalence in new as compared to failed schools combined with relative stability but high levels of "churning" in colleges and universities that persisted throughout the period. Fields marked by high levels of churning experienced both many adoptions and many drops. These fields included physics, sociology, and economics. While net change had mainly to do with the failure of these fields to be adopted in new organizations, turbulence in continuing organizations could be a prelude to steeper future declines, because of the high number of drops characteristic of these fields. The third form of decline is similar: decreased prevalence in new schools, as compared to failed schools, and relative stability in the continuing schools. However, these fields—English, mathematics/statistics, and history—showed little churning, which may suggest a lower likelihood of subsequent decline. The fourth form of decline consists of many more drops than adoptions in continuing schools, with similar levels of prevalence in new as compared to failed schools. By holding their own in new schools, the retreat from these fields in continuing schools is at least slightly dampened. These fields included geography and geology/earth sciences. The fifth form of decline consists of more adoptions than drops in the continuing schools, but lesser prevalence in new as compared to failed schools. The fields described by this form of decline included education, chemistry, and biology. These fields were in a relatively strong position compared to the others, because their position within the continuing, more stable set of colleges and universities was improving rather than deteriorating. The only reason for their declining prevalence was lower popularity in newly established schools.

From these data, we draw two principal conclusions: First, in the majority of cases, declining prevalence was the result of the failure of fields to keep pace in colleges and universities established during the period, rather than the result of high rates of drops in colleges and universities that continued throughout the period.[5] Second, the level of threat experienced by a field depends on the form of its decline. Only the first form of decline described above is truly devastating for a field. Lesser prevalence in new organizations, combined with high levels of churning in the continuing schools, may represent another unfavorable position, but more research will be necessary to determine if this is so.

Institutional Locations of Drops and Adoptions

Table 3 reports the institutional characteristics of colleges and universities that offered declining fields in 1970–1 and dropped the fields by the end of the period. We report results for logistic regressions focusing on fields that were present in at least 20% of colleges and universities in

TABLE 2
Presence of Fields by Type of School

Field	Failed Schools (N = 143)		New Schools (N = 296)		Continuing Schools (N = 1,120)			
	Not Present	Present	Not Present	Present	Never Had	Adopted	Dropped	Kept
Core Fields (Institutionalization > 50% in 1971)								
Romance Languages/Literature	65	78	240	56	156	87	190	687
History	39	104	183	113	30	37	48	1005
Sociology*	64	79	234	62	103	122	120	775
Mathematics and Statistics	50	93	198	98	28	54	53	985
English	28	115	160	136	15	24	23	1058
Chemistry	80	63	233	63	83	86	72	879
Economics	109	34	262	34	327	120	128	545
Physics	119	24	272	24	367	105	106	542
Education: Teaching and Curriculum	55	88	162	134	111	92	77	840
Biology/Life Sciences*	46	97	170	126	25	74	22	999
Mass Fields (Institutionalization 20–49% in 1971)								
Germanic Languages/Literatures	126	17	288	8	524	55	227	314
Home Economics/Consumer Science	116	27	263	33	708	77	130	205
Classical Languages/Literatures	134	9	294	2	785	72	99	164
Geography	138	5	282	14	798	45	63	214
Geology/Earth Sciences	134	9	280	16	696	83	55	286
Niche Fields (Institutionalization 5–19% in 1971)								
Administrative Assistant/ Secretarial Science*	136	7	293	3	906	10	200	4
Zoology*	139	4	295	1	978	10	85	47
Library Science	140	3	295	1	1,038	2	73	7
Slavic Languages/Literatures	138	5	294	2	907	39	84	90
Botany*	140	3	296	0	1,016	7	59	38
Agronomy/Crop Science*	142	1	296	0	1,046	11	31	32
Industrial Engineering*	140	3	294	2	983	28	40	69

Sources. U.S. Department of Education, National Center for Education Statistics (1971, 2009).
Notes. * Denotes fields that have not been aggregated. See Appendix A for a listing of academic fields included in each category in 1971 and 2006.

1970–1. Because we do not consider the niche fields reported in Table 1, this reduces the number of fields in the analysis from 22 to 15. In Table 3, coefficients are odds ratios. Coefficients above 1.0 indicate a higher propensity to drop fields, net of covariates in the model, while coefficients below 1.0 indicate a lower propensity to drop fields.

Based on organizational ecology theories, we expected that high numbers of organizations offering the field in 1970 would be associated with higher number of drops. We also expected that larger organizations would be less likely to drop declining fields. Counter to our expectations, we found no consistent net associations between geographic regions with higher densities of adoption in 1970–1 and declining fields. Organizational size, however, showed a strong relationship with the preservation of declining fields. Net of covariates, higher enrollments were associated with the preservation of 14 of the 15 fields in the analysis. This suggests that larger institutions can generate a critical mass of faculty and students to continue to offer degrees in arts and sciences fields.

Based on interinstitutional stratification theories, we expected high-status organizations to be less likely to drop declining fields. We also expected doctoral granting institutions to be less likely to drop these fields. Findings for the organizational status index supported our expectations. The organizational status index showed a net positive association with preservation of declining fields in nine of the 13 cases where it would be expected to matter (i.e., in all fields except the occupational-professional fields of education and home economics). In the remaining four cases, the direction of the net association was as expected, but coefficients were not statistically significant. Results for doctoral-granting organizations, however, ran counter to our expectations. Net of covariates, these organizations were more rather than less likely to drop several basic fields.

