An Analysis of General Education Requirements on Course Enrollment at Pomona College

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Abstract

"Changing a college curriculum is like moving a graveyard–you never know how many friends the dead have until you try to move them"

Calvin Coolidge, *President of the United States, 1923-1929*

This paper analyzes the effects that a 2006 change in the general education requirements at Pomona College had on course enrollments. Using curriculum data from the Pomona College Registrar, this study looks at the factors affecting the breadth of courses that students choose (i.e. the number of different disciplines in which students are taking classes). Specifically, this study provides an overview of how factors such as double majoring or majoring in an interdisciplinary field relate to course enrollment decisions. Analysis of the data shows that interdisciplinary majors and double majors take classes in a greater number of disciplines than their respective counterparts. Furthermore, the results indicate that the change in the general education system did lead to students taking subjects in fewer disciplines on average.

1 Introduction

What is the purpose of higher education? One conventional view postulates that higher education serves as an investment towards the expectation of higher future income. According to a recent report from the OECD, "Economic returns to education are a key driver for individuals' decisions to invest time and money in education beyond compulsory schooling" (OECD 2009, p. 154) [9]. This description conceptualizes education instrumentally, as a means to reaching an explicit goal of higher earnings, and an implicit higher quality of life. Regardless of how well this characterization of education aligns with that of research universities across the nation, it undeniably contradicts the explicitly non professional mission statements of most liberal arts colleges. Hugh Hawkins, Emeritus Professor of History at Amherst College, defines the basic structure of a liberal arts college as "a four-year institution of higher education, focusing its attention on candidates for the B.A. degree who are generally between the

ages of eighteen and twenty-one, an institution resistant to highly specific vocational preparation and insisting on a considerable breadth of studies" [6].

In the introduction to his book *America Goes to College*, Pomona College professor John Seery (2002) argues that liberal arts colleges provide a different approach to education from the research university. In line with the liberal arts spirit, "freedom of inquiry, the life of the mind, cannot be tethered to the freedom of the marketplace" [11]. Rather, liberal arts colleges provide a unique opportunity for students to gain a deeper understanding of what it means to be a complete human being. At their core, these colleges focus on imparting students with general knowledge in a wide range of academic subjects. Ideally, students at these institutions are motivated intrinsically to learn for the sake of learning, rather than for the purpose of securing job-specific technical skills (Frey 1997) [4].

Furthermore, there is a social component of education that individuals value as a personal identity marker beyond a traditional economic view of education as a form of human capital (Akerlof and Kranton, 2002) [1]. Indeed, Alstadsoeter and Sievertsen (2009) recently published a paper that uses the National Longitudinal Survey of Youth from 1979 to look at the consumption value of higher education [2]. Their results show that graduates from liberal arts colleges in the US were willing to sacrifice a significant amount of their potential income for the sake of non-pecuniary benefits of higher education, indicating that people find value in a liberal arts education beyond the expected future financial returns. This finding gives positive reinforcement to the ideal that liberal arts colleges operate with the motivation of developing "interests and capabilities that will enrich both the individual learner and future communities" [6].

Aside from a college's stated goals, its institutional structure implicitly addresses the question of educational purpose. As such, the general education requirements compulsory for graduation serve as one method for formalizing and promoting institutional goals. This is an especially interesting measure because there is no clear consensus on the effects of these requirements on student education outcomes. While it has been shown that students attending selective liberal arts colleges experience greater educational growth than do peers in other institutions (Winter, McClelland, and Stewart 1981) [12], the literature on the role of general education in terms of educational gains is mixed. Using a comparison of ACT test scores of general education and knowledge for students at a variety of colleges, Forrest (1982) found that general education gains were highest in schools that put larger emphasis on general education requirements in their curriculum [3]. However, using the same standardized tests but a different methodology, Knight (1993) found that general education gains were greatest for students who attended schools with fewer general education requirements and more flexibility within these requirements [7].

