ARE CAREER AND TECHNICAL EDUCATION PROGRAMS AT CALIFORNIA COMMUNITY COLLEGES ALIGNED WITH LOCAL LABOR MARKETS?

A Thesis

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by

Eric Joseph Chisholm

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Eric Joseph Chisholm

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Department of Public Policy and Administration

Abstract

of

ARE CAREER AND TECHNICAL EDUCATION PROGRAMS

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Career and technical education offered at community colleges has taken on renewed importance as America's economy tries to recover from the recession that began in 2007. Labor market projections show that middle skill jobs will be among the fastest growing categories of employment over the next decade, and because community colleges are the primary provider of trained workers for this classification they have become critical to America and California's economic future. For California's economy and its students to receive the full possible return from career and technical education, programs must align with local labor markets so that students are able to quickly and efficiently move from the classroom to the workforce.

I collected data for student awards and program offerings from the California Community College Chancellor's Office website to match against past occupational growth and occupational projections from California's Economic Development Department. In order to test how well aligned CTE and local labor markets are, the data was matched for each Metropolitan Statistical Area and analyzed using an index of dissimilarity. An index of dissimilarity is a statistical tool used to calculate the difference between two percentage distributions, in this case, between job growth and awards and offerings. The result of an index of dissimilarity is a percentage representing the misalignment between CTE and local labor markets. Data on awards and offerings were analyzed separately with both job growth from 2007-2010 and future projections, giving my study four separate questions.

The average index of dissimilarity across all four questions was 50.4 percent, meaning that statewide 50.4 percent of all awards and programs were misaligned with local labor markets. The four questions show great similarity in regards to the statewide averages, with a range of only 1.7 percent. Metropolitan Statistical Areas with only a single campus, as opposed to those served by multiple community colleges, had consistently higher indexes. My thesis highlights the need for further research on community colleges and their alignment with local labor markets, and provides results that are an ideal starting point for future study.

_______________________, Committee Chair
Su Jin Jez, Ph.D.

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Date

DEDICATION

To California's system of public education, which has schooled for 20 consecutive years. May future generations of students benefit even greater than I have from the public's commitment to education.

AKNOWLEDGEMENTS

I owe a debt of gratitude to many as I complete my thesis. Firstly, to my family, your steady patience and love has seen me through an academic career filled with diversions and mistakes. To Clare, I owe thanks for the many years of growth and joy we have shared; I look forward to the bright future we have charted.

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INTRODUCTION

Aligning local job market demand with the supply of trained workers from career and technical education (CTE) programs at community colleges is important for employers, students, and the state's economy. Currently, the United States and particularly California are struggling to recover from the country's worst economic downturn since the Great Depression, and are facing unemployment rates around 9 percent for the nation and 12 percent for the state throughout 2011 (Bureau of Labor Statistics, 2011). During the past few decades, higher education has taken on growing importance for workers and employers. Between 1973 and 2007, the proportion of workers with a high school education or less declined from 72 to 41 percent, while the percent with an associate degree or "some college, no degree" increased from 12 to 27 percent (Symonds, Schwartz, & Ferguson, 2011).

Community colleges are critical to the future of California's economy because they are a primary provider of trained workers for "middle skill" jobs. The Bureau of Labor Statistics projects jobs defined as middle skill, for which the associate's degree is the most significant source of education, will grow 19 percent through 2018, faster than any other job category. Nearly half of current U.S. jobs are commonly defined as middle skill, requiring less than a baccalaureate but more than a secondary education (Holzer & Lerman, 2010). By 2018, the United States' economy will require 22 million new holders of college degrees, but the Center on Workforce and the Economy projects a shortfall of 3 million (Carnevale, Smith, & Strohl, 2010).

The trend toward middle skill employment does not bode well for California. Over the next few decades, projections show California possessing a shortage of workers prepared for “skilled work,” defined as at least 12 months of training through work experience, CTE or a professional degree (Employment Development Department, 2007). The 2006 report *California’s Edge: Keeping California Competitive, Creating Opportunity* asserted that demographic and economic shifts would pose major challenges to the state’s economy during the next few decades. Central to these challenges is California’s education system, which once produced a “highly trained and productive workforce” but is currently unable to meet the needs of its economy (California EDGE Campaign, 2006).

Research Questions

Despite the importance of CTE programs, policymakers and researchers do not have a strong understanding of their effectiveness. The primary purpose of this thesis is to explore whether the programs offered at the campuses of the California Community Colleges System (CCCS) currently align with their local labor markets. Specifically, I address four questions:

1. How closely do the CTE programs that students complete match with the jobs created between 2008 and 2010?

2. How closely do the CTE programs that students complete match with jobs projections for the next decade?

3. How closely do the CTE programs that colleges offer align with the jobs created between 2008 and 2010?

4. How closely do the CTE programs that colleges offer align with jobs projections for the next decade?

Using both program offerings and awards allows me to potentially assess where misalignments occur. It may be that colleges are offering a reasonable set of programs but students are not being successful in those programs. Alternatively, it may be that the set of program offerings at colleges are not well matched to labor market needs. Two quite different set of responses would be implied depending on which findings result from the research. For each of these questions, I use an index of dissimilarity to analyze how well aligned program offerings and awards from community colleges are with demand in occupations in each college's local labor market. In Chapter 3, I explain this methodology in detail.

History of Career and Technical Education in America

The analysis I present assumes community colleges have an important role to play in economic development and that serving regional labor markets is central to their goal. However, community colleges have gone through many alterations since their founding, with their goals shifting accordingly. At the turn of the 20th century, the pressures of immigration, increased high school enrollments, and an industrializing economy led to the establishment of vocational education and community colleges. Administrators created community colleges to handle the lower-division course work of universities while educators established CTE largely at the secondary education level (Eells, 1931). The public held neither CTE nor community colleges in high esteem, because the public viewed both as inferior educations. Parents, students, and many school administrators viewed CTE as diverting students from liberal arts coursework, while the public viewed community colleges as lesser universities (Cohen & Brawer, 1996).

Not long after the establishment of CTE and community colleges, many educators began to advocate that the two systems become integrated (Eells, 1931). These activists reasoned that community colleges were the appropriate location for CTE because the schools possessed greater flexibility, offered a higher level of instruction than high schools, and had lower costs (Kasper, 2002). It was not until the 1970s that CTE became a primary mission of community colleges. At that time, the need for vocational training grew, because the national job market slowed, and began to transition away from manufacturing and towards technology fields (McClure, Chrisman, & Mock, 1985). College graduates fared better in the job market than non-graduates, but the media focused on the plight of out-of-work baccalaureate holders. Because these college graduates were unable to find employment despite their academic credentials, the public began to reconsider CTE and community colleges as a way to better prepare students for employment (Brint & Karabel, 1989).

Therefore, during the 1970s community colleges became the established centers of occupational training. During this same period, CTE programs came under attack from critics accusing administrators of using programs as a form of de-facto segregation. Critics posited that racial differences in enrollment were the result of a desire to separate minority students from non-minority students and to divert minority students from universities (Bailey & Averianova, 1998; Jacobs & Dougherty, 2006). In addition to the pressure created by critics, higher costs also led to the reduction or elimination of many

CTE programs in high schools (McClure, Chrisman, & Mock, 1985).

In the past decade, the same pressures that originally led to the development of community colleges and CTE have caused renewed interest. Increased dropout rates, changing demographics in education, and a changing economy are forcing those involved in CTE and community college administration to understand better how to serve their local economies. These forces have caused community colleges and CTE programs to receive increased attention from researchers, educators, and policy makers. In addition, all systems of public education have come under heightened stress because of a lack of public funding and competition provided by for-profit colleges. As the negative effects of the "Great Recession" continue to linger, college programs must prepare students to enter the job market and make a return on the public's investment in education.

Organization of Remainder of Paper

In Chapter 2, I review the literature on my topic, to assess what research exists currently and to reinforce the suitability of my methodology. In Chapter 3, I explain the primary methodology of my study, discuss my hypothesis, define key terms necessary for my analysis and evaluate the data I use. Chapter 4 explains the findings of my study. In Chapter 5, I discuss the results of my study and explore interpretations, drawing conclusions about how well aligned CTE programs in California Community Colleges are with local labor markets.

Chapter 2

LITERATURE REVIEW

Scant literature exists analyzing the connections between community colleges, CTE programs, and local labor markets. The majority of literature concerning colleges, and more specifically literature analyzing labor markets and colleges, focuses on four-year institutions (Allmendinger, 1989; James, Alsalaam, Contay, & To, 1989; Monk, 1999). The academic literature available on community colleges mostly focuses on how enrollment at a community college affects the student's likelihood of getting a baccalaureate degree (Rouse, 1995; Lee, Mackie-Lewis, & Marks, 1993). I review literature relevant to my study in three sections. First, I analyze what constitutes value from CTE programs, specifically for students earning awards. Secondly, I discuss past studies that analyze the degree of alignment between CTE programs and labor markets. Finally, I look at the available literature to better define what constitutes a 'local labor market'.

Value of CTE and Community Colleges

A recent literature review using twenty-one studies on whether attending a community college increases a workers earnings found an unweighted average increase in earnings of 13 percent for males and 22 percent for females (Belfied & Bailey, 2011). However, these averages capture studies using students in many different types of programs reducing the usefulness of the study. For instance, Dadgar and Weiss (2012) found that much of community college graduates increased earnings came from increased hours worked, not increased pay, indicating that wage gains came from improved employability instead of added job skills.

Two studies found that students earning associate degrees in CTE-related fields fare better in the labor market than students earning non-CTE associates degrees (Grubb, 2002; Kane & Rouse, 1995). Jacobsen and Mokher (2009).analyzed the earnings of students in all postsecondary levels, finding consistent benefits to long-term certificate programs, often in excess of associate earners. Earnings were particularly strong for students that studied in high-demand fields, like health (Jabobson & Mokher, 2009). Dadgar and Weiss' (2012) study also found greater earnings for long-term certificates (30 credits or greater) than short-term certificates. However, unlike Jacobson and Moker (2009) assocoiiate degree holders had higher earnings than either long or short-term certificates. The results for associate degrees were heaviliy affected by the field of study, with degrees in areas like health earning far more than students who majored in humanities (Dadgar & Weiss, 2012). Short-term certificates have a particular value for community college students, where they can serve as intermediary awards as part of a longer-term degree pathway. In addition, for adults seeking specific workforce skill upgrades , there may be greater value to short-term certificates (Bosworth, 2010).

Alignment between CTE and Labor Markets

Researchers have done few analyses to determine whether secondary or post-secondary colleges offer programs that align with local labor markets. In 2007, by simply comparing supply (job openings between 1995 and 2000) with demand (whether California imported degree holders in those job fields) the California Postsecondary Education Commission (CPEC) attempted to estimate how well matched both associates and baccalaureates degrees are with California's job market statewide. The authors assumed that if degrees earned by California residents match well with available industries, there would be less need to import degree holders (California Postsecondary Education Commission, 2007).

During the years considered, California imported 224,000 bachelor's degree holders and 141,000 people with associates or other advanced degrees, leading the authors to conclude that California has a "significant shortfall" compared to current job demand (California Postsecondary Education Commission, 2007). During the same period, the BLS reports that California added 1,776,140 jobs, meaning that 21 percent of new jobs needed an imported worker. However, this percentage does not take into account graduates of California schools who left the state during that period. The authors looked closer at five industries to analyze hiring trends: computer occupations, engineering occupations, nursing and healthcare occupations, lawyers, and teachers. With the exception of lawyers, each of the occupations showed significant shortfalls as measured by imported talent, indicating California is under producing graduates in these fields (California Postsecondary Education Commission, 2007).

Leigh and Gill (2007), in their study asking 'do community colleges respond to local needs?,' analyze with geographic data whether community college programs are aligned with local labor markets. The literature review for that question refers to a "fragmented literature" on the subject, so the authors set out to create a "new empirically based approach to measuring at the local labor market level, the performance of community colleges in supplying occupational training that matches employers' demand for skills" (Leigh & Gill, 2007, p. 47).

Leigh and Gill studied how responsive California's Community Colleges are by looking at the match between the courses students took between 1996 and 2002 and labor projections for that period. The authors' analysis used an index of dissimilarity, a measure of the difference between two proportions, which in this case measured student enrollment and labor projections. Leigh and Gill's index calculated responsiveness (R), ranging from 0 to 100 percent, with 100 indicating a positive match between credits taken and labor market needs. For supply of labor, their study used the credits completed by first-time freshmen (FTF) at both the college and district level. The authors used both college and district level data to test their theory that within multi-college districts, colleges may specialize in certain programs to compliment eat other, and therefore match their local labor market collectively. The authors calculate demand from labor projections published by the California Employment Development Department (EDD) at the county level.

The responsiveness of individual colleges ranged widely from 32.4 up to 81.7 percent with an average of 60.1, indicating significant room for improvement on the part of some community colleges. The authors explained the large range in responsiveness, in part, by their district level analysis, which increased the responsiveness for many of the lowest ranked colleges, supporting the hypothesis of complementary specialization between colleges within the same district to serve their regions. With the analysis at the district level, the average responsiveness increased by 2.2 percent.

My study will be similar to Leigh and Gill's in many ways, but it takes the analysis of California's Community Colleges further. The first key difference is that I use metropolitan statistical areas as my unit for region rather than districts and counties as Leigh and Gill did. In addition, their analysis used FTF, while I use program offerings and awards earned. FTF may capture students who enroll in programs but leave short of an award but still enter the labor market in their chosen field. My analysis, using offerings and awards, helps to provide new information; offerings especially may indicate what occupations schools choose to focus on with their resources.

The Institute for Higher Education Leadership and Policy (IHELP) published a 2012 report, *Career Opportunities: Technical Education and the College Completion Agenda, Part II: Inventory and Analysis of CTE Programs in the California Community Colleges*, which analyzed the program offerings and awards in the CCCS (Moore, Jez, Chisholm, & Shulock, 2012). IHELP's analysis sought to inventory offerings and awards to provide baseline information about their range, variety, and to a limited degree, efficiency in California. Two aspects warrant discussion here. First, the authors conclude that programs in California do not "reflect careful planning," indicating there may not be the mechanisms in place necessary to keep programs aligned with local needs (Moore, Jez, Chisholm, & Shulock, 2012, p. i).

Second, among the many tools used to review CCC programs, IHELP conducted a basic analysis of the alignment of awards and job openings statewide. Focusing only on occupations defined as fast-growing by EDD, IHELP's results showed a wide range in how awards granted between 2008 and 2010 matched with projected job openings from 2008-2018. In order to match awards with occupations, IHELP cross-walked the awards data collected from the Chancellors website first to Classification of Instructional Programs (CIP) and then to Standard Occupation Classification (SOC) codes. SOC codes often match to multiple TOP codes, and IHELP determined to allow this overlap rather than create a crosswalk based on what occupation they thought best matched with each Taxonomy of Program (TOP) code. IHELP found that the CCCS has trained over 100 percent of the projected openings in Radiologic Technician and Paramedic as well as 10 percent or less in Medical Secretaries, Surgical Technician and Fitness Trainer, results that indicate a poor alignment between programs and the labor market for certain occupations. However, their analysis is limited by reviewing the data at the state level and the small number of programs studied (only those that were fastest growing).