Based on theories about the influence of demographic composition, we expected organizations enrolling higher proportions of minorities to be more likely to drop basic fields. We expected organizations enrolling higher proportions of women to be less likely to drop traditionally female fields, and we expected organizations enrolling higher proportions of international students to be less likely to drop business and technology fields. We found partial support for each of these expectations. Colleges and universities enrolling higher proportions of minorities showed a significant net propensity to drop several, but by no means all, of the 13 basic fields in this analysis, and, in particular, showed no significant net propensity to drop scientific fields. Those colleges and universities

TABLE 3

Logistic Regressions—Characteristics of Institutions Dropping Declining Fields

Independent Variable	English	Classics	Romance Lang.	Germanic Lang.	History
Organizational Ecology					
Log total enrollment	0.313*	0.761	0.471***	0.357***	0.261***
	(0.159)	(0.297)	(0.079)	(0.078)	(0.083)
N w/ field in region 1970	0.954	0.963	0.992	0.999	0.924
	(0.072)	(0.143)	(0.026)	(0.043)	(0.047)
Inter-Institutional Stratification					
Organizational status index	0.883	0.514***	0.673***	0.707***	0.871
	(0.166)	(0.066)	(0.049)	(0.047)	(0.093)
Doctoral-granting	3.904	0.307*	1.524	0.764	3.359+
	(3.708)	(0.162)	(0.489)	(0.237)	(2.147)
Baccalaureate-granting	1.217	0.500	0.772	0.327**	0.322*
	(0.967)	(0.290)	(0.212)	(0.113)	(0.154)
Demographic Composition					
% Minority	1.018*	1.003	1.009*	1.035***	1.018**
	(0.009)	(0.016)	(0.004)	(0.009)	(0.006)
% Women	0.960+	1.011	1.002	1.013	0.995
	(0.023)	(0.016)	(0.009)	(0.012)	(0.015)
% International	1.050	0.925	0.913*	0.971	1.020
	(0.047)	(0.071)	(0.035)	(0.039)	(0.042)
Demographic Composition					
% Liberal arts degrees 1970	0.907**	0.965+	0.973**	0.967**	0.964*
	(0.031)	(0.018)	(0.009)	(0.011)	(0.016)
Public	1.528	0.303+	1.042	0.888	0.650
	(1.218)	(0.204)	(0.311)	(0.338)	(0.360)
Observations	1066	263	866	535	1038
Pseudo R^2	0.261	0.400	0.182	0.258	0.180
AIC	150.9	230.9	757.2	560.5	310.2
BIC	205.6	270.2	809.6	607.6	364.6

Sources. College Division of Barron's Educational Series (1999); U.S. Department of Education, National Center for Education Statistics (1971, 2009).

Notes. [1] Exponentiated coefficients; Standard errors in parentheses. [2] Table 3 reports only fields institutionalized at 20% or more colleges and universities in 1970. [3] Schools for which no Barron's Selectivity Measure was available in 2006 had their Barron's score imputed based upon their previously observed Barron's Selectivity Ranking (College Division of Barron's Educational Series, 1976, 1982, 1986, 1992, 1997; Fine, 1972). [4] Significance levels: + $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

TABLE 3 (*Continued*)
Logistic Regressions—Characteristics of Institutions Dropping Declining Fields

Independent Variable	Sociology	Economics	Geography	Education	Home Econ.
Organizational Ecology					
Log total enrollment	0.346***	0.281***	0.253***	0.623*	0.434**
	(0.073)	(0.067)	(0.084)	(0.146)	(0.113)
N w/ field in region 1970	0.989	0.957	0.773+	1.028	0.981
	(0.030)	(0.038)	(0.117)	(0.035)	(0.095)
Inter-Institutional Stratification					
Organizational status index	0.889+	0.531***	0.954	1.105	0.988
	(0.061)	(0.054)	(0.110)	(0.081)	(0.102)
Doctoral-granting	0.545	3.750***	1.292	1.713	1.198
	(0.286)	(1.469)	(0.641)	(0.735)	(0.463)
Baccalaureate-granting	0.407**	0.493*	0.379	0.549	1.169
	(0.121)	(0.173)	(0.271)	(0.228)	(0.559)
Demographic Composition					
% Minority	0.997	1.001	1.035**	1.023***	0.998
	(0.005)	(0.006)	(0.011)	(0.005)	(0.006)
% Women	1.015	1.006	0.997	0.993	0.992
	(0.009)	(0.012)	(0.026)	(0.014)	(0.014)
% International	1.117***	0.904+	1.000	1.066*	1.024
	(0.036)	(0.050)	(0.066)	(0.034)	(0.043)
Demographic Composition					
% Liberal arts degrees 1970	0.971**	0.984	0.974	1.075***	1.022
	(0.010)	(0.011)	(0.018)	(0.014)	(0.016)
Public	0.401*	0.684	0.463	4.339***	0.513
	(0.165)	(0.279)	(0.261)	(1.895)	(0.235)
Observations	883	666	276	903	331
Pseudo R^2	0.192	0.285	0.200	0.151	0.218
AIC	573.9	482.0	257.1	448.2	367.5
BIC	626.5	531.5	296.9	501.1	409.3

Sources. College Division of Barron's Educational Series (1999); U.S. Department of Education, National Center for Education Statistics (1971, 2009).
Notes. [1] Exponentiated coefficients; Standard errors in parentheses. [2] Table 3 reports only fields institutionalized at 20% or more colleges and universities in 1970. [3] Schools for which no Barron's Selectivity Measure was available in 2006 had their Barron's score imputed based upon their previously observed Barron's Selectivity Ranking (College Division of Barron's Educational Series, 1976, 1982, 1986, 1992, 1997; Fine, 1972). [4] Significance levels: + $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

