Evaluating Academic Programs in California's Community Colleges

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Foreword

California's system of higher education is a three-legged stool. One leg of that stool—the California Community College (CCC) system—has the largest number of students. Sprawling over the state with 108 colleges in 72 districts, the CCC system enrolled well over 1.5 million students in academic year 2002. The other two legs of the stool—the University of California (UC) and California State University (CSU)—together enrolled less than 600,000 students in that same year. PPIC is committed to improving public understanding about the financing and operation of California's community colleges because they are critically important in educating and training the state's future labor force.

In this study, Andrew Gill and Duane Leigh ask a key question about the function of the CCC system: To what extent do California's community colleges choose different missions? This is an important question for two reasons. First, as part of the master plan for higher education, it is assumed that community colleges often represent a stepping stone to completion of a four-year education at one of the UC or CSU campuses. Do the community colleges perform this function? If not, alternative means of preparing students for four-year degrees will be required.

Second, if community colleges are to be assessed for their contribution to higher education in the state, each campus will have to be judged against its own mission—not some generalized mission that seriously weakens the conclusions of a statewide evaluation of the system.

In fact, the authors conclude that a "one-size-fits-all" strategy for community colleges may not be appropriate. Over 40 percent of the colleges specialize in one way or another. For example, Gill and Leigh find that most credits offered by most community colleges are transferable to four-year colleges. They note that both vocational education programs and traditional academic programs generate these credits. At the same time, many campuses provide vocational education

courses that are not transferable but that are expected to lead to jobs in the local labor market. The authors estimate that 19 of California's 108 community colleges emphasize nontransferable vocational education credits and de-emphasize transfer credits, whereas 26 community colleges do the opposite.

The message of this report is clear: Although community colleges are part of a statewide system of higher education, their roots in local communities generate a greater variety of missions, curricula, and courses than is found in traditional four-year universities. This variety is to be expected, and presumably each campus serves the needs and requirements of its particular student body.

It is likely that tensions will continue between the overall goals of the California system of higher education, which is funded in large part with state resources, and the goals of local community colleges, which rightly feel that they are more in touch with the preferences of families and employers in their respective cities and towns. This tension has probably been responsible, in part, for a declining share of total higher education spending allocated to community colleges. The tension is a reflection of those who see community colleges as an integral part of a three-legged stool and of others who prefer that community colleges exercise their freedom to break from the mold that constrains most college curriculum. There is no easy solution, but the authors of this report make it clear that the mission of each community college is important to its program of services and should therefore be judged accordingly.

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Summary

Community colleges have traditionally received funding based on student enrollment, which is usually considered an input in the educational process. Recently, however, legislation enacted at the federal and state levels specifies that funding is to hinge, as least in part, on student performance—an output measure. Performance standards improve resource allocation by identifying colleges whose programs do not measure up to the standards so that remedial action can be taken or sanctions imposed. At the same time, performance standards applied uniformly across community colleges may be counterproductive if colleges differ significantly in their missions.

Using data for community colleges in the California Community College System (CCCS), our study provides empirical evidence on the extent to which community colleges choose different missions. We ask three interrelated questions. First, do colleges differ in their missions as reflected in the mix of academic programs they offer? The size and complexity of the CCCS make it likely that individual colleges will choose different missions, which we measure as differences in curriculum "emphasis" and "specialization." Differences in curriculum emphasis are defined by systematic deviations in the curriculums offered by individual colleges from those offered by a "typical" or average college. Curriculum specialization goes a step further by linking an emphasis on one curriculum measure with a de-emphasis on another.

If colleges do appear to differ in their missions, our second question is whether observed differences in emphasis and specialization can be explained using measurable indicators of college-specific characteristics and community needs. If community colleges differ in ways that are linked to these explanatory variables, the third question is whether our evidence may be useful in developing guidelines for evaluating community college performance.

Evidence on the missions of community colleges is typically obtained by interviewing college administrators and stakeholders in the community. The approach we pursue in this report, in contrast, is to collect in one large dataset curriculum information available online for all 108 CCCS campuses. One element of this dataset is our characterization of whether individual colleges have different curriculum emphases as indicated by their campus descriptions. In addition, we collect a wealth of quantitative data on curriculum mix measured in terms of credits, courses, programs, and the interests of freshman students. To this curriculum information, we append data available online measuring local labor market characteristics, community demographic variables, and college-specific characteristics such as membership in a multicampus community college district and proximity to a four-year college.

In response to our first research question, we find that most community colleges are oriented toward offering programs that supply credits transferable to four-year colleges. We note, however, that transferable programs include both traditional academic programs and vocational education (voc-ed) programs such as programs in business, computer science, and electronics. Transferable voc-ed offerings are increasingly common in California and nationwide. Where California community colleges do seem to differ is in their emphasis on voc-ed offerings that are transferable and taught at an advanced level. For example, the interquartile range calculated for a curriculum variable measuring the proportion of transferable voc-ed credits indicates that the top 25 percent of colleges differ from the bottom 25 percent by at least 27 percentage points. Similarly, the top 25 percent of colleges differ from the bottom 25 percent by nearly 20 percentage points on the proportion of voc-ed courses taught at an advanced level.

Moving beyond emphasis to the concept of specialization, our preferred measure suggests that 45 colleges specialize in some way. Specifically, 26 colleges have a transfer specialization, meaning that they choose to emphasize transfer credits while de-emphasizing nontransferable voc-ed credits. Another 19 colleges specialize in nontransferable voc-ed, meaning that they emphasize nontransferable voc-ed credits while de-emphasizing transfer credits.

Turning to the second research question, the intercollege differences in curriculum emphasis and specialization we observe are reasonably well explained by measurable indicators of college-specific characteristics and community needs. Colleges that specialize in either a transferable curriculum or in nontransferable voc-ed offerings are more likely than other colleges to belong to a multicampus district and to be located in large labor markets. Between these two categories of specialization, colleges that have a transfer specialization tend to be closer to a UC or a CSU campus. Colleges that specialize in nontransferable voc-ed tend to have a larger proportion of Hispanic students and to be in larger communities with greater minority populations.

Building on our empirical evidence, we offer the following observations that we believe should be considered in evaluating the performance of California's community colleges.

1. On average, California community colleges offer more credits in transferable programs than in other broad curriculum categories. With a few exceptions, our evidence suggests that colleges are heavily engaged in offering transferable curriculums.
2. Although colleges place a priority on transferable offerings, attention to transfer rates is not sufficient for evaluation because transferable curriculums are a mix of voc-ed courses and traditional academic courses. Success for colleges with a strong transferable voc-ed orientation might be placement in training-related jobs as opposed to transfers to four-year colleges.
3. Some colleges specialize in transferable curriculums, whereas others specialize in nontransferable voc-ed. Similarly, colleges differ in their emphasis on advanced voc-ed curriculums and in the interests of their freshman students in voc-ed. These differences in specializations and emphases indicate important differences in the missions chosen by different colleges. Differences in missions, in turn, suggest that a "one size fits all" evaluation strategy is not appropriate.
4. Basic skills programs are a small proportion of most community colleges' total credits offered.

5. Differences in missions as reflected in differences in curriculum specializations and emphases are responsive to differences in college-specific characteristics and community needs.

Precisely how to allow for differences in missions in evaluating performance is a difficult issue that is currently receiving attention by policymakers in states across the nation. We conclude our report by describing two possible approaches. The first is a model-based approach that allows common performance standards to be adjusted in response to quantitative differences between colleges in student characteristics and local economic conditions. To the extent that colleges can demonstrate that their missions differ, the second approach is for the state to tailor performance standards to take into account alternative missions.

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1. Introduction

Community colleges are complex institutions offering a wide range of academic programs to various groups. Historically, community college students completed two years of a general undergraduate education and earned an associate's degree (A.A.). Students with the interest and capability would then transfer to a four-year college to complete a bachelor's degree. Kane and Rouse (1999) describe how over time community colleges have also expanded their course offerings in vocational education (voc-ed) and adult basic skills. Voc-ed programs often culminate in an A.A. degree or certificate. But Grubb (1996, p. 94) emphasizes that today, credits earned in such voc-ed programs as business, computer science, and electronics are frequently transferable to four-year colleges. In addition to offering a broad range of courses in traditional academic areas, voc-ed, and adult basic skills, a growing number of community colleges provide "contract training"—that is, occupational skills classes designed to meet the needs of particular employers and sometimes delivered on site.

As academic offerings have expanded, so has the number of groups to which community colleges must be responsive. Traditional students are 18–22-year-olds who attend community college full-time with the objective of transferring to a four-year college. Nontraditional community college students include adult workers returning to school to sharpen their skills or earn a degree, dislocated workers and returning homemakers seeking retraining for new careers, single mothers seeking to make the welfare-to-work transition, and immigrants interested in improving their language skills and learning more about American culture. These nontraditional students are typically enrolled part time. Other community college constituencies include employers looking for contract training programs and local government officials seeking to encourage the economic development of their communities.

As their program offerings and constituencies expand, community colleges are increasingly being held to performance standards. The primary objective of performance standards—improving resource allocation—is laudable. These standards help colleges identify weak programs and either improve or drop them from the curriculum. They also help community college districts and state systems, such as the California Community College System (CCCS), identify underperforming colleges in need of remedial action or sanctions.

The downside of performance standards is that community colleges may not be all alike. When colleges differ substantially in their missions, performance standards applied uniformly will penalize colleges that are accomplishing the mission they have chosen. For example, transfer rate is not an appropriate performance criterion for a community college whose primary mission is to provide occupational training for immediate employment in the local labor market.

In this report, we investigate the extent to which California community colleges differ in their missions, which we measure by differences in the mix of academic programs they offer. We focus on California community colleges for four reasons. First, the CCCS is the nation's oldest and most extensive community college system offering educational services on 108 campuses to over 1.6 million students as of Fall 2001. Romano (2003) remarks that California so dominates national community college statistics that researchers often do their calculations with and without California data included. In a community college system as large and complex as California's, community colleges are most likely to differ in their missions.[1] Second, California is well known for and has been widely emulated by other states for its open admission and low tuition policies. These policies were established in 1960 by the Master Plan for Higher Education in California. Third, the rich ethnic and racial diversity of the state allows us to address issues involving the effect of race and ethnicity on the mix of community

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[1]As Bailey (2002, p. 69) notes, community colleges cannot be expected to do everything well and therefore must choose a more limited set of objectives in much the same way that a business firm chooses to focus on its "core competency." At the same time, he indicates that, largely for political reasons, community colleges nationwide often pursue a comprehensive strategy emphasizing breadth of program offerings.

college academic offerings. Finally, a wealth of data is available online identifying the academic programs provided by California community colleges. To our knowledge, our report is the first to bring together the several sources of curriculum data for California community colleges into a unified and consistent dataset.

Multiple Missions and Reporting Requirements

The Master Plan of 1960 gives California community colleges considerable discretion in determining the mix of academic programs to offer. At the same time, California community colleges, as is true for community colleges across the nation, face a plethora of performance standards. One example is the federal student-right-to-know (SRTK) regulation that requires the collection and reporting of transfer and completion rates. To set the stage for our discussion of differences in missions among colleges, Table 1.1 displays transfer and completion rates for 107 colleges in the CCCS measured as of 1999 (Chancellor's Office, 2003).

Several measurement issues make us cautious in comparing the performance of particular colleges using SRTK data.[2] The main point we draw from Table 1.1 is simply the variability across colleges in the two rates shown. Completion rates range from a high of 49.5 percent for Las Positas College to a low of 11.5 percent for Los Angeles Mission College. Similarly, transfer rates range from a high of 55.9 percent for Merritt College to a low of 4.6 percent for Lassen College. If we take these data at face value, a question that comes to mind is, what are colleges with low completion and transfer rates doing? One answer is that they are not doing their job and need to improve. An equally plausible answer, and one that is noted in the Chancellor's Office (2003) report, is that colleges differ in their missions. As suggested above, some colleges may choose not to emphasize the transfer function but instead

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[2]The first of these is the restriction of the universe of students to first-time, full-time freshmen (which greatly reduces the tracking pool). The second is a counting methodology that requires a hierarchy of outcomes such that students who earned degrees or became transfer-prepared are removed from the calculation of transfer rates. The third issue is inclusion in transfer rates of students who transfer between community colleges in addition to students who transfer to four-year institutions.

Table 1.1

Percentage Completion and Transfer Rates for Full-Time Freshman Students Enrolled in California Community Colleges, Fall 1999 to Spring 2002

College	Completion Rate	Transfer Rate	College	Completion Rate	Transfer Rate
Alameda	33.7	38.4	Evergreen Valley	28.4	40.1
Allan Hancock	41.9	11.0	Feather River	48.5	33.3
American River	33.6	13.4	Foothill	39.2	31.5
Antelope Valley	43.3	10.1	Fresno City	30.2	32.8
Bakersfield	34.6	23.3	Fullerton	23.7	47.7
Barstow	29.6	12.7	Gavilan	37.9	22.7
Butte	36.8	17.2	Glendale	32.8	25.5
Cabrillo	35.1	17.1	Golden West	35.5	29.3
Canada	23.1	41.0	Grossmont	30.2	24.2
Canyons	40.7	23.5	Hartnell	44.1	15.3
Cerritos	27.1	20.8	Imperial Valley	46.4	16.6
Cerro Coso	39.8	18.3	Irvine Valley	39.7	23.7
Chabot	33.8	30.5	Lake Tahoe	35.0	52.5
Chaffey	25.7	18.9	Laney	28.0	37.9
Citrus	28.3	26.8	Las Positas	49.5	22.4
Coastline	26.7	33.3	Lassen	23.1	4.6
Columbia	32.1	30.4	Long Beach	30.2	18.6
Compton	17.4	21.7	Los Angeles City	29.4	25.2
Contra Costa	32.5	22.5	Los Angeles Harbor	29.8	22.8
Cosumnes River	27.6	25.5	Los Angeles Mission	11.5	26.9
Crafton Hills	29.9	20.5	Los Angeles Pierce	36.7	30.7
Cuesta	35.3	25.7	Los Angeles Southwest	23.1	15.4
Cuyamaca	28.1	28.1	Los Angeles Trade-Tech	21.6	35.1
Cypress	20.8	41.2	Los Angeles Valley	38.3	28.3
DeAnza	42.8	33.4	Los Medanos	24.3	29.2
Desert	48.4	4.8	Marin	26.5	36.7
Diablo Valley	41.1	24.3	Mendocino	34.4	23.2
East Los Angeles	26.1	22.5	Merced	30.8	15.2
El Camino	38.6	16.1	Merritt	23.7	55.9

Table 1.1 (continued)

College	Completion Rate	Transfer Rate	College	Completion Rate	Transfer Rate
Mira Costa	27.8	25.9	San Francisco City	43.5	20.1
Mission	32.0	33.3	San Joaquin Delta	32.4	17.3
Modesto	34.6	18.0	San Jose City	17.9	38.4
Monterey	41.5	18.7	San Mateo	41.7	33.1
Moorpark	29.9	27.3	Santa Ana	36.3	25.0
Mt. San Antonio	31.6	28.5	Santa Barbara	43.8	26.6
Mt. San Jacinto	29.8	20.2	Santa Monica	36.8	19.1
Napa Valley	35.0	10.0	Santa Rosa	45.7	9.7
Ohlone	33.8	26.8	Santiago Canyon	31.1	37.8
Orange Coast	40.3	26.7	Sequoias	34.2	15.3
Oxnard	27.4	19.2	Shasta	34.7	16.7
Palo Verde	31.8	18.2	Sierra	36.0	22.0
Palomar	28.2	21.0	Siskiyous	30.3	25.8
Pasadena City	39.7	20.2	Skyline	31.9	24.8
Porterville	41.6	13.6	Solano	29.6	24.4
Redwoods	31.7	23.2	Southwestern	36.5	11.6
Reedly	41.0	38.5	Taft	42.0	14.5
Rio Hondo	23.7	32.2	Ventura	32.8	26.6
Riverside	32.1	27.2	Victor Valley	23.4	22.3
Sacramento City	33.1	23.9	Vista	22.1	48.8
Saddleback	38.2	22.1	West Hills	23.3	17.0
San Bernardino	15.7	20.4	West Los Angeles	17.4	32.6
San Diego City	13.1	21.3	West Valley	40.6	31.5
San Diego Mesa	28.4	30.5	Yuba	38.1	25.3
San Diego Miramar	17.1	51.4			

SOURCE: Chancellor's Office (2003).

