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ECONOMIC CONDITIONS AND ENROLLMENT AT
COMMUNITY COLLEGES IN HAWAI'I:
A MULTIPLE CASE STUDY

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ABSTRACT

Enrollment management is receiving increased attention at community colleges across the nation due to decreasing state appropriations causing increased reliance on tuition revenues for operating funds. Tuition revenues depend on enrollment and although there are many factors that impact enrollment levels, economic conditions, have long been considered of primary importance. This study examines the relationship between economic conditions and enrollment at community colleges in each of the four counties located within the State of Hawai'i and how this relationship differs by county. Time-series data for the period 1973 to 2005 are used. Results show that county economic conditions do impact enrollment but that different economic variables affect individual counties. Also, the results show that county economic conditions have a greater impact on both headcount and full-time equivalent enrollment than statewide economic conditions. These findings have implications for community college enrollment managers who grapple with predicting future tuition revenues in varying economic conditions.

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LIST of ABBREVIATIONS

AAPI - Asian American and Pacific Islander (Serving Institutions)

CPI - Consumer Price Index: a measure of the prices paid by consumers for a representative market basket of goods and services.

ENR – Enrollment

GDP- Gross Domestic Product: the total value of all final goods and services produced within an economy for a specific time period..

FTE - Full-time Equivalent (Enrollment): the total number of credit hours divided by the number of credit hours considered to be full-time (12 credits).

HC- Headcount (Enrollment): the actual number of students enrolled in credit courses. It includes concurrent, early admittance, and other special categories of students.

HS – High School

PCHC – Per Capita Headcount (Enrollment): headcount enrollment divided by the population.

PCFTE – Per Capita Full-time Equivalent (Enrollment): full-time equivalent enrollment divided by the population.

PCY – Per Capita Income: total income divided by the population.

PCYCH – Change in Per Capita Income: the difference between Per Capita Income in one period to the next.

UR – Unemployment Rate - the percentage of the labor force not working.

CHAPTER 1

INTRODUCTION

Background

When Joliet Junior College in Illinois opened its doors in 1901, no one anticipated that the event would go down in history as the birth of a unique American institution—the Community College (American Association of Community Colleges, 2001). During the following years, changes in the economy such as the growing need for skilled workers to operate the machinery in an increasingly industrialized nation and society's view that education enhances social mobility, created an environment that fostered rapid growth in the number of junior colleges opening across the nation (Cohen & Brawer, 2003). In 1930 there were 440 public junior colleges. By 1940 the number had grown to 610 and has continued to steadily increase (Cohen & Brawer, 2003). In 2005, just over one hundred years later, over 6.1 million students, almost 48% of all undergraduates enrolled in public institutions of higher education, were enrolled in 1036 community colleges nationwide (US Department of Education National Center for Education Statistics, 2006).

The success of the nation's community colleges is directly linked to their open-door policy which began not only because of the need for skilled workers and the ideal of an upwardly mobile society but also because of the increasing variety of students who could not be accommodated by traditional post-secondary institutions (Cohen & Brawer, 2003). According to Hendrick, Hightower, and Gregory (2006) part-time students, commuters, employed students, low-income and low achieving students from lower socio-economic groups who often also belong to minority groups, all find access

to education through the community colleges. The expansion of access to higher education for these groups, particularly minorities, has changed the face of higher education (Cohen & Brawer, 2003). Forty-five percent of community college students are first generation college students, 15% speak a language other than English at home (Bailey & Jacobs, 2004) and almost half of the 4.3 million minority students enrolled in degree-granting institutions of higher education are enrolled in 2-year colleges (US Department of Education National Center for Education Statistics, 2006).

According to Cohen and Brawer (2003) when referring to Community Colleges, “Two words sum up the students, *number* and *variety*” (p.37). The numbers are certainly impressive as evidenced above and perhaps the easiest way to explain the variety is to say that a community college student is not likely to be the stereotypical “traditional” student, a just graduated from high school 18 year old, who enrolls full-time in college, is financially dependent, and does not work or only works part-time (Hamm, 2004; Weber, 2004). According to Weber (2004), “the typical student might be a twenty-eight-year-old bartender raising two children, a forty-year-old laid-off steel worker on unemployment compensation, or a sixteen-year-old high school sophomore who qualifies for advanced placement courses” (p. 49). In other words, the traditional community college student is non-traditional, as 89.5% of community college students in 1999-2000 are either financially independent, work full-time, attend part-time, delay enrollment after high school, have dependents, are a single parent or do not have a high school diploma (National Center for Education Statistics, 2003).

Today, community colleges face challenges that have arisen from their open-door policies and the expansion of their broad “all things to all people” missions

(Hendrick et al., 2006). One such challenge is obtaining sufficient funds to provide pre-baccalaureate, vocational, remedial, workforce development, continuing education, community service, and other programs in response to community needs (Cohen & Brawer, 2003). Community colleges obtain their funding from many sources including state appropriations, local taxes, and tuition (Cohen & Brawer, 2003) but they are heavily reliant on state revenues as 44% of their funding comes from state appropriations (Bailey & Morest, 2006). Although state appropriations to higher education grew during the 1990's, the growth has not kept up with inflation (Schmidt, 2002). For example, state appropriations fell 13% in constant dollars in 2003 but growth in enrollment from 2000-2003 was 20% (Bailey & Morest, 2006). The result has been increases in tuition (College Entrance Examination Board 2004 cited in Bailey & Morest, 2006).

Bailey and Morest (2006) also claim that the current financial situation of the nation's community colleges is a threat to the educational equity mission. Betts and McFarland (1995) note that decreases in state appropriations which lead to reduced funding dilute the quality of education. This is due to the short term reaction which is most often to decrease the number of course sections, and/or increase class size which jeopardizes quality (Betts & McFarland, 1995). Increases in tuition may also hinder access, and this combined with a reduction in the number of courses/sections offered frustrates current and potential students (Betts & McFarland, 1995). Community colleges did initially respond by cutting programs to balance budgets but are now looking toward increasing their revenues, using options borrowed from business and private colleges such as private fundraising, outsourcing, and for-profit endeavors

(Hendrick et al., 2006). The national trend, however, shows a shift towards mounting dependence on tuition as a source of revenue (Cohen & Brawer, 2003), not just for community colleges but for all of higher education (Lee & Cleary, 2004). As tuition revenues are directly linked to enrollment, this trend, coupled with increasing competition for students, has led to more institutions appointing enrollment management officers (Lee & Cleary, 2004) and utilizing market models and strategies never before considered in public higher education (Kurz & Scannell, 2006).

Competition for students has been on the rise for many years. Institutions of higher education increased their capacity in response to the GI Bill and the Truman Commission, but in the 1970's and 1980's the number of high school graduates began to decline and institutions found themselves with excess capacity that led to greater competition for the available students (Hossler, 2004). In addition, in more recent years, public institutions have faced competition from proprietary institutions which are a special class of private institutions chartered as for-profit corporations or businesses (Lee & Cleary, 2004). Some proprietary institutions offer degree programs, but the majority offer specialized occupational training programs of short duration aimed at supplying workers for specific industries or retraining workers (Lee & Cleary, 2004). Enrollment at proprietary institutions increased by 128.1% from 1990 to 2000 (Lee & Cleary, 2004) and the competition is predicted to intensify as long as their students continue to be eligible for state and federal financial aid (Cohen & Brawer, 2003).

Although community colleges are generally less expensive, students often opt for the more expensive route and enroll at institutions such as the University of Phoenix, DeVry University or local enterprise colleges due to the perception that they

can reach their goal of “getting a job” faster (Hamm, 2004). Online learning is not a competitor in itself as it is a delivery mode, but it is used by competitors to entice students into their programs (Hamm, 2004).

