

**Expanding the Social Frame of Knowledge:
Interdisciplinary, Degree-granting Fields
in American Four-Year Colleges and Universities, 1975-2000**

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Abstract

The number of interdisciplinary, degree-granting fields in American colleges and universities has grown rapidly in recent decades. This paper demonstrates that socially incorporative programs (such as women's studies, ethnic studies, and nonwestern area studies) are responsible for a large share of this growth. The paper also shows that these fields have diffused widely over time, while other interdisciplinary fields have not. Variables based on ecological features of academic organizations provide a better guide to the location of interdisciplinary fields than variables based on student demographic composition or organizational stratification. Most studies of interdisciplinary change in academe have focused on external resource providers and new technology development. This study suggests that social movements are another important source of interdisciplinary change in academe.

While departments and disciplines continue to be the foundational organizational structures in colleges and universities (Abbott 2002), the growth of interdisciplinary research and teaching is now widely recognized as a notable feature of academic change over the last 30 years. Research has shown both a sharp increase in interdisciplinary collaborative research (Javits and Grimes 2006) and growing investments by national science agencies, states, and universities in interdisciplinary research (Geiger and Sa 2005; Brint 2005). The new interdisciplinary directions have articulate advocates in academe (see, e.g., Crow 2002; Duke University 1988; University of Southern California 1998), and prestigious national organizations have begun to produce a literature of “best practices” to facilitate interdisciplinary organization (Association of American Universities 2005; National Academy of Sciences 2004). The new environment supporting interdisciplinary work has influenced the value faculty members place on different forms of knowledge. In the 1960s and early 1970s, professors identified primarily with the intellectual projects of their disciplines (Blau 1973: chap. 8; Jencks and Riesman 1968: chap. 1). Today, professors are far more likely to say that interdisciplinary knowledge is better than knowledge obtained from a single discipline (Gross and Simmons 2007).

Interdisciplinary work has a long history in many disciplines, including education, gerontology, feminist studies, organization studies, and public policy (Abbott 2002; Geiger 1993; Slaughter 1993). Since the 1980s, state and private funding for interdisciplinary work has flowed into the natural and applied sciences (Brint 2005;

Slaughter and Leslie 1997; Slaughter and Rhoades 1996). Because the applied sciences are the primary recipients of external support, many higher education scholars have focused on changes in the funding and organization of science as the primary causes of growing interest in interdisciplinary work (see, e.g., Etzkowitz, Webster and Healey 1998; Feller 2005; Geiger 2004; Gibbons et al. 1994; Nelson 1993; Porter and Malone 1992; Powell and Owen-Smith 1998; Sa 2006; Stehr and Weingart 2000). Others have argued that external funding of the applied sciences has not been the cause of growing commitment to interdisciplinary work, but rather has turned attention away from the long history of researchers engaged in interdisciplinary projects located at a greater distance from the market (Slaughter 1993; see also Geiger 1993; Slaughter and Leslie 1997; Slaughter and Rhoades 1996).

Implicitly challenging both of these interpretations, Brint (2005) emphasized the combined force of efforts to promote technological innovation *and* social incorporation. In the arts, humanities, and social sciences, he argued, demographic and cultural changes encouraging the incorporation of under-represented populations (women, minorities, and non-western peoples) have strongly influenced the growth of interdisciplinary activities.¹ He argued further that university leaders developed an ideology in the 1980s and 1990s that brought these two sources of change under the same conceptual roof. This ideology stressed the importance of “creating the future” through programs encouraging both economic and social innovation. Other scholars have interpreted these developments as reflecting the increasing integration (or “embeddedness”) of universities in economy and society (Ramirez 2005).

In this paper, we will focus on one part of the larger picture of interdisciplinary change on campus: the growth and distribution of interdisciplinary, degree-granting programs for undergraduates. Consistent with developments noted by others (see, e.g., Association for Integrated Studies 2007; Edwards 1996; Klein 1996), we find that these curricula have grown substantially during the 25-year period of our study, far outstripping the rate of growth in student enrollments. We find further that emphases on new technology development are relatively unimportant in this domain, while emphases on the incorporation of under-represented groups are very important (see also Boxer 1997; Gates 1992; Karen 1991; Rojas 2007; Stimpson and Kressner Cobb 1986).

Thus, not only do the sources of interdisciplinarity vary by disciplinary domain (i.e., arts versus sciences), as Brint (2005) argued, but forms of institutionalization also appear to vary by disciplinary domain. In the natural and applied sciences, graduate umbrella groups and interdisciplinary research centers are primary vehicles of institutionalization (Brint 2005; Feller 2005; Geiger 2004). Our findings suggest that the introduction of new undergraduate curricula may, by contrast, play a comparatively larger role in the development of interdisciplinary work in the arts, humanities, and social sciences (see also Frank, Schofer, and Torres 1994; Levine and Cureton 1992; Oakley 1997).

The first part of the analysis focuses on patterns of growth over the period, 1975-2000. We focus both on the total number of interdisciplinary programs and on growth in each of nine large program areas. These program areas (in order of their frequency of representation) are: (1) non-western area and cultural studies; (2) race and ethnic studies; (3) western area and cultural studies; (4) environmental studies; (5) international

relations/global studies; (6) civic/governmental studies; (7) women's studies; (8) American studies, and (9) brain and biomedical sciences. We show that growth has been substantial over the period, but spread in a highly uneven way among fields. The socially incorporative fields (non-western cultural studies, American race and ethnic studies, and women's studies), the globally inclusive field of international relations/global studies, and the two science-based categories (environmental studies and brain and biomedical science) grew rapidly during the period. The other program areas have grown more slowly or have stagnated.

Drawing on the work of social power theorists, such as Pierre Bourdieu and Max Weber, higher education scholars have argued that power and contestation are endemic to the embedding of new knowledge within academic institutions (see especially Etzkowitz 1989; Geiger 2004; Slaughter 2002; Slaughter and Leslie 1997; Slaughter and Rhoades 1996; and Slaughter and Rhoades 2006). Following the lead of these scholars, our analysis of the growth and distribution of interdisciplinary programs is based on the assumption that the introduction of new fields typically involves identification and mobilization of new interests and opportunities, resistance by those who have a stake in existing structures, and contestation between coalitions of interested parties. This pattern has been particularly marked in the fields of race and ethnic studies (Gates 1992; Rojas 2007) and women's studies (Boxer 1998; Stimpson and Kressner Cobb 1986). Often advocates of socially incorporative curricula gain a foothold on campus only after vigorous contestation for curricular space. However, this pattern has been evident in the development of new fields in the natural (Etzkowitz 1989; Greenberg 2001) and social sciences (Haskell 1979) as well.

Within this context of struggle over curricular space, social scientists have proposed several explanatory frameworks for understanding the institutionalization of new fields on college and university campuses.² In the second part of the analysis, we will compare the explanatory power of four of these frameworks.