Mokher (2011) conducted a similar study to Leigh and Gill's (2007) using data from the Tennessee Department of Education, analyzing how closely the CTE concentrations of high school students in that state match with local jobs. In order to match the data at the local level, the author divided Tennessee into 13 regions (Mokher, 2011). In order to match Tennessee's CTE programs and SOC codes Mokher developed her own crosswalk. Despite attempting to match each program with a single SOC code, she double counted several programs. Mokher's report contains a sensitivity study using an alternative crosswalk in order to account for any errors made in developing the crosswalk and finds very similar results to the main study.

Similar to Leigh and Gill (2007), Mokher's methodology was an index of dissimilarity. However, Mokher's results produced a slightly modified analysis, examining the percentage of students who would need to change their concentration in order to match identically with the proportions of workers in the labor market. Whereas Leigh and Gill used labor projections, Mokher analyzed the existing labor market. Statewide, Mokher's study found 18 percent of students would need to change their concentration to match with the jobs in their regions, meaning that 82 percent of concentrators were in programs aligned with local occupations. The range of indexes across individual regions was less than in California's community colleges, only from 15 to 35 percent, a result likely caused by Tennessee having 13 districts as opposed to California's 71.

Local Labor Markets

Labor markets can be analyzed at many levels, from international to domestic, national to county. The term local is also open to specification depending on the analysis, meaning there is no one definition of "local labor markets". In Legih and Gill (2007) and Mokher (2011) two different levels of analysis are seen. Leigh and Gill used the county and community college district as a proxy for region while Mokher utlizies the 13 Workforce Investment Areas the state established.

Beggs and Villemez (2001) argue that for occupations needing lower or middle skills, hiring occurs at a local level. In the modern economy both workers and employers are mobile, but sub-baccaluretee careers tend to occur within geographically bounded areas (Beggs & Villemez, 2001). Tolbert and Killian's 1987 report attempted to create 382 labor market areas (LMAs) expressly because they recognized that counties were inadequate proxys for regional economic activity (Tolbert & Killian, 1987). The LMAs were based on commuting-to-work data with a process similar to how metropolitan statistical areas (MSA) are devised. MSAs as designated by the federal Office of Management and Budget (OMB) are designed as a tool for researchers to analyze qualities across metropolitan areas (Frey, Wilson, Berube, & Singer, 2004). EDD describes a MSA as an area with a population nucleus and adjacent communities with a high-degree of economic and socialintegration (California Employment Development Department, 2010). As such, MSAs are used as a unit of analysis for a host of different fields, from infant mortality rate (Polednak, 1991)s to ozone patterns (Aneja, Oommen, Riordan, Arya, Wayland, & Murray, 1999) with much in between.

As mentioned earlier, labor markets exist at the international, national, state, and local level, but community colleges are designed as local institutions. Community colleges are often cited for their responsiveness to local needs and particularly employers (Grubb, Badway, Bell, Bragg, & Russman, 1997; Harmon & MacAllum, 2003). They vary by local area in the type of programs they offer and the degree to which they focus on workforce development (Dougherty, 2003). Because of their local orientation, community colleges' institutional reputations and relationships with employers may also vary by local area. By cultivating relationships with local employers and the community at large, community colleges may bolster their institutional reputations and by extension the reputation of their credentials (Rosenbaum, Deil-Amen, & Person, 2006).

Conclusion

The review of existing literature displays that CTE programs can be of greater value than non-CTE, but longer-term programs show much greater worth. In addition, little is known about the alignment of CTE programs with local job markets. I have been able to identify only three studies that analyze the alignment of CTE and the general labor market and only two that use community colleges as the unit of analysis. Mokher’s (2011) and Leigh and Gill's (2007) analyses are similar to mine in scope and use an index of dissimilarity, indicating this to be a proper methodology for my analysis. Both studies show that CTE programs are imperfect at matching with local job markets while Leigh and Gill’s displays the variation within California’s CTE program from earlier this decade. Metropolitan statistical areas are an appropriate unit for use as local labor markets because their creators designed them to capture regional economic ties.

Chapter 3

METHODOLOGY

My thesis addresses how well programs at California community colleges align with local labor markets, and proposes four questions in an attempt to examine the issue. My first two questions ask how well the programs that students complete are aligned with local labor markets, using occupation data from EDD, and in the next decade, using data from EDD's projections for 2008-2018. My third and fourth questions ask how well programs offered by California's community colleges align with jobs in the past few years and future using the same data as the first two questions.

I analyze both awards and offerings because the two sets of data may highlight different aspects of where misalignment occurs. For instance, the programs that colleges offer may align poorly with local labor markets, but students are able to find, enter and receive awards that are in fields with jobs available. Alternatively, it may be the programs that colleges offer are aligned, but awards have worse indexes because students are not entering or not completing high-demand programs. Many factors affect the availability of programs as well as what program students enter, but using both sources of data may provide greater context to my conclusions and more perspective for potential recommendations.

The four questions used in my analysis are only slightly different, needing only one methodological tool, an index of dissimilarity, and four sets of data: The awards in CTE courses at California community colleges between 2008 and 2011, CTE program offerings at California's community colleges in 2009, occupational data from 2008 until

2010, and occupational projections for 2008-2018. The remainder of this chapter discusses key terms for the analysis, the source, preparation and key qualities of the data, the methodology of this study, and limitations.

Definition of Key Terms

Career and Technical Education

The California Department of Education defines *career and technical education* as “a program of study that involves a multiyear sequence of courses that integrates core academic knowledge with technical and occupational knowledge to provide students with a pathway to postsecondary education and careers” (California Department of Education) Throughout this paper, I will use this definition, which encompasses programs formerly labeled by many other names, including *terminal*, *vocational*, *technical*, *semiprofessional*, *occupational*, and *career* (Cohen & Brawer, 1996). Career and technical education is a relatively new term, coined by educators during the 1980’s in part to try to escape negative connotations of vocational education and to reflect the new technical nature of career-oriented programs (Little Hoover Commission, 2007).

Community Colleges

As public institutions of education, the California Education Code provides that the mission for the state’s community colleges is to offer academic and vocational instruction for students at the lower division level, and to advance California’s economic growth and global competitiveness through the education and training provided (California Education Code section 66010.4, 2011). Community colleges are the primary, but not sole, provider of CTE in California. Other providers include private two-year colleges, for-profit universities, and public or private four-year universities. In addition to academic and vocational instruction, California tasks community colleges with offering remedial instruction, adult noncredit education curricula, and community service courses and programs (California Education Code section 66010.4, 2011).

Traditionally, community colleges have been institutions that award the associate in arts or science as their highest degree (Cohen & Brawer, 1996). In recent years, the California legislature has considered bills allowing community colleges to offer baccalaureate degrees, following the lead of other states that have done so, but no change in the law have yet been enacted (Small, 2010). In addition, California does not offer the Applied Associate degree as other states do. Applied Associate degrees are designed to prepare students to immediately enter the workforce, as opposed to the traditional Associate of Arts and Science whose original purpose was for transfer (Hughes & Karp, 2006). Two-year public collegiate institutions are popularly known modernly as *community colleges*, but when first established, were mostly branded *junior* or *city* colleges. Today, the public uses c*ommunity college* to refer to all two-year public colleges and for this reason, I will use it in this paper, but the terms are interchangeable. Within the 112-institution California Community College system, school names officially feature the title junior, city, or community college largely as a remnant from when the school system was created and the vocabulary featured less consistency.

Local Labor Market

The purpose of this study is to investigate how well community colleges serve their local markets. Because workers and jobs are mobile, the definition of *local* should be broad enough to ensure a high percentage of students trained seek employment within its bounds but narrow enough to remain regional. The literature review demonstrates that metropolitan statistical areas provide the appropriate definition of local for my analysis. The Office of Management and Budget (OMB) defines a *metropolitan statistical area* as having "at least one urbanized area of 50,000 or more population, plus adjacent territory that has a high degree of social and economic integration with the core as measured by commuting ties" (California Employment Development Department, 2010). In order to maintain similarity across local labor markets, I will not evaluate areas not defined as MSAs. Table 1 below displays what counties and community colleges comprise each MSA I use in my thesis.

Table 1: MSAs, Counties, and Colleges Analyzed

MSA	County	College
Bakersfield	Kern	Bakersfield College
		Cerro Coso College
		Taft College
Chico	Butte	Butte College
El Centro	Imperial	Imperial Valley College
Fresno	Fresno	Fresno City College
		Reedley College
		West Hills Coalinga
Hanford - Corcoran	Kings	West Hills Lemoore
Los Angeles-Long Beach-Santa Ana	Los Angeles	Antelope Valley College
		Cerritos College
		Citrus College
		College of the Canyons
		East LA College
		El Camino College
		Glendale College
		LA Mission College
		LA Pierce College
		LA SW College
		LA Valley College
		Long Beach Community College
		Los Angeles City College
		Los Angeles Harbor College

		Los Angeles Trade Technical
		Mt. San Antonio College
		Pasadena City College
		Rio Hondo College
		Santa Monica City College
		West LA College
	Orange	Coastline Community College
		Cypress College
		Fullerton College
		Golden West College
		Irvine Valley College
		Orange Coast College
		Saddleback College
		Santa Ana College
		Santiago Canyon College
Merced	Merced	Merced College
Modesto	Stanislaus	Modesto Junior College
Napa	Napa	Napa Valley College
Oxnard - Thousand Oaks - Ventura	Ventura	Moorpark College
		Oxnard College
		Ventura College
Redding	Shasta	Shasta College
Riverside - San Bernardino - Ontario	Riverside	College of the Desert
		Palo Verde College
		Riverside City College
	San Bernardino	Barstow College
		Chaffey College
		Copper Mountain College
		Crafton Hills College
		Mt. San Jacinto
		San Bernardino Valley College
		Victor Valley CC
Sacramento - Arden-Arcade - Roseville	El Dorado	Lake Tahoe CC
	Placer	Sierra College
	Sacramento	American River
		Cosumnes River
		Folsom Lake College
		Sacramento City College
	Yolo	Woodland CC
Salinas	Monterey	Hartnell College
		Monterey Peninsula College
San Diego - Carlsbad - San Marcos	San Diego	Cuyamaca College
		Grossmont College,
		Mira Costa College
		Palomar College
		San Diego City College
		San Diego Mesa College
		San Diego Miramar College
		Southwestern College

San Francisco-Oakland-Fremont	Alameda	Berkeley City College
		Chabot College
		College of Alameda
		Laney College
		Las Positas College
		Merritt College
		Ohlone College
	Contra Costa	Contra Costa College
		Diablo Valley College
		Los Medanos College
	Marin	College of Marin
	San Francisco	San Francisco City College
	San Mateo	Canada College
		College of San Mateo
		Skyline College
San Jose - Sunnyvale - Santa Clara	Santa Clara	De Anza College
		Evergreen Valley College
		Foothill College
		Gavilan College
		Mission College
		San Jose City College
		West Valley College
San Luis Obispo - Paso Robles	San Luis Obispo	Cuesta College
Santa Barbara - Santa Maria - Goleta	Santa Barbara	Hancock College
		Santa Barbara Community College
Santa Cruz - Watsonville	Santa Cruz	Cabrillo College
Santa Rosa - Petaluma	Sonoma	Santa Rosa Junior College
Stockton	San Joaquin	San Joaquin Delta
Vallejo - Fairfield	Solano	Solano Community College
Visalia - Porterville	Tulare	College of the Sequoias
		Porterville College
Yuba City	Sutter	Yuba College

Fields

The California Community College Chancellor's Office's (CCCCO) defines *fields* by the Taxonomy of Programs (TOP), which they use to classify areas of study. TOP codes come in multiple layers, ranging from two digits (most broad) to six digits (most specific). In this paper, *fields* will refer to an area of study defined by a six-digit TOP code. For example, *Nursing* is a field. There are 259 different fields using six digit TOP codes.

Programs

Program refers to a specific associate or certificate program at a specific college. For instance, *Registered Nursing* at San Francisco Community College is a program within the field of *Nursing*.

Award

I use the term *award* to refer to any student counted as having earned an associate degree or certificate at a California community college. Associate degrees require a minimum of 60 units and contain general education courses in addition to the courses in the subject the student is studying. Certificates programs do not typically require basic skills or general education courses and focus on a single subject. There is considerable variation in the length and requirements for both Associate degrees and certificates. The average Associate program requires 34 major credits (as opposed to General Education) but the range goes from 18 to 77 credits (Moore, Jez, Chisholm, & Shulock, 2012) Certificates are even more inconsistent, with an average of 24 total credits but a high of 102. In addition, numerous certificates require less than 3 credits, or one class, and are simply job skill refreshers (Moore, Jez, Chisholm, & Shulock, 2012).

Training and Education

Bureau of Labor Statistics (BLS) developed occupational training and education classifications, which EDD utilizes, to distinguish the education and training preferred by employers as well as required for workers to become proficient in an occupation. This classification is critical to my analysis because I must limit the occupations considered to those for which that a community college would reasonably be expected to train students. EDD presents its data on an 11-category scale ranging from “Short-Term-on-the-Job-Training” (11) to “First Professional Degree” (1). The occupations considered in my analysis are restricted to those defined as requiring “Post-Secondary Vocational Training” (7) or an Associate’s degree (6).

Standard Occupational Classification

The Bureau of Labor Statistics defines the Standard Occupational Classification (SOC) system to provide standard groupings for occupations. The BLS aggregates occupations into four groupings: major group, minor group, broad occupation, and detailed occupation, moving from least to most specific. I conduct my analysis using the 23 major groups, presented immediately below.

Table 2: SOC Code Major Groups

Code	Title
11-0000	Management Occupations
13-0000	Business and Financial Operations Occupations
15-0000	Computer and Mathematical Occupations
17-0000	Architecture and Engineering Occupations
19-0000	Life, Physical, and Social Science Occupations
21-0000	Community and Social Service Occupations
23-0000	Legal Occupations
25-0000	Education, Training, and Library Occupations
27-0000	Arts, Design, Entertainment, Sports, and Media Occupations
29-0000	Healthcare Practitioners and Technical Occupations
31-0000	Healthcare Support Occupations
33-0000	Protective Service Occupations
35-0000	Food Preparation and Serving Related Occupations
37-0000	Building and Grounds Cleaning and Maintenance Occupations

39-0000	Personal Care and Service Occupations
41-0000	Sales and Related Occupations
43-0000	Office and Administrative Support Occupations
45-0000	Farming, Fishing, and Forestry Occupations
47-0000	Construction and Extraction Occupations
49-0000	Installation, Maintenance, and Repair Occupations
51-0000	Production Occupations
53-0000	Transportation and Material Moving Occupations
55-0000	Military Specific Occupations

Data – Sources and Uses

Four sets of data are necessary for my analysis: the number of awards granted by each college, the collective college catalog for each MSA, occupational projections for California and occupational changes from the past. In the following sections, I detail my collection and manipulation of each set of data to conduct my analysis.