In order for community colleges to remain attractive, they are going to have to be flexible, create programs to meet the diverse needs of a wide variety of students and be more than just a low-cost alternative in higher education (Hamm, 2004). However, it is predicted that demand for education will increase and community colleges may face capacity constraints if they don't plan accordingly (Martinez, 2004). Also, it's not just for-profit or proprietary institutions who compete with community colleges for students (Hamm, 2004). Four-year public institutions also compete but according to Hamm (2004) no data can be found to determine how many students may be affected.

Four-year institutions predominantly focus their enrollment management strategies towards increasing the number of applications and yield (Kurz & Scannell, 2006). However, community colleges with their open-door policies, although concerned about the number of applicants, place more focus on student services (Ritze, 2006). This increases retention which stabilizes enrollment and addresses a community college's financial dependence on student enrollment (Ritze, 2006).

Community colleges face the difficult task of enrolling students who have the most daunting economic, educational, and social barriers to their education while having the fewest resources available to serve those students (Bailey & Morest, 2006). Thus, it is important for administrators and enrollment managers at community colleges to have accurate information regarding the factors that determine enrollment, in order to respond appropriately and ensure that sufficient numbers of students enroll. Many

factors have been identified that influence a student's decision to enroll in a community college. These include: the direct cost of the education (tuition), the indirect cost of the education measured by foregone earnings while in college (opportunity cost), the tuition at other institutions, family income, rate of return to post-secondary education, the availability of financial aid, and other factors (Betts & McFarland, 1995; Hoenack & Weiler, 1979; Jackson & Weathersby, 1975).

Many of the factors, which are accepted as determining the level of enrollment, relate to prevailing economic conditions. Witt, Wattenbarger, Gollattscheck, and Suppiger (1995) recognized this relationship as early as the Great Depression of the 1930's and concluded that "American higher education had witnessed a cause and effect that would continue to the present: in every subsequent depression, recession and economic downturn, enrollment in these 2-year colleges would increase" (p.96). Referring to more recent years, other authors have included statements that attest to the belief that when economic activity decreases, enrollment increases and vice versa (Betts & McFarland, 1995; Pennington, McGinty, & William, 2002; Sundberg, 1998).

Sundberg (1998) for example begins her report on enrollment at an Illinois community college with the statement, "It is a widely held belief that low unemployment rates gives [*sic*] rise to lower enrollments for community colleges" (p.5). Pennington et al. (2002) begin their study on national community college enrollment with a similar statement, "It is a widely held belief by the leadership of community colleges that when the economic condition of the nation is bad, enrollment at the nation's community colleges will grow" (p.431). Although worded slightly differently, Betts and McFarland (1995) convey the same sentiment by asserting, in the introduction

to their study on the impact of business cycles on enrollments and finances, that “Recessions drive people into community colleges, as community colleges administrators have long observed” (p. 742).

Despite the anecdotal evidence, however, there is little empirical evidence to support these assertions and several studies have shown only a weak relationship between enrollment and unemployment (Betts & McFarland, 1995). However, the models, variables and data used in these studies vary considerably and cannot be generalized to every college or geographic area (Sundberg, 1998). Sundberg (1998) also suggests that the relationship between enrollment and unemployment should be accurately determined in order for a college to respond with appropriate marketing strategies. While some studies of this relationship have been conducted in other areas of the country, none have been conducted in Hawai‘i that specifically target community colleges at the statewide or the individual county level. Thus, this study investigates the nature of the relationship between economic conditions and enrollment at community colleges in Hawai‘i using time series state and county data.

Statement of the Problem

Prior to 1995, tuition received from all students in the University of Hawai‘i system was deposited into the State’s General fund and the University of Hawai‘i system received an appropriation from the General fund for operating expenses (University of Hawai‘i Budget Office, 2007). However, Act 161 which gave the University the right to set and keep tuition revenues was passed by the state legislature in July 1995 (Mortimer, 1998). This fundamentally changed the structure of financing the entire University of Hawai‘i system (Mortimer, 1998). The State still provides

funding for higher education and each of the seven Community Colleges in the system receives an allocation (University of Hawai'i Budget Office, 2007), so each individual community college campus is predominantly funded through a combination of state appropriations and its own tuition revenues. But state appropriations fell after the passing of Act 161 in 1995. In 1996-97 tuition increased by approximately 50% for most students and increased again by approximately 20-23% for the 1997-98 academic year (Mortimer, 1998). Further increases in tuition have ensued (University of Hawai'i Institutional Research Office, 2007). State appropriations have fluctuated and are only now reaching pre-1995 levels, unadjusted for inflation (University of Hawai'i Budget Office, 2007).

In effect, Act 161 made each community college in Hawai'i dependent on its own tuition revenues for operating funds, especially in light of decreasing or unpredictable state appropriations. But even if state appropriations are stable, tuition revenues could fall below projections, causing budget shortfalls which could impact program offerings.

Purpose of the Study

The general purpose of this study is to add to the existing literature on the relationship between economic conditions and enrollment at community colleges in Hawai'i. Specifically, it will examine the relationship between economic conditions in four counties: the City and County of Honolulu, the County of Maui, the County of Kauai, and the County of Hawai'i and the level of enrollment at the community colleges located in those counties, in order to discover the nature of that relationship.

Many of the studies conducted in this area use national data to examine the relationship between economic conditions and enrollment, [e.g. Heller (1996) and Pennington et al. (2002)]. This study assumes that the enrollment decisions made by students in Hawai'i are affected by local rather than national economic conditions. It also assumes that the unique geographic environment, with separate counties on different islands, creates differing economic conditions for each county.

Need for the Study

The Setting

Community colleges in Hawai'i became part of the University of Hawai'i system when the state legislature enacted the Community College Act in 1964 (S.L.H. 1964, Act 39). The system is presently comprised of 10 campuses, 3 UH-Centers, and some distance learning sites across the six Hawaiian islands (University of Hawai'i, 2007a). The flagship 4-year Research I institution, the University of Hawai'i at Mānoa, is located in Honolulu on the island of Oahu (the City and County of Honolulu) (University of Hawai'i, 2007a). Also located on Oahu is an upper division institution, the University of Hawai'i at West Oahu and four community colleges: Honolulu Community College, Kapi'olani Community College, Leeward Community College and Windward Community College (University of Hawai'i, 2007a). Located on the island of Hawai'i (County of Hawai'i) is the University of Hawai'i at Hilo, a 4- year institution; Hawai'i Community College, which is also located in Hilo; and the West Hawai'i UH Center in Kona. Kauai Community College and a UH Center are located on the island of Kauai (County of Kauai), and Maui Community College and Maui UH

Center are on the island of Maui, and distance learning sites are located on the islands of Maui, Molokai, and Lanai (County of Maui) (University of Hawai'i, 2007a).

The seven community colleges make up the University of Hawai'i Community College System (University of Hawai'i, 2007a). They offer a wide selection of credit and non-credit courses and other activities (University of Hawai'i, 2007a). At present the community college system educates approximately 25,000 students per semester in three major areas: for transfer to baccalaureate institutions, in vocational non-degree programs and a variety of Associates degrees (University of Hawai'i Institutional Research Office, 2007). The majority of these students (90.4%) are residents of Hawai'i and 66.4% of the total student population is classified as Asian/Pacific Islander. The predominant minority groups nationwide, African Americans and Hispanics, only account for 1.1% and 2.1% respectively and the white, nationwide majority group only accounts for 15.6 % of students. All seven community colleges in Hawai'i are classified as Asian American and Pacific Islander-Serving Institutions (AAPI) (Laanan & Starobin, 2004). In fact, they are ranked the top seven campuses in the nation in terms of the numbers of AAPI students. Leeward Community College has 81% and Maui has 61% fulltime equivalent (FTE) AAPI students and the rest of the community colleges fall in between. Only 17 other community colleges in the nation, all located in California have more than 25% FTE enrollment of AAPI students (Laanan & Starobin, 2004).

In addition to the public University of Hawai'i system, there are 13 private degree granting institutions in Hawai'i (US Department of Education, 2006). Three of

these, Transpacific Hawai'i College, Heald College and Hawai'i Business College, are 2-year institutions (US Department of Education, 2006).