The first is a *diffusion* framework. Diffusion models explain change as a function of the efforts of organizations to improve stability and effectiveness. Innovations that improve stability and effectiveness tend to spread through personal networks (Coleman, Katz, and Menzel 1957) and organizational fields (Rogers 1962). Neo-institutionalism is the most popular current form of diffusion theory in organization studies. Neo-institutionalism argues that organizations will adopt innovations that improve their legitimacy by conforming to dominant models in their environments (DiMaggio and Powell 1983, 1991; Meyer et al. 1979; Schofer and Meyer 2005). Legitimacy can be conferred on models that appear to improve organizational responsiveness to important constituency groups, as well as those that appear to improve efficiency or organizational rationality.

The second is a *socio-demographic* framework. Socio-demographic models explain change as an outcome related to the representation of new constituencies on campus (Slaughter 1997, 2002; Smelser 1994). Such models lead to the expectation that higher proportions of women, minorities, and/or international students can, following mobilization, lead to new programs responsive to the interests of these groups. Sociologists who favor these models do not argue that socio-demographic change automatically translates into organizational change. Instead, student numbers must, first, be interpreted as a potential source for change, and then sufficiently activated to give rise

to powerful demands for change (see, e.g., Gates 1992; Karen 1991; Rojas 2006, 2007; Smelser 1994).

The third is an *organizational stratification* framework. Organizational stratification models explain change as a function of the unequal adoption of innovations due to inequalities in organizational resources, market power, or prestige of consumers (Frank 2001; Kraatz and Zajac 1996; Polodny 1993). We assume that financial resources and status are the primary scarce values over which colleges and universities compete (see, e.g., Clotfelter 1996; Ehrenberg 2000: chap. 4; Riesman and Jencks 1968: chap. 1). Status can be either intellectual or social, though intellectual status has been more important since the 1960s, in large part because it has become a politically and socially legitimate way to maintain and expand the financial health of academic organizations in the long term (for histories of the rise of “meritocracy” in elite institutions, see Karabel 2005; Lehman 1999; and Riesman and Jencks 1968: chap. 1). Interdisciplinary programs may be associated with more prestigious locations in academe because of their reputations for generating avant-garde or “cutting-edge” ideas and therefore attracting intellectually creative students and faculty (Brint 2005). However, because social status continues to be a factor in academe, organizational stratification can at times work in the opposite way as well; programs associated with lower-status populations can be interpreted as associated with diminished institutional status and therefore become less popular in elite than in non-elite institutions (for an example of this process in an earlier period, see Karabel 2005: chaps. 3-4).³

The fourth is an *organizational ecology* framework. Most ecological frameworks explain the behavior of organizations as an adaptation to the structure of the

organizational field, including both constraints imposed by other organizations and open niche spaces that offer opportunities (see, e.g., Carroll 1988; Hannan and Freeman 1977). Our approach to organizational ecology is slightly different in that our primary focus is intra-institutional, rather than inter-institutional (see also Olzak and Kangas 2007). We focus on the ecological conditions created by the existing structure of the organization itself. These conditions include, for example, the size of student enrollments under the assumption that larger enrollments create a critical mass of students (and faculty) to support new programs. They also include pre-existing curricular emphases, such as high proportions of students majoring in the arts and sciences fields, rather than occupational-professional, fields.

In the second analysis, we show that organizational ecology variables – notably, enrollment size and the proportion of arts and sciences to total degrees – are strongly associated with both the total number of undergraduate interdisciplinary programs, and interdisciplinary programs in most of the nine major program areas we investigate. Panel year, our indicator of diffusion, shows a significant association with socially incorporative programs, indicating that the existence of these programs may enhance the willingness of institutions to add more such programs. In addition, the proportion of women students has an influence on the growth of socially incorporative programs. The analyses provide little additional support for socio-demographic explanations of the growth of interdisciplinary programs and very little support for explanations based on organizational stratification.

In the conclusion of the paper, we discuss the implications of our findings for understanding interdisciplinary change in academe.

DATA AND METHODS

We define undergraduate interdisciplinary programs as “degree-granting programs that draw on faculty from more than one academic department.” We include programs that offer majors, minors, or both. We also require that colleges and universities identify these programs as interdisciplinary.⁴ We do not include programs that offer courses but no degrees.

Our analysis is based on counting programs that are typically organized as interdisciplinary units and excluding programs that are typically organized as departments. This distinction is necessary, because some colleges and universities employ the interdisciplinary program designation as a managerial resource: to maintain struggling fields of inquiry without providing permanent resources, or to provide a transitional location for upwardly mobile fields. To count all interdisciplinary programs, regardless of their typical form of organization, would be to confound these managerial expedencies with the underlying phenomena in which we are interested. Nearly all academic fields (including, for example, chemistry, psychology, and English) are organized in at least a few of our sample institutions as “interdisciplinary programs.”

We have adopted the following criterion for judging whether a field is typically organized as an interdisciplinary program or as a department: We looked at the organization of fields as departments and programs throughout the period of our study. If the field was organized two-thirds or more of the time as an interdisciplinary program, we counted it as typically organized as an interdisciplinary program. With the exception of the borderline case of film studies⁵, those fields organized less than two-thirds of the time as interdisciplinary programs were not counted. Thus, Latin American Studies was

counted as an interdisciplinary field, because 96 percent of the Latin American Studies units in our sample were interdisciplinary programs rather than departments. By contrast, Classics was not counted as an interdisciplinary field, because 72 percent of the Classics units in our sample were organized as departments rather than as interdisciplinary programs. The two-thirds criterion is cautious, but it clearly differentiates fields (such as geology, linguistics, and classics) that are occasionally organized as interdisciplinary programs from those that are typically organized as interdisciplinary programs.

The College Catalog Study Database

Because our study is explicitly interested in change over time, we could not rely on cross-sectional directories of interdisciplinary programs (Newell 1986; Edwards 1996; Association for Integrated Studies 2007). The existing directories also use different criteria for identifying interdisciplinary programs.⁶ Instead, the data for this paper comes from the College Catalog Study (CCS) database, a unique set of data on academic organization in American four-year colleges and universities.

We selected the sample institutions for the College Catalog Study database from among those represented in the Institutional Data Archive (IDA) on American Higher Education. IDA is a database including more than 2000 variables on 384 American colleges and universities covering a 30-year period, 1970-2000. The link to IDA allowed us ready access to wealth of institutional data. The data in IDA is organized in a panel design, with entries coded at five year intervals; the CCS database includes the same panels as IDA. Coding in CCS occurs in six target years: 1975-76, 1980-81, 1985-86, 1990-91, 1995-96, and 2000-01.⁷

To collect the data, we contracted with CollegeSource, Inc., a San Diego-based company specializing in the reproduction of college catalogs on microfiche. We coded every IDA institution in the CollegeSource collection for which complete microfiche existed. We coded 293 institutions in all.