TABLE 3 (*Continued*)
Logistic Regressions—Characteristics of Institutions Dropping Declining Fields

Independent Variable	Math.	Chemistry	Physics	Biology	Earth Sciences
Organizational Ecology					
Log total enrollment	0.248***	0.303***	0.510**	0.241**	0.340***
	(0.081)	(0.086)	(0.125)	(0.106)	(0.109)
N w/ field in region 1970	1.011	1.098*	0.976	0.996	0.942
	(0.043)	(0.041)	(0.050)	(0.062)	(0.102)
Inter-Institutional Stratification					
Organizational status index	0.423***	0.488***	0.456***	0.936	0.816+
	(0.066)	(0.068)	(0.056)	(0.124)	(0.088)
Doctoral-granting	1.002	1.313	0.674	5.839*	0.945
	(1.137)	(0.926)	(0.320)	(5.071)	(0.549)
Baccalaureate-granting	0.337*	0.507+	0.330**	0.638	0.331*
	(0.158)	(0.198)	(0.132)	(0.437)	(0.178)
Demographic Composition					
% Minority	0.996	0.988+	1.000	0.990	1.008
	(0.007)	(0.006)	(0.007)	(0.011)	(0.011)
% Women	1.015	1.027*	1.033*	0.980	1.008
	(0.014)	(0.012)	(0.017)	(0.021)	(0.021)
% International	1.029	1.059	1.025	1.055	1.070
	(0.054)	(0.045)	(0.043)	(0.059)	(0.066)
Demographic Composition					
% Liberal arts degrees 1970	0.991	0.990	0.974+	0.980	0.961*
	(0.015)	(0.013)	(0.013)	(0.023)	(0.017)
Public	0.226*	0.291*	0.0794***	3.407+	0.162**
	(0.138)	(0.150)	(0.038)	(2.508)	(0.097)
Observations	1026	939	638	1010	339
Pseudo R^2	0.315	0.272	0.346	0.100	0.217
AIC	291.8	377.5	384.2	184.6	254.8
BIC	346.1	430.8	433.3	238.7	296.9

Sources. College Division of Barron's Educational Series (1999); U.S. Department of Education, National Center for Education Statistics (1971, 2009).
Notes. [1] Exponentiated coefficients; Standard errors in parentheses. [2] Table 3 reports only fields institutionalized at 20% or more colleges and universities in 1970. [3] Schools for which no Barron's Selectivity Measure was available in 2006 had their Barron's score imputed based upon their previously observed Barron's Selectivity Ranking (College Division of Barron's Educational Series, 1976, 1982, 1986, 1992, 1997; Fine, 1972). [4] Significance levels: + $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

enrolling higher proportions of women showed limited net associations with the preservation of traditional liberal arts fields, and they showed significant net negative associations with the preservation of two hard science fields: chemistry and physics. Those enrolling higher proportions of international students showed significant net positive associations with the preservation of economics, the declining field most closely aligned with business, and significant net negative associations with two fields rarely associated with business: sociology and education. However, they did not show significant net positive associations with the preservation of fields in the sciences.

Based on theories about the influence of historical traditions, we expected institutions awarding high proportions of liberal arts degrees in 1970 to be associated with preservation of declining arts and sciences fields. We also expected that public institutions would be more likely to preserve science and technology fields. These expectations were largely supported. Historical traditions favoring the liberal arts showed significant net associations in the expected direction for eight of the 13 fields in which they could be expected to matter (all fields except education and home economics), and the expected direction of association in the remaining five fields. Results were stronger for humanities and social science fields than for natural science fields. Public institutions showed significant net associations in the expected direction for all natural science fields. In addition, public institutions showed a higher net propensity to preserve two nonscience liberal arts fields (classics and sociology) as well as a nonsignificant but positive association with the preservation of three other liberal arts fields (history, economics, and geography).

We now turn to a second source of preservation of vulnerable fields, adoption of declining fields by institutions that did not previously offer them. Table 4 examines colleges and universities that did not offer the fields in 1970–1 and identifies the characteristics of institutions that adopted the fields by the end of the period. As in Table 3, coefficients are odds-ratios. Coefficients above 1.0 indicate a higher propensity to adopt declining fields, net of covariates in the model, while coefficients below 1.0 indicate a lower propensity to adopt fields. Results for English, history, mathematics, and biology should be treated with extreme caution, because these fields were very prevalent in 1970-1 and therefore only a small number of institutions that continued throughout the period would have had the opportunity to adopt them.