National Enrollment Trends

Nationally, enrollment in 2-year and 4-year institutions has been increasing for the past 35 years (US Department of Education National Center for Education Statistics, 2006). During this time enrollment at 4-year institutions has grown steadily at around 4% per year while enrollment at 2-year institutions experienced rapid growth in the 1970's, slowed in the 1980's and 1990's, and has been increasing during the past six years (US Department of Education National Center for Education Statistics, 2006). Total enrollment at degree-granting institutions is expected to increase by 13% – 18% during the period 2004 to 2015 (US Department of Education National Center for Education Statistics, 2006). The most important factor affecting this prediction is the expected increase in the number 18-24 year olds in the population (US Department of Education National Center for Education Statistics, 2006).

Much of the total growth in higher education enrollment between 1976 and 1994 was in the nation's community colleges (Heller, 1996). In 1976, there were fewer students attending community colleges than in 4-year institutions, but by 1994 community college enrollment was greater than enrollment at 4-year institutions by over 500,000 students (Heller, 1996). However, in 2004, the number of community college students enrolled fell to 48% of all undergraduates (US Department of Education, 2006).

Total community college enrollment is predicted to grow by 10% between 1996 and 2008 (Bryant, 2001). Part-time enrollment was 64% of total community college

enrollment in 1997 (Bryant, 2001) and is predicted to grow by 10% overall by 2015 (Pullman, 2006). The relatively high number of part-time students is explained by the fact that less than 16% of the students are not employed (Wilson, 2004). Fifty-four per cent of community college students work fulltime and 30% work part-time (Weber, 2004; Wilson, 2004). Possibly because over 30% of them are married, one third have at least one dependent, and 16% are single parents who have limited incomes (Weber, 2004; Wilson, 2004). Female students are likely to be single parents with at least one job, sometimes two (Weber, 2004). The trend toward more female community college students has been ongoing for some time and is predicted to continue for at least the next ten years (Wilson, 2004).

In addition to the increase in the number of 18-24 year olds, Andrews (2003) identifies three major national trends currently affecting community college enrollment: increases in the numbers of dual-credit and dual (concurrent) enrolled students, reverse transfer students, and job retraining. Dual credit students are defined as secondary school students who are enrolled in courses for which they receive both secondary school and college credit (Andrews, 2003). Dual or concurrent students are secondary school students who take college courses but only receive college credit for doing so (Andrews, 2003). Dual enrollment increased nationally from 96,913 in 1993 to 123,039 in 1995 and was predicted to reach 500,000 in 2003 with very high program growth in Missouri, Oklahoma, Virginia, Washington, Florida and other states (Andrews, 2003). 48 states had dual enrollment programs in 2001 and although these students comprise a very small percentage of total enrollment, their numbers are expected to grow (Bryant, 2001).

Approximately 16% of community college students are considered reverse transfer students (Bryant, 2001). Reverse transfer students are those who are enrolled at a community college even though they have already completed a baccalaureate degree or they are students who have been unsuccessful at a 4-year institution (Bryant, 2001). Those who have already completed a baccalaureate degree are generally enrolling at a community college for career training (Andrews, 2003). Non-completers of a baccalaureate degree tend to have an average age of 29 (the same as the average age for all community colleges students) and have a wide variety of reasons for enrolling at a community college including anything from financial difficulties, to lack of family support, immaturity, and/or academic failure (Andrews, 2003).

Community colleges have been involved in workforce development since the 1990's (Andrews, 2003). Grubb and Lazerson (2005) assert that community colleges became more involved with occupational preparation even earlier in response to a belief that more semiprofessionals and technical workers would be needed by the 1980's (Grubb & Lazerson, 2005). In some areas Federal and state programs such as Welfare to Work have encouraged enrollment for short-term job-training (Andrews, 2003). These programs rarely last for more than fifteen weeks and are often only open only to specific groups, like the long-term unemployed, dislocated workers, or welfare recipients (Grubb, 1988).

Enrollment Trends in Hawai'i

According to "*Measuring our Performance*", (University of Hawai'i, 2006) enrollment in the University of Hawai'i system grew rapidly immediately following World War II, then went through a period of relative stability before achieving modest

gains during the 1970's and 1990's (University of Hawai'i, 2006). System enrollment is expected to remain relatively stable at approximately 50,000 students (University of Hawai'i, 2006). Since Fall 1996 over 55% of system students were full-time (University of Hawai'i, 2006).

Enrollment Trends at Community Colleges in Hawai'i

Enrollment in Hawai'i's seven community colleges grew rapidly from their creation in 1964 to the mid-1970's (University of Hawai'i, 2006). Since then enrollment has followed the system trend with peak headcount enrollment of 27,783 students in Fall 1994, a decrease in the following few years to a low headcount enrollment of 23,777 students in Fall 2000 (University of Hawai'i, 2006). In Fall 2006, there was total of 25,260 students enrolled (University of Hawai'i Institutional Research Office, 2007). Overall population growth in the state has averaged approximately 2% per year from 1970 to 2000 (State of Hawai'i, 2006).

Following the national trend, Hawai'i established a dual-enrollment program in conjunction with the state Department of Education in 2000 (Haig, 2002). The program, called Running Start, was piloted at Honolulu Community College for two years (Haig, 2002). Presently, all seven community colleges and UH-Hilo participate in the program which allows high school students to enroll in college courses for credits which can be applied to both the high school diploma and a college degree (University of Hawai'i, 2006). Headcount enrollment in the Running Start program has more than tripled since Fall 2002 when 66 students enrolled for courses at participating community colleges (K. Jaycox, personal communication, February 14, 2007). This number increased to 259 in Fall 2006 (K. Jaycox, personal communication, February 14, 2007).

With respect to workforce development, community colleges in Hawai'i also follow the national trend by emphasizing workforce development as a key objective in their strategic plans (University of Hawai'i, 2007a). Individual colleges create specific programs to train students for employment in shortage areas (University of Hawai'i, 2006).

So while the community colleges in Hawai'i follow the national enrollment trend in workforce development and increasing dual enrollments, there are no empirical data to support the existence or increase in the number of reverse transfer students. Also, although the number of 18-24 year olds is projected to increase nationally, the number of high school seniors in Hawai'i is projected to decrease annually from 2006 to 2012 (University of Hawai'i Institutional Research Office, 2007). However, this decrease is projected to occur in the City and County of Honolulu only, while the other counties project modest increases (University of Hawai'i Institutional Research Office, 2007).

National Economic Trends

The period covered by this study begins in the 1970's, a decade characterized by stagflation, a condition of high unemployment and high inflation (US Department of State, 2006). The economy fell into recession in the early 1980's. In fact, the unemployment rate rose to over 9% in 1982, but by 1983 inflation slowed and the American economy began a period of sustained economic growth continuing into the 1990's (US Department of State, 2006). At the end of 1999 unemployment was at 4.1%, the lowest rate in nearly 30 years (US Department of State, 2006). In 2001, in the wake of September 11th, the economy fell into recession but recovered quickly (Kane &

Hederman, 2004). Since then the economy has continued to grow and the unemployment rate decreased from over 5.5% in 2003 to 4.5 % in 2006 (Federal Reserve Bank of St. Louis, 2007).

Since 1970, the US economy has grown at an average of 3.16 per cent per year (Kane & Hederman, 2004). Cohen and Brawer (2003) thus describe the US economy as “a great economic engine Barring major upheaval such as expansion of the limited war that began in 2001, a depression or a severe inflation the nation will be able to continue educating more of its youth...” (p. 403). Even with the expansion of the Iraq war, the US economy has continued to grow, although the growth slowed to 2.2 percent in 2007 (Bureau of Economic Analysis, 2008).