Like IDA, the CCS database is a stratified random sample of comprehensive four-year colleges and universities in the United States. IDA does not include specialized institutions (such as art colleges, business colleges, and seminaries). Larger and more prestigious universities are over-sampled in IDA. While most four-year colleges and universities in the United States are small (under 4000 students), small institutions enroll a low proportion of all students. In addition, larger and more prestigious institutions have the wealth and organizational capacity to respond to new developments. As Table 1 indicates, CCS and IDA institutions are larger than the norm for all four-year colleges and universities. The CCS and IDA samples also include higher proportions of research universities, of public institutions, and a somewhat lower proportion of religiously-affiliated colleges and universities.

Insert Table 1 Here

We took a number of precautions to improve coding accuracy. Student coders were given detailed instructions on coding, with particular attention to the coding of potentially ambiguous data. Experienced coders were designated to provide advice on difficult decisions. In addition, the research team held regular meetings to discuss coding issues. Independent checks, based on complete recoding of institutions, were conducted

on approximately 20 percent (56) of the sampled institutions. These independent checks were conducted on the larger and more complex institutions, and on those institutions whose catalogs were most difficult to interpret. Because of the checks and protections built into the process, we are confident that we obtained an acceptable level of accuracy in the coding of the college catalogs.

Dependent Variables

The total number of programs is defined as including only units typically organized as interdisciplinary. For fields that meet the two-thirds criterion we established for classifying programs as typically interdisciplinary, we included both programs and departments in the analyses. The logic of our approach is based on the assumption that the defining feature of “interdisciplinary fields” is their typical form of organization, not that they are invariably organized as interdisciplinary programs. The proportion of departments counted is low – by definition, under one-third for each interdisciplinary field. (As Table 2 indicates, the proportion of departments is actually much lower in most cases.) We use the same procedure when analyzing each of the eight main interdisciplinary areas, counting only fields that are organized at least two-thirds of the time as interdisciplinary programs and including departments for fields that meet this two-thirds criterion.

Most dependent variables in our analysis are measured as binomial, where “1” indicates the presence of at least one program in the category. In these analyses, we are interested, first, in testing the power of variables drawn from the four explanatory frameworks on the existence of programs in each of eight program areas. In the

subsequent analysis, we examine the total number of interdisciplinary programs in institutions using a simple count of programs as the dependent variable.

Table 2 provides a list of fields in our sample that are typically organized as interdisciplinary programs. The count includes every program in these fields that existed at any time during the period. All fields in Table 2 fit the criterion that they are organized as interdisciplinary programs rather than departments at least two-thirds of the time. The table includes our classification of these fields into either one of the nine large categories or a tenth category labeled “other interdisciplinary.” Although race and ethnic studies and women’s studies programs are both socially incorporative and closely associated, in their origins, with social movement activity (see, e.g., Boxer 1998; Moses, 2000; Olzak and Kangas 2007; Rojas 2006, 2007; Turk-Bicakci 2007), they have distinctly different histories (see Boxer 1998 for women’s studies; and Rojas 2007 for African-American studies). We consequently classified race and ethnic studies and women’s studies programs separately.

Insert Table 2 Here

In our statistical analysis, we adjusted for programs that were eliminated, absorbed into departments, consolidated, or split into two. Programs that were eliminated or absorbed into departments are not included following their change in status. Programs that consolidated are counted once, rather than twice, following consolidation. Programs that split are counted twice, rather than once, following the split. A number of programs were eliminated or absorbed into departments during the period. In addition,

consolidations were approximately three times more common than splits. For these reasons, the number of programs in our statistical analysis is lower for each of the six target years than the number of programs reported in Table 2.⁸

Independent Variables

The independent variables in our analyses are derived from the four explanatory frameworks discussed above.

We used growth in the number of adopting institutions during the period (DIFFUSE) as our measure of diffusion. In the analysis, we identify the presence of the nine types of programs at each institution. Positive coefficients for DIFFUSE indicate that an increasing number of institutions were offering a program in one of these nine categories over the 25-year period. DIFFUSE is a measure of the spread of programs across institutions, rather than of the simple growth of the number of programs.

We included two socio-demographic variables in the analysis. The first is female enrollments as a proportion of the total undergraduate enrollment (PCTFEM). The second is minority enrollments as a proportion of the total undergraduate enrollment (PCTMIN).

We included four measures of organizational stratification in the analysis. Each focuses on a different dimension of status in academe. The first organizational stratification measure is the Carnegie Classification of doctoral-granting universities, where doctoral-granting institutions are dummy coded as “1,” and other institutions are coded “0” (DOCTORAL). The second organizational stratification measure is control (PRIVATE), where private institutions are coded “1” and public institutions are coded

“0.” The third organizational stratification measure is operating budget per student, a standard measure of financial resources (OPBUDSTD). We used the Consumer Price Index to adjust OBSUDSTD to 2000 dollars. We also examined average entering SAT/ACT scores for freshmen, but dropped this variable from the final analyses because of its very high correlation with OPBUDSTD and because of limitations in using SAT/ACT scores due to missing data.⁹

We included three organizational ecology measures. The first is total enrollment (ENROLL). We use total enrollment as our measure of size, because graduate students are a factor in the capacity of institutions to offer new academic programs. We interpret ENROLL as a measure of the capacity of an institution to support a critical mass of students interested in a new field. The second ecology variable is liberal arts and sciences degrees as a proportion of the total degrees awarded (PCTLIB). PCTLIB measures the proportion of baccalaureate degrees in fields of arts and sciences, such as English, history, economics, sociology, biology, chemistry, and physics. We compare degrees in arts and sciences with degrees in occupational-professional fields, such as engineering, nursing, and business administration. We interpret PCTLIB as a measure of the receptivity of the environment to new programs connected to “basic” as opposed to “applied” fields. The third ecology variable is region (REGION). REGION is a dummy coded variable and measures whether an institution is located in a comparatively liberal region of the country: New England, the Mid-Atlantic States, or the West Coast. Location in these regions is coded as “1.” Because these regions are characterized not only by political liberalism, but also greater social diversity, we expect they may be associated with greater receptivity to interdisciplinary programs.

We also included one control variable, a measure of whether the institution had a program in the interdisciplinary field under investigation at t-1. This variable (PAST) is necessary to control for the tendency of academic programs to persist once founded (see, e.g., Gumport 2002).¹⁰

Table 3 provides information about the independent variables we included in the analysis.¹¹

Insert Table 3 Here

Analytical Methods

Analyses of growth are based on simple counts of interdisciplinary programs across time. In the subsequent multivariate analyses, we investigate the presence of programs in each of eight fields and the total number of programs, using variables drawn from four explanatory frameworks. In these analyses, we use the general estimating equation (GEE) with fixed effects (Littel, Stroup, and Freund 2002). GEE is a generalization of the linear model in which the distribution of the dependent variable can take a variety of forms, and the link between the dependent variable and the set of independent variables can be manipulated. GEE allows for repeated measures of the variables and the modeling of correlation of residuals within institutions across time.

