EVALUATING THE VARIETY OF EDUCATIONAL SERVICES OFFERED BY CALIFORNIA'S COMMUNITY COLLEGES

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I. INTRODUCTION

Community colleges are complex institutions offering a wide range of educational services. Historically, community college students completed two years of a general undergraduate education, often earned an associate's degree (A.A.), and then transferred to a four-year college to complete a bachelor's degree. Today, however, significant fractions of community college students are enrolled in vocational education (voc-ed) programs and adult basic skills programs. Voc-ed programs often culminate in a terminal A.A. degree or certificate, but credits earned in these programs may be transferable to a four-year college. In addition, a growing number of community colleges provide "contract" training – that is, classes designed to meet needs of particular employers and sometime delivered on-site.

Despite the broadening of curriculums to include voc-ed and adult basic skills programs and contract training, Bailey (2002) suggests that a transferable liberal arts education is still generally believed to be the core function of community colleges. The limited academic literature currently available that evaluates whether community colleges are fulfilling their missions tends to take this narrow focus on transferable curriculums. A recent example is the useful study of New York community colleges by Ehrenberg and Smith (forthcoming).

Rather than simply comparing transfer rates, our perspective in this paper that a more informative evaluation methodology requires attention to the matching of community colleges that differ in their missions to the variety of educational and training needs of students and employers. A first step in this direction is to ask the question whether individual colleges differ substantially in the mix of educational services they offer? If the answer to this question is "yes," then a logical second question is whether these differences can be explained by factors including college-specific characteristics, local employment opportunities, and community demographics?

These two research questions are addressed using a data set assembled for community colleges in California. We focus on California for three reasons. First, the California Community College System (CCCS) is the nation's most extensive community college system offering educational service to over 1.6 million state residents as of the fall of 2001. The CCCS is composed of 108 campuses, operated by 72 local community college districts. Second, California community colleges reflect the rich ethnic and racial diversity of the state. Of particular interest are Latino students who represent about 27 percent of the state's community college student population. Third, a wealth of data are available on-line by campus offering alternative measures of educational services.

II. THE DATA

Our data set has two components. The first includes measures of mix of educational services. These measures are analyzed to answer our first research question. The second component includes explanatory variables utilized in a regression framework intended to answer Research Question 2.

A. Measures of Educational Service Mix

To measure educational service mix for CCCS campuses, we use three independently collected data sets. These data sets are the following:

1. Partnership for Excellence (PFE) data on student enrollment broken down by voc-ed, transferable, and basic skills credits. The PFE is an agreement between the state and the CCCS to significantly expand the contribution of community

colleges to achieving priority policy objectives of the state. We use PFE data for the 2000-01 academic year.

2. Data on voc-ed courses and programs reported by the CCC Chancellor's Office to satisfy federal Vocational and Technical Education Act (VTEA) obligations. Voc-ed course and program data are classified as apprenticeship, advanced occupational, and introductory occupational. VTEA data are measured for 1998-99.
3. First Time Freshman (FTF) data on students' academic objectives. FTF data are derived from a longitudinal study following the universe of 108,859 first-time freshmen at all campuses in the CCCS between their initial enrollment in fall 1997 and spring 2000.

We supplement voc-ed measures constructed from VTEA data with data from the Chancellor's Office "Inventory of Approved and Projected Programs." "Approved" programs are those that require 18 or more credits of course work. PFE data are available for all 108 campuses, while VTEA data and FTF data are available for 107 campuses (excluding Copper Mountain College).

PFE measures. Using these data sets, Table 1 describes and presents descriptive statistics for 20 alternative measures of curriculum mix. Variables shown in rows 1-8 are developed from PFE data exploiting the breakdown available between transferable, voc-ed, and basic skills credits attempted; and, for voc-ed credits, the distinction between apprenticeship, advanced occupational, and clearly occupational course enrollment. In row 1, we measure overall emphasis on voc-ed, where voc-ed is defined broadly to include transferable as well as nontransferable credits. Row 2 is included to get a feel for the importance of transferable voc-ed enrollment as opposed to voc-ed enrollment that is not transferable. It is interesting to note that the range on the nontransferable voc-ed ratio (0.920) is even larger than the range shown in row 1 for voc-ed to all credits (0.758). Maximum values for both ratios are observed for the same college -- Taft College, which is located at the southern end of the San Joaquin Valley near Bakersfield.

Rows 3 and 4 of Table 1 make use of the distinction between levels of voc-ed courses taken. While well over half of all California community colleges have no students enrolled in apprenticeship programs, row 3 suggests that apprenticeship training does represent a sizable component of voc-ed enrollment for at least some colleges. The leading example is Santiago Canyon College in which fully 72.7 percent of voc-ed enrollment is in apprenticeship courses. Note, however, that the next highest ratio of apprenticeship programs is just 12.3 percent. Parallel but in the opposite direction to the nontransferable voc-ed ratio in row 2, the advanced occupational voc-ed ratio appearing in row 4 shows substantial variation about the mean of 20.7 percent. For Taft College, just 2.8 percent of voc-ed enrollment is taught at an advanced level.