Awards

Publicly available on the California Community College Chancellor's Office (CCCCO) website are data on degrees and certificates awarded from the 1992-1993 academic year through 2010-2011. I collected the data by field and aggregated the information into a single spreadsheet, which I was able to use for analysis concerning awards. In order to match the degrees from community colleges with their applicable occupations, I used a chart published on the website of the California Chancellor's Office to crosswalk the data. The chart outlined the crosswalk from the CCCCO's Taxonomy of Program (TOP) codes to 2010 Classification of Instructional Programs (CIP), a national standard set of codes for classifying education programs and courses. From CIP, I was able to use the information provided by the National Crosswalk Service Center to crosswalk to Standard Occupational Classification (SOC), which made the data comparable to information provided by EDD. I selected awards data for the academic years 2007-2008 through 2010-2011, allowing me to match it with the most recent years available for occupation data from OES. In addition, I analyze awards data with occupational projections for the next decade to assess the potential performance of CCC's moving forward.

For both awards and the catalog (discussed below) my analysis contains 103 of the 112 community colleges in the state. I removed three colleges for the same reason IHELP (2012) did not consider their data. Their data are unreliable for my use, because Compton Community College is under the management of another district while Moreno Valley and Norco are too new to use. In addition, Columbia College, College of the Redwoods, Mendocino College, College of the Siskiyous, Feather River College, and Lassen College are not within MSAs and therefore are not comparable to more urban colleges.

Catalog

The Institute for Higher Education Leadership and Policy collected data on the catalog of all program offerings at California community colleges for Part 2 of their report *Career Opportunities: Technical Education and the College Completion Agenda*. IHELP provided their data to me, which I was able to use with the only modification being organizing it by MSA. IHELP first downloaded information from the database of approved certificates and associate degrees available on the Chancellors website. All associate degrees must be Chancellor-approved, as must certificates of greater than 18 units. IHELP supplemented the data by reviewing college catalogs for all community colleges to collect information on locally approved certificates, those that are of less than 18 units. The college catalog is complete for all California community colleges for the 2009-2010 academic year.

Occupational Growth - Projections

Every two years, EDD produces long-term (10-year) labor market projections. The most recent edition available is for the period 2008-2018. The only manipulation necessary for the data was to aggregate occupations from broad occupations into their major group and remove information on occupations that required less than post-secondary vocational education or more than an associate's degree.

Projection data from the EDD website came aggregated on the MSA level. Data for the Los Angeles-Long Beach-Santa Ana MSA and San Francisco-Oakland-Fremont MSA came broken up into four metropolitan divisions: Los-Angeles-Long Beach-Glendale MD, Santa Ana-Anaheim-Irvine MD, San Francisco-San Mateo-Redwood City MD, and Oakland-Fremont-Hayward MD. A metropolitan division is an MSA with a single core with a population of 2.5 million or more that EDD subdivides into smaller groupings. EDD publishes data for MDs to maintain continuity in their data, but I combined the data for the two pairs of MDs in these MSAs in order to make the local labor markets analyzed all MSAs.

Occupational Growth - Past

From the EDD website, I was able to collect statistics on employment and wages from the Occupational Employment Statistics (OES) survey, a semiannual mail survey conducted by the agency. The OES survey collects annual occupation and wage data for the state, which I was able to gather for every MSA after aggregating the four MDs (as described above). OES data does not come with information on training and education, but I was able to use information from other occupational data sets from EDD and the EDD website to match occupations with their appropriate level of education. Once I properly matched the data, I removed categories above or below the education and training typically provided by community colleges. I collected data for 2010, 2009, 2008, and 2007 to match the years for which I had community college data.

Method of Analysis

I answer all four questions by calculating an index of dissimilarity. An index of dissimilarity, also known as an index of difference or differentiation, is a method used to calculate the difference between two percentage distributions. Commonly, an index of dissimilarity is used to calculate differences in occupational segregation, particularly between the genders, (Jacobs J. A., 1987) and racial segregation, predominantly concerning residential housing patterns (Logan & Schneider, 1984; Massey & Denton, 1988). Simply put, it is a measure of the evenness between two proportions within a population, and for the examples given it would measure the evenness between women and men (occupationally) or blacks and whites (residentially) (Kestenbaum, 1980). It is the appropriate tool for my study to measure the differences between the percentage of awards and offerings in each occupation with the percentages of occupation openings in each MSA and was used in similar studies by Leigh and Gill (2007) and Mokher (2011).

An index of dissimilarity measures the cumulative difference within a population between the proportions of a corresponding pair of values, after multiplying by one-half (Kestenbaum, 1980). To calculate an index, first one finds two corresponding sets of proportions, in the form of percentages, within a population. For my analysis, the population is each MSA and the two sets of proportions are the percentage of workers in a certain occupation out of all workers within an MSA and the percentage of awards (or programs) in the same occupation out of all awards (or programs) within the same MSA. Next, the difference between the percentage of awards (or programs) and the percentage of occupational openings is found, converted to an absolute value, and summed for the entire set. Finally, the sum of all differences is multipled by one-half to account for the double representation of every instance of misalignment. Every award or program that takes an MSA out of perfect alignment contributes to the raising of the index twice, in both the field it should be in as well as the field it is in but should not be; this double counting is removed by multiplying by one-half.

Figure 1: Equation to Calculate Index of Dissimilarity

$$.5 \sum_{i=1}^{N} \left| \frac{c_i}{C} - \frac{m_i}{M} \right|$$

I calculate the index of dissimilarity using the following equation: i is the identifier for each SOC code with a program offered or completed at a community college or present in the job market; N is the total number of SOC codes; c_i is the number of awards or programs offered in a field; C is the total number of awards or programs offered; m_i is the number of jobs in the job market in that SOC code; M is the total number of jobs in the job market. After all calculations are completed, the result is always positive and lies in the range 0 to 1, and directly indicates the percentage of awards or programs that would need to be reallocated to other occupations in order to make the two distributions the same. After my calculations are complete, I will multiply the indexes by 100 to display their values directly as a percentage, rather than as a decimal.

Index of Dissimilarity Example

In order to illustrate how an index of dissimilarity operates in my study, I provide the following fictional example, using awards at College A. In this simplifed example there are only 3 mutually exclusive occupational fields: Auto Mechanics, Nursing, and Accounting. There are 15 awards at College A and 25 projected job openings in the MSA. Table 3 displays how the awards and job openings are spread among the three fields.

Table 3: Example – Awards and Openings

	Auto Mechanic	Nursing	Accounting
Awards (n=15)	3	7	5
Openings (n=25)	8	6	11

Next I find the percentage of the total awards at College A awarded in each particular field. I do the same for openings.

Table 4: Example – Proportion of Awards and Jobs

	Auto Mechanic	Nursing	Accounting
Awards (n=15)	20%	47%	33%
Openings (n=25)	32%	24%	44%

After I determine the percentage of awards and openings for each field, I calculate the difference between the two, convert the difference to an absolute value, sum across all three fields, and multiply by one-half (.5).

Table 5: Example – Difference, Sum and Multiplicaion

	Auto Mechanic	Nursing	Accounting	Sum	Multiplied by .5
Absolute value of Awards (%) minus Openings (%)	12%	23%	11%	46%	23%

Therefore, the index of dissimilarity for fictional College A would be .23, meaning that 23 percent of awards or offerings would need to change fields to perfectly match with local labor markets.

An index of 0 for nursing in Sacramento County would indicate that 0 percent of awards would need to be reallocated. That is, the percentage of awards in nursing would match perfectly with the percentage of those employed in nursing for Sacramento County. An index of .15 would indicate that 15 percent of awards would need to be reallocated from some other field to nursing to match with the labor market and an index of 1 would indicate 100 percent would need to be reallocated. Therefore, the percentage given as the result of each question presents the magnitude of misalignment between CTE and local labor markets.

Equations and Specific Application of Data

Question 1. How closely do the CTE programs students complete match with the jobs created between 2007 and 2010?

For question 1, I calculate the index of dissimilarity using the cumulative job growth captured between 2007 and 2010 from the OES against all four years of awards data. I use the aggregate of both sets of data to attempt to compensate for the variability in job growth and awards for any given year. By viewing the data for multiple years, this variability can be minimized and a more precise look at how well aligned awards and job growths are may be ascertained. I will present the results of this calculation in the next chapter.

In addition, I present the results of six more calculations from my first question in Appendix A, in order to display this variability. Each of the three years of OES data will be matched against its corresponding year of award data, i.e., awards granted in 2008 will be calculated with 2008 data, which will answer what percentage of those awards would need to change their field to match with the jobs created between 2007 and 2008. The second set of three calculations will use the combined job growth from 2007-2010 and be matched against the 2008-2009, 2009-2010, and 2010-2011 awards data separately. The equation reads for all seven analyses: absolute value of the (awards in SOC code (i) in year X divided by total awards for the MSA in year X), minus (occupation growth in SOC code (i) in year X divided by total occupation growth the MSA in year X), summed for all SOC codes in the MSA and multiplied by .5.

Question 2: How closely do the CTE programs students complete match with the jobs projections for the next decade?

Projection data, unlike OES, only presents a single set of data to compare with awards. I calculate an index of dissimilarly using all four years of awards data with the annual average job growth found in the EDD projections. To attempt again to display the variability found year-to-year in awards data, in Appendix B I present additional calculations. I calculate and index using each year of award data separately with the average annual total job openings projected by EDD.

The equation will read: absolute value of the (awards in SOC code (i) in year X divided by total awards for the MSA in year X), minus (projected occupation growth in SOC code (i) divided by projected occupation growth for all SOCs in the MSA), summed for all SOC codes in the MSA and multiplied by .5.

Question 3: How closely do the CTE programs that colleges offer align with the jobs created between 2007 and 2010?

I calculated an index of dissimilarly using the 2009-2010 CCC catalogs and the aggregate job growth between 2007 and 2010 found in the OES. As additional analyses, I matched the catalog against the 2008, 2009, and 2010 OES, the results of which can be found in Appendix C. The equation reads: absolute value of the (offerings in SOC code (i) in 2009-2010 divided by total offerings for the MSA in 2009-2010), minus (occupation growth in SOC code (i) in year X divided by total occupation growth the MSA in year X), summed for all SOC codes in the MSA and multiplied by .5.

Question 4: How closely do the CTE programs that colleges offer align with the jobs projections for the next decade?

I examine the final question with a single calculation, because both the CCC catalog and EDD projections present a single set of data to match. The single equation will run: absolute value of the (offerings in SOC code (i) in 2009-2010 divided by total offerings for the MSA in 2009-2010), minus (average annual projected occupation growth in SOC code (i) in year X divided by average annual projected occupation growth in all SOCs for the MSA), summed for all SOC codes in the MSA and multiplied by .5.

Limitations

The type of analysis I have chosen and the available data present several limitations. An index of dissimilarity will only analyze how well matched awards and offerings are to local labor markets, and will not be able to identify any causes or effects of the results. As such, a low result will indicate that a community college is misaligning its programs with its region, under the assumption that the community college is alone responsible for fully meeting the need, but the result cannot say whether the region is well served overall. A community college may not offer programs to train individuals if other private, public, or for-profit colleges and universities already focus on this area. Researchers can use the indexes produced by this study to attempt to identify why colleges succeed or fail at aligning their programs and awards.

Secondly, the match between California's TOP codes and SOC presents issues. Because TOP codes do not match one-to-one with the SOC, a researcher must either manipulate the crosswalk to remove double-matches, as Mokher (2011) did, or double count awards as matching with several occupations like IHELP and leave the crosswalk unchanged. Like IHELP, I have determined to conduct my analysis without manipulating the crosswalk by removing matches in order to account for the multiple career paths available to graduates of different fields.

Chapter 4

RESULTS

In this chapter, I present the results of the calculations conducted to examine my four questions. All results can be found in Chart (X). I evaluate each question separately followed by a discussion of what the outcomes indicate taken together. Each of the four questions provide insight into my thesis' overarching query of 'how well aligned are CTE programs at California community colleges with local labor markets?'

Table 6: Magnitude of the Misalignment

	Question 1: How closely do the CTE programs that students complete match with the jobs created in the past few years?	Question 2: How closely do the CTE programs that students complete match with jobs projections for the next decade?	Question 3: How closely do the CTE programs that colleges offer align with the jobs created between 2008 and 2010?	Question 4: How closely do the CTE programs that colleges offer align with jobs projections for the next decade?	Average for Colleges Across all Four Questions
Bakersfield					
Bakersfield	59.1%	58.7%	44.4%	49.7%	52.9%
Cerro Coso	50.9%	49.7%	49.4%	46.7%	49.2%
Taft	49.5%	47.7%	50.4%	48.0%	48.9%
Chico					
Butte	76.9%	67.8%	52.1%	56.8%	63.4%
El Centro					
Imperial Valley	67.1%	66.4%	65.7%	76.9%	69.0%
Fresno					
Fresno City	59.7%	53.5%	50.0%	45.2%	52.1%
Reedley	49.2%	43.8%	48.3%	47.0%	47.0%
West Hills Coalinga	50.0%	46.5%	50.9%	48.3%	48.9%
Hanford - Corcoran					
West Hills	56.3%	78.8%	52.2%	61.9%	62.3%

Lemoore					
Los Angeles-Long Beach-Santa Ana					
Antelope Valley	48.9%	48.8%	49.2%	49.1%	49.0%
Cerritos	48.3%	48.4%	48.1%	48.4%	48.3%
Citrus	49.0%	48.9%	49.5%	49.5%	49.2%
College of the Canyons	49.6%	49.2%	48.8%	48.8%	49.1%
East LA	50.4%	48.2%	49.1%	49.0%	49.2%
El Camino	48.7%	48.7%	48.9%	49.0%	48.8%
Glendale	49.1%	49.2%	49.4%	49.3%	49.3%
LA Mission	49.5%	49.6%	48.9%	49.0%	49.3%
LA Pierce	49.1%	49.1%	49.5%	49.6%	49.3%
LA SW	49.8%	49.7%	49.3%	49.1%	49.5%
LA Valley	48.9%	48.9%	48.2%	48.3%	48.6%
Long Beach	47.6%	48.4%	49.1%	49.0%	48.5%
Los Angeles	49.2%	49.1%	49.3%	49.3%	49.2%
Los Angeles Harbor	49.6%	49.5%	49.0%	48.9%	49.2%
Los Angeles Trade Technical	48.1%	48.7%	48.1%	48.3%	48.3%
Mt. San Antonio	48.4%	47.9%	48.3%	48.4%	48.2%
Pasadena City	48.8%	48.7%	49.4%	49.3%	49.1%
Rio Hondo	49.2%	49.2%	49.3%	49.3%	49.3%
Santa Monica	49.0%	49.0%	49.5%	49.3%	49.2%
West LA	49.4%	49.3%	49.1%	49.1%	49.2%
Coastline	49.9%	49.7%	47.3%	48.2%	48.8%
Cypress	48.7%	48.9%	48.7%	48.7%	48.7%
Fullerton	49.2%	49.3%	48.7%	48.9%	49.0%
Golden West	48.8%	48.7%	49.0%	49.1%	48.9%
Irvine Valley	49.8%	49.6%	49.5%	49.4%	49.6%
Orange Coast	48.4%	48.4%	48.2%	48.4%	48.4%
Saddleback	48.4%	48.7%	48.2%	48.6%	48.5%
Santa Ana	49.1%	49.0%	48.9%	49.0%	49.0%
Santiago Canyon	49.6%	49.4%	49.0%	49.0%	49.3%
Merced					
Merced	55.6%	58.0%	57.4%	75.1%	61.5%
Modesto					
Modesto Junior	63.2%	63.9%	63.4%	58.7%	62.3%
Napa					
Napa Valley	69.9%	59.5%	64.1%	64.2%	64.4%