Beyond looking at general education requirements through a purely instrumental role, there is a question of how requirements shape students' overall educational trajectory. Seery defines the liberal arts college as one that "values some amorphous notion of well-roundedness" that is admittedly hard to prescript, define, and pass on to others" [11]. This conception encom-

passes many facets of the college experience both in and out of the classroom, including course enrollments. According to Eugene Lang (2000), in recent years "curricula have been modified to dilute the European tradition of Platonic idealism with the American tradition of philosophical pragmatism". Concepts such as "double majors" and "distribution requirements" are relatively recent entrants to the liberal arts vernacular, but they have quickly become a central focal point of educational discourse [8]. Interdisciplinary majors are also a relatively recent, as a merging of more established disciplines. Thus, they inherently embody a notion of well-roundedness in their focus on multiple traditional areas of study.

In context of these considerations, questions of breadth vs. depth in terms of course enrollment are an important aspect of this evaluation. In line with these views, Pomona College tries to foster student engagement "in the probing inquiry and creative learning that enable them to identify and address their intellectual passions (Pomona College Course Catalog) [10]. This study focuses on measuring outcomes in terms of the number of different subjects in which a student takes classes. The data in this study include information on students and their course enrollment decisions before and after 2006, when Pomona College moved from the Perception, Analysis, and Communication (PAC) system in 2006 to its current Breadth of Study Requirements.

Background

The PAC system, implemented in 1994, is based on a set of 10 intellectual capacities or skills designed to "satisfy students' individual interests while training them to identify and question their own assumptions" ("General Education", 2002). As part of the requirements, each student was required to pass a course in each of the ten areas:

1. Reading literature critically
2. Using and understanding the scientific method
3. Using and understanding formal reasoning
4. Understanding and analyzing data
5. Analyzing creative art critically
6. Performing or producing creative art
7. Exploring and understanding human behavior
8. Exploring and understanding an historical culture
9. Comparing and contrasting contemporary cultures
10. Thinking critically about values and rationality

In 2006, Pomona College switched to a simpler Breadth of Study Requirements system, which is designed to encourage exploration while providing significant freedom of choice. Under this system, students need to pass a class in each of five areas:

1. Creative Expression

2. Social Institutions and Human Behavior
3. History, Values, Ethics and Cultural Studies
4. Physical and Biological Sciences
5. Mathematical Reasoning

Hypothesis

I hypothesize that under the PAC system, the range of classes taken by students in interdisciplinary vs. single-discipline majors would be comparable. While it is true that interdisciplinary majors are required to take classes in more disciplines by the nature of their major, I expect that the relatively heavy requirements of the PAC system would outweigh this effect in requiring both types of majors to take a broad range of classes. However, with the shift to the Breadth of Study Requirements, I expect that single major students would take classes in fewer disciplines on average. This result would logically follow since the current Breadth of Study Requirements system places fewer requirements on students, which would lead many single-discipline majors to take a less diverse array of classes.

However, by the nature of their major, interdisciplinary students are required to take classes in a greater variety of disciplines, so the change in general education requirements would have less affect on the diversity of their class choices. I also hypothesize that the shift to Breadth of Study Requirements will result in an increased number of double majors, as students are less constrained in their general education course choices and can shift more classes towards specific disciplines.

2 Data

The data set contains information for students who graduated with the class of 2000 through the class of 2012, who matriculated at Pomona as first-year students (i.e., transfer students are not included in the data set). Initially, the data set contained 4,754 observations. I omitted students who do not graduate in the spring (i.e. summer or fall), as well as students with special majors in order to consistently analyze cohorts and to be able to control for major type consistently, resulting in a final 4,562 observations. (For the first set regressions, students graduating between 2007-2009 will also be dropped from the data so that they do not create extraneous noise in the interpretation of the effects of the policy change, producing a data set of 3,456 observations.)

The data set includes the following information:

- Mock ID
- Degree conferral year/semester
- Major 1 discipline

- Major 2 discipline

Additionally, there are data available for each of the courses these students took during their time at Pomona:

- Mock ID
- Discipline of course
- Course number
- Course title
- Year/semester course was taken

A student was defined as pursuing an interdisciplinary major if at least one of their majors was classified as an interdisciplinary major by the Pomona College course catalog. Students were defined as single-disciplinary majors if their major(s) did not fall under this category.