NOTES: Completion rates measure the percentage of students who earn an A.A. degree or certificate or become "transfer-prepared." Excluding those measured as "completers," transfer rates measure the percentage of students who transfer to a four-year institution or to another two-year college. Copper Mountain College is omitted, since it did not begin operation until 2001.

choose to emphasize voc-ed training that provides occupational skills immediately salable in the local labor market. Before leaving Table 1.1, it is worth noting that the dataset used to calculate these rates—the First-Time Freshman (FTF) student cohort—is discussed in Chapter 2 as a measure of the educational objectives of freshman students.

In addition to SRTK regulation, community colleges are subject to reporting requirements imposed by two important pieces of federal legislation. These are the Workforce Investment Act (WIA) of 1998 and the Carl D. Perkins Vocational and Technical Education Act (VTEA) of 1998. These laws impose requirements that are substantially more detailed than those needed to satisfy colleges' SRTK obligations. In particular, both laws require that states establish comprehensive accountability systems that include multiple "core indicators" of performance. In California, the Partnership for Excellence (PFE) agreement of 1996 between the state and the CCCS and the California Perkins State Plan of 1994 specify performance standards that satisfy federal requirements.

With some justification, community college administrators often regard these performance standards as flawed. For our purposes, however, a favorable but unintended consequence of performance standards is that California community colleges report not only outcome measures, such as transfer and completion rates, but also measures of the academic programs they provide. As will be discussed in more detail in Chapter 2, these curriculum measures are expressed in terms of distributions of credits, courses, programs, and student interests. Existing analyses of the question "What do community colleges do?" typically proceed with site visits to selected colleges. Our investigation of a dataset covering all the community colleges in a large system such as the CCCS should allow us to provide a more comprehensive answer to this fundamental question.

Research Objectives

Our analysis has three primary goals. The first is to measure the extent to which community colleges differ in their missions as measured by the curriculum mixes they offer. We discuss this variation in terms of differences in curriculum "emphasis" and curriculum "specialization." In

Chapter 3, we consider alternative definitions of these two concepts. By differences in curriculum emphasis, we mean systematic deviations in the curriculums offered by individual colleges from that offered by a typical or average college. By differences in curriculum specialization, we go a step further by coupling emphasis on one curriculum variable (for example, traditional academic programs leading to transfer to a four-year college) with a de-emphasis on another variable, such as occupational skills training immediately applicable in the local labor market.

The second goal is to explain observed differences in emphasis and specialization using measures of college-specific variables, such as proximity to the nearest four-year college, and of community needs, such as local job opportunities and demographic characteristics of the local service area. Our final goal is to use this evidence to help guide policymakers in evaluating community colleges.

Organization of the Report

Chapter 2 outlines the several sources of online information we put together into a consistent dataset. This dataset includes, for each of the 108 campuses in the CCCS, a number of alternative curriculum measures. These measures receive detailed examination in Chapter 3, where we look for differences in curriculum emphasis and specialization across colleges. In Chapter 4, we present evidence on the extent to which differences in curriculum emphases and specializations can be accounted for by a reasonable set of explanatory variables including measures of community demographics, local labor market characteristics, and college-specific characteristics. In Chapter 5, we offer an overview of key provisions of the California Master Plan and provide some detail on the multiple performance indicators faced by community colleges. Then we draw on our empirical findings to offer suggestions to policymakers intended to better inform the process of evaluating the performance of community colleges.

2. Measures of Community College Curriculum Mix

In Chapter 1, we identified the three primary missions of colleges in the California Community College System. This chapter is concerned with measuring these three academic missions using data available online for the 108 CCCS campuses. In this chapter, we present simple descriptive statistics for the curriculum measures developed. A more detailed analysis of these data looking for evidence of curriculum emphasis and specialization is in Chapter 3.

One approach to measuring a community college's primary mission or missions is to examine how the college describes itself on its web page. We begin this chapter with a consideration of these campus descriptions, which are collected on the California Postsecondary Education Commission (CPEC) web site.

A second approach to measuring differences in missions is to use online sources of quantitative data measuring curriculum mix. As noted in Chapter 1, California community colleges report a wealth of curriculum data in response to performance standards imposed at the state and federal levels. In this chapter, we describe three sources of quantitative data from which we construct 21 curriculum mix variables. Sources of quantitative data are

- PFE data on student enrollment measured in credits;
- Data on voc-ed courses and programs reported by the CCCS Chancellor's Office to satisfy its VTEA obligation; and
- FTF data on students' academic objectives.

Added to our discussion of VTEA data is a brief description of the Chancellor's Office "Inventory of Approved and Projected Programs," which provides an additional measure of "approved" voc-ed programs. Technical detail on these quantitative datasets is found in Appendix A.

CPEC Campus Descriptions

For each community college, the CPEC web site provides a brief campus description, information on total enrollment, the gender and race or ethnicity of students, a list of programs offered, and links to additional information about the college. Also reported is a campus mailing address. The campus descriptions provide information indicating what the college believes to be especially noteworthy about its academic programs. Using this information to measure curriculum emphasis, we construct a three-category discrete variable with categories indicating voc-ed emphasis, transfer emphasis, and emphasis indeterminate. The criteria used to classify each college in this three-category scheme are as follows.

Voc-ed emphasis

- Pride expressed in particular occupational skill training programs;
- Emphasis on partnerships with local business firms; and
- Emphasis on employment opportunities in the local area and job placement assistance services.

Transfer emphasis

- Expression of pride in college's success in transferring students to University of California (UC) and California State University (CSU) campuses; and
- Emphasis on special transfer arrangements with four-year colleges, especially UC and CSU campuses.

Indeterminate

- Emphasis on breadth of course offerings, student services, and extracurricular programs;
- Emphasis on location and facilities; and
- Emphasis on other attributes such as multicultural student body, small classes, individual attention, and high-quality faculty.

Two colleges that are easily classified as having a voc-ed or transfer emphasis are, respectively, Los Angeles Trade-Tech College and Santa Barbara City College (SBCC). Los Angeles Trade-Tech describes itself as "the 'flagship vocational college' of the Los Angeles Community College District." On the other hand, SBCC writes that "the college prides itself on the overall excellence of its academic programs and student support services. It is a top community college for transferring students to the University of California system."

The SBCC statement goes on to describe the college's special transfer programs with area four-year colleges and universities. Laden (1999) identifies SBCC and Santa Monica College as the state's leading community colleges in terms of overall transfer rates and transfers to the highly selective UC system. In the discussion of PFE, VTEA, and FTF data that follows, we use Los Angeles Trade-Tech and Santa Barbara City College as examples to illustrate the variety of curriculum mix measures provided by these datasets.

Although Los Angeles Trade-Tech and SBCC neatly fit the criteria outlined above, many other colleges provide campus descriptions that are either too brief or too general to allow ready classification. In these cases, we followed up by examining the college's mission statement, the president's introductory letter if available, and other pertinent information. This additional information was seldom helpful. As seen in Table 2.1, we are able to classify 17 colleges, including Los Angeles Trade-Tech, as having a voc-ed emphasis, and 11 colleges, including Santa Barbara City College, as having a transfer emphasis. The remaining 80 colleges fall into the indeterminate emphasis category. Our general impression from reading CPEC descriptions is that most colleges do not take advantage of this opportunity to differentiate themselves when describing their academic programs. Rather, they indicate that they provide a full range of educational programs and attempt to distinguish themselves by emphasizing their location and facilities.

Table 2.1

California Community Colleges' Emphases Based on CPEC Campus Descriptions

College with Transfer Emphasis	College with Voc-Ed Emphasis
Chabot	Coastline
Diablo Valley	Contra Costa
Fullerton	Copper Mountain
Las Positas	Cosumnes River
Los Angeles Harbor	Desert
Los Angeles Pierce	East Los Angeles
Marin	Foothill
Oxnard	Fresno City
Santa Barbara City	Lassen
Santa Monica	Long Beach City
Ventura	Los Angeles Trade-Tech
	Moorpark
	San Diego Miramar
	San Joaquin Delta
	Shasta
	Siskiyous
	Taft

PFE Data on Enrollment

The Partnership for Excellence is an agreement between the state and the CCCS committing community colleges to five quantitative performance goals, two of which are interesting to us. Goal 3 is the system's commitment to increase overall rates of successful course completion, where courses are broken down by transferable, voc-ed, and basic skills credits. Goal 4 involves a CCCS commitment to enhance statewide workforce development by increasing successful course completion among voc-ed courses classified as apprenticeship, advanced occupational, and introductory occupational. Advanced occupational courses must have an introductory prerequisite in the same program area. Examples of advanced voc-ed courses are dental pathology, legal secretarial procedures, contact lens laboratory, fire hydraulics, and real estate finance. Introductory occupational courses are intended to provide students with entry-level job skills. Some examples of

introductory voc-ed courses are principles of advertising, clinical techniques, and technical engineering.

Goal 3 Measures of Broad Curriculum Categories

PFE data provided in response to Goal 3 are especially valuable because these data measure the quantitative importance of all three primary community college missions. Transferable courses are defined as courses that are transferable to UC or CSU campuses. Voc-ed courses, in contrast, are defined as nontransferable courses implying a "narrow" definition of voc-ed. Basic skills courses include those defined as "possibly occupational" and "nonvocational." It should be emphasized that the transfer, narrow voc-ed, and basic skills categories are mutually exclusive. We use credits for courses attempted (as opposed to credits for courses completed) as our PFE curriculum mix measure because credits for courses attempted represent the academic services a college offers.

One further point to note about Goal 3 PFE data is that the sum of transferable, narrow voc-ed, and basic skills credits attempted does not sum up to total credits attempted. We define as a "residual" category of course enrollment the difference between total credits attempted and the sum of enrollment in transferable, narrow voc-ed, and basic skills courses. Residual courses seem to us to fall under the heading of "consumption goods," defined as courses in which students choose to enroll to enhance the quality of their lives as opposed to improving their labor market opportunities or building up transferable credits.

The first four rows of Table 2.2 display means and maximum and minimum values for ratios of transferable, narrow voc-ed, basic skills, and residual credits to all credits. Also shown are the ratios calculated for SBCC and Los Angeles Trade-Tech. Row 1 indicates that on average, about 73 percent of credits offered during the 2000–2001 academic year are transferable. The ratio calculated for SBCC lies somewhat above this mean, whereas the ratio for Los Angeles Trade-Tech falls somewhat below. A maximum value of 92.2 percent is found for Orange Coast College in Orange County, and the minimum of 18.7 percent is calculated for Taft College at the southern end of the San Joaquin Valley. It is interesting to note from Table 2.1 that we failed to classify Orange Coast College as having a transfer emphasis because of its brief

Table 2.2

Measures of Curriculum Mix Using PFE Enrollment Data, 2000–2001

Enrollment Measure	SBCC	Los Angeles Trade-Tech	Mean	Minimum	Maximum
1. Transferable credits/all credits	.854	.624	.733	.187	.922
2. Narrow voc-ed credits/all credits	.058	.162	.087	.000	.756
3. Basic skills credits/all credits	.041	.093	.069	.008	.215
4. Residual credits/all credits	.047	.121	.111	.015	.326
5. Broad voc-ed credits/ all credits	.254	.252	.229	.063	.821
6. Narrow voc-ed credits/ all voc-ed credits	.227	.643	.356	.000	.920
7. Apprenticeship credits/ all voc-ed credits	.000	.057	.017	.000	.727
8. Advanced voc-ed credits/ all voc-ed credits	.614	.180	.207	.000	.647
9. Academic transfer credits/ all credits	.658	.534	.591	.117	.859

and nonspecific CPEC campus description. However, we did classify Taft College as having a voc-ed emphasis on the basis of its CPEC description.

The remaining three categories of credits shown in rows 2–4 are, on average, roughly evenly distributed across the narrow voc-ed, basic skills, and residual categories. In each of these three rows, in addition, ratios calculated for Los Angeles Trade-Tech are larger than those for SBCC. A large range of 75.6 percentage points between maximum and minimum values appears in row 2 for narrow voc-ed. The maximum value for this ratio is calculated for Taft College, and the minimum value is for Orange Coast College. Maximum/minimum ranges are much smaller for basic skills credits (20.7 percentage points) and residual credits (31.1 percentage points). The mean for proportion of basic skills credits (6.9%) in Table 2.2 probably understates the resources that

colleges devote to basic skills, since basic skills programs are typically noncredit programs (Gumport, 2003).

Goal 4 Variables Measuring Categories of Voc-Ed Credits

Whereas Goal 3 PFE data offer a more complete view of curriculum mix, Goal 4 PFE data provide a detailed breakdown of voc-ed credits by transferability and type. As indicated in Chapter 1, Grubb (1996) emphasizes that a growing proportion of voc-ed enrollment is in courses that are transferable to four-year colleges. He notes, in particular, that courses in business, computer science, and electronics are frequently transferable. A comparison of rows 2 and 5 of Table 2.2 indicates that, measured at the means, the proportion of voc-ed credits to all credits nearly triples to 22.9 percent when we consider the broad rather than the narrow definition. In row 5, inclusion of transferable voc-ed makes the broad voc-ed ratios for SBCC and Los Angeles Trade-Tech essentially the same at about 25 percent, whereas row 2 indicates a much lower narrow voc-ed ratio for SBCC. This difference in mix of voc-ed credits is highlighted in row 6 in the ratio of narrow voc-ed credits to all voc-ed credits. Almost two-thirds of voc-ed credits measured for Los Angeles Trade-Tech are nontransferable, as opposed to less than 25 percent for Santa Barbara City College.

Rows 7 and 8 make use of Goal 4 PFE information on credits broken down by type of occupational education courses. Row 7 shows that SBCC has no enrollment in apprenticeship courses, whereas only 5.7 percent of total voc-ed enrollment at Los Angeles Trade-Tech is in apprenticeship courses. Well over half of all colleges resemble SBCC in having no students enrolled in apprenticeship programs. Nevertheless, apprenticeship training does represent a sizable component of voc-ed enrollment at a handful of colleges. The leading example is Santiago Canyon College, in Orange in Southern California, in which 72.7 percent of voc-ed enrollment is in apprenticeship courses. Santiago Canyon is clearly an outlier, however, because the next highest ratio of apprenticeship programs is just 12.3 percent for American River College.

Row 6 shows that a much larger proportion of voc-ed credits offered at Santa Barbara City College is transferable than is the case at Los Angeles Trade-Tech. Row 8 indicates, similarly, that many more credits

are taught at the advanced level at SBCC than at Los Angeles Trade-Tech. The minimum level of 0 percent observed in row 8 is for Lake Tahoe Community College, followed by Taft College with only 2.8 percent of voc-ed enrollment at the advanced level. The maximum value of 64.7 percent is observed for Rio Hondo College.

Breaking Out Traditional Academic Transfer Credits

Knowing both nontransferable voc-ed credits and total voc-ed credits, we can readily calculate transferable voc-ed credits, which, when subtracted from total transfer credits, yields a measure of traditional academic transfer credits. Examples of traditional academic transfer courses are introduction to biology and introduction to sociology. The ratio of academic transfer credits to all credits is shown in line 9 of Table 2.2. Measured at the means in rows 1 and 9, academic transfer credits make up on average about 81 percent (.591/.733) of all transferable credits. The ratio of academic transfer credits to all credits calculated for Santa Barbara City College in row 9 exceeds that for Los Angeles Trade-Tech by 12.4 percentage points. The even larger difference of 23 percentage points observed in row 1 is clearly due to the greater emphasis of SBCC on transferable voc-ed courses. Minimum and maximum values of the academic transfer credit ratio are observed for Los Angeles Mission College (11.7 percent) and Orange Coast College (85.9 percent), respectively.

VTEA Data Measuring Courses and Programs and Program Inventory Data

We view the PFE enrollment data summarized in Table 2.2 as approximating an "equilibrium" description of a college's curriculum mix, where the term equilibrium is used to mean a balance between current student demand and the college's supply of courses and programs. Recognizing that current offerings of courses and programs hinge in part on past student demand, we view VTEA data as primarily capturing the current supply of courses and programs. From this perspective, VTEA data give us an alternative and independent measure of voc-ed curriculums.

Voc-Ed Course Measures

Beginning with VTEA course data, rows 1 and 2 of Table 2.3 display ratios of apprenticeship and advanced occupational courses to total voc-ed courses, respectively. The maximum value for the apprenticeship course ratio in row 1 is obtained for Santiago Canyon College. Recall from the discussion of Table 2.2 that Santiago Canyon was singled out as an outlier for our measure of apprenticeship credits to total voc-ed credits. Santa Barbara City College is seen in the second row to have a much higher ratio of advanced occupational courses to all voc-ed courses than is the case for Los Angeles Trade-Tech. The maximum value of this ratio (83.3 percent) is obtained for Mt. San Jacinto College. Note that the sample size in Table 2.3 is 107 rather than 108 campuses because data for Copper Mountain College are not available.