Where net associations for adoptions were statistically significant, they were generally consistent with our findings for drops. Density

TABLE 4

Logistic Regressions—Characteristics of Institutions Adopting Declining Fields

Independent Variable	English	Classics	Romance Lang.	Germanic Lang.	History
Organizational Ecology					
Log total enrollment	3.126	3.560***	2.416**	2.323**	1.339
	(2.491)	(1.010)	(0.675)	(0.647)	(0.553)
N w/ field in region 1970	0.803	0.782*	1.013	0.981	0.947
	(0.144)	(0.092)	(0.036)	(0.062)	(0.062)
Inter-Institutional Stratification					
Organizational status index	1.226	1.721***	1.195*	1.271**	1.210
	(0.299)	(0.169)	(0.107)	(0.110)	(0.183)
Doctoral-granting	2.375	1.864	0.492	1.212	0.538
	(7.287)	(0.876)	(0.333)	(0.695)	(0.699)
Baccalaureate-granting	8.041	2.947*	1.348	3.363**	0.434
	(14.338)	(1.305)	(0.556)	(1.399)	(0.317)
Demographic Composition					
% Minority	1.003	1.000	0.977**	0.962**	0.999
	(0.025)	(0.009)	(0.007)	(0.012)	(0.009)
% Women	1.165*	1.008	1.052**	1.021	1.085**
	(0.070)	(0.015)	(0.020)	(0.014)	(0.034)
% International	0.866	0.912	0.977	1.071+	0.975
	(0.166)	(0.054)	(0.042)	(0.042)	(0.083)
Demographic Composition					
% Liberal arts degrees 1970	0.956	1.053***	1.021+	1.032**	0.983
	(0.047)	(0.013)	(0.012)	(0.013)	(0.027)
Public	0.228	0.378*	0.995	1.146	0.597
	(0.422)	(0.183)	(0.419)	(0.506)	(0.441)
Observations	36	839	236	567	64
Pseudo R^2	0.457	0.321	0.174	0.175	0.170
AIC	47.59	352.5	278.8	319.9	94.37
BIC	65.01	404.6	316.9	367.6	118.1

Sources. College Division of Barron's Educational Series (1999); U.S. Department of Education, National Center for Education Statistics (1971, 2009)

Notes. [1] Exponentiated coefficients; Standard errors in parentheses. [2] Table 3 reports only fields institutionalized at 20% or more colleges and universities in 1970. [3] Schools for which no Barron's Selectivity Measure was available in 2006 had their Barron's score imputed based upon their previously observed Barron's Selectivity Ranking (College Division of Barron's Educational Series, 1976, 1982, 1986, 1992, 1997; Fine, 1972). [4] Significance levels: + $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

TABLE 4 (*Continued*)
Logistic Regressions—Characteristics of Institutions Adopting Declining Fields

Independent Variable	Sociology	Economics	Geography	Education	Home Econ.
Organizational Ecology					
Log total enrollment	3.625***	2.841***	2.804***	1.253	1.099
	(1.099)	(0.653)	(0.871)	(0.382)	(0.238)
N w/ field in region 1970	0.999	0.953	1.202	1.027	1.022
	(0.045)	(0.040)	(0.159)	(0.045)	(0.083)
Inter-Institutional Stratification					
Organizational status index	1.092	1.929***	1.017	0.707***	0.947
	(0.107)	(0.211)	(0.113)	(0.064)	(0.068)
Doctoral-granting	2.254	0.922	0.492	0.989	1.609
	(2.060)	(0.471)	(0.281)	(0.701)	(0.699)
Baccalaureate-granting	2.886*	1.364	0.253+	0.583	0.700
	(1.287)	(0.489)	(0.204)	(0.254)	(0.266)
Demographic Composition					
% Minority	1.025**	0.990+	0.990	0.998	1.010+
	(0.008)	(0.006)	(0.008)	(0.012)	(0.005)
% Women	1.064***	0.995	0.983	1.007	1.033*
	(0.020)	(0.013)	(0.023)	(0.013)	(0.013)
% International	0.830**	0.957	0.869	0.905+	0.971
	(0.051)	(0.035)	(0.077)	(0.051)	(0.043)
Demographic Composition					
% Liberal arts degrees 1970	1.007	1.024*	1.018	0.993	0.988
	(0.012)	(0.011)	(0.014)	(0.014)	(0.010)
Public	0.908	2.383*	9.665***	0.473	1.625
	(0.412)	(0.868)	(5.342)	(0.279)	(0.565)
Observations	219	436	826	199	771
Pseudo R^2	0.248	0.247	0.306	0.220	0.065
AIC	248.8	408.4	264.4	235.9	490.2
BIC	286.0	453.3	316.3	272.2	541.3

Sources. College Division of Barron's Educational Series (1999); U.S. Department of Education, National Center for Education Statistics (1971, 2009)
Notes. [1] Exponentiated coefficients; Standard errors in parentheses. [2] Table 3 reports only fields institutionalized at 20% or more colleges and universities in 1970. [3] Schools for which no Barron's Selectivity Measure was available in 2006 had their Barron's score imputed based upon their previously observed Barron's Selectivity Ranking (College Division of Barron's Educational Series, 1976, 1982, 1986, 1992, 1997; Fine, 1972). [4] Significance levels: + $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

TABLE 4 (*Continued*)