Interdisciplinary majors:

Africana Studies
American Studies
Asian American Studies
Asian Studies
Chicano\a-Latino\a Studies
Environmental Analysis
Gender & Womens Studies
Latin American Studies
Media Studies, Media Studies
Middle Eastern Studies
Philosophy, Politics, and Economics (PPE)
Public Policy Analysis
Russian and Eastern European Studies
Science, Technology, and Society (STS)

3 Methodology

A multiple regression analysis was run using dummy variables for interdisciplinary major (yes/no), general education system (before/after switch), and double major (yes/no). Students who double major were classified as interdisciplinary if at least one of their majors is in an interdisciplinary field. Table 1 shows descriptive statistics for each of the variables of interest, and the following regression was run:

$$numdifferent_i = \beta_0 + \beta_1 * interdisciplinary_i + \beta_2 * doublemajor_i + \beta_3 * GEsystem_i + \epsilon_i$$

where
i= student id number

- *numdifferent* number of different disciplines (i.e. majors) in which a student has taken classes.
- *interdisciplinary*= 1 if student is an interdisciplinary major (0 otherwise)

- *doublemajor* = 1 if student graduated with a double major (0 otherwise)
- *GEsystem* = 1 if student graduated after shift from PAC to Breadth of Study Requirements (0 otherwise)

This regression allowed for an intrinsic measurement of the effect of the general education system, although as a tradeoff, some of the nuance of the time element is lost in coding general education as a dummy variable. In particular, in order to capture the complete effects of PAC v. Breadth of Study, students who graduated from 2007- 2009 will need to be dropped from the data set. Students enrolled at Pomona during these years had the option of satisfying either the old or new general education policy. Thus, it was not possible to disaggregate the effects of the policy change for these years.

In addition to the initial regression, a test was also conducted to determine whether or not the change in general education requirements affected the course selection of students from interdisciplinary majors differently from other students, or students with double majors differently. To do so, a regression was run with two added interaction terms for the effects of the policy change on interdisciplinary majors and double majors respectively:

$numdifferent_i = \beta_0 + \beta_1 * interdisciplinary_i + \beta_2 * doublemajor_i + \beta_3 * GEsystem_i + \beta_4 * GEsystem_i * interdisciplinary_i + \beta_5 * GEsystem_i * doublemajor_i + \epsilon_i$

Another concern was whether or not the decision to double major or to major in an interdisciplinary major was itself influenced by the policy change. In order to test for these effects, two regressions were run to test for the effects of the policy change on proportion of double majors and interdisciplinary majors, respectively:

$$doublemajor_i = \beta_0 + \beta_1 * interdisciplinary_i + \beta_2 * GEsystem_i + \epsilon_i$$

$$interdisciplinary_i = \beta_0 + \beta_1 * doublemajor_i + \beta_2 * GEsystem_i + \epsilon_i$$

Next, to create a clearer comparison of change over time, a multiple regression analysis was run, using a dummy variable for interdisciplinary majors and for double majors on each graduation cohort separately. This allowed for observation of the transition phase in class enrollments for cohorts who were already enrolled at Pomona College during the curriculum changes, as well as general trends in enrollment and major decisions over time.

4 Results

The initial analysis tests the effects of interdisciplinary majors, double majors, and the impact of the general education system on the number of different subjects a student takes. To do so, yes-no dummies are coded for each of the three measurements and number of subjects is regressed on the variables to analyze their effects. The results of this test are reported in Table 2. The coefficient for majoring in an interdisciplinary subject is 1.70 and statistically

significant at the 1% using a two-sided p-value. This indicates that students with interdisciplinary majors take a wider variety of classes on average than their single-discipline major peers. The coefficient for students double majoring is -1.40 and significant at the 1% level, indicating that double majors take a smaller breadth of classes. The coefficient for general education -.438 and significant at the 1% level, meaning that the number of subjects students took decreased with the implementation of the new system, holding interdisciplinary and double major trends constant.

Next, the question of whether or not the policy change affected the course selection of students from interdisciplinary majors differently from students in single-discipline majors, or students with double majors vs. single majors is addressed. The regression results in Table 3 show that at a 5% level, there is no significant difference on the course selection decisions of interdisciplinary and double majors as a result of the policy change. Regressions were also run to test whether the decision to double major or to major in an interdisciplinary program is itself influenced by general education requirements. Table 4 indicates that the policy shift did in fact increase the proportion of double majors by -1.35 at a 1% level of significance, and Table 5 indicates that the same was true for interdisciplinary majors by 1.63 at a 5% level of significance. This indicates that the change in policy also affects course selection indirectly, through its impact on number of double majors and interdisciplinary majors.