Rows 5, 6 and 7 describe proportions of total course enrollment in basic skills courses, transferable courses (including transferable voc-ed courses), and academic transferable courses, respectively. Basic skills enrollment averages just 6.9 percent for California community colleges and has limited variation. Rows 6 and 7 make the distinction between all transferable credits and academic transferable credits, where academic transferable credits are calculated as all transferable credits minus transferable voc-ed credits. Comparing means in rows 6 and 7, academic transfer credits make up about 80 percent (=0.591/0.737) of all transferable credits.[1]

Overall, we find substantial variation, at least as measured at the extremes of the distributions, for six of the eight variables measured with PFE data. Relatively small ranges are observed for the two ratios involving basic skills credits and residual credits.

VETA measures. Rows 9-15 of Table 1 shift attention from credits attempted to voc-ed courses and programs offered. Rows 9 and 10 display ratios of apprenticeship and of advanced occupational courses to total voc-ed courses, respectively. Not surprisingly, the maximum value of the apprenticeship course ratio (0.485) is obtained for Santiago Canyon College. Since VETA data does not provide information on total courses, we are unable to calculate a ratio of voc-ed courses to all courses comparable to that shown for credits in row 1. What we can do is express our voc-ed course data on a per student basis, and this measure is shown in row 11. Mean number of voc-ed courses per 100 students is slightly less than 5, with a maximum of 22 courses per 100 students.

In terms of voc-ed programs offered, VTEA data allow us to distinguish between types of programs but total number of voc-ed programs is not available.[2] Hence, rows 12 and 13, respectively, show apprenticeship programs and advanced occupational programs on a per 100 student basis. Row 14 makes use of both course and program information to show the "depth" of voc-ed programs measured as the ratio of advanced courses to advanced programs. This ratio ranges to up over 38 advanced courses per advanced program. Row 15 uses Chancellor's Office Program Inventory data to calculate for "approved" programs the ratio of voc-ed programs to all programs. On average, 68 percent of approved programs are voc-ed programs. Since row 1 indicates that the proportion of voc-ed credits to all credits is about 23 percent, it is clear that voc-ed programs, or at least "approved" voc-ed programs, tend to be much smaller in terms of student credit hours than other programs.

FTF measures. FTF data distinguish 14 categories of academic objectives for first-time freshman. We aggregate these into the four categories shown in rows 16-19 in Table 1 plus an "other" category (not shown) that includes students for whom data were "uncollected." Ratios shown in the table are expressed as a proportion of total students surveyed less students in the uncollected category. Note that FTF data allow only a narrow definition of voc-ed in row 19, that is, one that excludes interest in voc-ed programs that are transferable. This definition may well be appropriate since many first-time freshman students are likely to be unaware that voc-ed courses are often transferable. It is also worth noting that the maximum value of the basic skills ratio in row 17 (0.790) is observed for Taft College. In row 20, we take individuals interested in an A.A. degree but not in transferring from the "other" category and add them to those interested in a voc-ed program to arrive at total interest in nontransferable programs. The sum of rows 16, 17, 18, and 20 is 100 percent.

B. Measures of Explanatory Variables

To explain inter-college differences in curriculum mix, we utilize three sets of explanatory variables. These are college-specific variables, local employer characteristics, and demographic characteristics of the local service area. We view college-specific variables as affecting primarily the supply of educational services, while local employer characteristics and demographic characteristics are viewed as primarily demand-side variables.

College-specific variables. Our college-specific variables, shown in Table 2, are membership in a multi-campus district, proximity to a state four-year college, and campus age. We expect, other things equal, that colleges in a multi-college district will compete with one another for students in their local area by differentiating themselves in terms of the educational service mix they offer. On the other hand, colleges that are the sole provider within reasonable commuting distance are expected to offer a broad range of educational services to satisfy the diverse needs of local residents and employers. Proximity to a four-year college is expected to increase a college's emphasis on transfer programs because transferring is likely to be cheaper for students and because the community college and four-year college are more likely to have an articulation agreement. Finally, older campuses are expected to have a greater commitment to traditional academic/transfer programs than are younger campuses.

PFE data on number of colleges in the district are used to create a dummy variable indicating whether the college is part of a multi-campus CC district. Of the 108 campuses in the CCCS, 56 campuses (or 51.9 percent) are located in a total of 21 multi-campus districts. Number of campuses included in each of these multi-campus districts is not reported in the table. However, the Los Angeles district is by far the largest district with nine campuses. The Peralta district serving the Oakland metropolitan area is second with four campuses.

In the next row of Table 2, we used a three-step procedure to calculate proximity to nearest University of California (UC) or California State University (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 by visual inspection at least two UC campuses and at least two CSU campuses as potentially nearest to each community college. For community colleges located in large metropolitan areas, 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 driving distance in miles. The third step in the procedure involved choosing for each community college the nearest UC and the nearest CSU in driving distance.

Table 2 indicates large variation about the means of 47.5 miles to nearest UC campus and 26.9 miles to 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 of proximity, College of the Redwoods located on the northern California coast in Eureka is nearly 283 miles from the nearest UC, and Palo Verde College located in the southeastern California desert is 178 miles from the nearest CSU.

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 it subsequently changed its name. Campus age measured from 2002 is seen in Table 2 to be 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; while Copper Mountain College, founded in 2001, is the youngest.