Economic Trends in Hawai‘i

Hawai‘i’s economy, measured in terms of real gross state product, grew an average rate of 4.4 % between statehood in 1959 and 1990 but slowed considerably between 1990 and 1996 to a rate of just 0.5% (Department of Business Economic Development and Tourism, 1998). But this slow growth of Hawaii’s economy took place while the nation was experiencing one of the strongest expansions in U.S. history (Department of Business Economic Development and Tourism, 1998). Neubauer (1997) also references this period of slow growth as evidence of Hawai‘i’s separateness from the trends of the national economy because as the US economy moved into a period of prosperity, Hawai‘i continued to “languish in a stubborn recession” (Neubauer, 1997, p. 2). This recession resulted in lowered state revenues and unemployment rates higher than the national average (Neubauer, 1997).

Hawai'i pulled out of this recession and has been growing since 1997 with a relatively brief slowdown caused by the events of September 11, 2001 (Laney, 2006). From May 2004 to May 2006, Hawai'i had the lowest monthly unemployment rate in the nation and projections forecast little change in the near future (Laney, 2006). In 1997, the national unemployment rate was slightly above the rate in Hawai'i (Laney, 2006). However, the rate in Hawai'i increased slightly and was above the national rate until 1999 when it dipped below the national rate and has remained there (Laney, 2006).. During this period the Hawai'i rate averaged below 3% while the national rate averaged above 5% (Laney, 2006).

Simply defined the national unemployment rate¹ is an average of the rate for each of the 50 states. Using the same simple definition, Hawai'i's unemployment rate is an average of all counties in Hawai'i, and just as there are differences in state rates (above or below the national average) there are differences in the county rates within Hawai'i. Historically, the unemployment rates in the counties of Maui, Kauai, and Hawai'i have been above the rate in the City and County of Honolulu (Laney, 2005). In 1997, there was a difference of approximately 4%; however, this gap has been closing (Laney, 2005) and the rate in the counties of Maui and Kauai in 2006 is below the state average (Laney, 2006). Laney (2005) also claims that there are areas within the counties where the unemployment rate is less than 1%. So, measured specifically in terms of the unemployment rate, Hawai'i's economy does not consistently follow the national trend and the some counties located within Hawai'i have been consistently above the state average until recently. As Hawai'i is the only island state in the United States, its

¹ The unemployment rate is the percentage of the labor force (either nationally or by state) that is unemployed at a given time or it is sometimes referred to as the total number of those in the labor force (either nationally or by state) actively looking for a job but unable to find one (Miller, 2005).

geographic location in the middle of the Pacific creates economic conditions that are often contrary to the trends in the national economy. It has been said that Hawai'i reacts as much to the fluctuations in the Japanese economy, given the dependence of the economy on tourism, as it does to national trends (Neubauer, 1997).

Sundberg (1998) claims, after studying enrollment at a community college in Illinois, that there is a "need to accurately determine how unemployment rates affect enrollment at specific schools..." (p.11) and Betts and McFarland (1995) assert that if community colleges are to be effective they must be able to respond quickly to changes in the labor market (Betts & McFarland, 1995). This study is targeted specifically at the relationship between economic conditions and enrollment at community colleges located in the isolated state of Hawai'i. It provides increased understanding of the economic factors that affect the enrollment decision of community college students in each county and thus the community college administrators in each county will be able to use the information in order to be more effective in their marketing endeavors and enrollment management.

Theoretical Foundation

Human capital theory has its roots in the writings of British economists Adam Smith (1723-1790) and even prior to that, Sir William Petty (1623-1627) (Becker, 1993). It was Theodore Schultz (1902-1998), however, who contributed and stimulated further research on the theory. Jacob Mincer (1922-2006) and Gary Becker (1930-) developed and refined the empirical foundations and Gary Becker's book published in 1964, *Human Capital: A theoretical and empirical analysis with special reference to education*, has become the standard reference on the subject (Henderson, 2002). Thus,

human capital theory, as described in *Human Capital: A theoretical and empirical analysis with special reference to education* (Becker, 1993) will provide the basic theoretical foundation for this study.

Becker's landmark study points out, among other things, that human capital is like any other type of capital and can be invested in through education and training which will lead to an improvement in the quality and level of production (Henderson, 2002). Thus, human capital can be briefly defined as, "a measure of the economic value of an employee's skill set" (Farfax, 2006). The concept of human capital recognizes that not all labor is equal and that employers can improve the quality of their employees by investing in them and that individuals can enhance their own abilities by investing in themselves through education and training (Becker, 1993).

Few early economists recognized the importance of including the acquired abilities and skills of the working population as part of a nation's wealth (Schultz, 1961). While people (labor) were considered to be a valuable component of productive processes, some economists perceived that there was something immoral about viewing people as capital to be invested in, as they saw it as linked somehow to slavery (Schultz, 1961). But as Schulz (1961) points out, "By investing in themselves people can enlarge the range of choice available to them." (p. 2).

Becker (1993) noted that much of the research in the area of human capital in the years prior to his study in 1964, was either conducted or stimulated by Schultz. So Schultz is credited by some sources as having invented the term human capital to reflect the value of our human capacities (Farfax, 2006). However, Becker is considered a cofounder, with Schultz, of the topic (Henderson, 2002). The essence of human capital

theory is that expenditure on training and education is costly and should be considered an investment since it is undertaken by individuals with a view to increasing personal incomes (Scheiding, 2000). So other things being equal, personal incomes vary according to the amount of investment in human capital; that is, the education and training undertaken by individuals or groups of workers (Schultz, 1961).

Although this study addresses mainly individual decision-making, human capital theory is not just an individual concern. Society as a whole derives economic benefits from human capital investments in their citizens (Noland *et al.*, 2007). An educated workforce increases productivity, and contributes to the general economic welfare of society, which is the reason why many societies provide governmental support for public education (Becker, 1964).

According to Becker (1993), there are four basic tenets of Human Capital Theory: people make investments in themselves which will yield returns over a long period of time, these investments relate to the acquisition of skills, employees have skills that employers “rent”, and costs are born in the present for expected future benefits. The basic theory categorizes human capital investments into four different types: education, on-the-job training, job search, and health (Becker, 1993), although this discussion will focus primarily on investment in formal education with some reference to on-the-job training. Costs are also divided into different categories: out-of-pocket or direct costs (including psychic losses), forgone earnings or indirect costs (better known in economics as opportunity costs) (Becker, 1993). The expected benefits are higher future earnings and non-pecuniary benefits such as prestige and power (Becker, 1993). In terms of cost-benefit analysis, a person would invest in human

capital as long as the present value of the benefits is greater than the present value of the costs (Becker, 1993). This study focuses on the aspects of human capital theory that are related to education which is considered to be an intangible good and has the improvement of human capital as its main economic effect (Schoppmeyer, 1992).

The expected benefit is predominantly higher future earnings but non-pecuniary benefits such as prestige and power can also be considered (Becker, 1993) as economists don't deny the existence of non-monetary values but focus more on outputs that can be measured in dollars (Douglass, 1997). There are, however, two different types of costs which must be considered: direct and indirect (Becker, 1993). The direct costs are the actual out-of-pocket expenditures made for tuition, books, etc. while the indirect (or opportunity) costs are predominantly the earnings foregone in order to attend college (Becker, 1993).

The results of Becker's (1993) analysis lead to the following conclusions: the probability of going to school increases as the cost of going to school decreases, as expected wages after college increase, as wages given up (foregone earnings) when in college decrease, as the number of years working after school increases, and as the internal rate of return decreases (Becker, 1993).