In order to observe course enrollment trends over time, dummy variables were coded for each graduation year. Table 6 shows summary statistics for each of the years of observation, with 2006 as the base year of reference. The results of this analysis, as shown by Figures 1-3 as well as Table 7, indicate a trend for students to take fewer subjects with the implementation of the new general education system. The upward trend is significant at the 1% level for 2008 and 2009 and is significant at the 5% level for 2010. Furthermore, there is not a statistically significant difference in subjects taken for the years prior to the curriculum shift, which supports the hypothesis that the decrease in subjects taken was not due to a general trend over time. This indicates that enrollment shifts happened simultaneously with the curriculum change.

5 Discussion

The results from this study indicate that the change in general education system did in fact have an impact on the breadth of courses taken by students. Under the Breath of Requirements system, students on average are taking courses in .438 fewer disciplines during their time at Pomona. This makes sense in since they are less constrained in their class choices, with fewer general education requirements. Thus, students are freer under the new system to specialize in subjects, without having to worry about fulfilling graduation requirements. It is worth noting that while statistically significant, on a practical level, results showing students are taking .438 fewer classes do not indicate drastic change on an individual basis. However, this number does have an impact at an institutional level, especially in evaluation of the intention and reality of policy measures. Furthermore, results indicate that moving to the

Breadth of Requirements system increased the number of students pursuing double majors and interdisciplinary majors, which also shifts the academic structure of coursework for the student body.

In terms of policy implications, if breadth of education is a goal of liberal arts colleges, these results indicate that moving to a looser system of course requirements leads to students taking a narrower range of classes. Thus, it may be that a more structured general education system fosters a more well-rounded education. However, John Seery, Professor of Politics at Pomona College, postulates that there is also the possibility that student course enrollment decisions are not a monotonic function of the intensity of general education requirements. In particular, he postulates there may be a negative relationship between intensity of general requirements and course diversity until the point at which the level of general requirement equals zero (i.e. an open curriculum). This trend may not hold true at that point though.
This hypothesis is explained by the idea that moving to an open curriculum may fundamentally change the nature of the relationship between a student and their education. Under an open curriculum, there is an explicit expectation that the student is in charge of their own education, so the responsibility of choosing an appropriate array of classes falls on the student, rather than the administration. In this way, Seery believes that when the administration ceases to impose requirements, students view their course enrollment decisions through a completely different framework. Thus, it may not be reasonable to extrapolate from test data and infer that the more relaxed the general education requirement system, the lower the breadth of disciplines students pursue.

The yearly analysis includes the transition years from the curriculum change and shows a decline in number of subjects taken after the curriculum change. The results are especially noticeable in the years directly following the curriculum change, and have leveled out somewhat since then. This could be indicative of an "adjustment" period, in which students, faculty, and administration adapt to the new system at hand. Thus, it is possible that in due time, as the college adapts to the new system through institutional and personnel channels, course enrollment patterns would converge more closely to pre-2006 trends.

The lack of more extensive data in both a cross-sectional and longitudinal sense presented a limitation to this study. For future research, it would be interesting to analyze course enrollment trends at other liberal arts colleges to compare them with those at Pomona College, if the data could be made available. This would provide a better picture of the scope of enrollment trends in the liberal arts. Furthermore, it would have been interesting to be able to link student information with their career outcomes after they left college, had that data been available.

Ultimately, there is no consensus on the optimal structure of a liberal arts education. Even within an institution, policy changes are constantly being enacted to reform and refine existing practices, such as curriculum requirements. Studies such as this help to uncover the specific effects of these implementations, and a continuation of research in this area will hopefully continue to shed greater light on the topic and in providing more informed policy decisions

in our education system.