For our analysis, the first eight models are defined with a binomial distribution and a logit link function with an autoregressive correlation structure. Autoregressive correlation describes the expectation that correlation within each institution from one time period to the next will become exponentially weaker over time.¹² Using GEE, we

seek to explain changes in the presence of the nine interdisciplinary areas between 1975-6 and 2000-1, and the major influences on the presence of these programs over time for this set of universities. We use the same modeling approach for the analysis of total number of programs on campuses over time. Here we model a negative binomial distribution because of the large number of institutions with few or no interdisciplinary programs.¹³

We conducted analyses using both weighted and unweighted data. Because the CCS data closely approximates the IDA sample (see Table 1), we applied weights based on the institutions represented in IDA's stratified random sample.¹⁴ Findings based on weighted and unweighted data differed little. In this paper, we present findings based on the weighted data to reflect better the population of higher education institutions in the period 1975 to 2000.

RESULTS

We will present the results of our analysis in two sections corresponding to our interest in both the growth and the distribution of interdisciplinary programs over the 25-year period of our study. In the first section, we will present findings on the growth of interdisciplinary programs. In the second section, we will present findings on the distribution of interdisciplinary programs. We examine this distribution using the four explanatory frameworks described above.

Growth of Interdisciplinary Fields, 1975-2000

Based on the two-thirds criterion, the total number of interdisciplinary fields in our sample institutions grew by nearly 250 percent during the period, 1975-2000: from 674 programs in 1975-6 to 1663 in 2000-1. By contrast, enrollments at our sample institutions grew from 2.14 million in 1975 to 2.52 million in 2000 (a growth rate of 17.8 percent). Thus, the growth of interdisciplinary fields during the period is not simply a function of enrollment growth.

Each of the nine large interdisciplinary areas grew over the period, but rates of growth were unevenly distributed across fields. The number of interdisciplinary units in international relations/global studies, race and ethnic studies, women's studies, and brain and biomedical science more than tripled over the time period. The number of programs in environmental studies nearly tripled over the period, and the number of programs in non-western cultural studies more than doubled. These six can be considered the high growth areas. Western studies also showed strong growth, nearly doubling in number, but civic/governmental studies and American studies grew more slowly. Indeed, the number of American studies programs barely grew over the period.

Thus, the trend data show a marked shift from western oriented to global and socially incorporative programs. The trend data also show strong growth in two-science based fields: environmental studies and brain and biomedical studies.

Insert Figure 1 Here

Distribution of Interdisciplinary Programs, 1975-2000

We report the results of our analysis of the distribution of interdisciplinary programs in Tables 4 and 5.

Table 4 shows the significant net predictors of interdisciplinary programs in each of the nine large interdisciplinary fields. The findings indicate that our two organizational ecology variables – percent arts and sciences degrees and enrollment size – were the most consistent predictors of having interdisciplinary programs in the eight program areas. PCTLIB showed a significant net effect in eight of the nine interdisciplinary program areas and ENROLL showed a significant net effect in six. Our measure of the broader environment, REGION, showed borderline statistical significance ($p < .10$) in three program areas (nonwestern studies, western studies, and American studies).

Programs in socially incorporative fields appear to provide legitimacy for colleges and universities. DIFFUSE, our measure of diffusion showed significant net effects on the existence of programs in women's and race/ethnic studies, nonwestern studies, environmental studies, and international relations/global studies. By contrast, U.S. and western-oriented programs (American studies, western studies, and civic/governmental studies) showed no signs of diffusing in a consistent way across the 25-year period.

Variables measuring campus demographic composition showed relatively few statistically significant effects in these models. The percent of women on campus was significantly related to the adoption of women's studies programs, but was otherwise insignificant. The percent of minority students on campus was negatively related to two

U.S. and western-oriented interdisciplinary fields (American studies and western studies). It was also negatively related to environmental studies. Otherwise, it showed no significant net effects in our models. Organizational stratification variables also showed little explanatory power, with the following exceptions: OPBUDSTD was significantly associated with the existence of international program areas and with women's studies, and private universities were more likely to adopt the new brain and biomedical fields.

Our control variable, the existence of a program in t-1, proved to be highly significant, as expected. Programs, once founded, tended to persist in all nine categories of interdisciplinary programs.

Insert Table 4 Here

Table 5 shows the significant net predictors of the total number of units (programs and departments) in interdisciplinary fields. Analysis of the total number of programs per institution showed a similar pattern to the analysis of the nine specific interdisciplinary areas.¹⁵ ENROLL, PCTLIB, and DIFFUSE showed the strongest net effects, consistent with the results for the nine categories of programs. In the analysis of total programs, however, REGION also showed significant net effects, as did one measure of organizational stratification, OPBUDSTD. Variables measuring socio-demographic composition did not show significant net effects in the model. The other organizational stratification variables, DOCTORAL and PRIVATE, also did not show significant net effects. The results of this analysis suggest more than one line of support for offering interdisciplinary degree programs, including not only variables linked to organizational

ecology, but also variables linked to organizational prestige. We know from the previous analysis that larger institutions focusing on arts and sciences are more likely to offer specific types of interdisciplinary programs. Wealthier institutions, whether due to capacity or faculty interests, are, in addition, more likely to offer a larger number of interdisciplinary programs.

Insert Table 5 Here

DISCUSSION

In this section, we will discuss why interdisciplinary programs tend to be found at particular types of colleges and universities, and not at others. We will also discuss the under-appreciated role of the humanities and social sciences as generators of support for interdisciplinary activity on campus. Finally, we will discuss why interdisciplinary fields have persisted and grown in recent decades, even though the foundational structures of colleges and universities remain department and discipline-based. We will conclude with an observation concerning future directions for research on interdisciplinary programs.

The Institutional Address of Interdisciplinary Fields

In the CCS data, we see that particular types of institutions have a propensity to offer interdisciplinary programs to undergraduates. During the period covered by our study, those interested in interdisciplinary programs were most likely to find favorable environments for expressing their interests if they worked in large, wealthy, arts and sciences-oriented universities on the East or West coasts. Our findings indicate that larger

institutions and those that award most of their undergraduate degrees in arts and sciences provide the most consistently favorable environments for a variety of different types of interdisciplinary studies. In addition, wealthier institutions, as measured by operating budget per student, tend to offer a larger total number of interdisciplinary programs and are more likely, in particular, to offer interdisciplinary programs in internationally oriented fields and in women's studies. Net of these more important covariates, neither campus demographic composition nor other indicators of campus financial strength or prestige appear to matter much for the development of interdisciplinary fields.