Since VTEA data do not provide information on total courses, we were unable to calculate a ratio of voc-ed courses to all courses

Table 2.3

Measures of Curriculum Mix Using VTEA Course and Program Data and Program Inventory Data, 1998–1999

Course or Program Measure	SBCC	L.A. Trade-Tech	Mean	Minimum	Maximum
1. Apprenticeship courses/ all voc-ed courses	.004	.072	.026	.000	.485
2. Advanced voc-ed courses/ all voc-ed courses	.628	.193	.265	.008	.833
3. Voc-ed courses/100 students	10.608	12.150	4.796	.927	22.060
4. Apprenticeship programs/ 100 students	.007	.038	.014	.000	.101
5. Advanced voc-ed programs/100 students	.288	.218	.188	.034	.788
6. Advanced courses/ advanced programs	23.116	10.765	6.128	1.750	38.444
7. Approved voc-ed programs/total programs	.581	.952	.680	.325	.970

NOTE: Copper Mountain College is omitted.

comparable to that shown for credits in row 5 of Table 2.2. What we can do is express voc-ed course data on a per student basis, using CPEC Fall 2001 student headcounts. Row 3 of Table 2.3 indicates that SBCC and Los Angeles Trade-Tech each offer roughly 11 to 12 voc-ed courses per 100 students. Ratios of this magnitude look large (the mean is under five courses per 100 students), but the maximum ratio is over 22 courses per 100 students observed for Lake Tahoe Community College.

Voc-Ed Program Measures

Rows 4 and 5 of Table 2.3 make use of VTEA data measuring programs offered. Because VTEA data do not provide a reliable measure of total voc-ed programs, these rows report, respectively, apprenticeship and advanced occupational programs per 100 students. Row 4 continues the impression yielded by our credit and course data that apprenticeship programs are atypical. Row 5 offers a simple way to understand variation in advanced voc-ed programs, which is to "blow up" the ratios shown for a hypothetical college of 10,000 students. For such a hypothetical college, the extreme values suggest a sizable range of between 3 and 79 advanced programs offered. The minimum value of this ratio is observed for Palo Verde College and the maximum for Lassen College.

Row 6 shows the "depth" or "intensity" of voc-ed programs measured as the ratio of advanced courses to advanced programs. For this measure, both Santa Barbara City College and Los Angeles Trade-Tech provide voc-ed programs of greater than average depth. Compared to the mean of about six advanced courses per advanced program, SBCC offers a ratio of 23 and Los Angeles Trade-Tech a ratio of nearly 11. The maximum value of over 34 advanced courses per advanced program appears for Cuesta College.

In addition to VTEA data on voc-ed programs offered, the Chancellor's Office maintains an "Inventory of Approved and Projected Programs." The program inventory dataset includes all programs that are approved in the sense that a program must require 18 or more credits of coursework. In row 7 of Table 2.3, we use program inventory data to calculate for "approved" programs the ratio of voc-ed programs to all programs. This ratio for Los Angeles Trade-Tech is an astounding 95.2

percent. Even Santa Barbara City College reports that 58.1 percent of its total approved programs are voc-ed. Recall from Table 2.2 that the proportion of voc-ed credits to all credits for both colleges is about 25 percent. It is clear that voc-ed programs tend to be much smaller than other programs in terms of student credit hours.

First-Time Freshman Data

FTF data are derived from a longitudinal study following the universe of 222,372 first-time freshmen at all CCCS campuses between their initial enrollment in Fall 1997 and Spring 2000. We use FTF cohort data measuring students' academic objectives formed without benefit of academic counseling to represent the demand of incoming students for community colleges' academic programs. The data distinguish 14 categories of academic objectives, which we group into the following four broad categories of programs.

Voc-ed

1. Formulate career interests
2. Vocational degree, no transfer
3. Acquire job skills
4. Update job skills
5. Vocational certificate
6. Maintain license

Transfer

7. Degree and transfer
8. Transfer, no degree

Basic skills

9. Basic skills
10. Education development
11. Complete GED

Other

12. Degree, no transfer
13. Undecided
14. Uncollected

Data measuring academic objectives are available for 107 campuses. Again, Copper Mountain College is excluded.

Of the four broad categories of programs distinguished for FTF data, probably the most clearly defined is interest in basic skills. As shown in row 1 of Table 2.4, the mean of the proportion of students with a basic skills objective is about 11 percent, which is reasonably close to the 7 percent shown in Table 2.2 for basic skills credits to all credits. Note that the denominator of this proportion excludes the "uncollected" category listed under "other" programs.[1] No interest at all in basic skills is reported for freshmen at three colleges, including Canyons, Cerritos, and Citrus. Canyons College is highly unusual, however, because nearly 95 percent of freshman academic interests are undecided (see the

Table 2.4

Measures of Curriculum Mix Using FTF Student Academic Objectives, 1997

Measure of Academic Objectives	SBCC	L.A. Trade-Tech	Mean	Minimum	Maximum
1. Interest in basic skills	.142	.083	.111	.000	.790
2. Interest in transferring	.569	.111	.385	.033	.705
3. Interest in voc-ed	.143	.644	.252	.017	.644
4. Interest in nontransfer programs	.204	.686	.302	.018	.686
5. Undecided	.086	.121	.202	.000	.949

NOTE: Copper Mountain College is omitted.

[1]Most campuses report either no data uncollected for their first-time freshmen or uncollected data for only a handful of students. However, FTF data are uncollected for more than 5 percent of first-time freshmen at 20 campuses; of these campuses, the uncollected rate is occasionally quite high. In particular, uncollected rates of 10 percent or higher are reported for 11 colleges, including at the high end Rio Hondo College (30.0%) and Sierra College (34.1%). We have no reason to expect that a systematic bias is causing these colleges to report high rates of uncollected responses. Therefore, we proceed with the proportions presented in Table 2.4 using as the denominator total students minus students for whom data could not be collected.

maximum in row 5). Minimum values shown in rows 2–4 are also observed for Canyon College. Taft College records the maximum value of the basic skills ratio (79%). We noted in discussing Table 2.2 that Taft College ranks very high in the proportion of voc-ed credits that are not transferable. An unexpected result in row 1 is that student interest in basic skills is slightly higher for Santa Barbara City College than for Los Angeles Trade-Tech.

Row 2 of Table 2.4 reports the ratio of freshman students with an interest in transferring to a four-year institution, either with or without an A.A. degree. Excluding Canyon College, the minimum value for this ratio is 7.3 percent for Napa Valley College followed by Taft College at 8.5 percent. The maximum value of 70.5 percent is found for Citrus College. Transfer ratios calculated for Los Angeles Trade-Tech and Santa Barbara City College are close to the minimum and maximum values, respectively, indicating an even bigger difference between the two colleges in interest in transfer courses (45.8 percentage points) than in proportions of transferable credits actually taken (23.0 percentage points).

FTF data allow only a narrow definition of voc-ed, which may well be appropriate because many freshman students are likely to be unaware that voc-ed courses are often transferable. In row 3, the mean voc-ed ratio is about one-quarter, with the maximum value of 64.4 percent appearing for Los Angeles Trade-Tech. Excluding Canyons College, the minimum value is for Taft College at 6 percent. This might seem surprising given what we know about Taft, but recall that nearly 80 percent of Taft freshman expect to enroll in basic skills programs. A huge 50 percentage point difference appears between the interest in voc-ed of Los Angeles Trade-Tech freshman as opposed to Santa Barbara City College freshman, with only 14 percent of SBCC freshman expressing an interest in voc-ed programs. In row 4, we add students interested in an A.A. degree (but not in transferring) to those who express an interest in voc-ed. About 30 percent of all freshman report interest in this broader category of nontransfer programs, with the minimum value (excluding Canyons College) observed for Taft College and the maximum for Los Angeles Trade-Tech.

Finally, row 5 indicates that, on average, about 20 percent of freshmen students are undecided about their academic objectives. Undecided ratios calculated for both Santa Barbara City College and Los Angeles Trade-Tech are considerably below this mean. No students in the undecided category are observed for two campuses (Cerritos and Citrus), and the maximum value of 94.9 percent is, as noted, recorded for Canyons College. The next highest ratio is 59.9 percent calculated for San Francisco City College. Note that for the first three columns of Table 2.4, rows 1, 2, 4, and 5 sum to 100 percent, subject to rounding error.

Summary

This chapter describes our attempt at using CPEC campus descriptions to classify California community colleges by curriculum emphasis. This information allows us to measure curriculum mix by what colleges say about themselves in promotional materials. Our conclusion is that 28 out of 108 colleges indicated either a voc-ed or transfer emphasis.

We next considered the wealth of quantitative data available online measuring curriculum in terms of credits, courses, programs, and student interests. In contrast to CPEC campus descriptions, these data allow measurement of what colleges actually offer their students. Descriptive statistics for curriculum mix variables constructed from the quantitative data indicate that, on average, nearly three-quarters of all credits in courses attempted are transferable. Measured at the extremes of the distribution, there appears to be considerable variation about this mean, as is the case for other curriculum measures including emphasis on voc-ed, type and transferability of voc-ed offerings, and apprenticeship training. We also noted sizable differences in the mix of voc-ed offerings and interests of freshmen students between Los Angeles Trade-Tech and Santa Barbara City College—our "representative" colleges with voc-ed and transfer emphases, respectively. Chapter 3 examines whether these differences in curriculum mix are pervasive across colleges or are limited to colleges at the extremes.

3. Curriculum Specialization

This chapter uses the quantitative data described in the previous chapter to identify colleges that differ in curriculum *emphases* as well as those that offer different curriculum *specializations*. We define differences in curriculum emphasis as systematic deviations in the curriculum offered by individual colleges from that of a typical or average college. Differences in curriculum specialization couple emphasis on one curriculum variable with a de-emphasis on another variable. For example, a college would specialize if it emphasizes a transferable curriculum while de-emphasizing nontransferable voc-ed. Note that all colleges that specialize must also have an emphasis, but not all colleges that have an emphasis meet our definition of specialization.

In the first of four sections, we begin by describing differences between colleges in their curriculum offerings using histograms. Our purpose is to see whether the large spreads observed for many of our curriculum variables are due to only a small number of colleges lying far from means or whether a more substantial number of colleges deviate systematically from means. In the next section, we attempt to distinguish those curriculum variables for which colleges differ substantially in their emphasis. The tool we use to measure differences in emphasis is the interquartile (IQ) range, which contrasts the top 25 percent of colleges with the bottom 25 percent. In the third section, our definition of specialization is implemented by examining the relationships between selected curriculum measures making use of scatter diagrams and pair-wise correlations. This analysis is carried out for selected curriculum measures. The fourth section highlights results of a factor analysis of all of our curriculum measures intended to provide further evidence on curriculum emphases and specializations.

Getting Started with Histograms

To get a feel for the importance of intercollege differences in curriculums, it is useful to examine visually the distributions of two of our PFE curriculum measures—transferable credits to all credits and narrow (or nontransferable) voc-ed credits to all voc-ed credits. Figure 3.1 displays a histogram for transferable credits. The figure shows that colleges with proportions of transferable credits of 0.5 or less are highly atypical. Instead, the mass of the distribution lies in the range between 0.6 and 0.9. As indicated in Table 2.2, this variable has a mean of 0.733, with a substantial range between a minimum value of 0.187 and a maximum of 0.922.

Figure 3.2 shows the histogram for our measure of nontransferable voc-ed credits to all voc-ed credits. Compared to Figure 3.1, the "spread" of this distribution is much larger, so that more colleges are found near the extremes of the distribution. Figure 3.1 indicates that California community colleges are similar in their emphasis on the transfer mission, but keep in mind that for many colleges, transfer credits include a heavy dose of transferable voc-ed coursework. For only a small number of colleges do we observe substantial deviations from the mean. On the other hand, Figure 3.2 illustrates that substantial deviations from

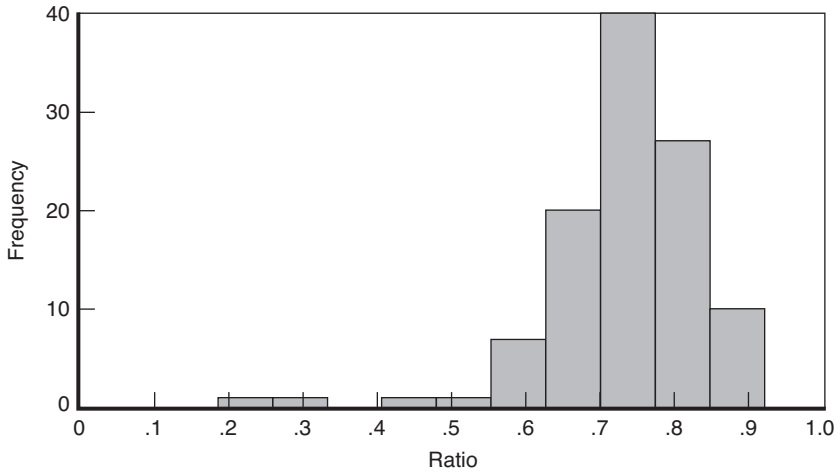

Figure 3.1—Ratio of Transferable Credits to All Credits

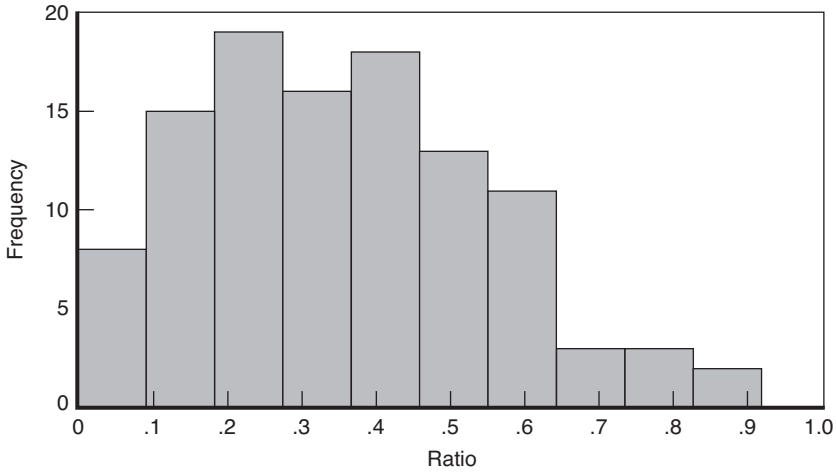

Figure 3.2—Ratio of Nontransferable Voc-Ed Credits to All Voc-Ed Credits

the mean are much more common, suggesting that colleges differ in their emphasis on nontransferable voc-ed.

What Do IQ Ranges Tell Us About Differences in Emphasis?

Table 3.1 presents several commonly used measures of variability for our 21 curriculum mix variables, where, as in Figures 3.1 and 3.2, we rely on measures of variability to capture differences in curriculum emphasis across colleges. In the first column, we carry over from Tables 2.2 to 2.4 the maximum/minimum range. Standard deviation is reported next. In the remaining three columns, we add the upper and lower quartiles and the associated interquartile range. As a measure of variability, IQ range has an advantage over the standard deviation of not being sensitive to extreme observations.

Based primarily on the IQ range, our main conclusion is that colleges differ in curriculum emphasis primarily in terms of the transferability and advanced level of their voc-ed curriculums. On the other hand, we find that differences in emphasis across colleges are small for measures of apprenticeship training and basic skills and "residual" courses.