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Table 1: Descriptive Statistics: Initial Regression

Variable	Mean	Standard Deviation	Minimum	Maximum
Number of Different Disciplines	13.29	2.09	6	24
Interdisciplinary Major	.179	.383	0	1
Double Major	.086	.280	0	1

n=3,456

Table 2: General OLS Regression, on Mean Number of Disciplines

Variable	Coefficient
General Education	-.438***
	(.072)
Interdisciplinary Major	1.70***
	(.086)
Double Major	-1.40***
	(.118)
Constant	13.24***
	(.043)
Obervations	3,456
R^2	.137

Standard errors in parentheses
***p<.01, **p<.05

Table 3: OLS Regression with Interactions, on Mean Number of Disciplines

Variable	Coefficient
General Education	-.466***
	(.083)
Double Major	-1.35***
	(.154)
Interdisciplinary	1.63***
	(.106)
General Education*Interdisciplinary	.214
	(.183)
General Education*Double Major	.-122
	(.281)
Constant	13.25***
	(.045)
Observations	3456
R^2	.137

Standard errors in parentheses
***p<.01, **p<.05

Table 4: OLS Regression, on Proportion of Double Majors

Variable	Coefficient
General Education	.048***
	(.010)
Interdisciplinary Major	.033***
	(.012)
Constant	.065***
	(.006)
Obervations	3,456
R^2	.008

Standard errors in parentheses
***p<.01, **p<.05

Table 5: OLS Regression, on Proportion of Interdisciplinary Majors

Variable	Coefficient
General Education	.033**
	(.014)
Double Major	.062***
	(.023)
Constant	.163***
	(.008)
Obervations	3,456
R^2	.004

Standard errors in parentheses
***p<.01, **p<.05

Table 6: Summary Statistics (by Year)

Year	Variable	Mean	Median	Std. Dev.	Min	Max
2000	Num. Different Disciplines	12.86	13	1.95	8	19
	Interdisciplinary Major	.171	0	.377	0	1
	Double Major	.063	0	.243	0	1
Observations	334					
2001	Num. Different Disciplines	12.68	13	1.80	8	19
	Interdisciplinary Major	.105	0	.307	0	1
	Double Major	.047	0	.211	0	1
Observations	343					
2002	Num. Different Disciplines	12.81	13	2.13	8	20
	Interdisciplinary Major	.154	0	.332	0	1
	Double Major	.082	0	.274	0	1
Observations	331					
2003	Num. Different Disciplines	12.89	13	2.09	8	20
	Interdisciplinary Major	.202	0	.402	0	1
	Double Major	.058	0	.233	0	1
Observations	347					
2004	Num. Different Disciplines	12.82	13	1.95	8	23
	Interdisciplinary Major	.174	0	.340	0	1
	Double Major	.068	0	.252	0	1
Observations	368					
2005	Num. Different Disciplines	12.89	13	2.23	6	20
	Interdisciplinary Major	.164	0	.371	0	1
	Double Major	.078	0	.268	0	1
Observations	347					
2006	Num. Different Disciplines	12.70	12	2.17	8	20
	Interdisciplinary Major	.188	0	.391	0	1
	Double Major	.098	0	.298	0	1
Observations	356					
2007	Num. Different Disciplines	12.62	13	2.41	6	19
	Interdisciplinary Major	.195	0	.397	0	1
	Double Major	.116	0	.320	0	1
Observations	354					
2008	Num. Different Disciplines	12.26	12	2.24	7	20
	Interdisciplinary Major	.172	0	.378	0	1
	Double Major	.068	0	.252	0	1
Observations	367					

(Continued on next page)

Year	Variable	Mean	Median	Std. Dev.	Min	Max
2009	Num. Different Disciplines	11.95	12	2.30	7	18
	Interdisciplinary Major	.199	0	.40	0	1
	Double Major	.142	0	.350	0	1
Observations	352					
2010	Num. Different Disciplines	12.31	12	2.27	6	19
	Interdisciplinary Major	.178	0	.383	0	1
	Double Major	.079	0	.270	0	1
Observations	353					
2011	Num. Different Disciplines	12.47	12	2.18	7	20
	Interdisciplinary Major	.249	0	.433	0	1
	Double Major	.127	0	.334	0	1
Observations	361					
2012	Num. Different Disciplines	12.32	12	2.15	7	20
	Interdisciplinary Major	.181	0	.385	0	1
	Double Major	.152	0	.359	0	1
Observations	349					