Why are organizational ecology variables so important? The likely causes have to do with organizational capacity and organizational propensity to support new fields. Capacity is related most clearly to critical mass. Larger institutions have the capacity to employ a critical mass of faculty to support new fields, and, equally, the potential for generating a critical mass of student interest in these fields. In addition, larger institutions have the capacity to experiment and perhaps also an incentive to offer "something for everyone" in their large and diverse student bodies. Propensity is related to pre-existing curricular bases out of which interdisciplinary programs grow or gain support. Our data indicate that new interdisciplinary fields, at least in the undergraduate curriculum, grow primarily out of the arts and sciences disciplines, rather than the occupational-professional disciplines. We speculate that arts and sciences-oriented colleges and universities are more likely to attract faculty who are attuned to new movements in knowledge production, some of which take an interdisciplinary form.¹⁶

Another ecological variable, the region surrounding institutions, may also influence their propensity to offer interdisciplinary programs. As compared to other

regions in the U.S., the coastal regions tend to be politically more liberal, socially more diverse, and they are also more closely connected to “new economy” industries (see Florida 2002). We speculate that these characteristics attract faculty and administrators who are receptive to programs related to social and economic change. Additional research will be necessary to determine whether political culture, social diversity, or “new economy” industries (or some combination of the three) explain the region effects we found, or if other characteristics of regions are responsible for these findings.

The Role of Humanities and Social Sciences

Much scholarship on interdisciplinary change in academe has focused on the role of the natural and applied sciences in new technology development. Yet campus administrators have often taken a more expansive view of opportunities for the development of interdisciplinary fields. Duke University, the first university explicitly to embrace interdisciplinary research and teaching as a strategy of intellectual advance, sought to build on the notoriety of its highly interdisciplinary comparative literature department (see Duke University 1987). In the 1990s and 2000s, proponents of interdisciplinary work on campus frequently advanced the idea that interdisciplinary work is an important contributor both to technological and social progress (see Brint 2005). Thus, one prominent advocate, Michael Crow, the president of Arizona State University, wrote: “The traditional disciplinary organization of universities may not be the optimal way to organize the institution itself or to teach students to solve...social, economic and technological challenges... Accordingly, I encourage teaching and research that is interdisciplinary” (Crow 2002: 20).¹⁷

Undergraduate interdisciplinary programs are only a small part of the larger picture of interdisciplinary change on campus. Nevertheless, because they are explicitly identified in college catalogs as study options, have administrative resources attached to them, and typically persist once established, these programs can be considered a well institutionalized feature of academe. Our findings provide support for those who see globally oriented programs and programs of social incorporation as important supports for interdisciplinary teaching and research in American colleges and universities. Our analysis indicates that interdisciplinary programs in the humanities and social sciences far outnumber those in the natural and applied sciences, and that these programs are closely tied to efforts to incorporate under-represented populations and under-represented regions of the world into the structure of academic knowledge. Our findings are, in this respect, consonant with other studies that have called attention to the role of social movements as a source of curricular change in the humanities and social sciences (see, e.g., Moses 2000; Olzak and Kangas 2007; Rojas 2006; Slaughter 2002). New technology development is undoubtedly the more important influence on graduate level collaborative research, but social incorporation looms large in the undergraduate curriculum.

Why Do Interdisciplinary Programs Persist?

One remaining question concerns the persistence of interdisciplinary organization in academic institutions whose foundations, particularly in the undergraduate curriculum, are built on departmental majors (Abbott 2002).

We do not consider interdisciplinary organization likely to continue in all fields. The new brain and biomedical science fields, such as cognitive and neuroscience, should

eventually become institutionalized in the departmental structure. Such a trajectory would follow a well-worn path of new academic disciplines, identified by Metzger as “subject parturition” followed by “subject dignification” (Metzger 1987). It is also possible that environmental studies will eventually become more fully institutionalized in the departmental structure of universities, although this trajectory is less certain because environmental studies retains an activist impulse that rests uneasily in the more professionalized structures of academic departments.

In some cases, departmentalization is a logistical problem. International relations programs, for example, must combine expertise from many disciplines and span all (or at least most) parts of the world. In other cases, programs may attract too few students to warrant institutionalization as departments. Some period history programs, such as Medieval Studies and Renaissance Studies, have been unable to attract sufficient numbers of majors to warrant departmental status.

The most interesting cases are those in which some sponsoring faculty members prefer interdisciplinary to departmental organization, because they perceive interdisciplinary organization to be friendlier to activism than the more professionalized structure of departmental organization. Clear evidence of this preference can be found in interview and document-based research on women’s studies (Boxer 1998; Stimpson and Kresner Cob 1986) and ethnic studies (Gates 1992; Rojas 2007) programs. As noted, environmental studies, too, is a field that has long appealed to the activist sensibilities of students and faculty who are concerned about environmental protection (see, e.g., Altbach 1997; Klee 1983).¹⁸

These expressed preferences underscore the relationship between social identity, social activism, and interdisciplinary research and teaching in the humanities and social sciences. Many interdisciplinary programs represent a niche space within the large and expanding structure of academic knowledge for students and faculty interested in exploring social identity and promoting social change. More broadly, they offer courses that can help students in other majors to become culturally more knowledgeable and effective actors in the diverse settings of adult life (Gurin 1999; Hurtado et al. 2003). Nor is the support of academic administrators for interdisciplinary organization in these fields necessarily a surprise. Evidence is accumulating that many academic administrators are interested in the uses of the university as an engine of economic and social change, as well as in the traditional role of the university as a creator and disseminator of specialized knowledge (Brint 2005; Feller 2005; Sa 2006).

During the 25-year period covered by our study, the number of interdisciplinary fields on campus grew rapidly. In the future, as some current interdisciplinary programs are incorporated into the departmental structure, new interdisciplinary fields will likely arise. Interdisciplinary programs are a relatively inexpensive way to support fields that involve expertise drawn from more than one discipline and to accommodate academic and extra-academic interests in economic and social change. At the same time, they create new lines of connection across campus. In all likelihood, they strengthen networks of professors who are sympathetic to new cross-campus initiatives to promote economic innovation and to solve societal problems. These networks contribute to the changing climate of opinion on college and university campuses about the value of interdisciplinary work. It is even possible that professors in some interdisciplinary fields

can have an impact beyond their numbers, because their networks crosscut departmental lines and their outlooks on the university emphasize activism.

Concluding Observation

Interdisciplinary studies are now well-established. Future research can help us better understand this growing arena of academic activity. In our view, future work might attend, not only to the sponsors and institutional addresses of interdisciplinary fields, as we have done, but also to the processes by which students become interdisciplinary thinkers and the difference this makes in ways of thinking about phenomena (for an interesting qualitative study of interdisciplinary socialization, see Holley 2006). Future researchers might also begin to study in a more rigorous way whether interdisciplinary work in fact leads more often to substantive intellectual breakthroughs, as its advocates contend, and the conditions under which it can do so (see, e.g. Hollingsworth and Hollingsworth 2000).