Oxnard - Thousand Oaks - Ventura					
Moorpark	58.1%	63.4%	45.6%	44.1%	52.8%
Oxnard	51.8%	47.5%	42.0%	43.9%	46.3%
Ventura	44.6%	48.6%	47.3%	43.2%	45.9%
Redding					
Shasta	54.5%	56.4%	67.8%	67.7%	61.6%
Riverside - San Bernardino - Ontario					
Barstow	48.3%	49.7%	48.5%	49.1%	48.9%
Chaffey	44.7%	46.7%	46.8%	47.5%	46.4%
College of the Desert	48.0%	48.7%	47.0%	49.2%	48.2%
Copper Mountain	49.7%	49.6%	48.9%	49.0%	49.3%
Crafton Hills	47.5%	47.3%	48.9%	48.8%	48.1%
Mt. San Jacinto	46.8%	48.7%	46.7%	45.8%	47.0%
Palo Verde	48.1%	49.3%	48.8%	48.8%	48.7%
Riverside	49.0%	45.4%	45.1%	45.6%	46.3%
San Bernardino Valley	46.9%	47.3%	45.8%	47.7%	46.9%
Victor Valley	46.1%	47.4%	47.3%	47.3%	47.0%
Sacramento - Arden-Arcade - Roseville					
American River	50.7%	47.6%	48.5%	48.1%	48.7%
Cosumnes River	46.5%	46.6%	46.5%	47.0%	46.7%
Folsom Lake	48.5%	48.9%	48.0%	48.5%	48.5%
Lake Tahoe	49.9%	49.9%	48.4%	48.0%	49.0%
Sacramento City	46.4%	44.7%	46.7%	45.8%	45.9%
Sierra	54.0%	52.0%	48.7%	47.1%	50.4%
Woodland	50.0%	49.9%	48.8%	48.5%	49.3%
Salinas					
Hartnell	64.3%	52.9%	46.3%	49.9%	53.4%
Monterey Peninsula	63.3%	56.6%	51.6%	51.7%	55.8%
San Diego - Carlsbad - San Marcos					
Cuyamaca	49.4%	49.4%	48.3%	48.4%	48.9%
Grossmont	47.5%	51.1%	47.9%	47.7%	48.6%
Mira Costa	47.3%	47.2%	46.7%	46.8%	47.0%
Palomar	48.2%	48.6%	46.2%	45.8%	47.2%
San Diego	47.7%	47.9%	46.4%	46.4%	47.1%
San Diego Mesa	49.5%	49.2%	47.6%	47.7%	48.5%

San Diego Miramar	48.5%	48.9%	48.2%	48.4%	48.5%
Southwestern	46.6%	48.0%	47.0%	47.5%	47.3%
San Francisco-Oakland-Fremont					
Canada	48.0%	48.4%	48.2%	48.5%	48.3%
College of Marin	48.9%	49.0%	48.3%	48.4%	48.6%
College of San Mateo	48.3%	49.0%	47.7%	48.1%	48.3%
San Francisco	43.5%	43.9%	47.6%	47.8%	45.7%
Skyline	46.0%	46.4%	46.3%	46.9%	46.4%
Berkeley	49.6%	49.9%	48.6%	48.7%	49.2%
Chabot	47.5%	48.0%	47.6%	47.9%	47.8%
College of Alameda	49.3%	49.4%	48.6%	48.6%	49.0%
Contra Costa	48.3%	48.6%	47.8%	48.1%	48.2%
Diablo Valley	47.2%	47.6%	47.7%	48.0%	47.6%
Laney	48.5%	48.9%	48.2%	48.3%	48.5%
Las Positas	49.1%	49.1%	48.0%	48.2%	48.6%
Los Medanos	47.9%	47.4%	47.5%	47.9%	47.7%
Merritt	47.9%	48.2%	48.0%	48.3%	48.1%
Ohlone	48.5%	48.6%	47.2%	47.7%	48.0%
San Jose - Sunnyvale - Santa Clara					
De Anza	48.1%	44.7%	46.3%	46.1%	46.3%
Evergreen Valley	48.9%	48.2%	49.2%	49.1%	48.8%
Foothill	47.2%	46.6%	46.9%	46.4%	46.8%
Gavilan	47.9%	47.7%	49.0%	48.3%	48.2%
Mission	49.0%	48.4%	47.5%	47.0%	48.0%
San Jose	47.9%	46.8%	49.9%	49.5%	48.5%
West Valley	50.1%	48.8%	48.0%	46.8%	48.4%
San Luis Obispo - Paso Robles					
Cuesta	65.8%	52.0%	45.3%	59.8%	55.7%
Santa Barbara - Santa Maria - Goleta					
Hancock	57.8%	54.8%	48.8%	45.7%	51.8%
Santa Barbara	46.3%	45.1%	45.9%	46.4%	45.9%
Santa Cruz - Watsonville					
Cabrillo	62.5%	53.0%	63.3%	58.1%	59.2%
Santa Rosa - Petaluma					

Santa Rosa	63.6%	69.4%	40.7%	60.4%	58.5%
Stockton					
San Joaquin Delta	63.3%	64.3%	69.1%	68.7%	66.4%
Vallejo - Fairfield					
Solano	67.7%	71.8%	66.1%	62.9%	67.1%
Visalia - Porterville					
College of the Sequoias	52.9%	57.0%	50.2%	55.5%	53.9%
Porterville	47.6%	45.8%	49.6%	49.8%	48.2%
Yuba					
Yuba	61.7%	56.0%	65.8%	62.7%	61.6%
State Averages	51.1%	50.7%	49.5%	50.1%	50.4%
Minimum	43.5%	43.8%	40.7%	43.2%	45.7%
Maximum	76.9%	78.8%	69.1%	76.9%	69.0%
Standard Deviation	6.1%	6.0%	5.1%	5.9%	5.8%
Within 1 Standard Deviation	81.7%	85.6%	88.5%	86.5%	85.6%
Within 2 Standard Deviation	93.3%	92.3%	92.3%	92.3%	92.5%

Question 1: How closely do the CTE programs students complete match with the jobs created between 2007 and 2010?

The statewide average for the misalignment of 2007-10 awards and past job growth is 51.1 percent, meaning that 51.1 percent of 2007-10 awards would need to switch fields to perfectly match with job growth. The lowest index, or strongest match between CTE and the local labor market, was for San Francisco City College (43.5) while the highest index, or weakest match, was Butte College (76.9) in Chico. The minimum and maximum values do indicate some variation in the results; however, 82 percent of results were within 1 standard deviation of the mean, a far greater percentage than would be expected from a normal distribution.

Question 2: How closely do the CTE programs that students completed between 2007-11 *match with the jobs projections for the next decade?*

The statewide average for the misalignment of awards and projected job growth is 50.7 percent, meaning that 50.7 percent of awards would need to switch fields to perfectly match with job growth. The lowest index was for Reedley College in Fresno (43.8) while the highest was West Hills Lemoore College (78.8) in Hanford - Corcoran (Kings County). The minimum and maximum values do indicate some variation in the results; however, only 15 of the 104 results were more than 1 standard deviation away from the mean.

Question 3: How closely do the CTE programs that colleges offer align with the jobs created between 2008 and 2010?

The statewide average for the misalignment of CCC catalogs and past job growth is 49.5 percent, meaning that 49.5 percent of awards would need to switch fields to match perfectly with job growth. The lowest index was for Santa Rosa Junior College (40.7) while the highest was San Joaquin Delta College (69.1) in Stockton. Question 3 had the most similar results across campuses; 88.5 percent of results were within one standard deviation of the mean.

Question 4: How closely do the CTE programs that colleges offer align with the jobs projections for the next decade?

The statewide average for the misalignment of CCC catalogs and projected job growth is 50.1 percent, meaning that 50.1 percent of awards would need to switch fields to match perfectly with job growth. The lowest index was for Ventura College (43.2) in Oxnard – Thousand Oaks – Ventura while the highest was Imperial Valley College (76.9) in El Centro (Imperial County).

Summary

Difference of Results across Questions

The statewide averages show great similarity across the four questions. The average index for all four questions contains a range of only 1.7 percent, indicating very small differentiation in how well aligned programs are whether being assessed using past or projected jobs and awards or offerings. This may result from a reliance on historical data in EDD's projections, meaning that labor projections are based heavily on the past. In the future, real time data use may be able to offer more forward-looking projections (Kobes, 2012; Wright, 2012).

Within each campus, there is much greater variability than the statewide averages. This is immediately apparent from the campus averages: the largest index is from Imperial valley College (69), compared to San Francisco City College (45.7), a difference of 24 percent. Within each campus, 62 of the 104 colleges assessed have individual ranges of greater than 2 percent across the four measures, while 15 are at 10 percent or greater. However, larger ranges are concentrated in MSA with 2 or fewer schools. The five campuses with the largest ranges serve their MSA alone. Every single-campus-MSA has a range of 5 or greater, compared to only 11 multi-campus-MSA.

Difference between Single and Multi-Campus-MSA

The averages for single-campus-MSA on all four questions were higher than multi-campus-MSA, as shown in Table 7. The averages differ consistently, with the 4-question average index 14 percent higher for single-campuses MLA, the lowest difference being 11 percent. In addition, all four of the highest indexes for each individual question, came from a single-campus MSA. I will discuss potential causes for poorer performance at single-campuses MSAs in the next chapter.

Table 7: Multi vs. Single-Campus MSA

Single-Campus-MSA					
N=13	Question 1	Question 2	Question 3	Question 4	Average
Mean	62.87%	63.69%	64.15%	59.46%	62.54%
Standard Deviation	7.93%	6.16%	6.32%	9.14%	7.4%
Minimum	52.0%	54.5%	56.8%	40.7%	51.0%
Maximum	78.8%	76.9%	76.9%	69.1%	75.5%
Range	26.8%	22.4%	20.1%	28.4%	24.4%
Multi-Campus-MSA					
N=91	Question 1	Question 2	Question 3	Question 4	Average
Mean	48.96%	49.35%	48.13%	48.13%	48.64%
Standard Deviation	2.80%	3.37%	1.60%	1.42%	2.30%
Minimum	43.8%	43.5%	43.2%	42.0%	43.1%
Maximum	63.4%	64.3%	55.5%	51.6%	58.7%
Range	19.6%	20.8%	12.3%	9.6%	15.6%

Differences between Awards and Offerings

Indexes for Awards are on balance higher than for offerings. 59 community colleges had an index higher for awards than offerings, compared to the 45 with offerings more misaligned that awards, meaning that the majority of colleges were better aligned in the programs students completed than those offered. Statewide, the Awards are on average 1.1percent higher than offerings. The vast majority of colleges have indexes with very little differences; only 22 colleges have a difference between awards and offerings of greater than 2 percent and 13 are greater than 5 percent.

Table 8: Awards vs. Offerings

	Average Index for Question 1 and 2 on Awards	Average Index for Question 3 and 4 on Offerings	Difference Between Awards and Offering Averages
Bakersfield			
Bakersfield	58.9%	47.1%	11.9%
Cerro Coso	50.3%	48.1%	2.3%
Taft	48.6%	49.2%	-0.6%
Chico			
Butte	72.4%	54.5%	17.9%
El Centro			
Imperial Valley	66.8%	71.3%	-4.6%
Fresno			
Fresno City	56.6%	47.6%	9.0%
Reedley	46.5%	47.7%	-1.2%
West Hills Coalinga	48.3%	49.6%	-1.4%
Hanford - Corcoran			
West Hills Lemoore	67.6%	57.1%	10.5%
Los Angeles-Long Beach-Santa Ana			
Antelope Valley	48.9%	49.2%	-0.3%
Cerritos	48.4%	48.3%	0.1%
Citrus	49.0%	49.5%	-0.6%
College of the Canyons	49.4%	48.8%	0.6%
East LA	49.3%	49.1%	0.3%
El Camino	48.7%	49.0%	-0.3%
Glendale	49.2%	49.4%	-0.2%
LA Mission	49.6%	49.0%	0.6%
LA Pierce	49.1%	49.6%	-0.5%
LA SW	49.8%	49.2%	0.6%
LA Valley	48.9%	48.3%	0.7%
Long Beach	48.0%	49.1%	-1.1%
Los Angeles	49.2%	49.3%	-0.2%
Los Angeles Harbor	49.6%	49.0%	0.6%
Los Angeles Trade Technical	48.4%	48.2%	0.2%
Mt. San Antonio	48.2%	48.4%	-0.2%
Pasadena City	48.8%	49.4%	-0.6%
Rio Hondo	49.2%	49.3%	-0.1%
Santa Monica	49.0%	49.4%	-0.4%

West LA	49.4%	49.1%	0.3%
Coastline	49.8%	47.8%	2.1%
Cypress	48.8%	48.7%	0.1%
Fullerton	49.3%	48.8%	0.5%
Golden West	48.8%	49.1%	-0.3%
Irvine Valley	49.7%	49.5%	0.3%
Orange Coast	48.4%	48.3%	0.1%
Saddleback	48.6%	48.4%	0.2%
Santa Ana	49.1%	49.0%	0.1%
Santiago Canyon	49.5%	49.0%	0.5%
Merced			
Merced	56.8%	66.3%	-9.4%
Modesto			
Modesto Junior	63.6%	61.1%	2.5%
Napa			
Napa Valley	64.7%	64.2%	0.6%
Oxnard - Thousand Oaks - Ventura			
Moorpark	60.8%	44.9%	15.9%
Oxnard	49.7%	43.0%	6.7%
Ventura	46.6%	45.3%	1.4%
Redding	0.0%	0.0%	0.0%
Shasta	55.5%	67.8%	-12.3%
Riverside - San Bernardino - Ontario			
Barstow	49.0%	48.8%	0.2%
Chaffey	45.7%	47.2%	-1.5%
College of the Desert	48.4%	48.1%	0.3%
Copper Mountain	49.7%	49.0%	0.7%
Crafton Hills	47.4%	48.9%	-1.5%
Mt. San Jacinto	47.8%	46.3%	1.5%
Palo Verde	48.7%	48.8%	-0.1%
Riverside	47.2%	45.4%	1.9%
San Bernardino Valley	47.1%	46.8%	0.3%
Victor Valley	46.8%	47.3%	-0.5%
Sacramento - Arden-Arcade - Roseville			
American River	49.2%	48.3%	0.9%
Cosumnes River	46.6%	46.8%	-0.2%
Folsom Lake	48.7%	48.3%	0.5%
Lake Tahoe	49.9%	48.2%	1.7%