It should be noted that human capital theory recognizes that individual decisions are made under a degree of uncertainty mostly related to the difficulties measuring key variables such as future income or the appropriate interest (discount) rate (Beattie, 2002; Becker, 1993). It is also noteworthy that it is younger people who are more likely to invest in human capital, and they have a tendency to be more unaware of their abilities and the available investment possibilities than their older counterparts (Becker,

1993). The theory also recognizes that there is a difference in how much emphasis individuals give some areas over others when making school or work decisions (Beattie, 2002). Changes in work schedules are often cited by students as a reason to leave community colleges (Cohen & Brawer, 2003), which indicates that work may be considered a higher priority. Also, higher wages and lower unemployment rates lead to lower reenrollment probabilities for those who interrupt their undergraduate education (Stratton, O'Toole, & Wetzel, 2004). From this foundation, this research explores the nature of the relationship between enrollment at community colleges in the State of Hawai'i and economic conditions.

Research Questions

The two research questions are:

1. What is the nature of the relationship between enrollment at the community colleges in each of the four counties in the State of Hawai'i and the economic conditions in that county?
2. How does this relationship differ by county?

By exploring these research questions, this study fills the need for a comprehensive investigation of the effects changing economic conditions have on enrollment at community colleges in Hawai'i. This, in turn, will inform policy-makers, administrators and enrollment managers, enabling them to make informed decisions.

Hypotheses

Hawai'i's location, relative to the other 49 states, makes it less likely that students contemplating enrolling at a community college will consider going out of state as an option. In Fall 2004, only 2.7% (66 students) of all freshmen who graduated from

high schools in Hawai'i in the previous 12 months left the state to go to institutions other than 4-year degree granting institutions (US Department of Education National Center for Education Statistics, 2006). Also, as the counties are on separate islands, the direct costs of attending a community college that is not located in the resident's county are higher, even though tuition rates across the community college system are almost equal. Commuting between the islands is prohibitively expensive and dormitories are not readily available where they do exist. This leads to students making their enrollment decisions based predominantly on local conditions rather than national conditions or those in other counties. Opportunity costs, in terms of foregone earnings, may also differ across counties.

Based on human capital theory, the perceived opportunity costs of attending a community college in Hawai'i increase as economic conditions improve, thereby increasing the likelihood that students will choose to work. The unemployment rate measures the probability that a job can be found. Thus, as the unemployment rate decreases (economic conditions improve) the probability of being able to find a job increases. Also, once a job is secured, the employer may offer longer hours.

Therefore, the hypotheses, based on the two research questions are:

1. Community college enrollment in each of the four Hawaiian counties decreases as local economic conditions improve and increases as local economic conditions worsen.

The null hypothesis is that economic conditions have no effect on enrollment.

2. Community college enrollment differs across counties due to the differences in local economic conditions.

The null hypothesis is that there is no difference between counties.

Summary

Enrollment projections include such economic factors as unemployment rates and disposable income (Pullman, 2006) and there has been some research investigating the effects of changing economic conditions on enrollment (Betts & McFarland, 1995; Pennington et al., 2002; Sundberg, 1998; Wyoming Community College Commission, 1999). There is little definitive evidence, however, that the widely held belief regarding the link between enrollment and economic conditions holds true for all community colleges in all geographic areas (Sundberg, 1998).

Chapter 2 of this study examines the literature in support of the research purpose and questions. Chapter 3 describes the methods used to conduct the research. Chapter 4 presents the findings pertinent to each of the research questions and Chapter 5 summarizes the findings and discusses their implications.

CHAPTER 2

LITERATURE REVIEW

Introduction

The existing research regarding enrollment in institutions of higher education can be found in the literature of both economics and education. The majority focuses on 4-year institutions or higher education as a whole with relatively little specifically focused on community colleges.

Student Demand Models

Fuller, Manski, and Wise (1982) claim the econometric literature on the subject of enrollment, or the college going decision; can be categorized into two branches. One branch uses the revealed preference of a student between available work and school alternatives (Fuller et al., 1982). The other branch estimates equations with enrollment as a function of student characteristics and available schools (Fuller et al., 1982).

Jackson and Weathersby (1975) divide the seven models they review into two categories: regression models and choice models. But Leslie and Brinkman (1987) in their review of twenty-five studies, which examine the relationship between economic factors and student enrollment, categorize them all as student demand models. Included in Leslie and Brinkman's (1987) review, however, are studies that may be better defined as choice theory or revealed preference models (Jackson & Weathersby, 1975). These studies focus on individuals evaluating available options and the probability that one option will be selected, with the assumption that there is utility or satisfaction associated with each option (Fuller et al., 1982; Jackson & Weathersby, 1975).

Categorization of the models is further confused by Heller's (1996) assertion that

student demand models fall into two categories: those utilizing cross-sectional data and those using time-series data. However, Heller (1996) then concludes that all studies, whether investigating individual or aggregate enrollment choices, have come to be known as student demand studies (Heller, 1996).

Regardless of categorization, it is difficult to compare studies because they use different variables, different time periods, different theoretical foundations and models, different data (time-series, cross sectional, or a combination of both), different data sources, and have different foci (national, state, area or individual institutions) (Leslie & Brinkman, 1987). This explains why both Jackson and Weathersby (1975) and Leslie and Brinkman (1987) attempt to standardize the results for comparison in the studies they review.

Leslie and Brinkman (1987) further define student demand studies as applications of the economic theory of demand, where the quantity of any good that will be purchased is a function of that good's own price, income of the buyer, the price of available substitutes, and the tastes and preferences of the buyer (Leslie & Brinkman, 1987). Student demand studies therefore view the level of enrollment (the quantity purchased) as a function of tuition (the price), the level of student aid (which affects price), and the tuition charged by other institutions, and students' preferences (Leslie & Brinkman, 1987).

Jackson and Weathersby (1975) reviewed seven student demand models published between 1966 and 1974 and concluded that the cost (the price of tuition) to the student is statistically significant and has a negative sign. Leslie and Brinkman (1987) examined twenty-five studies published from 1970-1982 (including some

already contained in Jackson and Weathersby's (1975) review) and all of the studies showed the expected result that enrollment declines when tuition rises (Leslie & Brinkman, 1987). Two of the studies (Berne (1980) and Suloc (1982)) included in this review focused specifically on community colleges. More recently, Heller (1996) conducted a study of enrollment at community colleges and 4-year institutions over the period 1976-1994 and came to the same conclusion regarding the relationship between price (tuition) and enrollment. But he also found that the effect was larger (approximately double) in community colleges than in 4-year institutions, leading Heller (1996) to conclude that community college enrollment is more sensitive to changes in tuition than 4-year institutions are to changes in their tuition levels. This finding contradicts Corazzini, Dugan, and Grabowski (1972) who found that although tuition rates are statistically significant for junior colleges, the magnitude is less than half of that for 4-year institutions. So although the relationship between tuition and enrollment is consistently negative, the magnitude of the degree of price responsiveness differs. As incomes increase, price responsiveness decreases showing that upper income families are less sensitive to price changes (Jackson & Weathersby, 1975). However, while all of the studies contained a price variable, there was no consistency regarding the other variables used (Jackson & Weathersby, 1975; Leslie & Brinkman, 1987).

As stated previously, the variables used in all student demand models differ greatly, especially with respect to which economic and other factors, are included. As the relationship of price to enrollment has already been ascertained, the following discussion will refer to variables other than price.

Campbell and Siegel (1967) examined individual demand for 4-year institutions in the United States for a thirty-six year period from 1927 to 1963 from a human capital investment perspective. The dependent variable was the undergraduate degree enrollment in 4-year institutions while the independent variables included the population of 18-24 year olds with high school diplomas, real disposable income per household, and average tuition (Campbell & Siegel, 1967). The results showed no trend with 18-24 year olds, but fluctuations in enrollment were related to household income (Campbell & Siegel, 1967).