Table 3.1

Variability in Curriculum Mix Measures Using Data for Credits, Courses, Programs, and Student Objectives

Curriculum Measure	Max/Min Range	Standard Deviation	First Quartile	Fourth Quartile	IQ Range
A. High Variability					
1. Nontransferable voc-ed credits/all voc-ed credits	.920	.198	.207	.481	.273
2. Advanced occupational credits/all voc-ed credits	.647	.142	.101	.283	.182
3. Advanced occupational courses/all voc-ed courses	.825	.158	.153	.348	.195
4. Approved voc-ed programs/total approved programs	.645	.140	.576	.771	.196
5. Advanced courses/ advanced programs	36.694	4.576	3.429	7.357	3.929
6. Voc-ed courses/100 students	21.133	4.576	2.465	5.675	3.210
7. Advanced occupational programs/100 students	.754	.114	.114	.231	.116
8. Interest in transferring	.672	.127	.296	.476	.180
B. Moderate Variability					
1. Broadly defined voc-ed credits/all credits	.758	.105	.162	.260	.098
2. Transferable credits/all credits	.735	.106	.693	.788	.095
3. Academic transfer credits/all credits	.742	.111	.547	.667	.120
4. Interest in nontransfer programs	.668	.109	.229	.372	
5. Interest in voc-ed	.672	.104	.183	.310	.126
6. Undecided interest	.949	.114	.149	.244	.095
7. Interest in basic skills	.790	.094	.055	.137	.082

Table 3.1 (continued)

Curriculum Measure	Max/Min Range	Standard Deviation	First Quartile	Fourth Quartile	IQ Range
C. Low Variability					
1. Nontransferable voc-ed credits/all credits	.756	.093	.036	.100	.064
2. Apprenticeship credits/ all voc-ed credits	.727	.073	.000	.007	.007
3. Basic skills credits/all credits[a]	.207	.038	.081	.119	.039
4. Residual credits/all credits[a]	.311	.055	.076	.139	.063
5. Apprenticeship courses/ all voc-ed courses	.485	.061	.000	.019	.019
6. Apprenticeship programs/100 students[a]	.101	.021	.000	.021	.021

[a]Indicates variables classified on the basis of a small maximum/minimum range.

To delve into the details of Table 3.1, we began by placing in the low variability category three variables with small maximum/minimum ranges: namely, basic skills credits to all credits, residual credits to all credits, and apprenticeship programs per capita. These variables appear in rows C.3, C.4, and C.6. The remaining 18 measures are candidates for the high or moderate variability categories.

Fifteen of these remaining 18 variables are measured as proportions, two are measured in per capita terms, and one is program depth measured as courses per program. Beginning with variables measured as proportions, we showed in Figure 3.2 the histogram representing proportion of nontransferable voc-ed credits to all voc-ed credits. In the first row of Table 3.1, the IQ range for this variable (0.273) is seen to be the largest of the IQ ranges shown for all 15 proportionate variables. Its interpretation is that the top 25 percent of colleges (or 27 colleges) report a proportion of nontransferable voc-ed credits to all voc-ed credits that exceeds the proportion offered by the bottom 25 percent by at least 27.3 percentage points. A total of five variables measured as proportions are

classified as having high variability, which we define as IQ ranges between 0.180 and 0.273. These variables include

- Nontransferable voc-ed credits to all voc-ed credits;
- Advanced occupational credits to all voc-ed credits;
- Advanced occupational courses to all voc-ed courses;
- Approved voc-ed programs to all approved programs; and
- Student interest in transferring to all student interests.

Seven more variables measured as proportions are classified as having moderate variability as indicated by IQ ranges between 0.082 and 0.142. Note that these variables include the proportion of transferable credits to all credits, the variable depicted in Figure 3.1. The final three variables expressed as proportions have IQ ranges of 0.064 or below, and we place them in the low variability category. Two of these three variables involve apprenticeship training.

It is more difficult to classify the remaining three variables involving courses and programs because they are not measured as proportions that must lie between 0.0 and 1.0. Nevertheless, we suggest that the ratio of advanced courses to advanced programs belongs in the high variability category (row A.5). The reason is that voc-ed programs provided by colleges in the fourth quartile (7.4 advanced courses per advanced program) have at least twice the depth as those offered by colleges in the first quartile (3.4 advanced courses per advanced program).

We make a similar argument for the per capita measures of voc-ed courses and advanced voc-ed programs (rows A.6 and A.7, respectively). Row A.6 indicates that fourth quartile colleges offer students at least 5.7 voc-ed courses per 100 students, whereas first quartile colleges offer at most 2.5 voc-ed courses per 100 students. Row A.7 suggests that, blown up to the level of a hypothetical college of 10,000 students, fourth quartile colleges offer students at least 23 advanced voc-ed programs, whereas first quartile colleges supply at most 11 advanced voc-ed programs. For both variables, in other words, colleges in the top quartile offer at least twice the number of voc-ed courses or at least twice the number of advanced voc-ed programs as colleges in the bottom quartile.

Evidence of Specialization

We turn now to the question of whether differences between colleges in curriculum mix represent specialization or an emphasis on one activity with a de-emphasis on another. To implement this definition, we look for evidence of negative relationships between pairs of curriculum variables as measured by correlation coefficients. Negative correlation coefficients are calculated in the two-variable case if, when one variable is above its mean, the other tends to fall below its mean. Table 3.2 displays estimated correlation coefficients calculated for selected pairs of curriculum mix measures. Our focus is primarily on four sets of correlation coefficients, which we label Correlation Results 1–4. Correlation Results 1 and 2 form the basis of our discussion of specialization in this section. Correlation Results 3 and 4, which are only briefly discussed, play a more prominent role in the factor analysis summarized in the next section.

Correlation Result 1: Transferable Curriculum vs. Nontransferable Voc-Ed

We find a large negative correlation (-0.837) between transferable credits to all credits and narrow voc-ed credits to all credits. That is, colleges above average in transferable credits tend to be below average in narrow voc-ed credits. And colleges above average in narrow voc-ed credits tend to be below average on their transferable credits ratio. This correlation coefficient is reported in row 2 and column (1) of Table 3.2.[1]

The negative relationship between the transfer credit ratio and the narrow voc-ed ratio is shown graphically in the scatter diagram appearing

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[1]Recall from Chapter 2 that the transfer credit ratio and the narrow voc-ed ratio are developed from our most inclusive dataset, which we referred to as Goal 3 PFE data. The four mutually exclusive categories of Goal 3 PFE data are transfer, narrow voc-ed, basic skills, and residual credits. A negative relationship between any two of these variables is expected, since proportions representing mutually exclusive categories must sum to 1.0. Hence, being above average on one variable must be offset by being below average on at least one other variable. Nevertheless, a *large* negative coefficient is not guaranteed. In particular, the correlation between the transfer credit ratio and the basic skills ratio is only –0.09 and not statistically significant. Among the selected variables considered in Table 3.2, the only statistically significant negative correlation coefficient involving basic skills credits is that with freshmen interest in transfer programs. The estimated coefficient is –0.272.

Table 3.2

Estimated Correlation Coefficients Between Selected Curriculum Mix Measures

Curriculum Measure	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1. Transferable credits/all credits	1.000								
2. Nontransferable voc-ed credits/all credits	**–.837**	1.000							
3. Academic transfer credits/all credits	**.781**	**–.668**	1.000						
4. Nontransferable voc-ed credits/all voc-ed credits	**–.766**	**.730**	**–.369**	0.000					
5. Advanced occupational credits/all voc-ed credits	**.237**	**–.191**	.162	**–.186**	1.000				
6. Advanced occupational courses/all voc-ed courses	**.383**	**–.284**	**.292**	**–.309**	**.802**	1.000			
7. Advanced courses/ advanced programs	.139	–.039	.069	–.068	**.598**	**.635**	1.000		
8. Interest in transferring	**.355**	**–.260**	**.415**	–.075	.167	**.270**	**.292**	1.000	
9. Interest in voc-ed	–.185	.076	**–.202**	**.195**	–.070	**–.287**	**–.236**	**–.494**	1.000

NOTE: Estimates statistically significant at the 5 percent level are in bold.

in Figure 3.3, where deviations from the mean of transferable credits are measured vertically and deviations from the mean of nontransferable voc-ed are measured horizontally. The negative relationship between these two ratios is captured in the figure by a concentration of data points in the upper left and lower right quadrants. The two outlying data points appearing in the lower right quadrant are for Palo Verde College and Taft College, with Taft College being farther from the origin.[2] Recall from Chapter 2 that Taft College places a heavy emphasis on vocational education, particularly nontransferable voc-ed. It is a moderately small college with 8,033 students. Palo Verde College

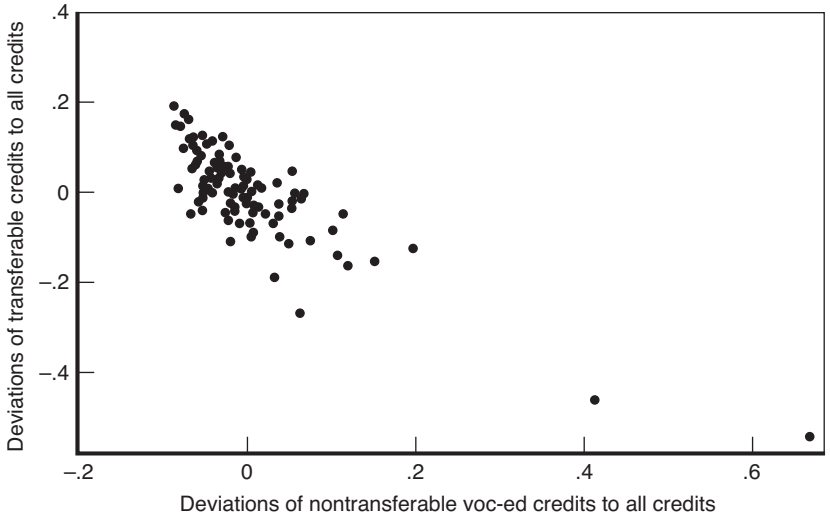

Figure 3.3—Ratio of Transferable Credits to All Credits vs. Ratio of Nontransferable Voc-Ed Credits to All Credits

[2]Similar outlying data points in the upper left quadrant are not possible because of the large mean of transferable credits to all credits (0.733) and the small mean of narrow voc-ed credits to all credits (0.087). Extreme values of these variables reported in Table 2.2 imply that the maximum deviation from the mean for the transferable credits ratio is 0.189, and the maximum deviation from the mean for the narrow voc-ed credits ratio is –0.087.

is a very small college (2,903 students) in Blythe, in the southeastern California desert.[3]

Continuing with Figure 3.3, it appears that the bulk of the data points are in an imaginary box centered at the origin and extending right and left and up and down by about 5 percentage points. In an attempt to pin down those colleges that specialize as opposed to those that do not, we define colleges that *specialize* in offering a transferable curriculum as those for which deviations of the transferable credits ratio exceed 0.05 and deviations of the nontransferable voc-ed credits ratio are less than –0.05 (in other words, data points that lie above and to the left of the upper left corner of the box). Similarly, colleges that specialize in offering a nontransferable voc-ed curriculum are those for which deviations of the nontransferable voc-ed credits ratio exceed 0.05 and deviations of the transferable credits ratio are less than –0.05. The names of colleges that, according to these definitions, specialize in a transferable curriculum and in nontransferable voc-ed are reported, respectively, in Tables 3.3 and 3.4.

Beginning with Table 3.3, we list in column (1) the names (in alphabetical order) of the 19 colleges that meet our definition of specializing in a transferable curriculum (termed "Definition 1"). For purposes of comparison, we repeat from Table 2.1 the names of 11 colleges that we classified in Chapter 2 as having a transfer emphasis based on our reading of CPEC campus descriptions. These 11 colleges are listed in column (3). There is some overlap between colleges listed in the two columns, with five colleges appearing in common. But it is worth noting that Santa Barbara City College and Santa Monica College are missing from column (1).

Parallel to Table 3.3, Table 3.4 lists colleges that meet our definitions of nontransferable voc-ed specialization and emphasis. Column (1) of Table 3.4 reports that just 10 colleges *specialize* in nontransferable voc-ed, meaning that they emphasize nontransferable voc-ed credits while de-emphasizing transferable credits. As in Table 3.3,

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[3]In comparison, Santa Barbara City College and Los Angeles Trade-Tech are midsized with 14,913 and 15,630 students, respectively. Several colleges have more than 30,000 students, with Riverside Community College the largest at 34,042 students.

Table 3.3

Colleges Emphasizing and Specializing in a Transferable Curriculum, Alternative Definitions of Specialization

Transfer Specialization		Emphasis Based on
Definition 1	Definition 2	CPEC Descriptions
(1)	(2)	(3)
Chabot	Chabot	Chabot
Coastline	Coastline	Diablo Valley
Cuyamaca	Consumnes River	Fullerton
El Camino	Cuyamaca	Las Positas
Grossmont	Cypress	Los Angeles Harbor
Hartnell	Diablo Valley	Los Angeles Pierce
Las Positas	El Camino	Marin
Los Angeles Harbor	Grossmont	Oxnard
Los Angeles Pierce	Hartnell	Santa Barbara
Marin	Las Positas	Santa Monica
Orange Coast	Los Angeles Harbor	Ventura
Palomar	Los Angeles Pierce	
Reedley	Marin	
San Diego Mesa	Napa Valley	
San Francisco City	Orange Coast	
San Joaquin Delta	Palomar	
Sierra	Reedley	
Skyline	San Diego Mesa	
Southwest	San Francisco City	
	San Joaquin Delta	
	San Mateo	
	Santa Barbara	
	Santa Monica	
	Sierra	
	Skyline	
	Southwestern	

NOTES: Definition 1 transfer specialization is an emphasis on transfer credits coupled with a de-emphasis on nontransferable voc-ed credits measured relative to all credits. Definition 2 transfer specialization is an emphasis on transfer credits coupled with a de-emphasis on nontransferable voc-ed credits measured relative to all voc-ed credits.

Table 3.4

Colleges Emphasizing and Specializing in Nontransferable Voc-Ed, Alternative Definitions of Specialization

Nontransferable Voc-Ed Specialization		Emphasis Based on
Definition 1	Definition 2	CPEC Descriptions
(1)	(2)	(3)
Allan Hancock	Allan Hancock	Coastline
Los Angeles Trade-Tech	Contra Costa	Contra Costa
Los Medanos	Evergreen	Copper Mountain
Monterey Peninsula	Imperial Valley	Consumnes River
Palo Verde	Laney	Desert
Rio Hondo	Los Angeles City	East Los Angeles
Santa Ana	Los Angeles Trade-Tech	Foothill
Santiago Canyon	Los Medanos	Fresno City
Taft	Monterey Peninsula	Lassen
Victor Valley	Moorpark	Long Beach City
	Oxnard	Los Angeles Trade-Tech
	Palo Verde	Moorpark
	Porterville	San Diego Miramar
	Rio Hondo	San Joaquin Delta
	Santa Ana	Shasta
	Santiago Canyon	Siskiyous
	Taft	Taft
	Ventura	
	Victor Valley	

NOTES: Definition 1 nontransferable voc-ed specialization is an emphasis on nontransferable voc-ed credits measured relative to all credits coupled with a de-emphasis on transfer credits. Definition 2 nontransferable voc-ed specialization is an emphasis on nontransferable voc-ed credits measured relative to all voc-ed credits coupled with a de-emphasis on transfer credits.

there is limited overlap between these 10 colleges and the 17 colleges listed in column (3) as having a voc-ed emphasis based on CPEC descriptions. Los Angeles Trade-Tech and Taft College appear in both columns, but Palo Verde College is listed in column (1) but not in column (3).

Correlation Result 2: Transferable Curriculum vs. Proportion of Voc-Ed That Is Nontransferable

Making use of the detail available on the mix of voc-ed credits, we obtain a negative correlation coefficient (–0.766) between transferable credits to all credits and narrow voc-ed credits to all voc-ed credits.[4] This negative relationship is reported in row 4 and column (1) of Table 3.2 and shown graphically in Figure 3.4. As in Figure 3.3, note in Figure 3.4 the concentration of data points in the upper left and lower right quadrants. A difference between the two figures is that the more narrowly defined denominator in the ratio of nontransferable voc-ed credits to all voc-ed credits has the effect of "spreading" horizontally the scatter diagram in Figure 3.4. Employing the imaginary box applied in Figure 3.3 with dimensions of 5 percentage points in each direction from the origin, we apply the same definitions of what it means to specialize in, say, a transferable curriculum by being above the mean of the transferable credits ratio by at least 5 percentage points while being below the nontransferable credits ratio by at least 5 percentage points. The greater horizontal spread of Figure 3.4 results in a larger number of colleges that meet this definition of specializing (termed "Definition 2").

Names of the 26 colleges that specialize in a transferable curriculum according to Definition 2 appear in column (2) of Table 3.3. Note that both SBCC and Santa Monica College are listed. Column (2) of Table 3.4 lists the 19 colleges that specialize in a nontransferable voc-ed curriculum according to the information included in Figure 3.4. Our preferred definition of specialization is the more inclusive definition implemented in column (2) of both tables. The reason is that the column (2) definition incorporates the breadth of Goal 3 PFE data covering transferable, voc-ed, and basic skills curriculums with the detail on voc-ed offerings available in Goal 4 PFE data.