Sacramento City	45.6%	46.3%	-0.7%
Sierra	53.0%	47.9%	5.1%
Woodland	50.0%	48.7%	1.3%
Salinas			
Hartnell	58.6%	48.1%	10.5%
Monterey Peninsula	60.0%	51.7%	8.3%
San Diego - Carlsbad - San Marcos			
Cuyamaca	49.4%	48.4%	1.1%
Grossmont	49.3%	47.8%	1.5%
Mira Costa	47.3%	46.8%	0.5%
Palomar	48.4%	46.0%	2.4%
San Diego	47.8%	46.4%	1.4%
San Diego Mesa	49.4%	47.7%	1.7%
San Diego Miramar	48.7%	48.3%	0.4%
Southwestern	47.3%	47.3%	0.1%
San Francisco-Oakland-Fremont			
Canada	48.2%	48.4%	-0.2%
College of Marin	49.0%	48.4%	0.6%
College of San Mateo	48.7%	47.9%	0.8%
San Francisco	43.7%	47.7%	-4.0%
Skyline	46.2%	46.6%	-0.4%
Berkeley	49.8%	48.7%	1.1%
Chabot	47.8%	47.8%	0.0%
College of Alameda	49.4%	48.6%	0.8%
Contra Costa	48.5%	48.0%	0.5%
Diablo Valley	47.4%	47.9%	-0.5%
Laney	48.7%	48.3%	0.5%
Las Positas	49.1%	48.1%	1.0%
Los Medanos	47.7%	47.7%	-0.1%
Merritt	48.1%	48.2%	-0.1%
Ohlone	48.6%	47.5%	1.1%
San Jose - Sunnyvale - Santa Clara			
De Anza	46.4%	46.2%	0.2%
Evergreen Valley	48.6%	49.2%	-0.6%
Foothill	46.9%	46.7%	0.2%
Gavilan	47.8%	48.7%	-0.9%
Mission	48.7%	47.3%	1.5%
San Jose	47.4%	49.7%	-2.4%

West Valley	49.5%	47.4%	2.1%
San Luis Obispo - Paso Robles			
Cuesta	58.9%	52.6%	6.4%
Santa Barbara - Santa Maria - Goleta			
Hancock	56.3%	47.3%	9.0%
Santa Barbara	45.7%	46.2%	-0.5%
Santa Cruz - Watsonville			
Cabrillo	57.8%	60.7%	-3.0%
Santa Rosa - Petaluma			
Santa Rosa	66.5%	50.6%	16.0%
Stockton			
San Joaquin Delta	63.8%	68.9%	-5.1%
Vallejo - Fairfield			
Solano	69.8%	64.5%	5.3%
Visalia - Porterville			
College of the Sequoias	55.0%	52.9%	2.1%
Porterville	46.7%	49.7%	-3.0%
Yuba			
Yuba	58.9%	64.3%	-5.4%

Differences across Occupations

Table 9 displays the average indexes for all 4 questions; considerable variation is present. The majority of occupations had indexes of less than 5 percent and 20 had indexes of 20 percent or lower. The worst aligned occupation is Healthcare Practitioners and Technical Occupations with an average index (24.8%), twice that of the second worst major group. Only Installation, Maintenance, and Repair Occupations (11.6%) and Education, Training, and Library Occupations (10.4%) are also above ten percent.

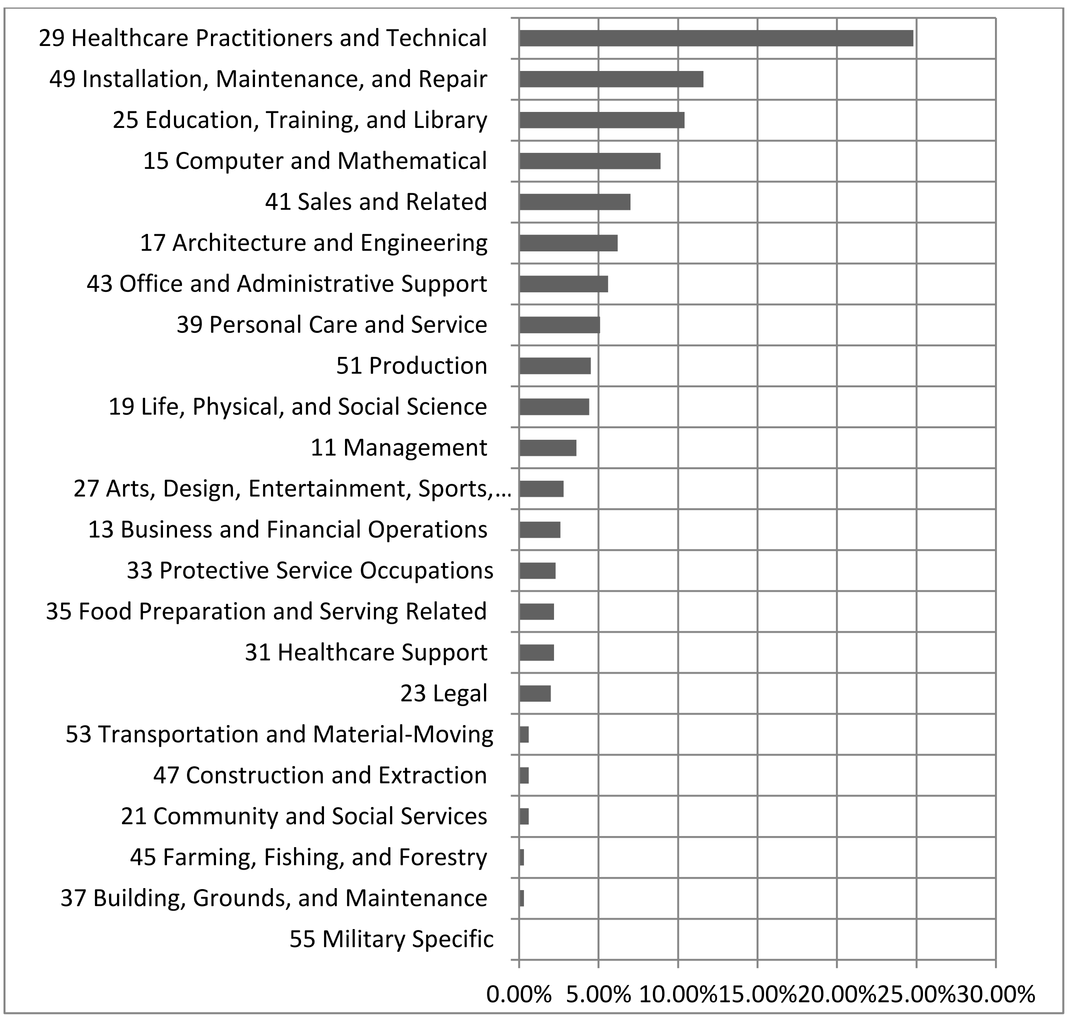
Table 9: Differences for Occupations

	Question 1	Question 2	Question 3	Question 4	Average	Min	Max	Range
11 Management	3.1%	3.6%	3.8%	3.9%	3.6%	3.1%	3.9%	0.9%
13 Business and Financial Operations	2.9%	2.7%	2.7%	2.3%	2.6%	2.3%	2.9%	0.6%
15 Computer and Mathematical	17.6%	6.4%	5.6%	6.1%	8.9%	5.6%	17.6 %	12.0%
17 Architecture and Engineering	8.3%	3.6%	8.8%	3.9%	6.2%	3.6%	8.8%	5.2%
19 Life, Physical, and Social Science	5.0%	3.6%	5.6%	3.4%	4.4%	3.4%	5.6%	2.2%
21 Community and Social Services	0.7%	0.7%	0.4%	0.4%	0.6%	0.4%	0.7%	0.3%
23 Legal	2.4%	1.5%	2.7%	1.5%	2.0%	1.5%	2.7%	1.2%
25 Education, Training, and Library	8.4%	10.1%	16.1%	6.8%	10.4%	6.8%	16.1 %	9.3%
27 Arts, Design, Entertainment, Sports, and Media	1.7%	0.8%	5.1%	3.6%	2.8%	0.8%	5.1%	4.3%
29 Healthcare Practitioners and Technical	12.7%	37.3%	8.1%	41.1%	24.8%	8.1%	41.1 %	33.0%
31 Healthcare Support	1.8%	2.1%	3.0%	1.8%	2.2%	1.8%	3.0%	1.2%
33 Protective Service Occupations	3.6%	3.2%	1.3%	1.3%	2.3%	1.3%	3.6%	2.4%
35 Food Preparation and Serving Related	1.5%	0.4%	6.5%	0.5%	2.2%	0.4%	6.5%	6.1%
37 Building, Grounds, and Maintenance	0.1%	0.1%	0.4%	0.6%	0.3%	0.1%	0.6%	0.5%
39 Personal Care and Service	4.2%	6.5%	2.8%	7.0%	5.1%	2.8%	7.0%	4.2%
41 Sales and Related	6.3%	3.7%	14.9%	3.2%	7.0%	3.2%	14.9 %	11.7%
43 Office and Administrative Support	6.2%	6.8%	3.4%	6.2%	5.6%	3.4%	6.8%	3.4%
45 Farming, Fishing, and Forestry	0.3%	0.3%	0.2%	0.2%	0.3%	0.2%	0.3%	0.1%
47 Construction and Extraction	0.7%	0.6%	0.7%	0.7%	0.6%	0.6%	0.7%	0.1%

49 Installation, Maintenance, and Repair	12.2%	8.8%	17.8%	7.4%	11.6%	7.4%	17.8 %	10.4%
51 Production	6.9%	2.4%	6.9%	2.0%	4.5%	2.0%	6.9%	4.9%
53 Transportation and Material-Moving	0.4%	0.3%	1.3%	0.3%	0.6%	0.3%	1.3%	1.0%
55 Military Specific*	0%	0%	1%	0%	0.0%	0%	0%	0%

*Zero occupations required the Post-Secondary Vocational Training or an Associate's degree, the two training categories considered. In addition, zero community college programs or awards corresponded to the Military Specific Occupations.

Figure 2: Average Difference for SOC Codes



Chapter 5

CONCLUSION

In this final chapter, I revisit the purpose of my study, draw conclusions regarding the results of my four indexes of dissimilarity, discuss policy implications, and make recommendations. Finally, I will evaluate the limitations of my study and suggest areas in need of further research.

Purpose of this Study – Revisited

The public, educators, and researchers have largely undervalued CTE and community colleges since their formal creation around the early 1900s. Both CTE and community colleges went through long periods of formulation, lacking clear goals or public support (Eells, 1931). A minority of educators advocated throughout the century that CTE and community colleges would complement each other if brought together, but it was only within the last few decades that community colleges became a primary provider of vocational training, particularly for middle-skill jobs (Eells, 1931; Kasper, 2002).

Middle-skill jobs are among the fastest growing jobs in America, and because CTE is a primary provider of trained workers for these occupations, community colleges and CTE have earned new interest from the public and politicians (Holzer & Lerman, 2010). Significant economic changes during the last half of the 20th century have greatly increased the importance of education for a student’s future employment. Not all education programs carry equal value for students, but research has shown that CTE programs offered at community colleges can increase workers earnings (Belfied &

Bailey, 2011). Nevertheless, for students and the public to gain the maximum benefit from CTE programs, programs must be in occupational areas where jobs are available locally.

Community colleges are designed to serve local needs in part for that reason. However, researchers have published few studies evaluating whether community colleges in any state offer programs that are well aligned with local labor markets. My thesis has set out to help fill this void. I evaluate the alignment of CTE program offerings and awards in California's community colleges with the college's local metropolitan statistical area.

Interpretation of Index Results

Is CTE at California community colleges well aligned with local labor markets? There simply is no standard for how well aligned programs *should* be. No one would reasonably expect any college's programs to match with local labor markets perfectly; with the constant changes in the labor market and the natural lag in response by community college administrators a perfect match is nearly impossible. However, no one could say a college should have no programs match with the labor market.

Leigh and Gill's (2007) study, because of its similar purpose and methodology, provides a baseline to assess the indexes from my analysis. The statewide averages for all four questions indicate a worse alignment by about 10 percent than Leigh and Gill's results. However, the two studies should not be taken as directly comparable, because the difference could result from differences in the data, their use of FTF as opposed to my use of offerings and awards, or changes in alignment between the periods studied. I will discuss more nuanced findings in the remainder of this section.

Differences between Alignment of Individual Occupations and CTE

My thesis focuses on the alignment of CTE and local labor markets; however, I can also manipulate the data produced by my study to observe highly generalized trends in the alignment of specific occupations and CTE at community colleges. As displayed in Graph X (above), Healthcare Practitioners and Technical Occupations are particularly poorly aligned statewide. The indexes of dissimilarity used through my thesis do not indicate whether the index is a result of there being a surplus of jobs or a surplus of students. However, I manually reviewed the calculations that culminated in the indexes of all four questions for Healthcare Practitioners and Technical Occupations and found that community colleges were consistently under producing graduates in this field, results that match with the findings of Moore, Jez, Chisholm, and Shulock (2012). Assuming that college administrators have not already made reforms that the data does not capture to close this gap, it will grow: half of the 20 occupations projected for the fastest growth by the Employment Development Department are in the health field. Community college administrators should also evaluate other areas of consistent misalignment: Installation, Maintenance, and Repair Occupations; Education, Training and Library Occupations; and Computer and Mathematical Occupations.

Differences between Indexes for Awards and Offerings

Statewide, there was not a wide disparity in results between indexes for awards and offerings, indicating that in general the programs students complete and the programs colleges offer are equally aligned with local labor markets. However, community colleges should evaluate their own results to find if programs or awards are seriously misaligned. Table 10 lists all colleges with a difference of greater than 5 percent between awards and offerings. Colleges with a high degree of difference in their misalignments have a plain area in need of attention or reform. A college with a greater misalignment in awards should consider how they are counseling students and whether there are enough spots available in programs of high demand. For colleges where programs are more misaligned than awards, consideration should be given to how well program review and discontinuance policies are being implemented.

Table 10: Differences Larger than Five Percent

	Average Index for Question 1 and 2 on Awards	Average Index for Question 3 and 4 on Offerings	Difference
Butte	72.4%	54.5%	17.9%
Santa Rosa	66.5%	50.6%	16.0%
Moorpark	60.8%	44.9%	15.9%
Shasta	55.5%	67.8%	12.3%
Bakersfield	58.9%	47.1%	11.9%
Hartnell	58.6%	48.1%	10.5%
Hancock	56.3%	47.3%	9.0%
Fresno City	56.6%	47.6%	9.0%
Monterey Peninsula	60.0%	51.7%	8.3%
Oxnard	49.7%	43.0%	6.7%
Cuesta	58.9%	52.6%	6.4%
Solano	69.8%	64.5%	5.3%

Differences between Single-Campus and Multi-Campus MSAs

In chapter 4, I discussed the high number of colleges falling within one-standard deviation of the mean, indicating that most colleges are performing similarly well. The broadest exception to this heterogeneity lies in the score of community colleges that are the only campus within a MSA. Single-campus MSAs perform consistently worse than the state average, a fact that leads me to the conclusion that there is a significant difference between single and multi-campus MSA that affects alignment. This trend becomes even clearer by looking at MSA broken down by the number of colleges in each, as displayed in Table 11. Averages are quite consistent from the largest down to MSA with 3 colleges, rising slightly with two-campus-MSA then significantly with single-campus MSA.