Corazzini, Dugan, and Grabowski (1972) also base their enrollment model on human capital theory. The data used came from Project Talent's national cross-sectional sample from the early 1960's and a survey of 4,000 high school seniors in Boston, Massachusetts. The dependent variable in this model is the probability that a high school student selected randomly in a given region will go to college. The independent variable with respect to population is the number of high school graduates who wish to attend college rather than the 18-24 year olds in Campbell and Siegel's (1967) study. Other independent variables represent the benefits and costs of college attendance, including the opportunity cost measured by the state average wage rate for production and non-supervisory workers and the level of unemployment (Corazzini et al., 1972). Corazzini et al. (1972) found unemployment rates to be statistically significant and conclude that high unemployment rates deter high school graduates from immediately entering the work force. The other measure of opportunity cost, the average wage rate, had the expected negative relationship with enrollment, meaning that as the potential earnings of high school graduates increases, they are more likely to choose work over

college (Corazzini et al., 1972). The analysis using local data from the Boston area reinforced the results found in the national study (Corazzini et al., 1972). In addition, both analyzes found that family income is important in determining who enters the market for a college degree (Corazzini et al., 1972). Campbell and Siegel (1967) also found that income was associated with fluctuations in enrollment, but they used real disposable income per household, not family income.

Radner and Miller (1970) estimated a choice theory model using 1966 SCOPE (Schools to College: Opportunities for Post Secondary Education, the longitudinal study conducted by the University of California, Berkeley) data for four states: California, Illinois, Massachusetts, and North Carolina. Their results showed that four quantitative factors affected college choice: family income, cost of alternative choice, academic ability, and a measure for the quality of alternatives (Radner & Miller, 1970). No direct variables relating to economic conditions were included.

Kohn, Manski and Mundel (as cited in Jackson and Weathersby, 1975) extended Radner and Miller's (1970) study using Illinois data and including more variables, but still used a conditional logit model to determine the probability that a student will select a specific option from the available options. The additional variables did not, however, include measures of economic conditions.

Fuller et al. (1982) further refined the work of Kohn et al. (1972). Although they still estimate a multinomial logit choice model, Fuller et al. (1982) include foregone earnings that are more often found in human capital models, as a variable and include community colleges and private vocational schools as options. Fuller et al. (1982) used cross-sectional national data drawn from the NLSS (National Longitudinal Study of

High School class of 1972) and found, as Corazzini et al. (1972) did, that an increase in foregone earnings decreases the likelihood of college attendance. However, Fuller et al. (1982) calculated foregone earnings as a function of labor market conditions (including the unemployment rate) while Corazzini et al. (1972) used average unemployment rates and average wage rate for production and non-supervisory workers. Fuller et al. (1982) also obtained a measure of parental income as a function of occupation and education level of the student's father. Parental income was found to be positively related to the probability of college attendance (Fuller et al., 1982).

Hoenack (1967) as cited in Jackson and Weathersby (1975) used 1965 cross-sectional data to estimate individual demand, using a utility² maximization model with the proportion of eligible high school graduates who enrolled at a particular University of California campus as the dependent variable. Hoenack (1967) used measures for economic conditions in the form of average unemployment rates and wages in each high school district in a similar manner to Corazzini et al. (1972) and Fuller et al. (1982). Attending a community college was included as an option in the same manner as Fuller et al. (1982) and median family income in each high school district was also included in the model (Hoenack, 1967). The effects of these variables on student demand are not reported.

Hoenack, Weiler, and Orvis, (1973) followed up on the 1967 study by estimating student enrollment demand for the University of Minnesota, using time series (1948-1972) data and multiple regression analysis. Per capita Minnesota real income was included and found to be significant, but measures for economic conditions were not included in the model (Hoenack et al. 1973).

² Utility is the amount of satisfaction one gets from a good or service (Miller, 2005).

One study that focuses entirely on the effect of short-run economic trends on higher education was conducted by Polzin (1984). Using time series data from 1963-1981 for Montana's 56 counties, this study utilizes regression analysis to investigate the relationship between economic trends and enrollment in the University of Montana system which consists of six units (Polzin, 1984). Although there are three community colleges in Montana, they are not included in the Montana University system (Polzin, 1984). The conceptual model that underlies the research is that enrollment is a function of the pool of potential students and economic conditions (Polzin, 1984). The dependent enrollment variables used are actual (or headcount) Fall enrollment for four different groups: first-time freshmen, first-time freshman from Montana, undergraduate students who are not first time freshmen, and Montana undergraduates who are not first-time freshmen (Polzin, 1984). Three independent variables are used to quantify potential students: the number of Montana high school graduates, and lagged dependent variables for undergraduate students who are not first time freshmen, and Montana undergraduates who are not first-time freshmen (Polzin, 1984). The variables used to measure economic conditions are: the average unemployment rate for Montana, the average national unemployment rate, average national unemployment rate for 16-19 year olds, and real Montana per capita income (Polzin, 1984). As the time series includes years affected by the military draft, Polzin (1984) includes a dummy variable, which is 0 in the years before 1973 and 1 for the years after.

None of the overall unemployment and income measures is statistically significant, leading Polzin (1984) to conclude that system-wide enrollment is not affected by national or state economic conditions. However, even if short run economic

conditions do not influence the decision to enroll, they may influence the decision regarding the choice of institution (Polzin, 1984). With that in mind, Polzin (1984) extended the analysis to investigate a very similar model with the underlying concept that enrollment of first time freshmen from a specific county in a unit of the Montana university depends on the number of recent high school graduates in that county, relative costs of attendance, and local economic conditions (Polzin, 1984). However, there were only small differences in tuition and fees during the time period analyzed and increases were implemented equally so that no relative changes in costs occurred (Polzin, 1984). Thus, Polzin (1984) estimated a model where enrollment of first-time freshmen at each institution in the system is a function of the number of high school graduates in the county, the average unemployment rate in the county, and the distance between the county seat and the institution. The estimated regression coefficients for this model showed that local unemployment rates are statistically significant for three of the four institutions (Polzin, 1984).

The primary focus of Heller's (1996) study is the effect of rising tuition rates on enrollment at 4-year institutions and community colleges nationally. However, economic variables in the form of unemployment rates for different racial groups are included as controls (Heller, 1996). Using cross-sectional and time series data, Heller (1996) found, that an increase in unemployment is related to decreases in enrollments in 4-year institutions. This differs from Corazzini et al. (1972) who found that increases in unemployment caused increases in enrollment and Polzin (1984) who found no effect, Heller (1996) speculates that this may be because as economic conditions worsen, families may not be able to afford 4-year institutions and potential students may shift to

the less expensive community colleges. Betts and McFarland (1995) also comment that “loss of income may force individuals to enroll in lower cost community colleges” (p. 742). Heller (1996), however, found the opposite result for community colleges: enrollment in community colleges is positively related to unemployment rates.

Community College Models

Betts and McFarland (1995) argue that the 4-year college demand models “are of limited use for analyzing the link between unemployment and community college attendance” (p.743), noting that several empirical studies of the demand for higher education have found that the link between enrollments and unemployment is weak (Betts & McFarland, 1995). But potential community college students are not necessarily just out of high school (Betts & McFarland, 1995), and the majority work to support themselves (Grubb & Lazerson, 2004). Many have spouses and children or are responsible for elderly parents or other extended family members (Grubb & Lazerson, 2004). They have lower savings, higher discount rates, and little or no parental support (Betts & McFarland, 1995). Recession, or periods of high unemployment, affect this group more than the “traditional” college student (Betts & McFarland, 1995). Different variables are, therefore, more important in their decision-making (Betts & McFarland, 1995).