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Notes

¹ Some industry influences are also apparent in these fields, particularly that of the entertainment industry through digital arts, experimental performance arts, and cultural studies programs.

² We have not attempted to develop a conflict theory of curricular change, because we have no direct way to measure the relative power of interested groups on the campuses in our sample or the level of political mobilization of these groups. However, we do lay out

assumptions about organizational and group interests in our discussion of two of the four frameworks: those based on organizational stratification and socio-demographic composition. In addition, because one effect of power is to set the terms of legitimacy (Mann 1986: chap. 1), we address issues of legitimacy in our discussion of the neo-institutional theory of diffusion.

³ As in the case of student numbers, organizational interests in resources and status must be interpreted as legitimate and activated politically to create organizational change.

⁴ The term “interdisciplinary” is used most frequently to describe the programs in which we are interested, but some institutions use the terms “multidisciplinary,” “trans-disciplinary,” “interdepartmental,” or “cross-departmental.” For purposes of classifying programs, we treat these labels as interchangeable. These labels have been subject to considerable discussion among partisans of different approaches to integrative and interdisciplinary studies (for a discussion, see Klein 1996).

⁵ Film studies programs (64% interdisciplinary) came within percentage points of meeting the two-thirds criterion.

⁶ The Association for Integrative Studies (AIS) provides online resources for interdisciplinary undergraduate and graduate programs, archives interdisciplinary course syllabi, and published the first edition of “Interdisciplinary Undergraduate Programs: A Directory” (Newell 1986). The AIS (1986) directory of Ph.D. programs focuses on

programs located within the liberal arts and determines whether or not the program is to be included based upon an evaluation of program websites and the degree to which programs integrate the knowledge of other disciplines into the requirements of the program. In an updated version of Newell (1986), Edwards (1996) employed different criteria for interdisciplinary program inclusion than the criteria currently in use by the AIS for classifying doctoral programs. Edwards's criteria include: undergraduate focus, persistence over time, explicit and intentional orientation to approach subjects from an interdisciplinary perspective, and institutional recognition as an interdisciplinary program. Edwards mailed approximately 4000 surveys and a follow-up. Many of the responses did not fit his criteria for inclusion in the directory. The directory ultimately included over 400 program descriptions and has not been updated since 1995.

⁷ In some cases, catalogs were not available for specific target years, either because catalogs were published biannually, or because published catalogs spanned more than one year. In these cases, we coded catalogs from the nearest available adjacent year.

⁸ We excluded one institution, California Institute of Technology, from the analysis, because it was an outlier in the number of interdisciplinary programs it sponsored, in operating budget per student, and in average SAT scores of entering freshmen.

⁹ Because SAT/ACT and OPBUDSTD (adjusted for 2000 dollars and logged) were correlated ($r > .80$ in every year for which data are available.), we use OPBUDSTD only

in these analyses. High correlation among independent variables can cause numerical imprecision, less stable coefficient estimates, higher standard errors, and less powerful statistical tests. OPBUDSTD is the better measure of institutional prestige: in IDA, SAT is missing for 1985, 1990, and 1995 and for several sample institutions (32 in 1999 and 17 in 1977 and 1982).

¹⁰ We were unable to determine whether programs existed in 1970-1, because most CollegeSource catalogs were collected beginning in the mid-1970s. We had the choice either to drop 1975 as a panel, or to impute values for 1975 based on 1975 (rather than 1970) programs. PAST is a control variable, so the imputation is not central to our analysis. Nevertheless, we ran analyses a second way, dropping data from 1975 except as a measure of the control variable PAST. In these models, DIFFUSE became insignificant in the cases of nonwestern area studies and international relations. PCTFEM became significant for American Studies and PCMIN became significant (as a negative covariate) for civic/governmental studies. We interpret these differences in results as marginal, and we therefore report data from all six panels to maximize use of the collected data.

¹¹ The dataset includes 33 records (of 1770) containing missing data. Some of this missing data comes from institutions that did not exist until later years in the time period; and some from missing data on OPBUDSTD.

¹² The autoregressive structure of the correlations is based on an assumption that the correlation of residuals between time 1 and time 6 will be weaker than the correlation of residuals between time 1 and time 2. We chose the autoregressive structure for substantive reasons. In our view, the autoregressive structure is preferable to an exchangeable error structure (i.e. constant correlations between residuals), because broad secular trends in the institutional environment can be expected to influence campus level events. Nevertheless, as a precaution, we ran models based on three other assumptions about error structure – AR (1), exchangeable, and independent -- with no major changes in model fit. We note that GEE is robust against mistakes in assumptions about error structure, so long as the assumptions are approximately accurate.

¹³ We modeled a negative binomial distribution, rather than a Poisson distribution, because the mean and the variance of the dependent variable are not equal. Basic findings are unchanged when the model is based on a Poisson distribution. PCTFEM becomes a less strong predictor, and is not quite significant at $p < .05$.

¹⁴ Weights were determined by the proportion of institutions coded within each of four strata of American colleges and universities: elite colleges and universities (18.8% of the IDA sample), other selective colleges and doctoral-granting universities (28.4% of the IDA sample), masters'-granting institutions (26.8% of the IDA sample), and other bachelors'-granting institutions (26.0% of the IDA sample). Specialized institutions, such as art schools, music schools, and business colleges are not included in the population used for purposes of weighting (Brint, Turk-Bicakci, Riddle, and Levy 2003).

¹⁵ The variable PAST is not included in these analyses, because we have no reason to control for persistence.

¹⁶ Unreported analyses suggest that pre-existing interdisciplinary programs may be another ecological factor associated with the development of new interdisciplinary programs. We interpret this result as perhaps indicative of variably supportive environments in which these new “species” have a greater or lesser chance of propagating. We do not report the analyses, because the index of pre-existing interdisciplinary programs is highly correlated with size of enrollments.

¹⁷ Historically, international relations and area studies programs were very important sources of interdisciplinary programs. These fields also have little to do with new technology development. They were sponsored by foundations and the federal government for purposes of broadening understanding of strategically important regions of the world (Goodwin and Nacht 1991; Clotfelter 2005).

¹⁸ These preferences for flexible forms of organization supporting activist outlooks may coincide with the interests of administrators in representing socially incorporative fields without allocating high levels of permanent resources to them.