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[4]As described in Chapter 2, PFE Goal 4 data on the mix of voc-ed credits allow us to measure nontransferable voc-ed credits as a proportion of all voc-ed credits.

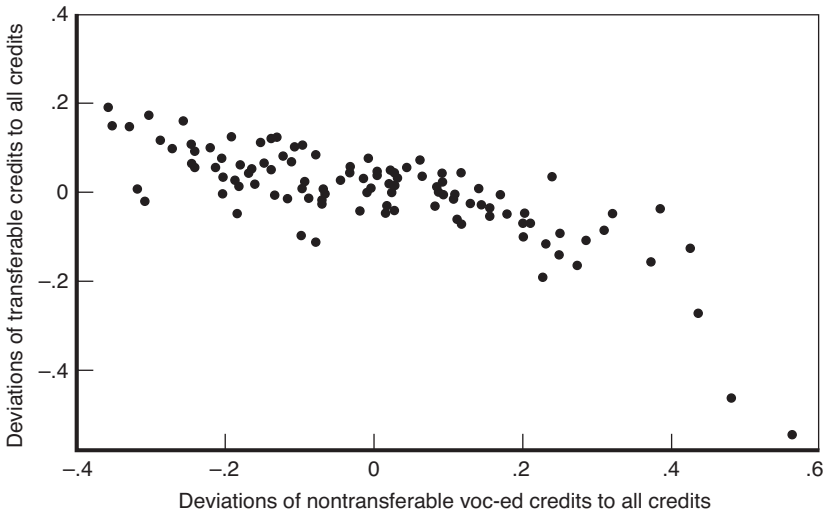

Figure 3.4—Ratio of Transferable Credits to All Credits vs. Ratio of Nontransferable Voc-Ed Credits to All Voc-Ed Credits

Correlation Result 3: Positive Relationships Between Measures of Advanced Voc-Ed Curriculum

Adding VTEA data for courses and programs to our PFE measures of credits, we obtain a cluster of three *positive* correlation coefficients relating variables measuring mix of advanced voc-ed credits, mix of advanced voc-ed courses, and advanced voc-ed courses to programs. The three positive correlation coefficients, which appear in rows 6 and 7 and columns (5) and (6) of Table 3.2, range in value from 0.598 to 0.802.

Correlation Result 4: Tradeoff Between Student Interests in Voc-Ed and Transferring

Our final correlation result introduces FTF measures of freshmen student academic interests. We find a sizable negative relationship between student interest in voc-ed and student interest in transferring. As seen in row 9 and column (8) of Table 3.2, the correlation coefficient between these two variables is –0.494. It is worth noting from row 9 that student interest in voc-ed is also negatively correlated with measures

of academic transfer credits (-0.202), advanced voc-ed courses (-0.287), and advanced courses to advanced programs (-0.236).

Bringing It Together Using Factor Analysis

The findings in the previous section are based on an analysis of measured relationships between nine of our curriculum variables. In this section, we buttress these findings with results obtained using a more rigorous, formal approach called *factor analysis,* which we apply to all 21 of our curriculum variables.[5] Briefly, the objective of factor analysis is to help researchers categorize their data. More specifically, factor analysis identifies a small number of underlying unobserved variables, called *factors*, that account for measured relationships between a larger number of observed variables.

Our results indicate that the relationships between our curriculum mix variables can be captured by just four unobserved factors. Ranked in descending order by their ability to distinguish colleges in terms of observed curriculum measures, the four factors and the labels we assign to each are as follows:

Factor 1: transferable curriculum/nontransferable voc-ed tradeoff;
Factor 2: advanced voc-ed curriculum;
Factor 3: demand for nontransferable curriculum; and
Factor 4: apprenticeship training.

Allowing us to identify these four factors is an underlying matrix of *factor loadings* that we estimate to measure the importance of each observed variable in explaining a particular factor. (A detailed description of factor analysis and our key results is presented in Appendix B.)

Beginning with Factor 1, the message we take from our results is a distinction between colleges that emphasize a transferable curriculum

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[5]We actually used 18 of our 21 curriculum variables in the factor analysis. The three omitted variables are residual credits to all credits, first-time freshmen undecided about their academic objectives to all freshmen, and broadly defined voc-ed credits to all credits. These variables are omitted because they are linear combinations of the remaining variables.

and colleges that emphasize nontransferable voc-ed and appeal to students interested in basic skills. Large positive factor loads are obtained for measures of transferable credits to all credits and academic transfer credits to all credits. Negative factor loads appear for nontransferable voc-ed credits to all credits, nontransferable voc-ed credits to all voc-ed credits, and student interest in basic skills. In other words, Factor 1 appears to capture the two curriculum specializations we described in the previous section based on our Correlation Results 1 and 2. The first of these is a transfer curriculum specialization, and the second is specialization in nontransferable voc-ed.

We label Factor 2 *advanced voc-ed curriculum*, as our data seem to be contrasting colleges that emphasize an advanced vocational curriculum with all other colleges. Large and positive factor loadings are observed for three variables: advanced voc-ed credits to all voc-ed credits, advanced occupational courses to all voc-ed courses, and advanced occupational courses to advanced occupational programs. Recall that positive correlation coefficients between these three variables were noted above as Correlation Result 3.

Positive factor loads for Factor 3 are obtained for FTF measures of student interest in voc-ed, student interest in more broadly defined nontransferable programs (i.e., interest in voc-ed plus interest in an A.A. but not in transferring), and proportion of credits in basic skills. At the same time, a negative factor load appears for student interest in transfer programs. Since the variables with large factor loads are primarily calculated from FTF measures of student objectives, we label Factor 3 *demand for nontransferable curriculum*. Consistent with Correlation Result 4, these results suggest a distinction between colleges whose students express an interest in nontransferable programs and colleges whose students are interested in other curriculums, both voc-ed and traditionally academic, that are transferable to a four-year college.

Factor 4 is clearly *apprenticeship training*. Large and positive factor loadings are observed for our measures of apprenticeship courses to all voc-ed courses, apprenticeship credits to all voc-ed credits, and apprenticeship programs per 100 students.

Estimated factor loadings can be used to calculate predicted values of the common factors, called *factor scores*, for each community college in

our dataset. Thus, for each factor, factor scores allow us to measure the magnitude of differences between individual colleges. Table 3.5 lists the top five and bottom five colleges ordered by factor scores for each of the four factors. Beginning with Factor 1, the transferable curriculum/ nontransferable voc-ed tradeoff, both top-ranked Orange Coast College and bottom-ranked Taft College were mentioned in Chapter 2 as being at the extremes of the distribution for the PFE measure of transferable credits. All five top-ranked colleges appear in the Table 3.3 list of colleges that specialize in a transfer curriculum, using either the column (1) or column (2) definitions. Only Lassen College among the five bottom-ranked colleges does not appear in the Table 3.4 list of colleges that specialize in nontransferable voc-ed.

With respect to the remaining factors, it is interesting to note for Factor 2 that Santa Barbara City College and Santa Monica College rank in the top five in terms of offering advanced voc-ed, although they do not rank in the top five for specializing in a transferable curriculum. The

Table 3.5

Top Five and Bottom Five Colleges Ordered by Factor Scores for Factors 1–4

Factor 1: Transferable Curriculum/ Nontransferable Voc-Ed Tradeoff	Factor 2: Advanced Voc-Ed Curriculum	Factor 3: Demand for Nontransferable Curriculum	Factor 4: Apprenticeship Training
Top Five Colleges			
Orange Coast	Cuesta	Los Angeles Southwest	Santiago Canyon
Palomar	Santa Barbara	Los Angeles Trade-Tech	San Mateo
San Diego Mesa	Galivan	Los Angeles Mission	Los Angeles Trade-Tech
Sierra	Santa Monica	San Jose City	Rio Hondo
Los Angeles Pierce	Rio Hondo	Compton	Foothill
Bottom Five Colleges			
Taft	Santiago Canyon	Taft	Taft
Palo Verde	Marin	Diablo Valley	Siskiyous
Lassen	Merced	Orange Coast	Lassen
Los Medanos	West Hills	DeAnza	Canyon
Rio Hondo	Palo Verde	West Valley	Merritt

top-ranked college for Factor 2, Cuesta College, was noted in Chapter 2 as being at the extreme right-hand tail of the distribution of advanced courses per advanced program.

Summary

Do California community colleges specialize in the academic programs they offer? Our answer, using three different empirical approaches, is that many do. We first examined interquartile ranges for our 21 curriculum mix variables to check whether large differences identified at the extremes of the distributions hold up more broadly across colleges. Our results indicated sizable differences between the top 25 percent and the bottom 25 percent of colleges for eight variables that are primarily measures of advanced level or transferability of voc-ed curriculums.

Next we examined relationships between pairs of curriculum variables to determine whether intercollege differences can be interpreted as specialization. Using scatter diagrams to visualize pair-wise correlation coefficients between variables, we implemented a common-sense definition of specialization linking emphasis on one curriculum measure with a de-emphasis on another. Our preferred specification indicates that 26 colleges offer a transfer specialization, and 19 colleges specialize in nontransferable voc-ed. The correlation coefficients also suggested (1) a direct relationship between various measures of advanced voc-ed, and (2) a negative relationship between student interest in voc-ed and in other types of programs.

Our third empirical approach used factor analysis to identify unobserved common factors that underlie observed relationships among all of our curriculum measures. We found that our data can be summarized by four common factors. Of the four factors, Factors 1-3 identify differences between colleges that reinforce three important results coming out of our pair-wise correlations. These are that (1) some colleges specialize in offering a transferable curriculum and others specialize in nontransferable voc-ed, (2) colleges differ in their emphasis on advanced voc-ed, and (3) colleges differ in the interest of their students in nontransferable voc-ed programs.

4. Explaining Differences in Curriculum Mix

Chapter 3 presented evidence suggesting that California community colleges differ in terms of their curriculum emphases and specializations. In this chapter, we ask whether these differences can be explained. To answer this question, we append to our dataset measuring college curriculum variables additional data measuring college-specific characteristics, local job opportunities, and community demographics.

The first section provides a brief overview of our measures of college-specific characteristics, local job opportunities, and demographic characteristics. Appendix C includes a description of the online data sources and technical details involved in constructing these variables. A complete listing of all variables included in our dataset appears in Appendix D.

Our main substantive results are reported in the second section, where we present cross-tabulation evidence indicating that differences between colleges in curriculum emphasis and specialization can be reasonably explained by our measures of college-specific characteristics and community needs.

Description of Explanatory Variables

College-Specific Characteristics

Measures of campus-specific characteristics are broken up into two categories that we term *institutional variables* and *student demographics*. For the first category, Table 4.1 presents simple descriptive statistics for measures of membership in a multicampus district, proximity to a state four-year college, and campus age. Of the 108 CCCS campuses, 56 campuses (51.9 percent) are in 21 multicampus districts. The number of campuses included in each of these multicampus districts is not reported

Table 4.1

Descriptive Statistics for Explanatory Variables

Variable	Mean	Standard Deviation	Minimum	Maximum
Institutional variables				
Multicampus district	.519	—	.000	1.000
Proximity to four-year college				
Miles to nearest UC	47.5	51.4	1.7	282.5
Miles to nearest CSU	26.9	30.9	1.5	178.2
Age of campus (years)	53.1	22.6	1	119
Student demographics				
Asian	.098	.090	.010	.424
Black	.077	.097	.003	.694
Filipino	.031	.028	.002	.159
Hispanic	.253	.156	.039	.856
Native American	.011	.009	.002	.064
White	.438	.199	.021	.869
Nonresident alien	.013	.014	.000	.091
Other	.017	.015	.000	.178
Nonresponse	.062	.047	.000	.237
Female	.558	.062	.200	.677
Male	.435	.064	.318	.798
Gender unknown	.006	.010	.000	.054
Employer characteristics				
Percentage of employees in				
Manufacturing	.165	.123	.000	.533
Wholesale trade	.083	.057	.002	.400
Retail trade	.216	.087	.030	.436
Real estate	.030	.020	.008	.179
Professional services	.074	.048	.011	.218
Administration and support services	.108	.063	.013	.322
Education services	.005	.004	.000	.030
Health care	.106	.049	.009	.256
Arts and entertainment	.023	.029	.000	.179
Accommodations and food services	.151	.064	.030	.398
Other services (except public administration)	.039	.014	.000	.085
Total employees (thousands)	76.3	178.4	.3	898.9
Community demographics				
Bachelor's degree	.265	.146	.054	.781
Foreign born	.233	.116	.013	.544

Table 4.1 (continued)

Variable	Mean	Standard Deviation	Minimum	Maximum
Median household income ($ thousands)	49.3	21.2	21.9	173.6
Race				
White	.621	.167	.167	.937
Black	.063	.075	.002	.403
Native American	.014	.008	.002	.045
Asian	.112	.110	.003	.618
Other race	.142	.104	.005	.494
Two or more races	.048	.013	.019	.101
Hispanic ethnicity	.281	.174	.022	.893

in the table. The Los Angeles district is by far the largest district with nine campuses. The Peralta district serving the Oakland metropolitan area is second largest with four campuses.

The next two rows of Table 4.1 measure proximity to the nearest UC and CSU campuses. The table indicates large variation about the means of 47.5 miles to the nearest UC campus and 26.9 miles to the nearest CSU campus. At the extreme of easy access, it is only 1.7 miles from Irvine Valley College to the nearest UC campus, and only 1.5 miles from San Francisco City College to the nearest CSU campus. At the other extreme, College of the Redwoods on the Northern California coast in Eureka is nearly 283 miles from the nearest UC campus, and Palo Verde College in the southeastern California desert, is 178 miles from the nearest CSU campus. Recall that Palo Verde College was described in Chapter 3 as a very small college that places heavy emphasis on nontransferable voc-ed.

Campus age measured from 2002 is widely dispersed, but there is some concentration in the data at founding dates in the early to mid-1950s. Chaffey College, founded in 1883, is the oldest CCCS institution; Copper Mountain College, founded in 2001, is the youngest.

The student demographic variables in Table 4.1 include race and ethnicity as well as gender. Kane and Rouse (1999) report that at the national level, the combined student body of community colleges is 70 percent white, 11 percent black, and 11 percent Hispanic. (Kane and

Rouse do not break out the percentage of Asian students.) It is apparent that California community colleges enroll on average a much higher percentage of Hispanic students (25.3 percent) and a much lower percentage of white students (43.8 percent) than do community colleges nationally. Indeed, nine campuses mostly in the Los Angeles Basin and south to San Diego fall into the category of "predominantly Hispanic-serving institutions" (PHIs), defined as those whose student bodies are over 50 percent Hispanic. A total of 47 community colleges, including the PHIs, fall into the more numerous "Hispanic-serving institutions" (HSIs) category, defined as those whose student bodies are 25 percent or more Hispanic. Imperial Valley College near the Mexican border reports the maximum proportion of Hispanic students (85.6 percent). Regarding gender, the unexpectedly low minimum ratio of female students (just 20 percent) is observed for Taft College.

Local Job Opportunities

Shown next in Table 4.1 are descriptive statistics for our two measures of local job opportunities—industry mix and total employment. Grubb (1996) emphasizes that the labor market for community college students (what he calls the "sub-baccalaureate labor market") is almost entirely local. To concentrate on local labor markets, we make use of 1997 Economic Census information for employers in the immediate proximity of the community college campus using a three-step protocol described in Appendix C. With this protocol, we obtained unique college-specific employment information for 94 colleges. The remaining 14 colleges are all in large metropolitan areas, including Los Angeles, Oakland, Sacramento, San Diego, and San Jose. We measure employer characteristics using data for the entire city for at least two colleges in each of these metropolitan areas.

In terms of industry mix, Table 4.1 shows that the largest spread between maximum and minimum values appears for manufacturing, followed by retail trade, wholesale trade, and accommodations and food services. Also observed is a huge variation in the size of the local labor market as measured by total employment. Total employment ranges between 335 employees for Foothill College in Los Altos Hills and nearly

900,000 employees for the four Los Angeles area colleges for which we use data for the Los Angeles metropolitan area.

Community Demographics

The community demographic variables appearing at the bottom of Table 4.1 are based on 2000 Census data for the city in which the college is located using the protocol developed for measuring local employer characteristics. The variation shown in proportions of bachelor's degree holders and foreign-born residents and in median household income illustrates the diversity of California's population. Maximum and minimum values for bachelor's degree are obtained for Foothill College (78.1%) and Los Angeles Mission College (5.4%), respectively. The maximum value of median household income is also reported for Foothill College (over $173,000). The proportion of foreign-born residents ranges between the minimum reported for Lassen College (1.3%) and the maximum observed for Glendale Community College (54.4%). Lassen College is in the Sierra Nevada region of northeastern California; Glendale Community College is in the greater Los Angeles metropolitan area.