Using national cross-sectional and panel data, Betts and McFarland (1995) conducted a study covering the late 1960’s to the mid 1980’s, examining the impact of the business cycle (the ups and downs of economic activity, generally characterized by increases and decreases in the unemployment and inflation rates) on enrollment and finances in community colleges. Using a simple income maximization model based on

traditional human capital theory, this study focuses on the choices made by high school graduates (Betts & McFarland, 1995). The dependent variable is enrollment and the independent variables include three measures for unemployment (based on age and years of education), three measures for the present discounted value of earnings (also based on age and years of education), three measures of wages (again based on age and years of education), two measures of fees, two measures for financial aid, two measures for tuition costs, two population measures, the percentage of the adult population that is black, and per capita income (Betts & McFarland, 1995). Several regression equations are estimated which lead to the conclusion that “community college enrollments rise and fall remarkably in phase with the ups and downs of unemployment” (Betts & McFarland, 1995, p. 749) meaning that a higher unemployment rate leads to increased enrollment at community colleges (Betts & McFarland, 1995). Based on this result and an examination of the New England region, Betts and McFarland (1995) claim that although there are some regional variations, “there is a notable consistency in the unemployment/attendance relationship across the country (p. 749). Per capita income is included in the model as a measure of the ability to pay for college with the assumption that incomes increase as economic activity increases (unemployment decreases) and vice versa (Betts & McFarland, 1995). The results showed that a rise in regional per capita income leads to an increase in part-time enrollment but lowers fulltime enrollment (Betts & McFarland, 1995). Also, as predicted by human capital theory, higher starting wages of high school graduates reduce enrollment (Betts & McFarland, 1995).

In addition, Betts and McFarland, (1995) point out the relationship between changes in economic conditions and the level of State appropriations. When economic conditions worsen State revenues fall and appropriations to higher education often decrease, making revenue from tuition increasingly important (Betts & McFarland, 1995). Thus, during recessions financial stress can be placed on community colleges just when they are most needed (Betts & McFarland, 1995; Hendrick et al., 2006). This prompts Betts and McFarland (1995) to suggest that labor market policy and education policy should be linked. Similarly, although referring to 4-year institutions, Hoenack and Weiler (1979) suggest that labor market variables, which follow the business cycle, should be included in forecasts of student demand.

In contrast to the national study conducted by Betts and McFarland (1995), Sundberg (1998) researched patterns of enrollment at an individual community college, Carl Sandburg College in Illinois. This analysis was conducted to support the theory that low unemployment rates do not have to drive down enrollment at community colleges (Sundberg, 1998). Sundberg (1995) used 20 years of credit hour data to estimate three regression equations for the dependent variables: total credit hours credit hours for baccalaureate courses, and credit hours for all other courses (vocational, GED, and occupational). The local unemployment rate is the only independent variable (Sundberg, 1998). The results showed no correlation between unemployment rates and baccalaureate hours, a low correlation between total hours and unemployment rates, and only a moderate correlation between all other hours (which include vocational, occupational, and general education) and unemployment rates (Sundberg, 1998). These results are contrary to the outcome obtained by Betts and McFarland (1995) although

Betts and McFarland (1995) did point out that there are regional differences. Sundberg (1998) concludes that enrollment has not declined at Carl Sandburg College during periods of low unemployment, even though other community colleges have suffered declines, because of successful marketing strategies.

Although the abstract for Sundberg's (1998) article indicates that local unemployment rates are utilized, the report itself does not specify which unemployment rates are used. Even if the assumption is made that it is the local rate, there is still confusion whether that means the unemployment rate for the State of Illinois or a local rate for the district that Carl Sandburg College is located in.

Wyoming Community College Commission (1999) conducted a study primarily focusing on student access, but the relationship between unemployment and headcount enrollment was also briefly examined. Using linear regression with college enrollment as the dependent variable and the aggregated number of unemployed in the primary feeder counties for each college as the independent variable, a strong and significant correlation between the levels of college enrollment and the number unemployed in the primary feeder counties was found (Wyoming Community College Commission, 1999). However, adding a set of dummy variables to the regression in order to identify individual colleges led to the conclusion that the relationship between the number of unemployed in each primary feeder county and the level of enrollment at each college is insignificant (Wyoming Community College Commission, 1999).

Pennington et al. (2002) note that there have not been many studies conducted which investigate the link between economic conditions and community college enrollment. Wetterlind's (1976) unpublished doctoral dissertation (as cited in

Pennington et al., 2002) found that local unemployment rates and enrollment rates at Arizona's community colleges are positively correlated and that a negative correlation exists between increases in the income level and enrollment. Wetterlind (1976) concludes that job market improvements encourage employment and thus decrease enrollment while a decrease in job availability promotes the desire to pursue education. However, it is uncertain what enrollment measure was used and there is the same confusion as found in Sundberg's (1998) study regarding what constitutes the local unemployment rate.

Betts and McFarland (1995), Sundberg (1998) and the Wyoming Community College Commission (1999) are all cited by Pennington et al. (2002). But the two student demand models for community colleges (Berne (1980) and Suloc (1982) which are included in Leslie and Brinkman's (1987) review of student demand models are not. This is possibly because Berne (1980) and Suloc (1982) focus heavily on the relationship between tuition and enrollment. Although Suloc (1982), using cross-sectional data for 1969-1970 academic years from a sample of 126 community colleges divided into 62 separate markets, did use a measure of income, which was found to be significant, as a variable. Pennington et al. (2002) also only refer to the "strong, significant positive relationship between the number of unemployed residents in the primary feeder counties for the college and the levels of college enrollment" (p. 432) found by the Wyoming Community College Commission (1999) and ignore the insignificance of the relationship between the number of unemployed in each primary feeder county and the level of enrollment at each college.

Pennington et al. (2002) investigate the cause and effect relationship between the economic strength of the nation and nationwide enrollment at community colleges nationwide using 31 years of enrollment data in a partial correlation study (Pennington et al., 2002). Three economic variables are used as indicators of national economic activity: national annual average unemployment rate, (which they claim is the most reported as effecting community college enrollment), the consumer price index (CPI) as an indicator of price levels (inflation), gross domestic product (GDP), which measures goods and services produced in the United States. Three economic variables are used as indicators of economic vitality: disposable income measured in dollars, personal consumption expenditures, and average hourly earning of production workers (Pennington et al., 2002). Two enrollment variables were used: total enrollment and per capita enrollment that was created by dividing total enrollment by the total US population. Per capita enrollment controls for normal population growth and the interaction between population growth and the economic variables (Pennington et al., 2002). Correlation analysis was conducted and partial correlation coefficients were generated for each of the two community college enrollment variables and the six economic variables.

Strong relationships were found between both the enrollment variables and GDP, Personal Consumption Expenditure. High GDP and Personal Consumption expenditure were associated with low enrollment in community colleges. The unemployment rate was positively correlated with both enrollment variables but not as strongly as the previous ones mentioned (Pennington et al., 2002). In the original correlation analysis, the enrollment figures were “lagged” to allow time for enrollment

to react to the economic conditions. When the unemployment rates were correlated with the same years' enrollment figures, the relationship between unemployment and both enrollment variables were stronger, indicating that the effects of unemployment are more immediate than delayed (Pennington et al., 2002).

The methodology of the study to investigate the relationship between economic conditions, education costs, and enrollment conducted by the Montgomery College Office of Institutional Research (1983) includes both correlation analysis and multiple regression analysis of time series data. The dependent enrollment variables consist of 12 categories of student groups, and the independent variables are population source, the unemployment rate, the consumer price index for the Washington area, the difference between tuition at Montgomery College and the University of Maryland, and the total financial aid awarded to Montgomery College students. Neither of the economic variables, the unemployment rate nor the consumer price index, are significant for any of the 12 student groups identified (Montgomery College Office of Institutional Research, 1983).

As there are few studies that investigate the relationship between economic conditions (unemployment) and community college enrollment, it is difficult to make meaningful comparisons or conclusions. Pennington et al. (2002), Montgomery College Office of Institutional Research (1983) and the Wyoming Community College Commission (1999) use total headcount enrollment. Betts and McFarland (1995) use FTE enrollment data. Sundberg (1998) used total credit hours and divided them up into different categories. Pennington et al. (2002) and Betts and McFarland (1995) used national time series data while Sundberg (1998), the Montgomery College Office of

Institutional Research (1983) and the Wyoming Community College Commission (1999) used local time series data. Pennington et al. (2002) calculated partial correlations, Sundberg (1998) and the Wyoming Community College Commission (1999) used linear regression analysis, and Betts and McFarland (1995) used an income maximization model. Montgomery College Office of Institutional Research (1983) used a combination of partial correlation and regression analysis. However, there is one aspect that all of these studies that investigate the relationship between economic conditions and community colleges have in common and that is that they all use time series data.