Logistic Regressions—Characteristics of Institutions Adopting Declining Fields

Independent Variable	Math.	Chemistry	Physics	Biology	Earth Sciences
Organizational Ecology					
Log total enrollment	2.791+	2.345**	2.345***	2.001	2.823***
	(1.566)	(0.723)	(0.562)	(0.851)	(0.675)
N w/ field in region 1970	1.014	0.919+	0.959	0.988	0.900
	(0.055)	(0.041)	(0.043)	(0.051)	(0.082)
Inter-Institutional Stratification					
Organizational status index	0.814	1.449**	2.129***	0.921	1.223*
	(0.157)	(0.164)	(0.232)	(0.137)	(0.098)
Doctoral-granting	0.746	1.411	1.169	3.774	0.521
	(1.108)	(1.332)	(0.693)	(4.086)	(0.240)
Baccalaureate-granting	1.405	3.206*	2.010*	7.176*	1.690
	(1.069)	(1.624)	(0.704)	(6.038)	(0.678)
Demographic Composition					
% Minority	0.991	1.002	1.013*	0.998	0.986*
	(0.011)	(0.007)	(0.005)	(0.013)	(0.007)
% Women	0.969	1.044*	0.978+	1.045	1.015
	(0.039)	(0.019)	(0.012)	(0.033)	(0.014)
% International	0.697*	0.989	0.982	0.932	1.048
	(0.112)	(0.057)	(0.035)	(0.076)	(0.039)
Demographic Composition					
% Liberal arts degrees 1970	0.999	0.993	1.010	0.974	1.022*
	(0.020)	(0.012)	(0.011)	(0.019)	(0.011)
Public	4.860	1.500	3.108**	0.577	7.466***
	(4.967)	(0.744)	(1.164)	(0.487)	(2.887)
Observations	76	163	464	92	763
Pseudo R^2	0.271	0.142	0.235	0.167	0.244
AIC	89.91	215.6	399.7	102.2	418.8
BIC	115.5	249.6	445.3	130.0	469.8

Sources. College Division of Barron's Educational Series (1999); U.S. Department of Education, National Center for Education Statistics (1971, 2009)

Notes. [1] Exponentiated coefficients; Standard errors in parentheses. [2] Table 3 reports only fields institutionalized at 20% or more colleges and universities in 1970. [3] Schools for which no Barron's Selectivity Measure was available in 2006 had their Barron's score imputed based upon their previously observed Barron's Selectivity Ranking (College Division of Barron's Educational Series, 1976, 1982, 1986, 1992, 1997; Fine, 1972). [4] Significance levels: + $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

dependence measures continued to show low explanatory power. However, enrollment showed a statistically significant net association in the expected direction in every case; larger organizations were more likely to adopt. The same was true for the organizational status index; in every case but sociology and geography, higher-status organizations were more likely to adopt. Results for our other status measure, highest degree, ran counter to our expectations. Indeed, results for adoptions were more consistently positive and robust for baccalaureate-granting institutions, rather than for doctoral-granting institutions. As in the case of drops, colleges and universities enrolling higher proportions of minorities showed significant net negative associations with European languages and literatures, and organizations enrolling higher proportions of women showed significant net positive associations with adoption of several traditional liberal arts fields (English, romance languages and literatures, history, and sociology), as well as with adoption of home economics. As in the case of drops, organizations enrolling higher proportions of international students were less likely to adopt sociology and education. Results for liberal arts oriented colleges and universities and for public institutions were not as consistent in the case of adoptions as in case of drops.

In sum, each one of the four perspectives we used to investigate the characteristics of colleges and universities that drop declining fields received some support, but support was inconsistent and often weak for explanations based on demographic composition. Moreover, specific variables derived from the three other perspectives—organizational ecology, interinstitutional stratification, and historical traditions—provided more explanatory power than the perspectives taken as a whole. The most important explanatory variables were organizational size, organizational status, and a tradition of support for the liberal arts. Public institutions also showed surprising support, not only for scientific fields, as expected, but also for basic fields in humanities and social sciences. Based on our findings, we conclude that the geographic context is less important as an influence on the dropping of declining fields than to the adoption of new fields (Brint et al., 2011), perhaps because drops expand and redistribute niche space geographically among those institutions continuing to offer declining programs. We also conclude that functional bases of status differentiation, as measured by highest degrees awarded, are less important to the dynamics of decline than status differentiation based on wealth and selectivity.

Discussion

This paper makes four major contributions to the study of institutional change in U.S. four-year colleges and universities:

1. It identifies 22 fields that experienced declining prevalence during the period. The list qualifies the conclusions of some early scholars of declining fields that these fields are concentrated among those studied mainly by women, among those serving disadvantaged populations (Slaughter, 1993) or among those located in the humanities (see, e.g., Delbanco, 1999). Many declining fields during the period (such as mathematics and statistics, chemistry, economics, physics, geography, geology, agronomy, and industrial engineering) were science fields. They were neither populated primarily by women nor mainly served disadvantaged populations.

2. The paper shows that declining prevalence is more common than absolute decline. Of the 10 largest fields that showed declining prevalence, only five showed absolute declines as well—and these absolute declines were, for the most part, minor. We found absolute declines in 50 or more colleges and universities only in the cases of European languages and literatures, library science, zoology, botany, and secretarial science.

3. The paper defines five forms of decline. We identified more and less salutary forms of decline, showing that the most important form involves both declining prevalence in new organizations, as compared to failed organizations, and many more drops than adoptions in the continuing schools. Declining prevalence in new schools, combined with high levels of "churning" in continuing schools, may be a second unfavorable condition, but further research will be necessary to determine whether this is so.

4. The paper examines the utility of four conceptual frameworks for explaining patterns of decline and demonstrates that specific variables derived from three of the conceptual frameworks—organizational size, organizational status, and traditions of support for the liberal arts—were particularly important for explaining patterns of decline. Future studies of declining fields may wish to focus on these key variables, rather than the four conceptual frameworks.

Our findings on institutional characteristics are particularly important for understanding what concrete colleges and universities are likely to do when faced with changing levels of support for academic fields. They suggest that larger institutions are relatively insulated from pressures to make dramatic changes. They have the student and faculty numbers to continue to offer a wide range of courses of study.