Table 11: Indexes by Number of Colleges in MSA

Number of Colleges in MSA	1	2	3	7	8	10	15	29
Average of all Indexes (%)	62.5	53.4	49.4	48.1	47.9	47.7	48.0	49.0

Several theories are available to help explain potential reasons why single-campus MSAs would appear worse at serving local labor markets. Single-campus MSAs may have less access to labor market data or, because they are stretched to serve students without other campuses to relieve pressure, less able to accurately maintain data files. Students must apply for degrees themselves after finishing the required coursework, and an over stretched campus may be unable to guide students towards receiving their award. In addition, the MSAs in single-campus MSAs may need the community college to offer a wider range of programs because of scare educational opportunities, misaligning the college with local labor markets.

Recommendations for California's Community Colleges and Chancellors Office

My thesis documents that there is room for improvement in the alignment of CTE at California community colleges and local labor markets. To ensure that programs are as aligned as possible with available jobs, colleges must make use of data to analyze market trends and shift resources to growing industries.

Community colleges should not just use data to understand where the labor market is growing, but more specifically, where additional trained workers are needed. Community colleges are not the only workforce trainers, so community colleges must be aware of what other training providers, both public and private, are in their local labor market to ensure that programs do no duplicate programs or over supply in any occupation. Improved data is critical to understanding the complex needs of a local labor market.

The Centers of Excellence, a statewide program run by Economic and Workforce Development through the California Community College Chancellors Office, are supposed to provide labor market analyses for the colleges. However, the willingness of colleges to request and use the data varies, as does their ability to seek independent studies of labor market trends (Shulock & Offenstein, 2012).

For California's community colleges to improve the career counseling available to students, they must to make better use of data. Colleges should provide counselors up-to-date labor market information, to help students understand how their education can lead to available occupations. However, due to shrinking budgets, counselors are in short supply throughout California's community colleges (Holland, 2009). Colleges must place a greater emphasis on making online resources about labor market trends and community college programs available, accessible and useful.

Limitations of Thesis

The chief limitation of my thesis is the inability to analyze reasons for differences in indexes. An index of dissimilarity is designed to analyze questions of ‘what is’ but is wholly unable to ask questions of ‘why’. To understand why each college received the index it did, researchers will need to conduct further analysis. In addition, an index of dissimilarity can say *how well aligned* a community colleges programs are with the local labor market, but it should not be misinterpreted as answering *whether the local economy is well served* . What each local labor market needs from its community colleges is complex, and an index of dissimilarity is unable to tell the whole story. An MSA with a community college as its only provider of trained workers will have vastly different needs than a MSA with many colleges of different levels expecting a community college to specialize in certain industries. An index of dissimilarity is wholly unable to ascertain these differences.

Future Research

My study is well suited for use in future regressions analyses, which would help to overcome the limitation related to “reasons” I discussed above. Indexes of dissimilarity could be used as the dependent variable in order to test several independent variables as the cause of one school being better aligned than others are. For instance, the *number of private/trade schools in the MSA* could be a significant variable, because some occupations may not need community colleges to produce trained workers. *Occupational change*, measured by net change over the last decade or some other period may also drive the indexes, as colleges facing a steadier job market may be better able to position their programs to serve the local labor market. The *number of fields offered* may provide interesting insight in regards to whether colleges are over extending themselves trying to offer every program; alternatively, some schools may be offering too few programs to meet their local labor market's needs. The trend identified above, of single-campus MSA having lower indexes would be an area of particularly interesting research.

Appendix A

Full Results for Question 1

	2009-10 Awards and 2008-10 OES	2008-09 Awards and 2008-10 OES	2007-08 Awards and 2008-10 OES	2009-10 Awards and 2010 OES	2008-09 Awards and 2009 OES	2007-08 Awards and 2008 OES	2007-10 Awards and 2008-10 OES
Bakersfield							
Bakersfield	58.0%	61.5%	59.1%	81.1%	81.3%	57.3%	59.1%
Cerro Coso	50.3%	51.3%	50.9%	54.9%	54.7%	51.4%	50.9%
Taft	47.5%	49.6%	49.5%	53.2%	54.4%	49.9%	49.5%
Chico							
Butte	75.6%	77.0%	76.9%	91.4%	88.5%	82.3%	76.9%
El Centro							
Imperial Valley	76.1%	72.1%	67.1%	74.0%	83.7%	91.4%	67.1%
Fresno							
Fresno City	65.9%	54.9%	59.7%	72.9%	59.2%	65.6%	59.7%
Reedley	47.5%	52.6%	49.2%	53.6%	54.1%	51.7%	49.2%
West Hills Coalinga	46.7%	50.7%	50.0%	48.5%	51.7%	50.8%	50.0%
Hanford - Corcoran							
West Hills Lemoore	55.6%	59.8%	56.3%	55.7%	94.1%	68.9%	56.3%
Los Angeles-Long Beach-Santa Ana							
Antelope Valley	48.6%	49.1%	48.9%	49.0%	49.9%	50.3%	48.9%
Cerritos	47.5%	48.6%	48.3%	47.8%	49.9%	51.3%	48.3%
Citrus	47.8%	49.1%	49.0%	48.5%	49.6%	50.9%	49.0%
College of the Canyons	49.6%	49.4%	49.6%	49.6%	49.8%	50.4%	49.6%
East LA	49.3%	48.6%	50.4%	47.0%	51.4%	54.8%	50.4%
El Camino	48.1%	48.6%	48.7%	48.3%	49.8%	50.8%	48.7%
Glendale	49.3%	49.2%	49.1%	49.5%	49.6%	50.8%	49.1%
LA Mission	49.4%	49.6%	49.5%	49.4%	49.7%	50.5%	49.5%
LA Pierce	49.3%	49.3%	49.1%	49.3%	49.6%	50.5%	49.1%
LA SW	49.8%	49.8%	49.8%	49.8%	49.9%	50.3%	49.8%
LA Valley	49.0%	49.3%	48.9%	49.0%	49.7%	50.8%	48.9%
Long Beach	47.4%	47.6%	47.6%	48.4%	48.9%	51.0%	47.6%
Los Angeles	49.0%	48.9%	49.2%	49.3%	49.4%	50.6%	49.2%
Los Angeles Harbor	49.4%	49.5%	49.6%	49.4%	49.7%	50.0%	49.6%

Los Angeles Trade Technical	49.2%	48.9%	48.1%	49.3%	49.2%	50.1%	48.1%
Mt. San Antonio	48.5%	48.9%	48.4%	49.0%	52.2%	50.9%	48.4%
Pasadena City	48.8%	49.0%	48.8%	49.0%	49.5%	50.4%	48.8%
Rio Hondo	49.0%	49.4%	49.2%	49.2%	50.4%	51.9%	49.2%
Santa Monica	48.5%	49.2%	49.0%	48.7%	49.9%	50.8%	49.0%
West LA	49.3%	49.3%	49.4%	49.3%	49.4%	50.0%	49.4%
Coastline	49.2%	49.9%	49.9%	49.2%	49.9%	50.2%	49.9%
Cypress	48.3%	48.6%	48.7%	48.8%	49.2%	50.3%	48.7%
Fullerton	48.2%	49.4%	49.2%	48.3%	50.3%	51.3%	49.2%
Golden West	48.7%	48.8%	48.8%	48.9%	50.0%	50.5%	48.8%
Irvine Valley	49.6%	49.8%	49.8%	49.6%	49.9%	50.3%	49.8%
Orange Coast	48.0%	48.3%	48.4%	48.6%	50.0%	50.4%	48.4%
Saddleback	48.3%	48.8%	48.4%	48.5%	49.8%	50.7%	48.4%
Santa Ana	48.6%	49.0%	49.1%	48.9%	50.0%	51.3%	49.1%
Santiago Canyon	49.2%	49.5%	49.6%	49.2%	49.5%	50.1%	49.6%
Merced							
Merced	59.8%	58.6%	55.6%	68.2%	79.6%	77.9%	55.6%
Modesto							
Modesto Junior	72.9%	63.0%	63.2%	84.3%	74.3%	89.1%	63.2%
Napa							
Napa Valley	71.9%	62.2%	69.9%	50.0%	92.0%	70.4%	69.9%
Oxnard - Thousand Oaks - Ventura							
Moorpark	60.4%	59.9%	58.1%	63.9%	68.1%	49.0%	58.1%
Oxnard	53.4%	50.5%	51.8%	54.5%	52.9%	56.9%	51.8%
Ventura	48.7%	44.8%	44.6%	52.1%	53.8%	46.3%	44.6%
Redding							
Shasta	68.8%	61.7%	54.5%	58.1%	78.0%	66.2%	54.5%
Riverside - San Bernardino - Ontario							
Barstow	48.6%	48.8%	48.3%	48.9%	49.7%	50.6%	48.3%
Chaffey	44.4%	46.4%	44.7%	45.3%	48.2%	53.0%	44.7%
College of the Desert	47.8%	48.0%	48.0%	48.0%	48.7%	51.8%	48.0%
Copper Mountain	49.5%	49.3%	49.7%	49.5%	49.5%	50.3%	49.7%
Crafton Hills	47.6%	46.5%	47.5%	47.8%	47.1%	53.0%	47.5%
Mt. San Jacinto	46.5%	47.0%	46.8%	46.6%	49.2%	51.8%	46.8%
Palo Verde	48.5%	49.1%	48.1%	48.8%	50.2%	51.1%	48.1%
Riverside	54.9%	50.5%	49.0%	56.1%	50.4%	58.7%	49.0%
San Bernardino Valley	45.9%	46.5%	46.9%	46.4%	49.1%	51.5%	46.9%

Victor Valley	46.2%	45.8%	46.1%	46.5%	47.2%	55.5%	46.1%
Sacramento - Arden-Arcade - Roseville							
American River	50.5%	48.0%	50.7%	60.8%	54.5%	54.1%	50.7%
Cosumnes River	47.8%	46.3%	46.5%	53.4%	49.8%	49.1%	46.5%
Folsom Lake	48.9%	48.6%	48.5%	51.5%	50.0%	50.6%	48.5%
Lake Tahoe	49.9%	49.9%	49.9%	50.3%	50.1%	50.1%	49.9%
Sacramento City	48.8%	46.8%	46.4%	53.7%	54.2%	51.9%	46.4%
Sierra	55.4%	53.4%	54.0%	59.4%	57.3%	52.1%	54.0%
Woodland	50.0%	50.0%	50.0%	50.2%	50.2%	50.0%	50.0%
Salinas							
Hartnell College	64.6%	63.9%	64.3%	54.8%	65.4%	71.4%	64.3%
Monterey Peninsula	65.6%	62.9%	63.3%	51.7%	65.4%	72.3%	63.3%
San Diego - Carlsbad - San Marcos							
Cuyamaca	48.8%	49.0%	49.4%	51.1%	52.9%	51.5%	49.4%
Grossmont	47.8%	48.6%	47.5%	53.5%	58.8%	51.0%	47.5%
Mira Costa	47.7%	47.3%	47.3%	50.0%	53.5%	52.1%	47.3%
Palomar	48.9%	48.1%	48.2%	54.0%	57.7%	52.6%	48.2%
San Diego	47.7%	47.6%	47.7%	49.4%	54.7%	52.6%	47.7%
San Diego Mesa	48.2%	49.6%	49.5%	53.7%	55.0%	51.5%	49.5%
San Diego Miramar	48.0%	48.9%	48.5%	51.0%	54.4%	51.9%	48.5%
Southwestern	47.0%	47.0%	46.6%	52.8%	56.1%	52.3%	46.6%
San Francisco-Oakland-Fremont							
Canada	47.8%	48.1%	48.0%	49.2%	48.9%	50.2%	48.0%
College of Marin	49.1%	48.8%	48.9%	49.2%	48.9%	49.7%	48.9%
College of San Mateo	49.3%	48.9%	48.3%	50.2%	50.4%	51.1%	48.3%
San Francisco	44.1%	43.6%	43.5%	48.2%	45.8%	51.5%	43.5%
Skyline	45.2%	46.4%	46.0%	47.2%	47.8%	52.8%	46.0%
Berkeley	49.8%	49.8%	49.6%	49.9%	49.9%	49.8%	49.6%
Chabot	48.0%	47.3%	47.5%	48.5%	48.7%	50.8%	47.5%
College of Alameda	49.1%	49.6%	49.3%	48.9%	49.6%	50.0%	49.3%
Contra Costa	47.7%	48.4%	48.3%	48.7%	48.9%	50.4%	48.3%
Diablo Valley	46.3%	47.4%	47.2%	50.7%	48.3%	50.1%	47.2%
Laney	48.4%	48.9%	48.5%	49.2%	50.3%	50.8%	48.5%
Las Positas	48.6%	49.1%	49.1%	49.5%	49.3%	50.4%	49.1%
Los Medanos	47.3%	47.5%	47.9%	48.9%	47.9%	51.7%	47.9%
Merritt	47.2%	48.4%	47.9%	49.3%	49.2%	52.3%	47.9%
Ohlone	48.8%	48.4%	48.5%	49.0%	48.9%	49.9%	48.5%

San Jose - Sunnyvale - Santa Clara							
De Anza	47.4%	47.4%	48.1%	49.3%	49.8%	55.6%	48.1%
Evergreen Valley	47.5%	49.3%	48.9%	47.6%	50.1%	52.3%	48.9%
Foothill	46.9%	46.2%	47.2%	48.0%	48.9%	57.2%	47.2%
Gavilan	46.8%	47.5%	47.9%	47.6%	48.3%	52.2%	47.9%
Mission	48.3%	48.9%	49.0%	48.7%	49.5%	52.4%	49.0%
San Jose	45.3%	47.0%	47.9%	49.2%	49.6%	54.0%	47.9%
West Valley	48.6%	50.1%	50.1%	48.9%	50.6%	53.6%	50.1%
San Luis Obispo - Paso Robles							
Cuesta	64.3%	65.7%	65.8%	64.6%	74.8%	68.0%	65.8%
Santa Barbara - Santa Maria - Goleta							
Hancock	46.2%	54.7%	57.8%	68.2%	68.9%	55.3%	57.8%
Santa Barbara	47.8%	45.5%	46.3%	67.4%	59.3%	47.7%	46.3%
Santa Cruz - Watsonville							
Cabrillo	76.3%	62.1%	62.5%	54.1%	58.6%	87.5%	62.5%
Santa Rosa - Petaluma							
Santa Rosa	59.9%	66.5%	63.6%	76.3%	73.0%	58.6%	63.6%
Stockton							
San Joaquin Delta	80.4%	60.8%	63.3%	81.4%	87.4%	74.5%	63.3%
Vallejo - Fairfield							
Solano	73.5%	71.2%	67.7%	86.8%	90.3%	68.0%	67.7%
Visalia - Porterville							
College of the Sequoias	55.9%	45.8%	52.9%	65.0%	84.0%	54.3%	52.9%
Porterville	39.6%	47.5%	47.6%	54.9%	62.7%	47.9%	47.6%
Yuba							
Yuba	68.2%	61.1%	61.7%	73.6%	56.3%	82.3%	61.7%
State Averages	51.7%	51.2%	51.1%	53.7%	55.7%	55.0%	51.1%