Our remaining community demographic variables include race and ethnicity, each measured separately. The race/ethnicity mix of students may differ somewhat from the race and ethnicity of the community because colleges draw students from outside the geographic boundaries of their communities. Nevertheless, there appears to be a direct correspondence between the two. As one example, Feather River College reports the maximum proportion of white residents in its local community (93.7%) and the maximum proportion of white students (86.9%). Maximum values for other major race and ethnicity variables measured at the community level are 40.3 percent for blacks at Compton College, 61.8 percent for Asians at East Los Angeles College, and 89.3 percent for Hispanics at Los Angeles Mission College. The correlation between the racial and ethnic composition of students and community race and ethnicity is strong: We estimate correlation coefficients between corresponding student and community variables of 0.76 for blacks, 0.69 for Asians, 0.76 for Hispanics, and 0.76 for whites.

Explaining Differences in Specializations and Emphases

We turn now to the question of the extent to which these explanatory variables may be helpful in understanding intercollege differences in curriculum specializations and emphases.

Specializations in Transferable Curriculums and Nontransferable Voc-Ed

Our two curriculum specialization measures are developed from a scatter diagram relating the ratio of transferable credits to all credits to the ratio of voc-ed credits that are nontransferable (see Figure 3.4). Colleges that specialize in a transferable curriculum are those above the mean of the transferable credits ratio by at least 5 percentage points but below the mean of the nontransferable voc-ed credits ratio by at least 5 percentage points. Similarly, colleges that specialize in nontransferable voc-ed are those above the mean of the nontransferable voc-ed credits ratio by at least 5 percentage points but below the mean of the transferable credits ratio by at least 5 percentage points.

Column (1) of Table 4.2 displays means of selected explanatory variables for the 26 colleges listed in Table 3.3 as having a transfer curriculum specialty using Definition 2. Column (2) provides the same information for the 19 colleges listed in Table 3.4 that specialize in nontransferable voc-ed. Means of explanatory variables for the remaining 63 colleges appear in column (3). The first group of explanatory variables shown in Table 4.2 consists of campus-specific institutional variables. We expect to see colleges in multicampus districts offering a more specialized curriculum than colleges in single-campus districts. A college in a multicollege district must compete with other colleges to enroll local students, and one way to compete is for the college to differentiate itself in terms of its mix of academic programs. On the other hand, colleges that are the sole provider within reasonable commuting distance do not face this kind of competition and may be expected to offer a broad range of educational services to satisfy the diverse needs of local residents and employers.

Table 4.2

Cross-Tabulations Between Specializations in Transferable Curriculums and Nontransferable Voc-Ed and Selected Explanatory Variables

Explanatory Variable	Transfer Specialization (1)	Nontransferable Voc-Ed Specialization (2)	Other Colleges (3)
Institutional variables			
Multicampus district	.577	.632	.460
Proximity to four-year college			
Miles to nearest UC	25.0	54.7	54.6
Miles to nearest CSU	15.6	33.9	29.4
Student demographics			
Asian	.120	.082	.094
Black	.058	.081	.084
Hispanic	.219	.343	.239
White	.451	.359	.457
Employer characteristics			
Manufacturing employment	.159	.185	.152
Total employees (thousands)	86.1	128.9	56.5
Community demographics			
Bachelor's degree	.299	.204	.269
Foreign born	.250	.264	.217
Median household income ($ thousands)	51.6	46.1	49.3
Race			
White	.649	.564	.627
Black	.043	.074	.068
Asian	.116	.081	.120
Hispanic ethnicity	.265	.411	.248
Number of colleges	26	19	63

Table 4.2 demonstrates that, consistent with these expectations, colleges that specialize are more likely than other colleges to be part of multicampus districts. In particular, columns (1) and (3) indicate that colleges with a transfer specialization are nearly 12 percentage points more likely to belong to a multi-campus district than are "other" colleges. Similarly, columns (2) and (3) show that colleges with a nontransferable voc-ed specialization are 17 percentage points more likely to belong to a multicampus district than are other colleges.

Consider next proximity to a four-year college. For at least two reasons, colleges close to a four-year college are more likely than other colleges to specialize in a transferable curriculum. First, proximity makes transferring cheaper for students because they may be able to continue to live with their parents or in their own homes. Second, proximity is likely to lead to closer relationships between faculties of the community college and the four-year college, which, in turn, should result in a greater number of articulation agreements and a more seamless transfer process. Again, results shown in Table 4.2 are consistent with expectations. A comparison of columns (1) and (2) shows that colleges that specialize in a transferable curriculum are on average nearly 30 miles closer to a UC campus and about 18 miles closer to a CSU campus than are colleges with a nontransferable voc-ed specialization. Similarly, columns (1) and (3) show that colleges with a transferable curriculum specialization are over 29 miles closer to a UC and about 14 miles closer to a CSU than are other colleges. In other words, colleges offering a transferable curriculum are on average about half the distance to the nearest UC or CSU campus compared to colleges with a nontransferable voc-ed specialization and all other colleges.

Within the other college category, we singled out for further analysis 17 colleges offering what might be termed a "comprehensive" curriculum, by which we mean a mix of transferable credits and nontransferable voc-ed credits that is within 5 percentage points of the mean of each variable. Probability of membership in a multicampus district is 41 percent for these colleges compared to the 46 percent shown in Table 4.2 for all 63 other colleges. Consequently, gaps in multicampus membership between colleges with a curriculum specialization and comprehensive colleges are even larger than the gaps appearing in the table. For example, colleges with a transfer specialization are nearly 17 percentage points more likely than comprehensive colleges to belong to a multicampus district, compared to the 12 percentage point gap in Table 4.2 between colleges with a transfer specialization and other colleges. Similarly, comprehensive colleges are even farther away from the nearest UC and CSU campuses than are the 63 other colleges—about 65 miles to the nearest UC and 39 miles to the nearest CSU.

Regarding race and ethnicity of students, Table 4.2 suggests that Asian students are slightly more likely to attend colleges with a transfer specialization than colleges specializing in nontransfer voc-ed. On average, Asian students represent 12 percent of students attending colleges with a transfer specialization, whereas 8 percent of students attending colleges with a nontransfer voc-ed specialization are Asian. Among the other race and ethnicity categories, columns (1) and (2) indicate a larger difference in the opposite direction for Hispanic students. Hispanics are over 12 percentage points more likely to attend a college specializing in nontransferable voc-ed than to attend a college with a transfer specialty.

Turning to employer characteristics, Table 4.2 indicates that colleges specializing in nontransferable voc-ed tend to be in larger labor markets than are colleges with a transfer specialty. In addition, both categories of colleges that specialize are in larger labor markets than are the remaining 63 colleges. Differences in mix of employment, in contrast, tend to be quite small. The table shows that the percentage of local employment in manufacturing is higher by less than 3 percentage points for colleges that have a nontransferable voc-ed specialty than it is for colleges with a transfer specialty.

Finally, the community demographic variables shown in Table 4.2 suggest that colleges with a transfer specialization are somewhat more likely to be in more highly educated, higher-income communities than are colleges with a nontransferable voc-ed specialization. For example, columns (1) and (2) indicate a nearly 10 percentage point difference in the percentage of residents with a bachelor's degree. Echoing an earlier result for Hispanic students is the finding that communities with colleges that specialize in nontransferable voc-ed have a 15 percentage point greater share of Hispanics than do communities with colleges with a transfer specialization.

Emphasis on Advanced Voc-Ed

In Chapter 3, we noted as Correlation Result 3 the existence of large positive relationships between three measures of advanced voc-ed: (1) advanced voc-ed credits to all voc-ed credits, (2) advanced voc-ed courses to all voc-ed courses, and (3) ratio of advanced voc-ed courses to

advanced voc-ed programs. Any one of these variables would serve as a reasonable candidate for measuring an advanced voc-ed emphasis. The particular advanced voc-ed variable we examine in Table 4.3 is advanced voc-ed courses to all voc-ed courses.

The first two columns of the table contrast colleges in the top and bottom quartiles of the ratio of advanced voc-ed courses to all voc-ed courses for the same selected explanatory variables appearing in Table 4.2.

Table 4.3

Cross-Tabulations Between Emphasis on Advanced Voc-Ed Courses and Student Interest in Voc-Ed and Selected Explanatory Variables

	Emphasis on Advanced Voc-Ed		Student Interest in Voc-Ed	
Explanatory Variable	Top Quartile (1)	Bottom Quartile (2)	Top Quartile (3)	Bottom Quartile (4)
Institutional variables				
Multicampus district	.462	.333	.630	.667
Proximity to four-year college				
Miles to nearest UC	31.9	73.5	35.7	39.5
Miles to nearest CSU	17.6	41.6	27.4	19.6
Student demographics				
Asian	.092	.070	.094	.123
Black	.052	.078	.120	.054
Hispanic	.273	.227	.310	.200
White	.446	.513	.333	.482
Employer characteristics				
Manufacturing employment	.183	.124	.089	.092
Total employees (thousands)	61.4	93.3	167.3	50.8
Community demographics				
Bachelor's degree	.270	.210	.251	.333
Foreign born	.229	.199	.282	.232
Median household income ($ thousands)	49.9	40.3	52.1	54.0
Race				
White	.641	.630	.533	.680
Black	.045	.080	.082	.037
Asian	.103	.077	.132	.126
Hispanic ethnicity	.307	.276	.348	.211
Number of colleges	26	27	27	27

Comparing columns (1) and (2) of Table 4.3, the primary differences between colleges in the top and bottom quartiles are for the campus-specific institutional variables. In particular, colleges emphasizing advanced voc-ed are 13 percentage points more likely than colleges that do not emphasize advanced voc-ed to be part of a multicampus community college district. In addition, top-quartile colleges for this variable are nearly 42 miles closer to a UC campus and 24 miles closer to a CSU campus than are bottom-quartile campuses. If we pull together comparable estimates in Tables 4.2 and 4.3, the picture that emerges is that colleges with a transfer specialization or an emphasis on advanced voc-ed are more likely to be part of a multicampus district and to be within reasonable commuting distance to a UC or CSU campus.

Differences between colleges in emphasis on advanced voc-ed tend to be small for race and ethnicity, whether measured for students or for the community. However, the limited evidence in Table 4.3 suggests that emphasis on advanced voc-ed is somewhat more common for colleges in more highly educated, higher-income communities. For example, the incidence of bachelor's degrees is 6 percentage points higher for top quartile than for bottom quartile colleges. Top quartile colleges also tend to be in somewhat smaller labor markets and in labor markets with a higher proportion of manufacturing employment.

Student Interest in Voc-Ed

The third difference between colleges singled out for further attention in Chapter 3 is in freshmen student interest in voc-ed programs. We also mentioned in Chapter 2 that student interest in voc-ed is likely to be primarily capturing demand for nontransferable voc-ed. Columns (3) and (4) in Table 4.3 compare top and bottom quartiles of colleges measured in terms of student interest in voc-ed. It should be noted that colleges appearing in the bottom quartile, indicating a low level of student interest in voc-ed, are likely to be colleges whose students exhibit a high level of interest in transfer programs.

A comparison of columns (3) and (4) in Table 4.3 indicates small differences between top and bottom quartile colleges for membership in a multicampus district and proximity to the nearest four-year college.

Larger differences between quartiles appear for student demographic variables. In particular, proportions of black and Hispanic students are 7 percentage points and 11 percentage points higher, respectively, for top quartile than for bottom quartile colleges. On the other hand, colleges with large proportions of Asian and especially white students are more likely to enroll students with relatively little interest in voc-ed. Race and ethnicity results at the community level echo these findings. For instance, the proportion of Hispanic residents is nearly 14 percentage points higher for top quartile than for bottom quartile colleges. Student interest in voc-ed is also positively related to proportion of foreign-born residents in the community and to the size of the labor market and negatively related to the proportion of bachelor's degree holders (Table 4.3).

Summary

Colleges that specialize in either a transferable curriculum or in nontransferable voc-ed are more likely than other colleges to be part of a multicampus district and to be in large labor markets. Between these two categories of specialization, colleges that have a transfer specialization are in closer proximity to a UC or CSU campus, whereas colleges that specialize in nontransferable voc-ed tend to have a larger proportion of Hispanic students and to be in larger communities with greater minority populations.

We also compared colleges that differ in their emphasis on advanced voc-ed curriculums and in the interest of their freshmen students in voc-ed programs. Emphasis on advanced voc-ed is directly related to membership in a multicampus district, proximity to a UC or CSU campus, and proportion of manufacturing employment. The racial and ethnic mixes of the student body and the community have a stronger effect on student interest in voc-ed programs, with interest in voc-ed increasing with the proportions of Hispanics attending the college or residing in the community. Demand for voc-ed programs also increases with size of the local labor market.

5. Policy Discussion

The purpose of this concluding chapter is to provide guidance to policymakers for evaluating the performance of community colleges. The chapter is divided into three sections. The first reviews key provisions of the California Master Plan for Higher Education. The second provides some detail on the multiple performance indicators faced by community colleges. The third discusses several observations drawn from our empirical findings that we suggest should be taken into account when evaluating California community colleges.

Key Provisions of the California Master Plan

The 1960 California Master Plan laid the foundation for the subsequent development of the California Community College System on two guiding principles. The first is a policy of open admission to state high school graduates at no tuition (later, that principle was modified to very low tuition). California still leads the nation in accessibility of community college educational services and low tuition (Romano, 2003). The second guiding principle is the flexibility granted to community college districts and individual colleges to define their own missions. As stated in the Master Plan, community colleges are to offer instruction in (1) standard collegiate courses for transfer to four-year institutions, (2) vocational-technical fields leading to employment, and (3) general or liberal arts courses (California State Department of Education, 1960, p. 36). Hence, community college districts and individual colleges have for decades enjoyed considerable latitude in setting their missions in line with perceived local business and community needs and with the vision of college leaders.

Over time, the Master Plan has frequently been amended by the California state legislature. An important amendment was passed in 1996, reiterating that the primary missions of California community colleges are to offer traditional academic programs and vocational

instruction at the lower-division level. Academic and voc-ed programs are to be accessible to both traditional college-age and older students, including adults returning to school. As part of these primary missions, the amendment specifies that colleges are to offer remedial instruction and adult noncredit education.

The 1996 amendment states that an additional primary mission of community colleges is "to advance California's economic growth and global competitiveness through education, training, and services that contribute to continuous workforce improvement" (State of California, 1996, section 2). To help understand the legislature's intent, other provisions of the amendment add that in fulfilling this new mission, community colleges are to play a more active and even entrepreneurial role in local and regional economic development. Along with this emphasis on workforce development, the legislature also established in 1996 the California Performance Based Accountability (PBA) system to monitor the performance of community colleges in meeting workforce development goals.

Performance Evaluation Requirements

As their missions have expanded, California community colleges have also been faced with increasing demands for accountability in their use of taxpayers' money. Chapter 1 described the federal student-right-to-know regulation requiring that colleges collect and report student transfer and completion rates. As we noted above, data for First-Time Freshman student cohorts are used to calculate SRTK completion and transfer rates.

More important are the reporting requirements established by two additional pieces of federal legislation, both of which were passed in 1998. The Workforce Investment Act specifies a total of 17 core indicators of performance and consumer satisfaction for state institutions, including community colleges. Core indicators of performance include such labor market outcomes as placement in unsubsidized employment, initial wages, and retention in employment and wages measured after six months on the job. These employment-related measures are to be obtained from Unemployment Insurance (UI) quarterly earnings histories. Levels of performance on core indicators

that community colleges are expected to meet or exceed are established in negotiations between federal and state officials. Specific to voc-ed programs, VTEA establishes a similar set of core indicators of performance and requires that states collect and report data with which performance can be assessed. Not covered under WIA is an additional VTEA goal requiring completion of voc-ed programs that lead to nontraditional training and employment.

Performance goals required by WIA were established in the 1996 Partnership for Excellence agreement between the State of California and the CCCS. The five PFE goals include

- A greater number of transfers to UC and CSU campuses;
- An increased number of degrees and certificates awarded;
- Higher rates of course completion for transfer, voc-ed, and basic skills courses;
- Greater contribution to workforce development as measured by completion of apprenticeship, advanced voc-ed, and introductory voc-ed courses; and
- Basic skills improvement as measured by number of students completing coursework at least one level above prior basic skills courses.