Smaller institutions, by contrast, must make tough decisions about what they will offer given changing student demand for curricula and the limited number of students on campus to support academic programs. High-status colleges and universities tend to retain traditional high-status fields, both because these fields retain their association with intellectuality and refinement and because many of their students will study more applied fields in their postgraduate years. Lower-status colleges and universities, by contrast, have greater incentives to offer students curricula that they will perceive as leading directly to jobs. Commitment to the liberal arts identity has much the same effect as high organizational status; prior investment in the liberal arts identity predisposes institutions to resist dropping basic fields in the arts and sciences.

Two findings from these analyses come as surprises and therefore merit further discussion. The first is that public control showed a strong net positive association with the preservation of declining fields, not just in the natural sciences where this would be expected, but in several of the humanities and social sciences as well. The second is that doctoral-granting universities were relatively unimportant for the preservation of arts and sciences fields, net of covariates.

As compared to public institutions, private institutions, with their higher tuitions and typically stronger endowments, would seem likely to be more interested in preserving traditional arts and sciences fields. To understand why our findings run counter to these expectations it is important to keep in mind that coefficients represent effects net of covariates in the models. In other words, as sector changes from private to public for institutions similar in size and status, arts and sciences fields had a higher probability of being preserved. Our findings indicate that large and high status institutions, whether public or private, tended to preserve arts and sciences fields. However, at lower levels in the size and status hierarchies other pressures and incentives on public and private institutions evidently come into play. We can speculate about what these pressures and incentives may be. In the first place, public institutions are at least partially insulated from the market due to the support they receive from states. This may somewhat reduce the priority senior administrators place on responding to market signals. It is also possible that the self-image of academic leaders in the two sectors differs in ways that support curricular traditionalism in the public sector.[6] Moreover, leaders of public institutions may encounter more obstacles to eliminating programs, given the norms of transparency and many levels of review required to make changes in public universities (for sug-

gestive evidence, see, e.g., Gumport, 1993; Melchiori, 1982; Reinardy & Halter, 1994).

As compared to master's- or baccalaureate-granting institutions, doctoral-granting institutions, the producers of new knowledge and new faculty, would seem more likely to be interested in preserving traditional arts and sciences fields. Larger and higher-status doctoral institutions, like other large and high-status institutions, do tend to preserve the basic arts and sciences fields. However, our findings suggest that smaller and lower-status doctoral-granting institutions are not as inclined to do so. Again we can speculate about why this may be so. First, these institutions are located in very different resource environments than their larger and higher-status counterparts. They may preserve arts and science fields in which they offer doctoral programs, while at the same concentrating much of their attention on more popular occupational-professional degrees for undergraduates. Indeed, our previous research shows that doctoral-granting institutions are more supportive at the undergraduate level of applied business and technical fields, when compared to otherwise similar master's-granting and baccalaureate-granting institutions (Brint et al., 2010). Second, the incentives faced by baccalaureate-granting institutions are also important to consider. Our findings suggest that baccalaureate-granting institutions act to fill in liberal arts fields that they have not offered in the past more often than they abandon liberal arts fields that they have long offered. Based on these findings it seems likely that the liberal arts confer status in baccalaureate-granting colleges that they do not confer in the smaller and less prestigious doctoral-granting universities.

The findings of this study invite further reflection on the future of arts and sciences fields in U.S. four-year colleges and universities. Many arts and sciences fields are not keeping pace with the expanding numbers of colleges and universities in the United States, but decline has occurred at a relatively slow pace, particularly among fields that were widely represented at the beginning of our time period. The one exception is European languages and literatures. Paradoxically, the steep decline in European languages and literatures may speak at once to globalization and insularity. Asian and Middle Eastern languages and literatures grew during the period (Brint et al., 2010), while foreign language requirements as an element of general education remained roughly constant (Brint et al., 2009).

Apart from the serious problems experienced by European languages and literatures, we doubt that scholars will see especially worrisome signs of academic decay in the changes we found during the period covered by our study. However, one other development that may merit

sustained attention is the relative decline of three core natural science fields: mathematics, chemistry, and physics. Many commentators have pointed to the significance of new science and technology fields as engines of economic growth (see, e.g., Bush, 1945/1990; Geiger, 2004; Geiger & Sa, 2008; Graham & Diamond, 1998; Nelson, 1993). These are fundamental fields for scientific and technological progress, and the declining proportion of colleges and universities offering these fields may therefore be a matter for concern, even if decline has been evident so far mainly in smaller and less prestigious colleges and universities.

Our study ends prior to the "Great Recession" and the period of state disinvestment from public higher education that followed it. Further research will be necessary to determine whether these disruptive events led to the amplification of trends we observed during our study period—and whether they perhaps also led to vulnerabilities among previously unaffected academic fields.

Notes

[1] We checked for differences between our approach to measuring decline and an approach based on lists of degrees offered, as reported in college guides. We drew a random sample of 150 cases of inactive fields, based on our degree data, and compared these cases to lists of degrees offered by institutions in the College Blue Book (Romaniuk & Thompson, 2006). We found mismatches in 15 cases. This suggests that fields remain "on the books" approximately 10% of the time even when they are no longer awarding degrees.

[2] Estimates based on two years of degree data will have 1% unreliability compared to estimates based on three years of degree data. If we assume that error is randomly distributed, any error will tend to truncate the amount of variance we explain in our models. Some coefficients may therefore be understated by a trivial amount.

[3] Organizational ecologists would normally control for the number of organizations in a region, but our data showed correlations over 0.9 between number of institutions offering fields in 1970 and number of institutions in the region in 1970, creating insurmountable problems with collinearity when both variables were included in models.