Appendix B

Full Results for Question 2

	All Awards and Occupation Projections	2010-2011 Awards and Occupation Projections	2009-2010 Awards and Occupation Projections	2009-2008 Awards and Occupation Projections	2007-2008 Awards and Occupation Projections
Bakersfield					
Bakersfield	58.7%	55.5%	62.8%	59.2%	58.7%
Cerro Coso	49.7%	50.0%	49.2%	49.7%	50.2%
Taft	47.7%	48.0%	47.5%	47.8%	47.9%
Chico					
Butte	67.8%	63.5%	75.2%	67.3%	67.1%
El Centro					
Imperial Valley	66.4%	66.9%	79.1%	62.1%	62.9%
Fresno					
Fresno City	53.5%	49.3%	58.9%	52.2%	56.7%
Reedley	43.8%	42.1%	42.5%	46.4%	45.6%
West Hills Coalinga	46.5%	47.3%	44.6%	47.1%	47.4%
Hanford - Corcoran					
West Hills Lemoore	78.8%	69.8%	82.0%	84.0%	83.1%
Los Angeles-Long Beach-Santa Ana					
Antelope Valley	48.8%	48.6%	48.9%	49.0%	48.8%
Cerritos	48.4%	48.4%	48.1%	48.7%	48.5%
Citrus	48.9%	48.9%	48.5%	49.1%	49.1%
College of the Canyons	49.2%	49.1%	49.3%	49.2%	49.4%
East LA	48.2%	48.4%	47.1%	48.6%	48.4%
El Camino	48.7%	48.7%	48.6%	48.6%	48.8%
Glendale	49.2%	49.3%	49.3%	49.1%	49.0%
LA Mission	49.6%	49.7%	49.4%	49.6%	49.5%
LA Pierce	49.1%	49.2%	49.2%	49.1%	49.0%
LA SW	49.7%	49.8%	49.8%	49.7%	49.7%
LA Valley	48.9%	49.0%	48.7%	49.1%	48.8%
Long Beach	48.4%	48.2%	48.7%	48.3%	48.4%
Los Angeles	49.1%	49.3%	49.2%	48.8%	49.1%
Los Angeles Harbor	49.5%	49.5%	49.4%	49.5%	49.5%
Los Angeles Trade	48.7%	48.7%	49.3%	48.8%	48.0%

Technical					
Mt. San Antonio	47.9%	48.5%	48.9%	47.1%	48.3%
Pasadena City	48.7%	48.7%	48.5%	48.9%	48.7%
Rio Hondo	49.2%	49.3%	49.2%	49.3%	49.2%
Santa Monica	49.0%	49.0%	48.9%	49.2%	49.0%
West LA	49.3%	49.3%	49.3%	49.2%	49.3%
Coastline	49.7%	49.6%	49.7%	49.9%	49.8%
Cypress	48.9%	48.8%	49.0%	48.9%	48.9%
Fullerton	49.3%	49.4%	48.9%	49.6%	49.3%
Golden West	48.7%	48.8%	48.6%	48.6%	48.7%
Irvine Valley	49.6%	49.6%	49.6%	49.6%	49.6%
Orange Coast	48.4%	48.3%	48.4%	48.6%	48.5%
Saddleback	48.7%	48.7%	48.7%	48.8%	48.5%
Santa Ana	49.0%	48.8%	48.9%	49.0%	49.2%
Santiago Canyon	49.4%	49.4%	49.4%	49.4%	49.5%
Merced					
Merced	58.0%	56.0%	62.9%	61.0%	54.0%
Modesto					
Modesto Junior	63.9%	62.9%	72.8%	61.9%	62.3%
Napa					
Napa Valley	59.5%	62.2%	73.2%	50.8%	60.3%
Oxnard - Thousand Oaks - Ventura					
Moorpark	63.4%	62.4%	64.7%	64.2%	62.6%
Oxnard	47.5%	48.5%	50.6%	47.0%	46.7%
Ventura	48.6%	48.2%	52.8%	47.5%	47.5%
Redding					
Shasta	56.4%	56.1%	66.9%	57.6%	48.0%
Riverside - San Bernardino - Ontario					
Barstow	49.7%	49.8%	49.5%	49.9%	49.8%
Chaffey	46.7%	46.9%	46.0%	47.4%	46.5%
College of the Desert	48.7%	48.3%	49.0%	48.8%	48.8%
Copper Mountain	49.6%	49.4%	49.6%	49.4%	49.8%
Crafton Hills	47.3%	46.6%	48.2%	46.9%	47.8%
Mt. San Jacinto	48.7%	48.5%	48.1%	49.1%	48.8%
Palo Verde	49.3%	48.9%	49.7%	49.8%	49.0%
Riverside	45.4%	45.1%	46.5%	46.6%	44.4%
San Bernardino Valley	47.3%	46.8%	47.0%	47.5%	47.7%

Victor Valley	47.4%	47.4%	48.4%	47.2%	48.2%
Sacramento - Arden-Arcade - Roseville					
American River	47.6%	46.9%	48.8%	47.2%	49.3%
Cosumnes River	46.6%	46.9%	47.2%	46.4%	46.2%
Folsom Lake	48.9%	49.2%	48.7%	48.9%	48.6%
Lake Tahoe	49.9%	49.8%	50.0%	49.9%	49.9%
Sacramento City	44.7%	43.5%	46.4%	45.2%	44.6%
Sierra	52.0%	51.0%	53.6%	51.7%	52.4%
Woodland	49.9%	49.9%	50.0%	49.9%	50.0%
Salinas					
Hartnell College	52.9%	53.6%	56.2%	52.6%	53.6%
Monterey Peninsula	56.6%	57.5%	62.0%	55.8%	55.8%
San Diego - Carlsbad - San Marcos					
Cuyamaca	49.4%	49.3%	49.1%	49.4%	49.7%
Grossmont	51.1%	51.4%	50.9%	51.4%	50.5%
Mira Costa	47.2%	47.1%	47.3%	47.1%	47.5%
Palomar	48.6%	48.4%	50.6%	48.2%	47.9%
San Diego	47.9%	47.9%	48.1%	47.7%	47.9%
San Diego Mesa	49.2%	49.8%	49.7%	49.1%	49.0%
San Diego Miramar	48.9%	49.1%	48.4%	49.3%	48.8%
Southwestern	48.0%	48.3%	49.3%	47.8%	47.3%
San Francisco-Oakland-Fremont					
Canada	48.4%	48.6%	48.2%	48.7%	48.4%
College of Marin	49.0%	49.1%	49.3%	48.8%	48.9%
College of San Mateo	49.0%	48.9%	49.5%	49.2%	48.5%
San Francisco	43.9%	43.8%	44.9%	43.8%	44.0%
Skyline	46.4%	47.4%	45.4%	46.5%	46.0%
Berkeley	49.9%	49.9%	50.0%	49.9%	49.8%
Chabot	48.0%	48.5%	48.2%	47.5%	47.8%
College of Alameda	49.4%	49.5%	49.3%	49.5%	49.3%
Contra Costa	48.6%	49.1%	48.1%	48.6%	48.5%
Diablo Valley	47.6%	47.7%	46.8%	47.9%	47.8%
Laney	48.9%	48.8%	48.7%	49.1%	49.0%
Las Positas	49.1%	48.9%	49.1%	49.3%	49.2%
Los Medanos	47.4%	46.9%	47.6%	47.5%	47.9%
Merritt	48.2%	48.3%	47.7%	48.6%	48.1%
Ohlone	48.6%	48.7%	49.1%	48.6%	48.5%

San Jose - Sunnyvale - Santa Clara					
De Anza	44.7%	45.6%	47.3%	44.4%	45.2%
Evergreen Valley	48.2%	48.3%	46.9%	48.9%	48.4%
Foothill	46.6%	46.1%	48.3%	46.5%	46.1%
Gavilan	47.7%	47.7%	47.0%	47.6%	48.1%
Mission	48.4%	48.4%	48.6%	48.9%	47.9%
San Jose	46.8%	47.4%	45.6%	46.4%	47.2%
West Valley	48.8%	49.2%	46.9%	49.2%	49.2%
San Luis Obispo - Paso Robles					
Cuesta	52.0%	54.2%	53.3%	49.0%	52.7%
Santa Barbara - Santa Maria - Goleta					
Hancock	54.8%	52.1%	53.2%	54.4%	59.4%
Santa Barbara	45.1%	44.8%	45.7%	44.3%	46.4%
Santa Cruz - Watsonville					
Cabrillo	53.0%	51.2%	62.7%	49.6%	51.4%
Santa Rosa - Petaluma					
Santa Rosa	69.4%	64.4%	77.2%	65.9%	74.4%
Stockton					
San Joaquin Delta	64.3%	60.1%	79.5%	59.9%	62.6%
Vallejo - Fairfield					
Solano	71.8%	68.6%	79.7%	71.7%	70.3%
Visalia - Porterville					
College of the Sequoias	57.0%	54.3%	64.6%	53.8%	60.2%
Porterville	45.8%	47.4%	41.6%	47.2%	47.6%
Yuba					
Yuba	56.0%	53.7%	63.4%	54.2%	56.5%

Appendix C

Full Results for Question 3 and 4

	Question Three				Question Four
	2010-2009 Catalog and 2008 OES	2010-2009 Catalog and 2009 OES	2010-2009 Catalog and 2010 OES	2010-2009 Catalog and 2010-2008 OES	2010-2009 Catalog and Projections
Bakersfield					
Bakersfield	63.0%	68.9%	57.1%	44.4%	49.7%
Cerro Coso	55.1%	58.7%	55.1%	49.4%	46.7%
Taft	54.1%	57.5%	57.2%	50.4%	48.0%
Chico					
Butte	83.4%	80.8%	63.7%	52.1%	56.8%
El Centro					
Imperial Valley	87.5%	86.6%	61.7%	65.7%	76.9%
Fresno					
Fresno City	61.6%	56.3%	63.2%	50.0%	45.2%
Reedley	55.2%	51.2%	54.0%	48.3%	47.0%
West Hills Coalinga	52.5%	51.0%	51.5%	50.9%	48.3%
Hanford - Corcoran					
West Hills Lemoore	70.0%	90.0%	67.5%	52.2%	61.9%
Los Angeles-Long Beach-Santa Ana					
Antelope Valley	50.2%	49.6%	49.6%	49.2%	49.1%
Cerritos	50.6%	49.2%	49.0%	48.1%	48.4%
Citrus	50.6%	50.0%	49.7%	49.5%	49.5%
College of the Canyons	50.1%	49.1%	49.2%	48.8%	48.8%
East LA	50.2%	49.5%	49.6%	49.1%	49.0%
El Camino	50.2%	49.5%	49.5%	48.9%	49.0%
Glendale	50.0%	49.5%	49.8%	49.4%	49.3%
LA Mission	50.3%	49.3%	49.2%	48.9%	49.0%
LA Pierce	50.4%	49.7%	49.6%	49.5%	49.6%
LA SW	50.3%	49.7%	49.6%	49.3%	49.1%
LA Valley	50.5%	49.4%	49.1%	48.2%	48.3%
Long Beach	50.2%	49.4%	49.5%	49.1%	49.0%
Los Angeles	50.3%	49.4%	49.7%	49.3%	49.3%

Los Angeles Harbor	49.9%	49.4%	49.6%	49.0%	48.9%
Los Angeles Trade Technical	50.4%	49.3%	48.8%	48.1%	48.3%
Mt. San Antonio	50.6%	49.3%	49.1%	48.3%	48.4%
Pasadena City	50.2%	49.7%	49.6%	49.4%	49.3%
Rio Hondo	50.3%	49.5%	49.5%	49.3%	49.3%
Santa Monica	50.2%	49.5%	49.6%	49.5%	49.3%
West LA	50.0%	49.5%	49.5%	49.1%	49.1%
Coastline	51.0%	49.4%	50.5%	47.3%	48.2%
Cypress	50.6%	49.2%	49.0%	48.7%	48.7%
Fullerton	50.6%	49.7%	49.1%	48.7%	48.9%
Golden West	50.3%	49.7%	49.7%	49.0%	49.1%
Irvine Valley	50.3%	49.9%	49.7%	49.5%	49.4%
Orange Coast	50.3%	49.5%	48.8%	48.2%	48.4%
Saddleback	50.7%	49.8%	49.0%	48.2%	48.6%
Santa Ana	50.9%	49.7%	49.5%	48.9%	49.0%
Santiago Canyon	50.7%	49.6%	49.3%	49.0%	49.0%
Merced					
Merced	73.5%	68.9%	76.8%	57.4%	75.1%
Modesto					
Modesto Junior	86.5%	75.1%	73.8%	63.4%	58.7%
Napa					
Napa Valley	66.6%	78.1%	-	64.1%	64.2%
Oxnard - Thousand Oaks - Ventura					
Moorpark	54.0%	50.0%	46.8%	45.6%	44.1%
Oxnard	53.5%	48.2%	42.8%	42.0%	43.9%
Ventura	59.9%	50.6%	49.3%	47.3%	43.2%
Redding					
Shasta	86.0%	77.5%	62.6%	67.8%	67.7%
Riverside - San Bernardino - Ontario					
Barstow	51.4%	50.0%	49.0%	48.5%	49.1%
Chaffey	52.9%	50.2%	47.9%	46.8%	47.5%
College of the Desert	51.0%	50.1%	47.7%	47.0%	49.2%
Copper Mountain	49.8%	50.2%	49.3%	48.9%	49.0%
Crafton Hills	50.9%	50.1%	49.4%	48.9%	48.8%
Mt. San Jacinto	52.5%	49.9%	47.4%	46.7%	45.8%
Palo Verde	50.2%	49.9%	49.3%	48.8%	48.8%
Riverside	51.8%	48.1%	46.6%	45.1%	45.6%
San Bernardino	52.3%	49.1%	46.9%	45.8%	47.7%