The core indicators required by federal VTEA legislation are specified in the 1994 California Perkins State Plan. These core indicators include

- Completion rates for courses in voc-ed programs;
- Percentages of voc-ed students who transfer to a UC or CSU campus, earn a degree or certificate, or join the military;
- Placement and retention of voc-ed students in UI-covered employment; and
- Percentages of underrepresented gender students participating in voc-ed programs leading to nontraditional employment.

It is also worth noting that the federal WIA and VTEA acts require that data be collected by program area. Hence, at the state level, VTEA and PFE data are available for California community colleges by program. This level of detail allows college administrators to conduct

internal program evaluation. Similarly, students have the information necessary to make an informed comparison of different colleges that offer the same programs and of different programs offered by the same college.

Guidance to Policymakers for Evaluating Community Colleges

Given the number and variety of performance standards they face, community colleges must shoulder a substantial burden connected with collecting and reporting required information. Added to this burden is the possibility of failing to meet one or more of the performance criteria and losing state and federal funding. As might be expected in these circumstances, community college administrators are vocal in their criticism of existing performance standards and not at all reticent in offering suggestions for how these standards might be revised. These criticisms include the following:

- The costs of collecting required data are high. Especially burdensome are the requirements of following former students for up to six months and collecting and reporting data by program for each institution.
- The standards are poorly designed to capture the range of successful student outcomes given the range of student backgrounds and interests.
- Standards fail to reflect the multiple missions of community colleges.
- Standards are likely to have unintended and perverse consequences. These include the dropping of worthwhile courses that do not figure into the reward system, failing to admit students who are less likely to graduate or to be easily placed in jobs or in four-year colleges, and grade inflation to boost completion and retention rates.

If carried to an extreme, these criticisms suggest that each community college should be evaluated individually in terms of its performance in meeting the needs of the local community. A reasonable evaluation instrument for this purpose would be focus group interviews,

and we mentioned that a WIA performance indicator is consumer satisfaction with training services received. Nevertheless, the clear intent of legislators at both the federal and state levels is to mandate accountability standards requiring minimum levels of performance that are applied consistently across all colleges.

It is a difficult task to establish performance standards that insure minimum levels of performance while recognizing that community colleges may have different missions. Our objective in this report is not to provide specific evaluation guidelines. Rather, our more modest objective is to develop evidence that informs policymakers, helping them to establish evaluation standards that contribute to improved performance without being viewed by community colleges as onerous or even counterproductive.

What Does Our Evidence Show?

We believe that the following observations drawn from our empirical results will be helpful to policymakers in formulating standards used in evaluating community colleges.

1. *On average, California community colleges offer more credits in transferable programs than in other broad curriculum categories.* In Chapter 2, we discussed PFE data on the distribution of credits offered, broken down by transferable, nontransferable voc-ed, adult basic skills, and other credits; and we noted that, on average across CCCS campuses, colleges offer 73 percent of total credits in transferable programs. Further analysis in Chapter 3 indicated that most colleges offer at least half of all credits in transferable programs. Moreover, the interquartile range for the proportion of transferable to all credits is found to be quite narrow, lying between 69 percent and 79 percent. With a few exceptions, our evidence suggests that California community colleges are heavily engaged in offering transferable curriculums.

2. *Transferable curriculums are a mix of voc-ed courses and traditional academic courses.* Simply comparing transfer rates, as in a recent study by Ehrenberg and Smith (2004), may be misleading. Transferable curriculums are typically thought to be composed of traditional academic courses, but as we pointed out in Chapter 2, they are in fact a mix of credits generated by transferable voc-ed courses as well as traditional

academic courses. Broadly defined voc-ed that includes both transferable and nontransferable voc-ed credits is, on average across CCCS campuses, about 23 percent of all credits. Of all voc-ed credits, in turn, about 64 percent are on average transferable credits. In Chapter 2, we focused on Santa Barbara City College as an example of a CCCS college that promotes itself as having a strong transfer orientation. It is interesting to note that at 77 percent, the ratio of transferable voc-ed to all voc-ed credits for SBCC is even higher than the all-college average (73%). Because skills acquired in transferable voc-ed programs are likely to be valued in local labor markets, a successful outcome for a college with a strong transferable voc-ed orientation might well be placement in a training-related job as opposed to a successful transfer to a four-year college.

As indicated by Grubb (1996), probably the best way to measure the labor market effects of voc-ed curriculums is to use matched data that link student records to UI wage records. At the federal level, WIA and VTEA mandate the use of merged files containing student records and UI wage records to calculate employment, wage, and job retention outcomes. In their recent WIA implementation report, however, Macro, Almandsmith, and Hague (2003, chapter 8) indicate that few states have data currently available to evaluate the performance of training providers. Thus, performance standards specified in terms of labor market outcomes by program are likely to require the funding of additional institutional research by community colleges. Short of this financial commitment, the state might consider taking on centrally the management of large and complex administrative datasets and the production of the required data.

3. *Although most credits offered by most colleges are transferable, there are important differences across CCCS campuses in curriculum "emphasis" and "specialization."* Information on differences in the missions of community colleges may be obtained by reading colleges' promotional materials or by interviewing college officials in site visits. Our primary approach, in contrast, is to measure differences in the curriculum mixes offered to students. We argue that important differences in these mixes may be captured empirically by differences in curriculum "emphasis" and "specialization." What we mean by curriculum emphasis is systematic

deviations from the mean of a particular curriculum measure. As reported in Chapter 3, the data suggest that colleges differ in the emphasis they place on voc-ed offerings, especially in the mix of voc-ed credits and courses that are transferable or taught at an advanced level. We also find that colleges differ in terms of the interest of their freshmen students in transferable versus voc-ed programs.

Our definition of curriculum specialization goes beyond emphasis to link emphasis on one type of curriculum with a de-emphasis on another. Making use of this definition, we find that some colleges offer a transfer specialization including both traditional academic and voc-ed curriculums, whereas others specialize in nontransferable voc-ed. The number of colleges that specialize on these two dimensions depends on exactly how we implement our definition of specialization, and for this we consider two alternatives. Using our preferred alternative, we find that 26 colleges have a transfer curriculum specialty and another 19 colleges specialize in nontransferable voc-ed. Viewing these differences in curriculum emphases and specializations as indicating important differences in missions, we conclude that a "one-size-fits-all" evaluation strategy may not be appropriate.

4. *Basic skills programs are a small proportion of most community colleges' total offerings.* Employers frequently cite lack of basic skills as a major obstacle to finding qualified employees, and adult basic skills curriculums are closely linked to community colleges' workforce development mission. In Chapter 2, we reported that on average about 11 percent of full-time freshman students indicate that their primary academic objective is to acquire basic skills. Measured in terms of credits, about 7 percent on average of all credits are offered in basic skills courses. Although all colleges report freshman student interest in basic skills and offer basic skills courses for credit, we found in Chapter 3 that variation across colleges in our measures of basic skills is limited, especially in terms of credits offered. Our data thus indicate that the mission to provide basic skills courses is not one that receives great prominence, nor is it one on which community colleges attempt to differentiate themselves. Note that this conclusion rests on the assumption that the primary business of community colleges is to offer courses that supply credits toward a degree.

5. *Colleges are responsive to differences in community characteristics in the curriculum mixes they offer.* In Chapter 4, we examined the question of whether differences across colleges in curriculum emphases and specializations can be explained by indicators of college-specific characteristics and measures of community needs. College-specific characteristics include proximity to a four-year college and membership in a community college district, whereas community needs are measured by characteristics of the local labor market and community demographics.

Our evidence indicates clearly that differences between colleges in curriculum mix are not randomly determined. In terms of college-specific characteristics, we find that curriculum specializations and emphases have the expected relationships with membership in a multicampus district and proximity to a UC or CSU campus. Similarly, these measures of specializations and emphases appear to be related to the racial and ethnic composition of both students and the local community, in addition to other community demographic characteristics such as proportion of residents holding a bachelor's degree.

The conclusion we draw from this evidence is that California community colleges are responding in expected ways to differences in the interests and backgrounds of their students and to differences in the needs of their communities. In terms of accurately evaluating performance, these differences in missions should be taken into account.

Allowing for Differences in Missions

Precisely how to allow for differences in missions in measuring performance is a difficult issue that is currently receiving attention by policymakers in states across the nation. We conclude our report by commenting briefly on two possible approaches. The first was provided in the Job Training Partnership Act, which regulated federal employment and training activities for most of the 1980s and 1990s. The model-based JTPA procedure allowed performance standards to differ across colleges in response to quantitative differences in student characteristics and local economic conditions. Our evidence suggests that the model-based approach has merit. We find that differences in student characteristics and local economic conditions are closely related

to differences in colleges' missions, as measured by differences in curriculum mix.

Nevertheless, the model-based JTPA adjustment procedure was dropped from the Workforce Investment Act in 1998. In its place, WIA substituted a more ad hoc procedure that permits states either to waive performance standards or to negotiate adjustments in expected levels of performance. Such adjustments may be permitted if a college can make the argument that "unanticipated circumstances" involving a change in economic conditions or student characteristics make performance standards unreasonably burdensome. Analysts such as Barnow and Smith (2004) suggest that a fairer and less ad hoc procedure would be to return to the model-based system used under JTPA.

A second approach involves up-front recognition by the state that community colleges differ in their missions. That is, rather than adjusting levels of performance expected for a given set of accountability standards, community colleges would be allowed to report data for those performance standards deemed to be consistent with their missions. There is some evidence that this approach may be receiving consideration at the federal level. First, the Employment and Training Administration (ETA) of the U.S. Department of Labor recently recommended reducing the 17 core WIA performance measures to a set of eight "common" measures, four of which would apply to adult programs and four to youth programs (Employment and Training Administration, 2003). Second, the U.S. House of Representatives, building on a Bush administration proposal, recently crafted and passed a WIA reauthorization bill (H.R. 1261). The reauthorization bill follows the ETA recommendation to reduce the number of performance criteria while giving governors authority to modify statewide standards in response to recommendations of local workforce investment boards and training service providers. Should California policymakers choose to take this approach to performance evaluation, we hope that the methodology developed in this report is helpful in measuring differences across community colleges in their missions.

Appendix A

Technical Detail on Measures of Curriculum Mix

PFE Data on Enrollment

Partnership for Excellence data provide breakdowns of student credit hours attempted and completed by (1) type of course categorized by transferable, voc-ed, and basic skills, and (2) type of voc-ed program categorized as apprenticeship, advanced occupational, and introductory occupational. In the first or "Goal 3" breakdown, transferable courses are defined as courses that are transferable to UC or CSU campuses. Voc-ed courses, in contrast, are defined as nontransferable courses with Student Accountability Model (SAM) Priority Codes A, B, and C, classifying courses as "apprenticeship," "advanced occupational," and "clearly occupational," respectively. The basic skills classification includes courses that supply precollege basic skills and basic skills unrelated to college entrance. In the PFE dataset, basic skills courses are assigned SAM Priority Codes D and E, indicating that the courses are "possibly occupational" and "nonvocational," respectively. The Goal 3 breakdown of credits has the advantage of supplying a comprehensive overview of credits, but it provides a "narrow" specification of voc-ed.

The second or "Goal 4" breakdown of voc-ed course enrollment retains the Goal 3 restriction limiting voc-ed courses to those with SAM Priority Codes A, B, and C. However, voc-ed courses are not restricted to nontransferable courses, thus allowing a "broad" specification of voc-ed that includes transferable courses. The curriculum mix variables described in Table 2.2 include both narrow and broad measures of voc-ed.

VTEA Data Measuring Courses and Programs

The federal VTEA and California state law require that each community college voc-ed program is to be evaluated using four core indicators of performance. For this purpose, the CCCS Chancellor's Office maintains an electronic master Taxonomy of Programs (TOP) code file that lists over 300 individual programs and assigns to each a unique TOP code number. Vocational courses are defined as those having SAM Priority Codes A, B, C, or D and a vocational TOP code.

Our data measuring voc-ed courses come from VTEA "Core Indicator Reports" using the "Course Voc Status/SAM Code" file. This file provides the number of voc-ed course offerings with SAM Codes A, B, C, and D for each community college in 1998–1999. In Table 2.3, the curriculum mix variables we report for voc-ed courses are constructed using data for SAM Codes A, B, and C. Total voc-ed courses are defined as the sum of SAM Codes A, B, and C courses.

We use the same VTEA "Course Voc Status/SAM Code" file to measure the number of voc-ed programs offered grouped by SAM Priority Codes A, B, and C. Courses in each SAM Priority Code are listed by a TOP code. Our procedure for arriving at a number of programs in each priority code is to go down the list of courses offered and then to sum up the number of courses with different TOP codes. Two points should be noted regarding these data. First, since TOP codes are matched to courses, what we measure are program "areas" defined by content, which may not be the same as programs officially described in college catalogs. Second, our measures of SAM Codes A, B, and C programs are not mutually exclusive. The reason is that a program will often include courses categorized at more than one SAM Code level. For example, a program with a particular TOP code number might include advanced occupational (SAM Code B) courses as well as beginning occupational (SAM Code C) courses. Hence, this TOP-coded program would be counted in our dataset as both a SAM Code B program and a SAM Code C program. Chapter 2 notes that we do not have a reliable measure of total voc-ed programs with VTEA data.

Program Inventory Data

In addition to VTEA data on voc-ed programs offered, the Chancellor's Office maintains an "Inventory of Approved and Projected Programs." The program inventory dataset includes all programs that are "approved" in the sense that a program must require 18 or more credits of course work. Hence, the number of programs included in this dataset is likely to understate the number of programs described in college catalogs, whereas, as noted, VTEA data report program areas measured by content rather than programs as they are officially titled. Each approved program is listed in the program inventory data by TOP code, and the Chancellor's Office provides a list of programs matched to TOP codes that singles out vocational programs. Total approved voc-ed programs are also provided.

First-Time Freshman Data

As described in Chapter 2, FTF data are derived from a longitudinal study following the universe of first-time freshmen at all CCCS campuses between their initial enrollment in Fall 1997 and Spring 2000. Detailed information available by campus is presented in three categories: cohort, awards granted, and transfers. Cohort information includes gender, age, and race/ethnicity of students. In addition, FTF cohort data include a breakdown of freshman students' academic objectives uninformed by counseling ("uninformed goals") and informed by counseling ("informed goals"). Cohort data measuring students' academic objectives uninformed by counseling are used in Chapter 2 to represent the demand of incoming students for alternative categories of educational services (voc-ed, transfer, basic skills, and other).

FTF awards-granted data include total awards earned over the 1997–2000 period for the 1997 freshman cohort broken down by gender and race/ethnicity. Information is also available on type of award (A.A., A.S., and certificates) and title of program completed. Finally, FTF transfer data include total number of transfers broken down by whether the destination college is public or private, in California or out of state, the semester of transfer, and the name of the destination four-year college or university.

Appendix B

Technical Detail on Factor Analysis

We implemented our factor analysis using as a guide the multistep strategy outlined by Johnson and Wichern (1988, p. 415). The software we used is the factor procedure in base SAS (SAS Institute, 1990). Johnson and Wichern recommend, as a first step, performing a principal component factor analysis with varimax (orthogonal) rotation. Our varimax rotation results yielded six common factors based on the criterion that the eigenvalues of the correlation matrix are greater than 1. Inspection of these results shows that the first four common factors extracted have a clear interpretation in terms of our curriculum mix variables. Moreover, each possesses the desirable feature of having at least three curriculum mix variables with large factor loadings. The remaining two common factors were both difficult to characterize and had fewer than three variables with substantial factor loadings. Since the last two common factors added little to our understanding, we restricted further estimations to four common factors. Factor loadings obtained using a varimax rotation for our 18 independent curriculum measures are reported in Table B.1.

Continuing to follow the suggestions of Johnson and Wichern, we checked the sensitivity of our factor loadings to outliers, and we relaxed the orthogonality restriction by allowing for correlation among factors using the promax oblique (nonorthogonal) rotation. The main outlier we have identified is Santiago Canyon College with its heavy emphasis on apprenticeship training. Its omission caused only minor changes in the size of our factor loadings, so we retained Santiago Canyon in our analysis. Similarly, the promax rotation yielded results very similar to those obtained from the varimax rotation with little evidence of significant correlation between factors.