Local job opportunities. The middle panel of Table 2 displays descriptive statistics for our measures of local job opportunities using on-line data from the 1997 Economic Census. Grubb (1996, ch. 6) emphasizes that the labor market for community college students (what he calls the “sub-baccalaureate labor market”) is almost entirely local.

Following up on this point, we sought to obtain information for employers located in the immediate proximity of the community college campus using the following three-step protocol.

1. Check the city named in the college's mailing address. If there is only one college located 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 5-digit zip code in the college's mailing address. If required data are available for this 5-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 84 colleges. We were successful in applying Step 2 to just one college and Step 3 to nine additional colleges. The remaining 14 colleges for which we were unable to obtain unique college-specific employment data are all located in large metropolitan areas, including Los Angeles (four colleges), Oakland (two colleges), Sacramento (three colleges), San Diego (three colleges), and San Jose (two colleges).

We characterize local job opportunities in Table 2 by industry mix of employment and total employment. In terms of industry mix, the largest spread appears for manufacturing, followed by retail trade, wholesale trade, and accommodations and food services. Also observed is huge variation in the size of the local labor market as measured by total employment. Total employment ranges between 335 employees for

Foothill College located in Los Altos Hills and nearly 900,000 employees for the four Los Angeles area colleges for which we use data for all of L.A.

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 and their parents. In the bottom panel of Table 2, the approach we follow to measure race and ethnicity is to make use of information available for each college in California Postsecondary Education Commission (CPEC) data. Our assumption, which we think is reasonable for community colleges, is that the race/ethnicity of the local service area can be adequately represented by the race and ethnicity of the college's students. Also reported is information on the gender of students. The other three demographic variables shown in the table are based on 2000 Census data for the city in which the college is located using the protocol just outlined for measuring local employer characteristics.

Nationwide, Kane and Rouse (1999) report that the combined student body of community colleges is 70 percent white, 11 percent African American, and 11 percent Hispanic. In comparison with these percentages, it is apparent from Table 2 that California community colleges enroll on average a much higher percentage of Latino students (25.3 percent) and a much lower percentage of white students (43.8 percent). Regarding gender, the unexpectedly low minimum ratio of female students (just 20 percent) is observed for a college that has already received special attention – Taft College.

For the remaining three demographic variables, variation shown in percentages of B.A. degree holders and of foreign-born residents and in median household income further illustrates the diversity of California's population. Maximum and minimum values for percentage of B.A. degree holders are obtained for Foothill College (78.1 percent) in Los Altos Hills and L.A. Mission College (5.4 percent), respectively. The maximum value of median household income is also reported for Foothill College (over $173,000). Percentage of foreign-born residents ranges between the minimum reported for Lassen College (1.3 percent) and the maximum observed for Glendale Community College (54.4 percent). Lassen College is located in the Sierra Nevada region of northeastern California, while Glendale Community College is in the greater L.A. metropolitan area.

III. RESULTS

With this overview of our data set, we now proceed to results obtained for the two research questions raised in the Introduction. The first of these is whether individual colleges differ substantially in the mix of educational services they offer?

A. Evidence on Differences in Educational Service Mix

We use factor analysis to answer Research Question 1.[3] The objective of factor analysis is to describe the covariance relationships among many variables in terms of a few underlying, but unobservable, random quantities called factors. Factor analysis thus requires that (1) there is variation in observed variables, and (2) variables can be grouped by their correlations, that is, variables within one group are highly correlated among themselves but have only small correlations with variables in different groups. If these two conditions hold, factor analysis yields a set of *factor loadings* indicating the importance of observed variables in determining the smaller number of underlying (or common) factors. For factor analysis to be informative, moreover, a third condition is that the factor loadings yield a reasonable interpretation of the underlying factors identified. Fortunately, all three conditions appear to be met in our analysis. Ranges reported in Table 1 for our curriculum measures suggest that the first condition is satisfied, and our analysis yields a small number of underlying factors to which we can reasonably attach labels.

We applied factor analysis to 18 of the 20 curriculum measures described in Table 1. The two variables omitted are our measure of residual credits to all credits and the ratio of first-time freshmen undecided about their academic objectives. These variables were dropped because they can be formed by a linear combination of other curriculum measures derived from the same data set (PFE data for residual credits and FTF data for undecided student interest).

Factor loadings obtained using a varimax rotation are shown in Table 3. Following the recommendations of Johnson and Wichern (1988, ch. 9), we restricted estimation to the four common factors shown in column (1)-(4).[4] Beginning with column (1), the table reports large positive factor loads for measures of academic transfer credits to all credits, and transferable credits to all credits, and negative factor loads for broadly defined voc-ed credits to all credits, students interest in basic skills, and nontransferable voc-ed credits to all voc-ed credits. (Indicated in bold print are the largest factor loadings for each factor.) The message we get from column (1) is a distinction between colleges that emphasize a transferable curriculum and colleges that emphasize basic skills and nontransferable voc-ed curriculums. Consequently, we characterize as *transferable curriculum* the underlying factor responsible for the correlations represented in this column.

In column (2), large and positive factor loadings are observed for three variables: advanced occupational credits to all voc-ed credits, advanced occupational courses to all voc-ed courses, and the ratio of advanced occupational courses to advanced occupational programs. We label this column *advanced voc-ed curriculum*, as our data contrasts colleges that emphasize an advanced-level vocational curriculum with all other colleges.