Table 1
College Catalog Study Sample Characteristics, 2000

	Institutional Data Archive Institutions (n=384)	College Catalog Study Institutions (n=294)	All Four- Colleges and Universities (n=1958)
Public	45.1%	45.9%	27.9%
Religious	25.5%	27.6%	33.2%
Doctoral-Granting Universities	31.0%	32.7%	11.7%
Masters-Granting Universities	32.0%	32.7%	25.9%
Baccalaureate-Granting Colleges	36.5%	34.7%	30.4%
Specialized Institutions ¹	NA	NA	32.0%
Coastal Regions (West, New England, Mid-Atlantic)	39.3%	39.8%	39.6%

Note

¹ Carnegie “specialized institutions” include art institutes, business colleges, military institutes, and seminaries.

Sources

Higher Education Directory (1999); College Catalog Study Database

Table 2
Fields Typically Organized as Interdisciplinary Programs, 2000-1

<u>Program</u>	<u>Total</u>	<u># Interdisciplinary Organization (Percent)</u>	<u># Department Organization (Percent)</u>
<i>1. Non-Western Cultural Studies</i> 324			
Asian Area Studies	132	114 (86%)	18 (14%)
Latin American Area Studies	112	107 (96%)	5 (4%)
African Area Studies	51	42 (82%)	9 (18%)
Middle Eastern Studies	19	19 (100%)	0 (0%)
<i>2. Race and Ethnic Studies</i> 250			
African American Studies	114	87 (76%)	27 (24%)
Ethnic and Race Studies	54	41 (76%)	13 (24%)
Chicano, Hispanic Studies	41	27 (66%)	14 (33%)
American Indian Studies	24	19 (79%)	5 (21%)
Asian American Studies	17	14 (82%)	3 (18%)
<i>3. Western Studies</i> 227			
European, North American Studies	153	138 (90%)	15 (10%)
Western Period History Studies	70	68 (97%)	2 (3%)
European Origin Studies	2	2 (100%)	0 (0%)
Western Studies	2	2 (100%)	0 (0%)
Canadian Studies	2	2 (100%)	0 (0%)
<i>4. Environmental Studies</i> 215			
		173 (80%)	42 (20%)
<i>5. International/Global Studies</i> 204			
International Relations, Global	152	132 (87%)	20 (13%)
Peace, Conflict Studies	40	38 (95%)	2 (5%)
Political Economy	12	10 (83%)	2 (17%)
<i>6. Civic/Governmental Studies</i> 194			
Urban Studies	99	87 (88%)	11 (12%)
Public Affairs, Public Policy	48	37 (77%)	11 (23%)
Legal Studies	47	38 (81%)	9 (19%)
<i>7. Women's Studies</i> 192			
		173 (90%)	19 (10%)
<i>8. American Studies</i> 158			
American Culture/Studies	142	123 (87%)	19 (13%)
US Regional Studies	16	16 (100%)	0 (0%)

<i>9. Brain and Biomedical Science</i>	124		
Cognitive, Neuroscience	66	50 (76%)	15 (24%)
Biological Psychology	21	17 (81%)	4 (19%)
Biomedical, Biotechnology	19	18 (95%)	1 (5%)
Medical Technology	18	12 (67%)	6 (33%)
<i>10. Other</i>	387		
Interdisciplinary Studies ¹	106	98 (92%)	8 (8%)
Film Studies	66	42 (64%)	24 (36%)
Liberal Studies	57	50 (88%)	7 (12%)
Gerontology	43	39 (91%)	4 (9%)
Judaic Studies	41	39 (95%)	2 (5%)
Science and Society	22	19 (86%)	3 (14%)
Arts Management	13	13 (100%)	0 (0%)
Health Management	10	10 (100%)	0 (0%)
Folk Studies	9	6 (67%)	3 (33%)
Ethics, Values	5	5 (100%)	0 (0%)
Sexuality Studies	5	5 (100%)	0 (0%)

Note

¹ A small number of programs were listed twice in catalogs, both as interdisciplinary programs and as departments.

Source: College Catalog Study database

Table 3
Descriptive Statistics on Independent Variables, 2000-01

A. Continuous Variables

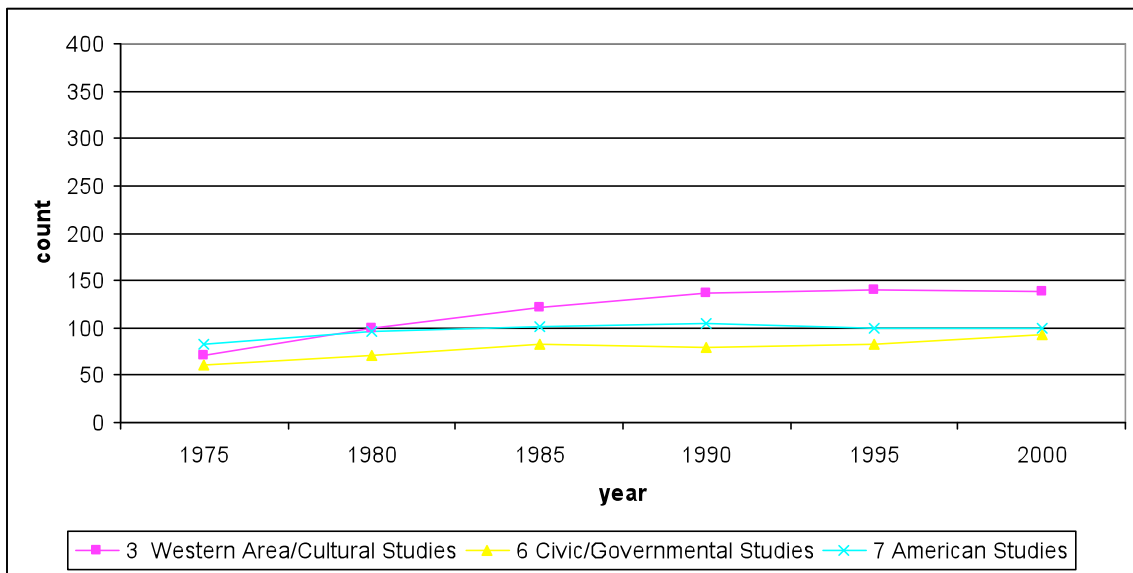
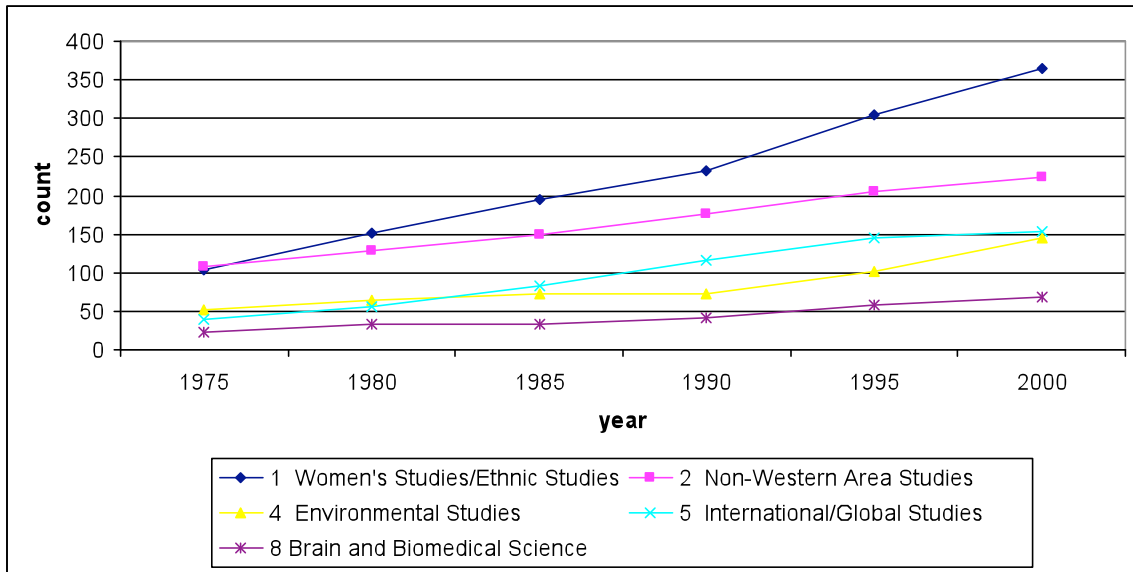
	Minimum	Maximum	Mean	St.Dev.	N
Percent Women	0	100	57.7	11.1	294
Percent Minority	3.5	100	28.7	19.7	294
Ave. SAT/ACT	850	1485	1114.3	132.9	294
Total Enrollment	372	51390	9175.1	10207.8	294
Operating Budget/ Student	3422.4	175505.7	24917.4	25840.4	294
Percent Arts & Sciences Degrees	6	100	49.9	24.7	294
No. Interdisciplinary Programs	0	30	5.2	5.0	294