Table B.1

Factor Loadings from the Orthogonal Rotated Factor Patterns

Curriculum Measure	Transferable Curriculum (1)	Advanced Voc-Ed Curriculum (2)	Demand for Nontransferable Curriculum (3)	Apprenticeship Training (4)
Transferable credits/ all credits	**.912**	.164	–.060	–.096
Academic transfer credits/all credits	**.801**	.050	–.230	.002
Nontransferable voc-ed credits/all credits	**–.906**	–.105	–.149	.149
Nontransferable voc–ed credits/all voc-ed credits	**–.711**	–.176	–.128	.240
Interest in basic skills	**–.677**	–.044	.097	–.263
Advanced occupational credits/all voc-ed credits	.166	**.845**	.138	.022
Advanced occupational courses/all voc-ed courses	.289	**.841**	–.083	–.031
Advanced courses/ advanced programs	–.019	**.832**	–.108	.034
Interest in voc-ed	–.053	–.323	**.779**	.230
Interest in nontransfer programs	.013	–.310	**.777**	.265
Basic skills credits/ all credits	.041	.069	**.652**	–.023
Interest in transferring	.358	.261	**–.597**	.051
Apprenticeship courses/all voc-ed courses	–.002	–.027	–.093	**.936**
Apprenticeship credits/ all voc-ed credits	–.037	–.142	–.080	**.862**
Apprenticeship programs/100 students	–.069	.168	.114	**.624**
Voc-ed courses/100 students	–.345	.073	.346	–.058
Advanced occupational programs/100 students	–.111	.195	.413	–.165

Table B.1 (continued)

Curriculum Measure	Transferable Curriculum (1)	Advanced Voc-Ed Curriculum (2)	Demand for Nontransferable Curriculum (3)	Apprenticeship Training (4)
Approved voc-ed programs/total approved programs	–.018	–.029	–.073	.027
Variance explained (%)	24.5	13.2	12.7	10.6

NOTES: Omitted curriculum variables are residual credits to all credits, undecided first-time freshmen to all freshmen, and broadly defined voc-ed credits to all credits; Copper Mountain College is omitted from the analysis. Factor loadings greater than 0.5 in absolute value are in bold.

Finally, Johnson and Wichern suggest performing a maximum likelihood factor analysis including a varimax rotation. We were unable to successfully carry out the maximum likelihood analysis because the estimator gave communality estimates (squared multiple correlations of the common factors with the i^{th} variable) that are greater than 1. This situation, described in the statistical literature as an "ultra-Heywood case," is a particular problem when using the maximum likelihood method because variables with high communality are given high weights in subsequent iterations.

The factor loadings shown in Table B.1 can be used to calculate predicted values of the common factors for each community college in our dataset. These predicted values are called factor scores. Descriptive statistics for the factor scores calculated for each of our four factors are shown in Table B.2. Note that factor scores are standardized to mean 0 and variance 1. Hence, the maximum/minimum and interquartile ranges shown in the table can be interpreted in terms of standard deviations. Colleges with the top five and bottom five factor scores for Factors 1–4 are listed in Table 3.5.

Table B.2

Descriptive Statistics for Factor Scores Obtained from Factor Analysis

Common Factors	Minimum	Maximum	Max/Min Range	IQ Range
Factor 1: transferable curriculum	–6.61	1.80	8.46	0.89
Factor 2: advanced vocational curriculum	–1.36	4.50	5.86	1.23
Factor 3: demand for nontransferable curriculum	–2.04	3.04	5.07	1.23
Factor 4: apprenticeship training	–1.37	7.77	9.14	0.57

NOTES: Factor scores are standardized to 0 mean and unit variance. Copper Mountain College is omitted from the analysis.

Appendix C

Data Sources and Technical Details Used to Construct the Explanatory Variables

College-Specific Characteristics

Table 4.1 describes four college-specific variables. Beginning with multicollege district, PFE data on number of colleges in the district (Var9) are used to create a dummy variable indicating whether the college is part of a multicampus community college district.

We used a three-step procedure to calculate proximity to the nearest UC or CSU campus. There are 10 campuses in the UC system and 23 campuses in the CSU system. Making use of a large map of California, we first identified at least two UC campuses and at least two CSU campuses as potentially nearest to each community college. For community colleges in large metropolitan areas such as Los Angeles and San Francisco, we picked up to seven UC campuses and seven CSU campuses for comparison. In the second step, we used Yahoo maps to calculate for each UC-CC pair and each CSU-CC pair (1) driving distance in miles and (2) travel time in minutes. The third step in the procedure involved choosing for each community college the nearest UC and the nearest CSU in driving distance and driving time. Proximity measured in miles is reported in Table 4.1.

Campus age is obtained from the web site for each college. We strived to pin down the year the campus was founded, even if the college was originally a branch campus or subsequently changed its name. Student demographic data come directly from CPEC.

Local Job Opportunities

Using online data from the 1997 Economic Census, we sought to obtain information about employers in the immediate proximity of the community college campus. Logically, this is best accomplished by selecting as the local labor market the city in which a community college is located. However, this characterization of the local labor market does not work for cities that are large enough to include multiple colleges. Nor does it work for communities that are too small to have the required Census data. In an attempt to deal with these problems, we used the following three-step protocol.

1. Check the city named in the college's mailing address. If there is only one college in this city and Census data are available, use these data for this city.
2. If the city indicated in the mailing address is so large that it includes multiple colleges, check the five-digit zip code in the college's mailing address. If the required data are available for this five-digit zip code, use these data.
3. If the city indicated in the mailing address is too small to have the required Census data, find the closest city for which data are available and use these data.

Step 1 of the protocol is satisfied for the vast majority of colleges. We specified Step 2 to investigate further the case of colleges that, according to their mailing addresses, are in large cities served by multiple community colleges. Our hope was that by looking at a college's five-digit zip code, we could locate a smaller community within the larger metropolitan area for which required data are available. As it turned out, only for Los Angeles Southwest College were we successful in applying this step. For Los Angeles Southwest College, the city specified in the mailing address is Los Angeles, but the five-digit zip code indicates that the college is in Gardena. Since the required data are available for Gardena, we use employment data for Gardena rather than for Los Angeles.

We were able to apply Step 3 to nine colleges whose local addresses indicate a small community in either a rural area or a large metropolitan

area. An example of the former is Cabrillo College in the small community of Aptos in Santa Cruz County. For this college, the closest larger city for which data are available is Santa Cruz. An example of the latter is Los Angeles Mission College in Sylmar. The required data are not available for Sylmar, but we could find data for nearby San Fernando.

Overall, our protocol allows us to obtain unique employment data for 94 colleges. That is, we are forced to use duplicate data for 14 campuses. Los Angeles employment data are used for four Los Angeles area schools (out of nine Los Angeles Community College District campuses), and Oakland employment data are used for two Oakland area campuses (out of four campuses in the Peralta Community College District). Similarly, Sacramento employment data are used for all three colleges in the Los Rios Community College District serving Sacramento, San Diego employment data are used for all three colleges serving that city in the San Diego Community College District, and San Jose employment data are used for both colleges in the San Jose/ Evergreen Community College District.

Local Service Area Demographics

Our objective in specifying this set of variables is to measure for each college the demographic characteristics of its "local service area" defined in terms of prospective students, their parents, and local public officials who might be influential in determining curriculum mix. We considered several alternative approaches to defining the local service area. Initially, the approach that seemed the most promising was to make use of data measuring for each college the three-digit and five-digit origination zip code of all students enrolled in a community college as of Fall 2001. These data were kindly made available to us by Patrick Perry, Vice President for Management Information Systems in the Chancellor's Office in Sacramento. Using 2000 Census data, the demographic information we require is also available at the three-digit and five-digit zip code levels, as well as for city and county. What we hoped was to find the zip codes (at the five-digit level or else at the three-digit level) that supplied a majority of a college's students. Using this information to construct weights, we planned to calculate as a weighted average the

demographic characteristics of the local service area for each college. Unfortunately, we ran into the following problem. Enrollment at many colleges is so dispersed at the five-digit level that we were unable to isolate a reasonable number of five-digit zip codes that supply anywhere near a majority of student enrollment. On the other hand, the geographic areas covered by the relevant three-digit zip code were often so large that they failed to correspond to a reasonable definition of a local service area.

Rather than trying to pin down the local service area in terms of three-digit and five-digit zip codes, the approach we ultimately followed was simply to make use of demographic data from the 2000 Census using information for the city in which the college is located. As indicated in Table 4.1, our community demographic variables include percentage of bachelor's degree holders, percentage of foreign-born residents, median household income, and race and ethnicity. The city corresponding to each college, in turn, is specified using the protocol just outlined to measure local employer characteristics.

Appendix D

Dataset for California Community Colleges

Table D.1

Data Descriptions, Sources, and Descriptive Statistics

Variable	Description	Data Source	Mean	Min.	Max.
Var1	Attempted transfer, count enrollment	PFE data file	56009	2720	156094
Var2	Attempted basic skills, count enrollment	PFE data file	4851	287	16819
Var3	Attempted nontransferable voc-ed, count enrollment	PFE data file	5737	0	25573
Var4	Attempted all, count enrollments	PFE data file	74525	10128	184948
Var5	Attempted SAM Code A, count enrollment (apprenticeship)	PFE data file	317	0	12667
Var6	Attempted SAM Code B, count enrollment (advanced occupational)	PFE data file	3578	0	25734
Var7	Attempted SAM Code C, count enrollment (clearly occupational)	PFE data file	12029	1360	46076
Var8	Attempted total voc-ed, count enrollment	PFE data file	15924	1520	48866
Var9	No. of colleges in district	PFE data file	2	1	9
Var10	No. of SAM Code A courses	VTEA	17	0	195
Var11	No. of SAM Code B courses	VTEA	148	4	994
Var12	No. of SAM Code C courses	VTEA	403	29	1877
Var13	No. of SAM Code D courses	VTEA	137	0	695
Var14	No. of SAM Code A programs	VTEA	2	0	20
Var15	No. of SAM Code B programs	VTEA	23	1	71
Var16	No. of SAM Code C programs	VTEA	35	13	82
Var17	No. of SAM Code D programs	VTEA	24	0	80
Var18	Total voc-ed programs	VTEA	41	15	96
Var19	Total “approved” voc-ed programs	Program inventory	34	10	64
Var20	Total “approved” programs	Program inventory	50	16	99

Table D.1 (continued)

Variable	Description	Data Source	Mean	Min.	Max.
Var21	Total student headcount, Fall 2001	www.cpec.ca.gov	14377	1993	38412
Var22	Formulate career interest	FTF 1997	89	0	299
Var23	Voc-ed degree, no transfer	FTF 1997	55	0	451
Var24	Acquire job skills	FTF 1997	149	0	943
Var25	Update job skills	FTF 1997	88	0	988
Var26	Voc-ed certificate	FTF 1997	72	0	517
Var27	Maintain license	FTF 1997	25	0	112
Var28	Degree and transfer	FTF 1997	626	35	2111
Var29	Transfer, no degree	FTF 1997	204	6	1912
Var30	Degree, no transfer	FTF 1997	102	2	1030
Var31	Basic skills	FTF 1997	64	0	533
Var32	Educational development	FTF 1997	94	0	847
Var33	Complete GED	FTF 1997	32	0	250
Var34	Undecided	FTF 1997	404	0	1771
Var35	Uncollected	FTF 1997	75	0	1022
Var36	Total students surveyed	FTF 1997	2077	182	5102
Var37	Community college emphasis (voc-ed = 1, transfer = 2, indeterminate = 3)	CPEC campus descriptions	3	1	3
Var38	Year college founded	www.cpec.ca.gov	1949	1883	2001
Var39	No. of male students, Fall 2001	www.cpec.ca.gov	6333	881	17580
Var40	No. of female students, Fall 2001	www.cpec.ca.gov	7960	1111	21109
Var41	No. of students gender unknown	www.cpec.ca.gov	84	0	773
Var42	No. of Asian students	www.cpec.ca.gov	1592	27	9955
Var43	No. of black students	www.cpec.ca.gov	1042	13	5417
Var44	No. of Filipino students	www.cpec.ca.gov	469	7	2590
Var45	No. of Hispanic students	www.cpec.ca.gov	3756	77	19518
Var46	No. of Native American students	www.cpec.ca.gov	143	16	646
Var47	No. of white students	www.cpec.ca.gov	5942	165	22859
Var48	No. of nonresident alien students	www.cpec.ca.gov	225	0	2953
Var49	No response on race/ethnicity	www.cpec.ca.gov	932	1	5277
Var50	Other race/ethnicity	www.cpec.ca.gov	276	0	1513
Var51	No. of full-time students	www.cpec.ca.gov	3295	279	8625
Var52	No. of part-time students	www.cpec.ca.gov	8781	661	23179
Var53	Full-time/part-time unknown	www.cpec.ca.gov	2402	175	9703
Var54	Community college district code	www.ccco.edu	37	1	72
Var55	Miles to nearest UC campus	www.yahoo.com	48	1.7	282.5
Var56	Miles to nearest CSU campus	www.yahoo.com	27	1.5	178.2
Var57	Minutes to nearest UC campus	www.yahoo.com	58	2	334
Var58	Minutes to nearest CSU campus	www.yahoo.com	35	3	170
Var59	No. of employees in manufacturing	1997 Economic Census	15666	0	186758

Table D.1 (continued)

Variable	Description	Data Source	Mean	Min.	Max.
Var60	No. of employees in wholesale trade	1997 Economic Census	7103	10	87405
Var61	No. of employees in retail trade	1997 Economic Census	11377	10	118117
Var62	No. of employees in real estate	1997 Economic Census	2775	10	39094
Var63	No. of employees in professional services	1997 Economic Census	8978	10	122686
Var64	No. of employees in administrative and support services	1997 Economic Census	9479	25	104788
Var65	No. of employees in educational services	1997 Economic Census	406	0	4599
Var66	No. of employees in health care	1997 Economic Census	6478	3	74565
Var67	No. of employees in arts and entertainment	1997 Economic Census	1566	0	23403
Var68	No. of employees in accommodations and food services	1997 Economic Census	9756	10	103746
Var69	No. of employees in other services (except public administration)	1997 Economic Census	2760	0	33761
Var70	% of population age 25+ with bachelor's degree or higher	2000 Census	26.5	5.4	78.1
Var71	% of population foreign born	2000 Census	23.3	1.3	54.4
Var72	Median household income ($)	2000 Census	49324	21900	173570
Var73	Completion rate	STRK	33.0	11.5	100.0
Var74	Transfer rate	STRK	25.0	0.0	55.9
Var75	% white	2000 Census	62.1	16.7	93.7
Var76	% black	2000 Census	6.3	0.2	40.3
Var77	% Native American	2000 Census	1.0	0.1	4.2
Var78	% Asian	2000 Census	11.2	0.3	61.8
Var79	% Native Hawaiian and other Pacific Islander	2000 Census	0.4	0.1	2.9
Var80	% some other race	2000 Census	14.2	0.5	49.4
Var81	% two or more races	2000 Census	4.8	1.9	10.1
Var82	% Hispanic ethnicity	2000 Census	28.1	2.2	89.3

Table D.2

Construction of Curriculum Mix Variables from Raw Data

Curriculum Variable	Transformation of Raw Data
Transfer credits/all credits	Var1/Var4
Narrow voc-ed credits/all credits	Var3/Var4
Basic skills credits/all credits	Var2/Var4
Residual credits/all credits	(Var4–Var1–Var2–Var3)/Var4
Broad voc-ed credits/all credits	Var8/Var4
Narrow voc-ed credits/all voc-ed credits	Var3/Var8
Apprenticeship credits/all voc-ed credits	Var5/Var8
Advanced voc-ed credits/all voc-ed credits	Var6/Var8
Academic transfer credits/all credits	[Var1–(Var8-Var3)]/Var4
Apprenticeship courses/all courses	Var10/(Var10+Var11+Var12)
Advanced voc-ed courses/all voc-ed courses	Var11/(Var10+Var11+Var12)
Voc-ed courses/student	(Var10+Var11+Var12)/Var21
Apprenticeship programs/student	Var14/Var21
Advanced voc-ed programs/student	Var15/Var21
Advanced courses/advanced programs	Var11/Var15
Approved voc-ed programs/total programs	Var19/Var20
Undecided student interest/all students	Var34/(Var36-Var35)
Student interest in basic skills/all students	(Var31+Var32+Var33)/(Var36-Var35)
Student interest in transferring/all students	(Var28+Var29)/(Var36-Var35)
Student interest in voc-ed/all students	(Var22+. . .+Var27)/(Var36-Var35)
Student interest in nontransfer programs/all students	(Var22+. . .+Var27+Var30)/(Var36-Var35)

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