Column (3) of Table 3 shows large factor loadings for three variables measured using FTF data. Positive factor loads are obtained for student interest in voc-ed programs and more broadly defined nontransferable programs, and a negative factor load appears for student interest in transfer programs. A fourth variable measuring the ratio of basic skills credits to all credits taken from PFE data also receives a large positive factor loading. These factor loadings suggest a distinction between colleges whose students express an interest in nontransferable programs and colleges whose students are interested in ultimately transferring to a four-year college. Since three of the four variables with large factor loadings appear for FTF measures of students' objectives, we apply the label *demand for nontransferable curriculum*.

The final column of Table 3 seems clearly identified with the underlying factor *apprenticeship training*. Large and positive factor loadings are observed for measures of apprenticeship courses to all voc-ed courses, apprenticeship credits to all voc-ed credits, and apprenticeship programs per 100 students.[5]

The factor loadings in Table 3 can be used to calculate predicted values of the common factors for each community college in our data set. These predicted values are called *factor scores*. Variability in these factor scores is indicated by the descriptive statistics in Table 4. Note that factor scores are standardized to mean 0 and variance 1.

Hence, the max/min and inter-quartile (IQ) ranges shown are interpreted in terms of standard deviations.

Large variation is indicated for each of the four factors measured at the extremes of the distributions. Max/min ranges lie between 5.73 standard deviations for Factor 3 and 8.76 standard deviations for Factor 4. This result for Factor 4, however, is largely due to the very large factor score for Santiago Canyon College (7.83). Without the influence of Santiago Canyon College, the IQ range for Factor 4 (0.61) is substantially lower than those for the other factors, which remain large in the range between 1.l5 and 1.25 standard deviations. These large IQ ranges indicate that variation in factor scores is not limited to the extremes of the distributions. The conclusion we draw from Table 4 is an affirmative answer to Research Question 1. That is, California community colleges do appear to differ substantially in their mixes of educational services.

B. Explaining Differences in Educational Service Mix

We turn now to the results of a multivariate approach to answering our second research question. Serving as dependent variables in this analysis are the underlying factors just described. We concentrate on Factors 1-3 since only a handful of California community colleges offer significant apprenticeship training programs. Explanatory variables were summarized in Table 2.

Factor 1 results. In Table 5, we present ordinary least squares (OLS) estimates of the effects of our college-specific variables, local employer characteristics, and demographic variables (excluding race and ethnicity) on Factor 1, *transferable curriculum*. Since factor scores are standardized, we also standardize the explanatory variables for ease of interpreting the results. The one explanatory variable we leave unstandardized is the dummy variable measuring inclusion in a multi-campus district. Hence, the estimated coefficient on multi-campus district is interpreted as the effect on Factor 1 measured in standard deviations of a shift from a single-campus to a multi-campus district.

Beginning in column (1) with the college-specific variables, both measures of proximity to nearest four-year college have the expected negative sign. One standard deviation increases in distance from nearest UC and from nearest CSU reduce Factor 1 by 0.20 and 0.30 of a standard deviation, respectively. The effect of distance from nearest CSU is statistically significant. Turning to the effect of multi-campus district, we expected that a shift from single-campus CC district to multi-campus district would increase Factor 1. Nevertheless, the estimated coefficient in column (1) indicates that such a shift would reduce Factor 1 by about 0.15 of a standard deviation. However, its large standard error indicates that this effect is measured imprecisely. Campus age is seen to have essentially no relationship to Factor 1.

Column (2) adds our set of local labor market characteristics. We collapse the 11 employment mix variables shown earlier in Table 2 to eight by combining into an "other" industry category the relatively small categories of real estate, education services, arts and entertainment, and other services (except public administration). In comparison to retail trade, the reference group, the seven industry mix variables shown are often found to have a sizable effect. In particular, a one standard deviation increase in professional services increases Factor 1 by 0.223 of a standard deviation. Note that the inclusion of local employment variables has the effect of reducing the negative effect of the proximity variables but strengthening the negative effect of multi-campus district.

Column (3) adds demographic characteristics of the local service area. Of these three variables, the largest effect is found for percentage of B.A. degree holders. A one standard deviation in this percentage is seen to increase Factor 1 by 0.209 of a standard deviation, although this effect is not measured precisely.

In Table 6, we continue to focus on the estimated effect of our college-specific variables, but we include, in addition, measures of race and ethnicity and of gender. Race/ethnicity variables were introduced in Section II as part of a set of local service area demographic characteristics. However, these variables are different from the other demographic characteristics (percent B.A. degree holders, percent foreign born, and median household income) in that they are specific to students attending a college. We use the race/ethnicity variables to capture the racial and ethnic diversity of the local community. But it needs to be recognized that causation may go the other way. That is, the coefficient estimates we report may be capturing choices made by members of different race/ethnicity groups between colleges offer differing curriculum mixes, as opposed to colleges responding in curriculum mixes offered to differences in race/ethnicity of students.

In column (1) of Table 6, we collapse the nine race/ethnicity variables introduced in Table 2 to seven variables representing the major racial/ethnic distinctions in our Census data. (Whites serve as the reference group.) Introduction of race/ethnicity does not change substantially estimated effects of the college-specific variables from those in Table 5. Estimated coefficients on proximity to nearest four-year college are still negative and are statistically significant for both UC and CSU campuses. We do not find evidence of sizable effects of individual race/ethnicity variables.