B. Categorical Variables

	Frequency	Percent of Total	N
Doctoral University	96	32.7	294
Private College/ University	159	54.1	294
Coastal Region	117	39.8	294

Source: College Catalog Study Database

Figure 1
Growth Rates of 8 Large Interdisciplinary Fields, 1975-2000



Source: College Catalog Study database

Table 4
Distribution of Interdisciplinary Programs, 1975-2000

A. Diffusing Programs

	<i>Nonwestern Cultural Studies</i> (B/St.Err.)	<i>Race & Ethnic Studies</i> (B/St.Err.)	<i>Environmental Studies</i> (B/St.Err.)	<i>International Relations/Global Studies</i> (B/St.Err.)	<i>Women's Studies</i> (B/St.Err.)
Intercept	-16.6*** (2.9)	-12.8** (3.5)	-9.0*** (2.6)	-9.8*** (2.4)	-19.9*** (2.8)
Existence of Program in t-1	6.0*** (.32)	6.1*** (.36)	5.6*** (.34)	5.2*** (.29)	6.6*** (.81)
Diffusion	.21* (.09)	.25** (.08)	.37*** (.08)	.18** (.06)	.42*** (.07)
Percent Liberal Arts/Sciences	.03*** (.01)	.03*** (.01)	.01** (.00)	.02** (.01)	.02*** (.01)
Enrollment Size	.76*** (.21)	.84*** (.20)	.16 (.14)	.34** (.14)	.97*** (.15)
Percent Female Enrollment	-.01 (.01)	.01 (.01)	-.00 (.00)	.00 (.01)	.03*** (.01)
Percent Minority Enrollment	-.12 (.17)	.23 (.17)	-.30* (.14)	-.19 (.13)	-.28* (.12)
Operating Budget/Student (in 2000 \$)	.57* (.25)	.01 (.29)	.38 (.24)	.36 (.21)	.60* (.25)
Doctoral University (1=Doctoral)	-.43 (.42)	-.03 (.48)	.31 (.36)	-.21 (.32)	-.15 (.35)
Private College/Univ. (1=Private)	.17 (.37)	-.36 (.35)	.11 (.28)	.23 (.29)	-.06 (.29)
Region (1=coast)	.49 (.28)	-.19 (.28)	.26 (.23)	-.10 (.23)	.37 (.22)
Corrected Quasi-Likelihood (QICC)	500.9	531.1	825.8	864.0	757.2

B. Non-Diffusing Programs

	<i>Western Studies (B/(St.Err.))</i>	<i>American Studies (B/(St.Err.))</i>	<i>Civic & Govt. Studies (B/(St.Err.))</i>	<i>Brain & Bio- medical Studies (B/(St.Err))</i>
Intercept	-17.2*** (3.1)	-8.15** (2.8)	-6.7* (2.8)	-9.5*** (2.8)
Existence of Program in t-1	5.5*** (.26)	5.4*** (.23)	4.9*** (.07)	4.9*** (.24)
Diffusion	-.002 (.08)	-.05 (.09)	.08 (.07)	.05 (.08)
Percent Liberal Arts/Sciences	.02* (01)	01 (.01)	.02** (.01)	.02*** (.01)
Enrollment Size	.66*** (.20)	.12 (.17)	.35** (.16)	.08 (.19)
Percent Female Enrollment	.02 (.01)	.01 (.01)	-.01 (.01)	.01 (.01)
Percent Minority Enrollment	-.52*** (.14)	-.27* (.11)	-.23 (.12)	-.21 (.12)
Operating Budget/ Student (in 2000 \$)	.76** (.28)	.36 (.22)	.01 (.24)	.39 (.23)
Doctoral University (1=Doctoral)	.12 (.41)	.20 (.37)	.26 (.37)	.67 (.42)
Private College/ Univ. (1=Private)	-.01 (.35)	-.23 (.29)	.05 (.26)	.59* (.29)
Region (1=coast)	.48 (.28)	.45 (.24)	.18 (.23)	.22 (.22)
Corrected Quasi- Likelihood (QICC)	514.8	697.2	704.1	503.3

* p<.05

**p<.01

***p<.001

Source: College Catalog Study database

Table 5
Distribution of Total Campus Interdisciplinary Programs, 1975-2000

	<i>Programs/ Campus (B/St. Err)</i>
Intercept	-7.6*** (1.16)
Diffusion	.13*** (.02)
Percent Liberal Arts/Sciences	.02*** (.00)
Enrollment Size	.49*** (.07)
Percent Female Enrollment	.01* (.00)
Percent Minority Enrollment	-.03 (.04)
Operating Budget/ Student (in 2000 \$)	.29** (.10)
Doctoral University (1=Doctoral)	.12 (.18)
Private College/ Univ. (1=Private)	.12 (.13)
Region (1=coast)	.25* (11)
Corrected Quasi- Likelihood (QICC)	-6735.6

* p<.05 **p<.01 ***p<.001

Source: College Catalog Study database