Valley					
Victor Valley	53.2%	50.6%	48.0%	47.3%	47.3%
Sacramento - Arden-Arcade - Roseville					
American River	50.8%	52.6%	55.9%	48.5%	48.1%
Cosumnes River	49.3%	50.3%	51.8%	46.5%	47.0%
Folsom Lake	49.5%	50.7%	50.6%	48.0%	48.5%
Lake Tahoe	50.3%	50.3%	50.2%	48.4%	48.0%
Sacramento City	49.8%	51.6%	52.8%	46.7%	45.8%
Sierra	50.9%	53.1%	54.8%	48.7%	47.1%
Woodland	49.9%	50.3%	51.4%	48.8%	48.5%
Salinas					
Hartnell College	60.1%	48.9%	52.6%	46.3%	49.9%
Monterey Peninsula	71.2%	56.4%	49.3%	51.6%	51.7%
San Diego - Carlsbad - San Marcos					
Cuyamaca	51.3%	52.6%	49.7%	48.3%	48.4%
Grossmont	50.5%	53.1%	49.6%	47.9%	47.7%
Mira Costa	50.6%	55.5%	49.6%	46.7%	46.8%
Palomar	53.6%	57.3%	49.8%	46.2%	45.8%
San Diego	51.5%	56.3%	49.6%	46.4%	46.4%
San Diego Mesa	50.9%	53.6%	49.2%	47.6%	47.7%
San Diego Miramar	51.1%	53.2%	49.8%	48.2%	48.4%
Southwestern	52.6%	58.3%	52.1%	47.0%	47.5%
San Francisco-Oakland-Fremont					
Canada	50.2%	48.8%	48.5%	48.2%	48.5%
College of Marin	50.6%	49.1%	48.6%	48.3%	48.4%
College of San Mateo	50.2%	48.8%	48.1%	47.7%	48.1%
San Francisco	51.2%	49.2%	48.2%	47.6%	47.8%
Skyline	52.0%	48.4%	47.5%	46.3%	46.9%
Berkeley	50.1%	49.1%	49.0%	48.6%	48.7%
Chabot	50.5%	49.3%	47.5%	47.6%	47.9%
College of Alameda	50.4%	49.0%	49.0%	48.6%	48.6%
Contra Costa	50.6%	49.2%	48.5%	47.8%	48.1%
Diablo Valley	50.7%	49.4%	47.8%	47.7%	48.0%
Laney	50.1%	48.9%	48.4%	48.2%	48.3%
Las Positas	50.6%	49.3%	48.5%	48.0%	48.2%
Los Medanos	50.2%	48.6%	48.2%	47.5%	47.9%
Merritt	50.5%	48.8%	48.4%	48.0%	48.3%
Ohlone	51.5%	49.3%	48.4%	47.2%	47.7%

San Jose - Sunnyvale - Santa Clara					
De Anza	54.4%	48.5%	46.4%	46.3%	46.1%
Evergreen Valley	51.1%	50.6%	49.4%	49.2%	49.1%
Foothill	55.2%	48.3%	47.6%	46.9%	46.4%
Gavilan	53.7%	50.6%	49.2%	49.0%	48.3%
Mission	53.4%	50.7%	48.8%	47.5%	47.0%
San Jose	52.9%	52.0%	50.7%	49.9%	49.5%
West Valley	53.1%	50.3%	48.4%	48.0%	46.8%
San Luis Obispo - Paso Robles					
Cuesta	54.7%	73.6%	66.5%	45.3%	59.8%
Santa Barbara - Santa Maria - Goleta					
Hancock	63.7%	66.3%	58.9%	48.8%	45.7%
Santa Barbara	59.9%	64.5%	57.0%	45.9%	46.4%
Santa Cruz - Watsonville					
Cabrillo	76.3%	63.4%	51.6%	63.3%	58.1%
Santa Rosa - Petaluma					
Santa Rosa	67.1%	75.1%	57.9%	40.7%	60.4%
Stockton					
San Joaquin Delta	83.6%	73.0%	71.9%	69.1%	68.7%
Vallejo - Fairfield					
Solano	69.2%	83.7%	74.8%	66.1%	62.9%
Visalia - Porterville					
College of the Sequoias	66.6%	73.9%	59.2%	50.2%	55.5%
Porterville	50.8%	58.4%	52.7%	49.6%	49.8%
Yuba					
Yuba	83.1%	54.6%	77.0%	65.8%	62.7%

Appendix D

Descriptive Statistics for Questions 1, 2, and 3

	Question 1			Question 2			Question 3		
	Ave.	Min.	Max.	Ave.	Min.	Max.	Ave.	Min.	Max.
Bakersfield									
Bakersfield	65.3	57.3	81.3	59.0	55.5	62.8	58.3	44.4	68.9
Cerro Coso	52.0	50.3	54.9	49.7	49.2	50.2	54.6	49.4	58.7
Taft	50.5	47.5	54.4	47.8	47.5	48.0	54.8	50.4	57.5
Chico									
Butte	81.2	75.6	91.4	68.2	63.5	75.2	70.0	52.1	83.4
El Centro									
Imperial Valley	75.9	67.1	91.4	67.5	62.1	79.1	75.4	61.7	87.5
Fresno									
Fresno City	62.6	54.9	72.9	54.1	49.3	58.9	57.8	50.0	63.2
Reedley	51.1	47.5	54.1	44.1	42.1	46.4	52.2	48.3	55.2
West Hills Coalinga	49.8	46.7	51.7	46.6	44.6	47.4	51.5	50.9	52.5
Hanford - Corcoran									
West Hills Lemoore	63.8	55.6	94.1	79.5	69.8	84.0	69.9	52.2	90.0
Los Angeles-Long Beach-Santa Ana									
Antelope Valley	49.3	48.6	50.3	48.8	48.6	49.0	49.6	49.2	50.2
Cerritos	48.8	47.5	51.3	48.4	48.1	48.7	49.2	48.1	50.6
Citrus	49.1	47.8	50.9	48.9	48.5	49.1	49.9	49.5	50.6
College of the Canyons	49.7	49.4	50.4	49.2	49.1	49.4	49.3	48.8	50.1
East LA	50.3	47.0	54.8	48.1	47.1	48.6	49.6	49.1	50.2
El Camino	49.0	48.1	50.8	48.7	48.6	48.8	49.5	48.9	50.2
Glendale	49.5	49.1	50.8	49.2	49.0	49.3	49.7	49.4	50.0
LA Mission	49.6	49.4	50.5	49.6	49.4	49.7	49.4	48.9	50.3
LA Pierce	49.4	49.1	50.5	49.1	49.0	49.2	49.8	49.5	50.4
LA SW	49.9	49.8	50.3	49.8	49.7	49.8	49.7	49.3	50.3
LA Valley	49.4	48.9	50.8	48.9	48.7	49.1	49.3	48.2	50.5
Long Beach	48.4	47.4	51.0	48.4	48.2	48.7	49.5	49.1	50.2
Los Angeles	49.4	48.9	50.6	49.1	48.8	49.3	49.7	49.3	50.3
Los Angeles Harbor	49.6	49.4	50.0	49.5	49.4	49.5	49.5	49.0	49.9

Los Angeles Trade Technical	49.0	48.1	50.1	48.7	48.0	49.3	49.2	48.1	50.4
Mt. San Antonio	49.5	48.4	52.2	48.1	47.1	48.9	49.3	48.3	50.6
Pasadena City	49.2	48.8	50.4	48.7	48.5	48.9	49.7	49.4	50.2
Rio Hondo	49.8	49.0	51.9	49.2	49.2	49.3	49.7	49.3	50.3
Santa Monica	49.3	48.5	50.8	49.0	48.9	49.2	49.7	49.5	50.2
West LA	49.4	49.3	50.0	49.3	49.2	49.3	49.5	49.1	50.0
Coastline	49.7	49.2	50.2	49.7	49.6	49.9	49.5	47.3	51.0
Cypress	48.9	48.3	50.3	48.9	48.8	49.0	49.4	48.7	50.6
Fullerton	49.4	48.2	51.3	49.3	48.9	49.6	49.5	48.7	50.6
Golden West	49.2	48.7	50.5	48.7	48.6	48.8	49.7	49.0	50.3
Irvine Valley	49.8	49.6	50.3	49.6	49.6	49.6	49.9	49.5	50.3
Orange Coast	48.9	48.0	50.4	48.5	48.3	48.6	49.2	48.2	50.3
Saddleback	49.0	48.3	50.7	48.7	48.5	48.8	49.4	48.2	50.7
Santa Ana	49.4	48.6	51.3	49.0	48.8	49.2	49.8	48.9	50.9
Santiago Canyon	49.6	49.2	50.1	49.4	49.4	49.5	49.6	49.0	50.7
Merced									
Merced	65.0	55.6	79.6	58.4	54.0	62.9	69.2	57.4	76.8
Modesto									
Modesto Junior	72.9	63.0	89.1	64.8	61.9	72.8	74.7	63.4	86.5
Napa									
Napa Valley	69.5	50.0	92.0	61.2	50.8	73.2	-	-	-
Oxnard - Thousand Oaks - Ventura									
Moorpark	59.6	49.0	68.1	63.5	62.4	64.7	49.1	45.6	54.0
Oxnard	53.1	50.5	56.9	48.1	46.7	50.6	46.6	42.0	53.5
Ventura	47.8	44.6	53.8	48.9	47.5	52.8	51.8	47.3	59.9
Redding									
Shasta	63.1	54.5	78.0	57.0	48.0	66.9	73.5	62.6	86.0
Riverside - San Bernardino - Ontario									
Barstow	49.0	48.3	50.6	49.7	49.5	49.9	49.7	48.5	51.4
Chaffey	46.7	44.4	53.0	46.7	46.0	47.4	49.4	46.8	52.9
College of the Desert	48.6	47.8	51.8	48.7	48.3	49.0	49.0	47.0	51.0
Copper Mountain	49.6	49.3	50.3	49.6	49.4	49.8	49.5	48.9	50.2
Crafton Hills	48.1	46.5	53.0	47.4	46.6	48.2	49.8	48.9	50.9
Mt. San Jacinto	47.8	46.5	51.8	48.6	48.1	49.1	49.1	46.7	52.5
Palo Verde	49.1	48.1	51.1	49.4	48.9	49.8	49.5	48.8	50.2
Riverside	52.7	49.0	58.7	45.6	44.4	46.6	47.9	45.1	51.8
San Bernardino	47.6	45.9	51.5	47.3	46.8	47.7	48.5	45.8	52.3

Valley									
Victor Valley	47.6	45.8	55.5	47.7	47.2	48.4	49.8	47.3	53.2
Sacramento - Arden-Arcade - Roseville									
American River	52.8	48.0	60.8	48.0	46.9	49.3	51.9	48.5	55.9
Cosumnes River	48.5	46.3	53.4	46.7	46.2	47.2	49.5	46.5	51.8
Folsom Lake	49.5	48.5	51.5	48.9	48.6	49.2	49.7	48.0	50.7
Lake Tahoe	50.0	49.9	50.3	49.9	49.8	50.0	49.8	48.4	50.3
Sacramento City	49.7	46.4	54.2	44.9	43.5	46.4	50.2	46.7	52.8
Sierra	55.1	52.1	59.4	52.1	51.0	53.6	51.9	48.7	54.8
Woodland	50.1	50.0	50.2	49.9	49.9	50.0	50.1	48.8	51.4
Salinas									
Hartnell College	64.1	54.8	71.4	53.8	52.6	56.2	52.0	46.3	60.1
Monterey Peninsula	63.5	51.7	72.3	57.5	55.8	62.0	57.1	49.3	71.2
San Diego - Carlsbad - San Marcos									
Cuyamaca	50.3	48.8	52.9	49.4	49.1	49.7	50.5	48.3	52.6
Grossmont	50.7	47.5	58.8	51.0	50.5	51.4	50.3	47.9	53.1
Mira Costa	49.3	47.3	53.5	47.2	47.1	47.5	50.6	46.7	55.5
Palomar	51.1	48.1	57.7	48.8	47.9	50.6	51.7	46.2	57.3
San Diego	49.6	47.6	54.7	47.9	47.7	48.1	50.9	46.4	56.3
San Diego Mesa	51.0	48.2	55.0	49.4	49.0	49.8	50.3	47.6	53.6
San Diego Miramar	50.2	48.0	54.4	48.9	48.4	49.3	50.6	48.2	53.2
Southwestern	49.8	46.6	56.1	48.1	47.3	49.3	52.5	47.0	58.3
San Francisco-Oakland-Fremont									
Canada	48.6	47.8	50.2	48.5	48.2	48.7	48.9	48.2	50.2
College of Marin	49.1	48.8	49.7	49.0	48.8	49.3	49.1	48.3	50.6
College of San Mateo	49.5	48.3	51.1	49.0	48.5	49.5	48.7	47.7	50.2
San Francisco	45.8	43.5	51.5	44.1	43.8	44.9	49.0	47.6	51.2
Skyline	47.3	45.2	52.8	46.4	45.4	47.4	48.6	46.3	52.0
Berkeley	49.8	49.6	49.9	49.9	49.8	50.0	49.2	48.6	50.1
Chabot	48.3	47.3	50.8	48.0	47.5	48.5	48.8	47.5	50.5
College of Alameda	49.4	48.9	50.0	49.4	49.3	49.5	49.2	48.6	50.4
Contra Costa	48.7	47.7	50.4	48.6	48.1	49.1	49.0	47.8	50.6
Diablo Valley	48.2	46.3	50.7	47.5	46.8	47.9	48.9	47.7	50.7
Laney	49.2	48.4	50.8	48.9	48.7	49.1	48.9	48.2	50.1

Las Positas	49.3	48.6	50.4	49.1	48.9	49.3	49.1	48.0	50.6
Los Medanos	48.4	47.3	51.7	47.5	46.9	47.9	48.6	47.5	50.2
Merritt	48.9	47.2	52.3	48.2	47.7	48.6	48.9	48.0	50.5
Ohlone	48.8	48.4	49.9	48.7	48.5	49.1	49.1	47.2	51.5
San Jose - Sunnyvale - Santa Clara									
De Anza	49.4	47.4	55.6	45.4	44.4	47.3	48.9	46.3	54.4
Evergreen Valley	49.2	47.5	52.3	48.1	46.9	48.9	50.0	49.2	51.1
Foothill	48.8	46.2	57.2	46.7	46.1	48.3	49.5	46.9	55.2
Gavilan	48.3	46.8	52.2	47.6	47.0	48.1	50.6	49.0	53.7
Mission	49.4	48.3	52.4	48.4	47.9	48.9	50.1	47.5	53.4
San Jose	48.7	45.3	54.0	46.7	45.6	47.4	51.4	49.9	52.9
West Valley	50.3	48.6	53.6	48.7	46.9	49.2	50.0	48.0	53.1
San Luis Obispo - Paso Robles									
Cuesta	67.0	64.3	74.8	52.2	49.0	54.2	60.0	45.3	73.6
Santa Barbara - Santa Maria - Goleta									
Hancock	58.4	46.2	68.9	54.8	52.1	59.4	59.4	48.8	66.3
Santa Barbara	51.5	45.5	67.4	45.3	44.3	46.4	56.8	45.9	64.5
Santa Cruz - Watsonville									
Cabrillo	66.2	54.1	87.5	53.6	49.6	62.7	63.7	51.6	76.3
Santa Rosa - Petaluma									
Santa Rosa	65.9	58.6	76.3	70.3	64.4	77.2	60.2	40.7	75.1
Stockton									
San Joaquin Delta	73.0	60.8	87.4	65.3	59.9	79.5	74.4	69.1	83.6
Vallejo - Fairfield									
Solano	75.1	67.7	90.3	72.4	68.6	79.7	73.4	66.1	83.7
Visalia - Porterville									
College of the Sequoias	58.7	45.8	84.0	58.0	53.8	64.6	62.5	50.2	73.9
Porterville	49.7	39.6	62.7	45.9	41.6	47.6	52.9	49.6	58.4
Yuba									
Yuba	66.4	56.3	82.3	56.8	53.7	63.4	70.1	54.6	83.1

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