We entered gender in column (2) in an attempt to sharpen the estimated effects of race and ethnicity.[6] Indeed, we see that effects of African American and the "other" race/ethnicity category increase in size and are statistically significant. As it happens, however, gender itself has a major independent impact on Factor 1. A one standard deviation increase in proportion of female students increases Factor 1 by fully 0.554 of a standard deviation. To understand this large effect, we first looked to see if these are colleges at the extremes of both the Factor 1 and gender distributions. Taft College jumps out in this respect. Taft College has both the lowest Factor 1 factor score at –6.15 standard deviations (see Table 4) and the lowest proportion of females at 20 percent (see Table 2). To investigate the possibility that Taft College by itself is driving these results, we omitted this observation in estimates presented in column (3). As expected, the coefficient estimate on female drops substantially. But it is still large at 0.303 and statistically significant.

We next attempted to examine more explicitly the possibility that curriculum mix is determining gender composition, rather than the reverse. Recognizing that students who live in metropolitan areas served by multi-campus CC districts have more choice between colleges than those residing in less urban areas served by just one college, we stratified our data by the multi-campus dummy variable and re-estimated the model. Results are shown in columns (4) and (5). Contrary to our expectations, we find a much larger effect of gender in column (5) for single-campus districts than in column (4) for multi-campus districts. Indeed, the effect of gender in no longer statistically significant in column (4). Results reported by Gill and Leigh (2003) indicate that smaller colleges in single-campus districts, typified by Taft College, often offer a more specialized curriculum than larger colleges in multi-campus districts. Given this information and recognizing that the gender composition of a community should be roughly 50-50, we interpret the very large gender effect (0.769) in column (5) as suggesting that enrollment of women residing in communities outside major metropolitan areas is highly sensitive to the curriculum mix offered by their local college.

Continuing to contrast columns (4) and (5), results in column (4) for multi-campus district colleges are generally consistent with our expectations. In particular, greater distance from nearest CSU is strongly and negatively related to transferable curriculum, as are proportions of African-American and especially of Latino students. Campus age is positively related to transferable curriculum, although its estimated effect is not quite statistically significant at the 10 percent level. For colleges in single-campus districts, as noted, the effect of gender dominates everything else. Among other explanatory variables, we find, in contrast to column (4), that campus age is negatively related to transferable curriculum. Distance to nearest CSU appears in column (5) with a coefficient estimate that is negative but less than half the size of that shown in column (4). Among race/ethnicity variables in column (5), the "other" and Filipino measures have sizable positive effects on transferable curriculum, with the coefficient estimate for "other" being statistically significant.

Factor 2 results. Four of the five curriculum mix variables that load most heavily on Factor 1 are taken from PFE data and expressed in terms of credits. (The fifth variable is freshman interest in a basic skills curriculum from FTF data.) Since credits taken represent the intersection between student demand for coursework and colleges' supply of courses, we suggest that Factor 1 is substantially an "equilibrium" measure of the emphasis a college places on transferable coursework. In contrast, Factor 2 measures as a proportion of voc-ed coursework the college's emphasis on advanced vocational courses. Two of the three curriculum mix variables that load most heavily on Factor 2 are from VTEA data measuring voc-ed courses and programs. (The third variable, obtained from PFE data, measures advanced occupational credits as a fraction of total voc-ed credits.) We therefore interpret Factor 2 as predominantly a "supply" variable, one that captures differences between colleges in the mix of advanced and beginning voc-ed courses and programs offered.

We obtained estimates for Factor 2 using the same specifications shown for Factor 1 in Tables 5 and 6. These results are discussed but not shown in a separate table because they are similar to those for Factor 1. In particular, CSU distance is consistently found to decrease Factor 2. In addition, proportion of African American students has a negative effect on advanced voc-ed curriculum, particularly for colleges in single-campus districts; while the Latino variable has a particularly large negative effect for colleges in multi-campus districts. In contrast to our Factor 1 findings, no effect of gender is found for any of the Factor 2 specifications.

Factor 3 results. Our results for Factor 3, *demand for nontransferable curriculum*, are again based on the regressions specified in Tables 5 and 6. For the college-specific variables, column (1) of Table 7 indicates that a one standard deviation increase in CSU distance increases demand for nontransferable curriculum by 0.26 of a standard deviation. This positive effect is consistent with negative estimates of CSU distance on Factors 1 and 2, which suggest that closer proximity to a CSU campus increases a community college's emphasis on transferable curriculum and, among voc-ed offerings, its emphasis on advanced courses.

We might expect local employment and demographic variables to overshadow college-specific variables in determining curriculum demand, and the remaining estimates in column (1) tend to support this expectation. In particular, one standard deviation increases in the share of employment in manufacturing and size of the local labor market raises demand for nontransferable curriculum by 0.41 and 0.37 of a standard deviation, respectively. Large effects are also estimated for two of the three demographic variables shown. A one standard deviation increase in percentage of the local population with a bachelor's degree lowers demand for nontransferable curriculum by 0.37 of a standard deviation, while the same one standard deviation increase in percentage of foreign-born residents raises Factor 3 by 0.22 of a standard deviation.