[4] Based on consultation with the IPEDS lead analyst of financial data, Dr. Craig Bowen, we determined that valid comparisons could be made following the changes in accounting rules for private universities in 1997. For total expenses, lines E19 (FASB reporters) and C19 (for GASB reporters) are comparable (Bowen, personal communication).

[5] Both the new and failed schools during the period were composed disproportionately of small, religiously affiliated colleges. Such colleges often employ too few faculty members and enroll too few students to offer degrees in every field. The new schools also included many technical institutes and branch campuses of state universities whose missions focused on career preparation.

[6] One recent study, for example, showed that senior administrators in public research universities, when asked to choose among five descriptions, most often saw their institutions as providers of specialized knowledge in a wide range of fields serving many dif-

ferent constituencies. By contrast, senior administrators in private research universities more often saw their institutions as engines of creativity working at the cutting-edge of knowledge in fast-changing fields (Brint 2005). To the extent that these views translate into similar or related views at lower levels in the system, they would help to reinforce divergent priorities in the two sectors.

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ERRATUM

The publisher regrets that the following appendix was omitted from the article "Declining Academic Fields in U.S. Four-Year Colleges and Universities, 1970–2006" by S. Brint, K. Proctor, K. Mulligan, M. B. Rotondi, and R. A. Hanneman, 2012, *The Journal of Higher Education, 83*(4), pp. 582–613. Tables 1 and 2 reference this appendix.

Appendix A

The academic field categorizations in this paper rely on HEGIS subject code and IPEDS CIPCODE classifications. HEGIS subject codes were employed for academic fields observed in 1971, while IPEDS subject codes were employed for fields observed in 2006. For theoretical and empirical reasons, fields were sometimes aggregated into larger categories in order to preserve a field's integrity between the two time periods. Below is a list of fields from 1971 and 2006 that were included in the degree field categories used in this paper.

Administrative Assistant/Secretarial Science

HEGIS: Secretarial Studies.

IPEDS: Administrative Assistant and Secretarial Science, General.

Agronomy/Crop Science

HEGIS: Agronomy, Field Crops, and Crop Management.

IPEDS: Agronomy and Crop Science.

Biology/Life Sciences

HEGIS: Biology/Biological Sciences, General.

IPEDS: Biology/Biological Sciences, General.

Botany

HEGIS: Botany, General.

IPEDS: Botany/Plant Biology.

Chemistry

HEGIS: Chemistry, General; Inorganic Chemistry; Organic Chemistry; and Physical Chemistry.

IPEDS: Analytical Chemistry; Chemistry, General; Chemistry, Other; Organic Chemistry; and Physical and Theoretical Chemistry.

Classical Languages/ Literatures

HEGIS: Classics; Greek, Classical; and Latin.

IPEDS: Ancient/Classical Greek Language and Literature; Classics/Classical Languages, Literatures, & Linguistics, General; and Latin Language and Literature.

Economics

HEGIS: Economics.

IPEDS: Applied Economics; Development Economics and International Development; Econometrics and Quantitative Economics; Economics, General; Economics, Other; and International Economics.

Education

HEGIS: Adult and Continuing Education; Art Education (Methodology and Theory); Business, Commerce, and Distributive Education; Curriculum and Instruction; Driver and Safety Education; Education of the Culturally Disadvantaged; Education of the Deaf; Education of the Emotionally Disturbed; Education of the Gifted; Education of the Mentally Retarded; Education of the Multiple Handicapped; Education of the Physically Handicapped; Education of the Visually Handicapped; Education, Other; Education, General; Elementary Education, General; Health Education (includes Family Life Education); Junior High School Education; Junior and Community College Education; Mathematics Education (Methodology and Theory); Music Education (Methodology and Theory); Physical Education, Physical Education 7–12; Pre-Elementary Education (Kindergarten); Reading Education (Methodology and Theory); Science Education (Methodology and Theory); Secondary Education, General; Social Foundations (History and Philosophy of Education); Special Education, General; Special Learning Disabilities; Speech Correction; Student Personnel-Counseling and Guidance; and Teaching of English as a Foreign Language.