Figure 1: Mean/Median Number of Different Disciplines

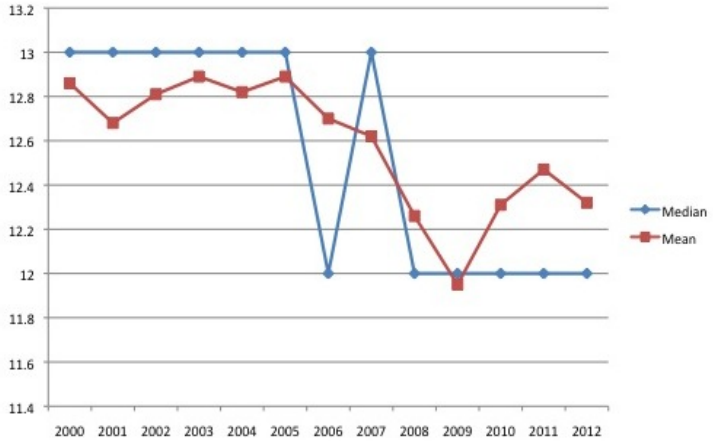

Figure 2: Mean Percentage of Interdisciplinary Majors

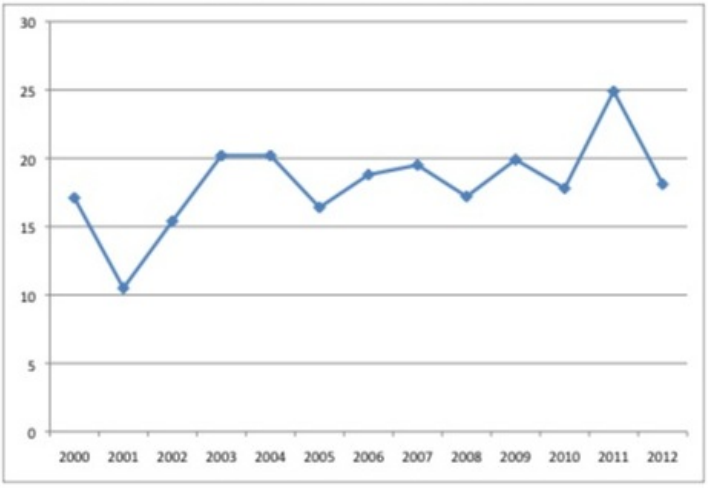

Figure 3: Mean Percentage of Double Majors

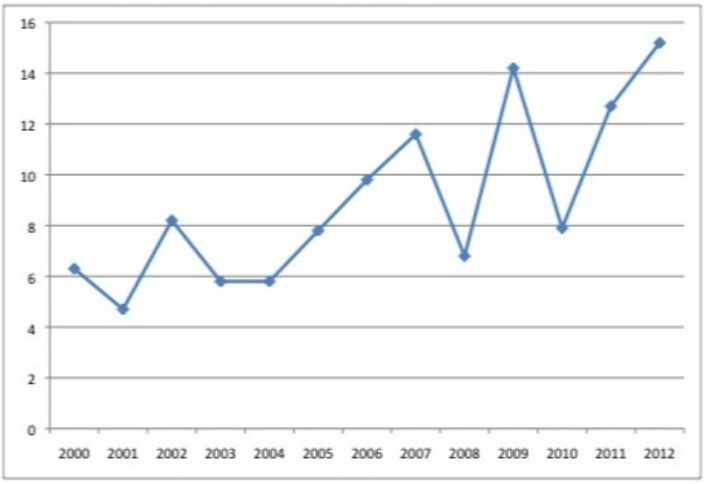

Table 7: Analysis by Year, on Mean Number of Disciplines

Variable	Coefficient
Interdisciplinary Major	1.56***
	(.079)
Double Major	-1.42***
	(.105)
2000	.137
	(.155)
2001	.036
	(.154)
2002	.140
	(.155)
2003	.112
	(.153)
2004	.098
	(.151)
2005	.199
	(.153)
2007	-.058
	(.152)
2008	-.457***
	(.151)
2009	-.699***
	(.153)
2010	-.394**
	(.152)
2011	.285
	(.152)
2012	-.285
	(.153)
Constant	12.54***
	(.109)
Obervations	4,562
R^2	.125

Standard errors in parentheses
***p<.01, **p<.05