Estimates appearing in column (2) of Table 7 also indicate the importance of student-specific demographic characteristics in explaining demand for nontransferable curriculum. One standard deviation increases in the proportions of African American and of Latino students increase Factor 3 by 0.32 and 0.36 of a standard deviation, respectively. These estimates are consistent with the negative effects on Factor 1 shown in Table 6 for these two race/ethnicity measures. The positive effect of female in column (2) of Table 7 is unexpected and appears to contradict our findings in Table 6. Further investigation, however, reveals that this result is sensitive to the inclusion of Taft College. The female coefficient drops to 0.04 and is statistically insignificant when Taft College is excluded from the analysis.

IV. SUMMARY AND CONCLUSIONS

Community colleges are often evaluated by their success in transferring students to four-year colleges. Recognizing that their missions may differ, our perspective in this paper is that we need to step back to consider the possibilities that community colleges may offer different mixes of educational services and that these differences may be responsive to community needs and unique features of colleges themselves. Specifically, we ask the following research questions: (1) Do community colleges differ substantially in the mix of educational services they offer? (2) And if they do, can these differences be explained?

To address these questions, we used on-line data sources to assemble a data set for California community colleges that includes both a variety of measures of curriculum mix and a set of variables intended to capture differences between colleges in demographic and local labor market characteristics and college-specific variables. Using this data set to answer our first research question, we subjected our 18 independent curriculum measures to factor analysis. The factor loadings coming out of this analysis indicated that covariance relationships among curriculum measures can be adequately captured by just four underlying factors. These factors are (1) transferable curriculum, (2) advanced voc-ed curriculum, (3) demand for nontransferable curriculum, and (4) apprenticeship training. Descriptive statistics computed for the resulting factor scores indicate that colleges differ substantially along the curriculum dimensions represented by Factors 1, 2, and 3. For Factor 4, apprenticeship training, variation exists only at the extremes of the distribution. We conclude with respect to Research Question 1 that colleges do differentiate themselves in terms of their emphasis on a transferable curriculum versus a nontransferable curriculum. It is also important to recognize that emphasis on a transferable curriculum includes voc-ed courses and programs taught at an advanced enough level that credits are transferable. Descriptive statistics reported in Gill and Leigh (2003) for our individual curriculum measures reinforce this conclusion.

Factors 1-3 serve as dependent variables in a multivariate analysis intended to answer Research Question 2. We treated Factor 1, transferable curriculum, as an equilibrium outcome measure, while Factor 2 is viewed as more of a supply-side measure related specifically to advanced voc-ed offerings. Our results for both factors suggested negative relationships with distance from nearest CSU campus and with proportions of Latino and African American students. We view Factor 3 is a demand-side measure representing student interest in a nontransferable curriculum. As expected, our measures of community demographics and labor market opportunities appear to be important determinants of Factor 3. Overall, we conclude from our multivariate analysis that curriculum mix is not randomly determined across colleges. Rather, our results suggest that inter-college differences vary in a predictable and statistically significant way.

FOOTNOTES

1. "Residual" course enrollment shown in row 8 is enrollment that remains after subtracting from total enrollment the categories of transfer course enrollment, basic skills course enrollment, and narrowly defined voc-ed enrollment.

2. VETA voc-ed course and program data are measured in terms of Taxonomy of Programs (TOP) codes and SAM Priority Codes. The electronic master TOP code file lists over 300 individual programs and assigns to each a unique TOP code number. SAM Priority Codes A, B, and C measure courses and programs that are apprenticeship, advanced occupational, and clearly occupational, respectively. Our procedure for arriving at number of programs for each priority code is to go down the list of courses offered, and then sum up the number of courses with different TOP codes. The reason total number of voc-ed programs is not available is that a program will often include courses categorized at more than one SAM Code level. For example, a typical program might include advanced occupational (SAM Code B) courses as well as beginning occupational (SAM Code C) courses. This program would be counted as both a SAM Code B program and a SAM Code C program.

3. In Gill and Leigh (2003), we also investigate descriptive statistics calculated for our 20 curriculum mix variables. Focusing on inter-quartile (IQ) ranges, our interested is in determining whether the large differences between colleges suggested by max/min ranges in Table 1 are limited to colleges at the extremes of the distributions or are more pervasive across colleges. Based on both max/min and IQ ranges, eight curriculum mix variables were placed in the category of "substantial" variability. As a group, these variables capture an emphasis on advanced and transferable voc-ed curriculum versus an

emphasis on nontransferable voc-ed curriculum. Our measures of apprenticeship training appear in the "low" variability category since the large differences we observe at the extremes of the distributions did not show up in IQ ranges.

4. Our varimax rotation results yielded six common factors based on the criterion that 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 of the four 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.

5. We checked the sensitivity of our results to omitting Santiago Canyon College. Omission of this observation has the impact of somewhat reducing the size of factor loadings on apprenticeship courses and credits, but increasing the loading on apprenticeship programs. Factor loadings in columns (1)-(3) and on the remaining variables in column (4) are little changed.