IPEDS: Adult and Continuing Education and Teaching; Agricultural Teacher Education; Art Teacher Education; Bilingual and Multilingual Education; Biology Teacher Education; Business Teacher Education; Chemistry Teacher Education; College Student Counseling and Personnel Services; Community College Education; Computer Teacher Education; Counselor Education/School Counseling and Guidance Services; Curriculum and Instruction; Drama and Dance Teacher Education; Early Childhood Education and Teaching; Education, General; Education, Other; Education/Teaching Individuals—Early Childhood Special Education Programs; Education/Teaching Individuals—Hearing Impairments; Education/Teaching Individuals—Orthopedic/Other Physical Impairments; Education/Teaching Individuals—Specific Learning Disabilities; Education/Teaching Individuals—Speech or Language Impairments; Education/Teaching Individuals—Vision Impairments/Blindness; Education/Teaching of Individuals with Emotional Disturbances; Education/Teaching of Individuals with Mental Retardation; Education/Teaching of Individuals with Multiple Disabilities; Educational/Instructional Media Design; Elementary Education and Teaching; English/Language Arts Teacher Education; Family and Consumer Sciences/Home Economics Teacher Education; Foreign Language Teacher Education; French Language Teacher Education; Geography Teacher Education; German Language Teacher Education; Health Occupations Teacher Education; Health Teacher Education; History Teacher Education; Indian/Native American Education; Junior High/Intermediate/Middle School Education and Teaching; Kindergarten/Preschool Education and Teaching; Latin Teacher Education; Mathematics Teacher Education; Montessori Teacher Education; Music Teacher Education; Physical Education Teaching and Coaching; Physics Teacher Education; Psychology Teacher Education; Reading Teacher Education; Sales & Marketing Operations/Marketing & Distribution Teacher Education; School Librarian/School Library Media Specialist; Science Teacher Education/General Science Teacher Education; Secondary Education and Teaching; Social Science Teacher Education; Social Studies Teacher Education; Social and Philosophical Foundations of Education; Spanish Language Teacher Education; Special Education and Teaching, General; Special Education and Teaching, Other; Speech Teacher Education; Student Counseling and Personnel Services, Other; Teacher Education, Multiple Levels; Teacher Education/Professional Development, Levels and Methods, Other; Teacher Education/Professional Development, Subject Areas, Other; Teaching Assistants/Aides, Other; Teaching English as Second/Foreign Language/ESL Language Instructor; Technical Teacher Education; Technology Teacher Education/Industrial Arts Teacher Education; Trade and Industrial Teacher Education; Urban Education and Leadership; and Waldorf/Steiner Teacher Education.

Slavic Languages/ Literatures

HEGIS: Russian; Slavic Languages (Other Than Russian).

IPEDS: Czech Language and Literature; Polish Language and Literature; Russian Language and Literature; Slavic Languages, Literatures, and Linguistics, General; and Slavic/ Baltic/Albanian Languages, Literatures, and Linguistics, Other.

Geography

HEGIS: Geography.

IPEDS: Cartography; Geography; and Geography, Other.

Geology/Earth Sciences

HEGIS: Earth Sciences, General; Geology; and Oceanography.

IPEDS: Geology/Earth Science, General; Oceanography, Chemical and Physical.

Germanic Languages/Literature

HEGIS: German; Scandinavian Languages.

IPEDS: Danish Language and Literature; German Language and Literature; Germanic Languages, Literatures, and Linguistics, General; Germanic Languages, Literatures, and Linguistics, Other; Norwegian Language and Literature; Scandinavian Languages, Literatures, and Linguistics; and Swedish Language and Literature.

History

HEGIS: History.

IPEDS: American History (United States); Asian History; European History; History and Philosophy of Science and Technology; History, General; History, Other; Public/Applied History and Archival Administration.

Home Economics/Consumer Science

HEGIS: Clothing and Textiles; Consumer Economics and Home Management; Family Relations and Child Development; Foods and Nutrition (including Dietetics); Home Decoration and Home Equipment; Home Economics, General; and Institutional Management & Cafeteria Management.

IPEDS: Adult Development and Aging; Apparel and Textile Manufacture; Apparel and Textile Marketing Management; Apparel and Textiles, General; Business Family and Consumer Sciences/Human Sciences; Child Care Provider/Assistant; Child Care and Support Services Management; Child Development; Consumer Economics; Consumer Merchandising/Retailing Management; Consumer Services and Advocacy; Facilities Planning and Management; Family Resource Management Studies, General; Family Systems; Family and Community Services; Family and Consumer Economics and Related Services, Other; Family and Consumer Sciences/Human Sciences Communication; Family and Consumer Sciences/Human Sciences, General; Family and Consumer Sciences/Human Sciences, Other; Family/Consumer Sciences/Human Sciences Business Services, Other; Fashion and Fabric Consultant; Foods, Nutrition, and Related Services, Other; Foods, Nutrition, and Wellness Studies, General; Foodservice Systems Administration/Management; Housing and Human Environments, General; Housing and Human Environments, Other; Human Development and Family Studies, General; Human Development, Family Studies, and Related Services, Other; Human Nutrition; and Work and Family Studies.

Industrial Engineering

HEGIS: Industrial and Management Engineering.

IPEDS: Industrial Engineering.

English

HEGIS: English Literature; English, General; Letters, Other; and Speech, Debate, & Forensic Science (Rhetoric & Public Address).

IPEDS: American Literature (United States); English Language and Literature, General; English Language and Literature/Letters, Other; English Literature (British and Commonwealth); and Speech and Rhetorical Studies.

Library Science

HEGIS: Library Science Other; Library Science, General.

IPEDS: Library Science/Librarianship.

Mathematics and Statistics

HEGIS: Applied Mathematics; Mathematics, Other; Mathematics, General; and Statistics, Mathematics and Theoretical.

IPEDS: Applied Mathematics; Applied Mathematics, Other; Computational Mathematics; Mathematical Statistics and Probability; Mathematics and Statistics, Other; Mathematics, General; Mathematics, Other; Statistics, General; and Statistics, Other.

Physics

HEGIS: Molecular Physics; Nuclear Physics; and Physics, General (excluding Biophysics).

IPEDS: Atomic/Molecular Physics; Physics, General.

Romance Languages/Literature

HEGIS: French; Italian; and Spanish.

IPEDS: French Language and Literature; Italian Language and Literature; Portuguese Language and Literature; Romance Languages, Literatures, and Linguistics, General; Romance Languages, Literatures, and Linguistics, Other; Romanian Language and Literature; and Spanish Language and Literature.

Sociology

HEGIS: Sociology.

IPEDS: Sociology.

Zoology

HEGIS: Zoology, General.

IPEDS: Zoology/Animal Biology.