6. These results are essentially unchanged when we allow for interactions between race/ethnicity and gender.

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Table 1. Descriptive Statistics for Measures of Curriculum Mix

Curriculum measure	Mean (s.d.)	Minimum	Maximum
1. Broadly defined voc-ed credits/all credits	.229 (.105)	.063	.821
2. Nontransferable voc-ed credits/all voc-ed credits	.356 (.198)	.000	.920
3. Apprenticeship credits/ all voc-ed credits	.017 (.073)	.000	.727
4. Advanced occupational credits/all voc-ed credits	.207 (.142)	.000	.647
5. Basic skills credits/all credits	.069 (.038)	.008	.215
6. Transferable credits/all credits	.737 (.106)	.187	.922
7. Academic transfer credits/all credits	.591 (.111)	.117	.859
8. Residual credits/all credits	.111 (.055)	.015	.326
9. Apprenticeship courses/ all voc-ed courses	.026 (.061)	.000	.485
10. Advanced occupational courses/all voc-ed courses	.265 (.158)	.008	.833
11. Voc-ed courses/100 students	4.796 (3.495)	.927	22.060
12. Apprenticeship programs/100 students	.014 (.021)	.000	.101
13. Advanced occupational programs/100 students	.188 (.114)	.034	.788
14. Advanced courses/ advanced programs	6.128 (4.576)	1.750	38.444
15. Approved voc-ed programs/total programs	.680 (.140)	.325	.970
16. Undecided	.202 (.114)	.000	.949
17. Interest in basic skills	.111 (.094)	.000	.790
18. Interest in transferring	.385 (.127)	.033	.705
19. Interest in voc-ed	.252 (.104)	.017	.644
20. Interest in non-transfer programs	.302 (.109)	.018	.686

Table 2. Descriptive Statistics for Explanatory Variables (N = 108)

Variable	Mean	Stand. dev.	Minimum	Maximum
College-specific variables				
Multi-campus district	.519	-	.000	1.000
Proximity to four-year campus:				
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	53.1	22.6	1	119
Employer characteristics				
Percentage of employees:				
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 & support services	.108	.063	.013	.322
Education services	.005	.004	.000	.030
Health care	.106	.049	.009	.256
Arts & entertainment	.023	.029	.000	.179
Accommodations & food services	.151	.064	.030	.398
Other services (except public administration)	.039	.014	.000	.085
Total employees	76,344	178,410	335	898,922
Demographic variables				
Race/ethnicity mix:				
Asians	.098	.090	.010	.424
Blacks	.077	.097	.003	.694
Filipinos	.031	.028	.002	.159
Latinos	.253	.156	.039	.856
Native Americans	.011	.009	.002	.064
Whites	.438	.199	.021	.869
Nonresident aliens	.013	.014	.000	.091
Other	.017	.015	.000	.178
Nonresponse	.062	.047	.000	.237

Gender mix:				
Females	.558	.062	.200	.677
Males	.435	.064	.318	.798
Gender unknown	.006	.010	.000	.054
Percent B.A. degree	26.5	14.6	5.4	78.1
Percent foreign born	23.3	11.6	1.3	54.4
Median HH income (in thousands of dollars)	49.3	21.2	21.9	173.6

Table 3. Factor Loadings from the Othogonal Rotated Factor Patterns

Curriculum measure	Transferable Curriculum (1)	Advanced Vocational Curriculum (2)	Demand for Non-Transferable Curriculum (3)	Apprenticeship Training (4)
Academic transfer credits/all credits	**.890**	.068	-.122	-.042
Transferable credits/all credits	**.829**	.250	-.021	-.131
Broadly defined voc-ed credits/all credits	**-.819**	.007	-.044	.082
Interest in basic skills	**-.687**	-.090	-.002	-.223
Nontransferable voc-ed credits/all voc-ed credits	**-.529**	-.287	-.089	.257
Advanced occupational credits/all voc-ed credits	.136	**.867**	.107	-.000
Advanced occupational courses/all voc-ed courses	.260	**.853**	-.117	-.040
Advanced courses/ advanced programs	-.040	**.806**	-.185	.052
Interest in non-transfer programs	-.019	-.213	**.869**	.186
Interest in voc-ed	-.082	-.233	**.867**	.153
Basic skills credits/all credits	-.022	.137	**.650**	-.072
Interest in transferring	.426	.210	**-.576**	.074
Apprenticeship courses/all voc-ed courses	.038	-.042	-.038	**.946**
Apprenticeship credits/all voc-ed credits	.017	-.155	-.005	**.865**
Apprenticeship programs/100 students	-.094	.153	.054	**.652**
Voc-ed courses/100 students	-.452	.067	.179	-.014
Advanced occupational programs/100 students	-.261	.220	.234	-.131
Approved voc-ed programs/total approved programs	-.006	-.027	-.042	.023
Variance explained	23.6%	13.2%	12.1%	10.9%

Table 4. Descriptive Statistics for Factor Scores Obtained from Factor Analysis[a]

Common factors	Minimum	Maximum	Max/min range	IQ range
Factor 1: Transferable curriculum	-6.15	2.14	8.29	1.17
Factor 2: Advanced vocational curriculum	-1.54	4.35	5.89	1.15
Factor 3: Demand for nontransferable curriculum	-2.61	3.12	5.73	1.25
Factor 4: Apprenticeship training	-0.92	7.83	8.76	0.61

a. Factor scores are standardized to 0 mean and unit variance.

Table 5. OLS Estimates of Effects on Factor 1, Transferable Curriculum, of College-Specific Variables, Employer Characteristics, and Demographic Variables, (N=107)[a]

	(1)		(2)		(3)	
Explanatory variable	Coef.	Stand. error	Coef.	Stand. error	Coef.	Stand. error
Intercept	.078	.138	.169	.146	.145	.149
College-specific variables:						
Campus age	-.057	.094	-.072	.096	-.046	.099
Miles to UC	-.199	.124	-.148	.130	-.147	.135
Miles to CSU	-.297**	.126	-.236*	.137	-.215	.139
Multi-college district	-.149	.201	-.323	.222	-.277	.228
Industry mix:						
Manufacturing			.010	.209	.005	.217
Wholesale trade			.165	.125	.141	.134
Professional services			.223*	.122	.099	.168
Admin. services			.126	.137	.121	.143
Health care			.129	.139	.109	.144
Hotels			-.063	.185	-.138	.200
Other[b]			-.012	.113	-.044	.123
Total employment			-.035	.101	.018	.115
% B.A. degree					.209	.190
% foreign born					-.106	.123
Median HH income					-.062	.162
Adj. R^2	.154		.160		.154	

a. All variables (except multi-campus district) are standardized. The reference group for industry mix is retail trade. Copper Mountain College is omitted.
b. Includes real estate, education services, arts and entertainment, and other services (except public administration).
** and * indicates statistically significant at the 5 percent and 10 percent levels, respectively.

Table 6. OLS Estimates of Effects on Factor 1, Transferable Curriculum, of College-Specific Variables, Race/Ethnicity, and Gender (standard errors in parentheses)[a]

	All colleges			Multi-campus district	Single-campus district
Explanatory variable	(1)	(2)	(3)	(4)	(5)
Intercept	.060	.031	.100	-.044	.104
	(.141)	(.114)	(.103)	(.122)	(.111)
Campus age	-.015	.046	.049	.173	-.186*
	(.098)	(.080)	(.072)	(.117)	(.103)
Miles to UC	-.234*	-.162	-.096	-.031	-.124
	(.130)	(.106)	(.096)	(.259)	(.109)
Miles to CSU	-.246*	-.242**	-.303**	-.542*	-.213**
	(.130)	(.105)	(.095)	(.288)	(.101)
Multi-campus district	-.114	-.059	-.117	-	-
	(.209)	(.169)	(.152)		
Race/ethnicity:					
Asians	-.021	.035	.022	-.020	.012
	(.118)	(.096)	(.086)	(.114)	(.148)
Blacks	-.107	-.183**	-.141**	-.156*	.019
	(.096)	(.078)	(.071)	(.087)	(.159)
Filipinos	.081	.120	.092	.025	.180
	(.106)	(.086)	(.077)	(.112)	(.114)
Latinos	-.155	-.013	-.041	-.325**	.103
	(.107)	(.087)	(.079)	(.140)	(.100)
Other[b]	.113	.195**	.140*	.044	.270**
	(.105)	(.086)	(.078)	(.131)	(.104)
Nonresponse	.004	.035	-.016	-.038	.095
	(.094)	(.076)	(.069)	(.097)	(.103)
Females		.544**	.303**	.176	.769**
		(.076)	(.084)	(.125)	(.084)
Adj. R^2	.162	.452	.314	.142	.725
N	107	107	106	56	51

a. All variables (except multi-campus district) are standardized. Reference group for race/ethnicity is white.

b. Includes Native Americans, nonresident aliens, and other.

** and * indicate statistically significant at the 5 percent and 10 percent levels, respectively.

Table 7. OLS Estimates of Effects on Factor 3, Demand for Nontransferable Curriculum, of College-Specific Variables, Employer Characteristics, Demographic Variables, and Race/Ethnicity and Gender (N=107)[a]

	(1)		(2)	
Explanatory variable	Coefficient	Standard error	Coeficient	Standard error
Intercept	.112	.135	.007	.134
College-specific variables:				
Campus age	-.115	.090	-.105	.094
Miles to UC	-.050	.123	-.000	.125
Miles to CSU	.256**	.126	.072	.124
Multi-college district	-.213	.207	-.013	.199
Industry mix:				
Manufacturing	.407**	.197		
Wholesale trade	.017	.122		
Professional services	-.026	.152		
Admin. services	-.024	.130		
Health care	.100	.131		
Hotels	.028	.182		
Other[b]	.172	.112		
Total employment	.366**	.104		
% B.A. degree	-.368**	.173		
% foreign born	.220**	.112		
Median HH income	.170	.148		
Race/ethnicity:				
Asians			-.003	.113
Blacks			.316**	.092
Filipinos			-.046	.101
Latinos			.364**	.103
Other[c]			-.046	.101
Nonresponse			.149*	.090
Females			.192**	.089
Adj. R^2	.300		.236	

a. All variables (except multi-campus district) are standardized. The reference group for industry mix is retail trade. Reference group for industry mix is retail trade; reference group for race/ethnicity is white.
b. Includes real estate, education services, arts and entertainment, and other services (except public administration).
c. Includes Native Americans, nonresident aliens, and other.
** and * indicate statistically significant at the 5 percent and 10 percent levels, respectively.