A summary of the results regarding the relationship between enrollment at community colleges and unemployment (the only economic variable that all studies include) shows: Betts and McFarland (1995) found significant positive relationships between unemployment rates and enrollment nationally and in New England; the Wyoming Community College Commission (1999) found a strong and significant positive relationship at the overall community college system level but insignificant results at the individual college level; Sundberg (1998) found a low correlation between total credit hours and unemployment rates, no correlation with baccalaureate hours and unemployment rates, and the highest correlation between non-baccalaureate hours (vocational) and unemployment rates; Montgomery College Institutional Research Office (1983) found no significant relationship between local unemployment rates and enrollment; and Pennington et al. (2002) found positive and significant correlations at the national level between unemployment and total enrollment and also between unemployment and per capita enrollment.

Conclusion

This review of the literature shows that although there are many student demand studies, very few are devoted specifically to community colleges. Even fewer have researched the link between economic conditions and community college enrollment, using variables other than the unemployment rate. Although Pennington et al. (2002) used more economic variables only partial correlation coefficients were calculated. The only study relating specifically to the state of Hawai'i was classified as a case study of an institution with few nearby competitors by Leslie and Brinkman (1987) and focused primarily on the effect of tuition increases on enrollment at the 4-year University of Hawai'i at Manoa (Ghali, Miklius, & Wade, 1977).

The methodology used in this study is primarily based on the model used by Polzin (1984) to investigate the effects of short-run economic trends on enrollment in the University of Montana system. However, as only 4-year institutions are included in Polzin's (1984) research and it is not specifically derived from human capital theory, aspects of other research outlined in this literature review are incorporated into this study. In particular, that which focuses on community college enrollment, economic conditions and/or are from a human capital perspective [e.g. Betts & McFarland (1995)], Montgomery College Institutional Research Office (1983), Pennington et al. (2002), and Sundberg (1998)]. Other research that focuses on 4-year institutions and/or uses different methods and models which is discussed in this literature review provides additional guidance.

Therefore, as previously stated, this study will fill the need for a comprehensive investigation of the effects changing economic conditions have on enrollment at

community colleges in Hawai'i which will, in turn, inform policy-makers, administrators, and enrollment managers, enabling them to make informed decisions.

CHAPTER 3

METHODOLOGY

Introduction

This research is a quantitative, multiple case study derived from a human capital perspective, to explore the nature of the relationship between economic conditions and enrollment at community colleges in Hawai'i. The first hypothesis is that community college enrollment in each of the four Hawaiian counties decreases as local economic conditions improve and enrollment increases as local economic conditions worsen. The null hypothesis is that economic conditions have no effect on enrollment at community colleges in Hawai'i. The second hypothesis is that community college enrollment in each of the four Hawaiian counties differs based on local economic conditions and the null hypothesis is that there is no difference between counties.

Data

This study utilizes secondary time series data for the period 1973-2005 (33 years) which has been extracted from two sources. County unemployment rates, number of high school seniors, per capita income, and the consumer price index are reported in the State of Hawai'i Data Books which are published annually by the State Department of Business, Economic Development and Tourism. The enrollment data are reported annually by the University of Hawai'i Institutional Research Office in MAPS (Management and Planning Support) Reports (University of Hawai'i Institutional Research Office, 2007). Due to organizational changes at Hawai'i Community College,

FTE enrollment data for 7 years of the analysis period was unavailable. The missing data was estimated using the series mean method available in SPSS.

Although time series data can be problematic because autocorrelation is often present and the effect of a change in an independent variable may not be immediate, it is often used so that future values can be forecast (Halcoussis, 2005). Hoenack and Weiler, (1979) point out that although many enrollment models use cross-sectional data, time series data should be used in most cases. Cross-sectional data is considered to be more limited in terms of establishing causal relationships and there can be some situations that require data collected on two or more occasions to examine change over time (Gayle, 2004; Heck, 2006). There are other claims that longitudinal data are important because they permit insight into processes of change and may be the only way to answer questions of interest regarding how measurement on an individual (or in this case an institution) changes over time (Halcoussis, 2005).

State dependence (also known as temporal dependence) occurs if the current outcome of a dynamic process depends on a prior outcome or more simply, current behavior depends on past behavior. There are many examples when this occurs: whether one travels on vacation this month depends (at least to some extent) on whether vacation travel occurred last month (Statsoft, 2003). Whether one is employed this month depends (again at least to some extent) on whether he or she was employed last month. In this study whether a student is enrolled in one fall semester may partially depend on whether that student was previously enrolled. Therefore, prior information is important to evaluating current situations (Gayle, 2004). But state dependence cannot be captured with cross-sectional data, it is only possible with longitudinal information

(Gayle, 2004). The existence of state dependence is, however, the cause of some of the problems encountered in analyzing time series data, (e.g., autocorrelation), as previously mentioned.

Variables in the Model

Dependent Variables

As Pennington et al. (2002) conducted a partial correlation study, there is no dependent variable per se, but total enrollment and per capita enrollment were used in the partial correlations calculated with the economic variables. Polzin (1984), Sundberg (1998), and the Montgomery College Office of Institutional Research (1983) all used forms of enrollment as dependent variables.

Four dependent enrollment (ENR) variables will be considered in this model:

- *Total head count enrollment* (ENR-HC) in community colleges located in county_i in Fall_t.
- *Full-time equivalent enrollment* (ENR-FTE) in community colleges located in county_i in Fall_t.
- *Per capita headcount enrollment* (ENR-PCHC) in community colleges located in county_i in Fall_t. This is calculated by dividing headcount enrollment in county_i in Fall_t by the population of county_i in Fall_t.
- *Per capita full-time equivalent enrollment* (ENR-PCFTE) in community colleges located in county_i in Fall_t. This is calculated by dividing full time equivalent enrollment in county_i in Fall_t by the population of county_i in Fall_t.

Head count enrollment measures the actual number of students enrolled in credit courses, regardless of the number of credit hours (or courses) students enroll in. So

while estimation of this variable may provide some insight, alone it may not capture whether or not students just enroll for fewer credits (or courses) in periods when economic conditions are good rather than not enroll at all. Consequently, FTE enrollment is estimated to provide additional information and insight. In addition, per capita headcount and per capita full-time equivalent enrollment are estimated to control for normal population growth and the interaction between population growth and the economic variables.

Independent Variables

The independent variables and reasons for inclusion are:

- *Public high school graduates (HS) in county_i in year_t.*

Polzin (1984), the Montgomery College Office of Institutional Research (1983), and other enrollment models reviewed. (e.g. Betts and McFarland, 1995, Hoenack and Weiler, 1979; and the Wyoming Community College Commission, 1999) all include a variable to represent the pool of potential enrollees. Although many community college students do not enroll immediately after graduation from high school, many recruitment and marketing strategies target specific groups including high school seniors (Cohen & Brawer, 2003). Private high school graduates were not included as it is assumed that they would enroll at a 4-year institution either in Hawai'i or on the mainland.

- *Per capita income (PCY) in county_i in year_t.*

Polzin (1984) includes real per capita income in Montana as one of the variables to measure economic conditions although no further justification for its inclusion is provided. Pennington et al. (2002) include national disposable income as a measure of economic vitality. It is not made clear, however, whether this variable is measured in

nominal or real terms. In addition to measuring economic conditions and vitality, this model includes per capita income in each county as a measure of the ability to pay for college as suggested by Betts and McFarland (1995). Human capital theory recognizes family income (sometimes expressed as the education and occupation of the father) as an important factor in the enrollment decision (Becker, 1993). Nominal per capita income is used because there is no way to accurately convert nominal income to real income for all counties. The consumer price index which is used to convert nominal income to real income is only available for the City and County of Honolulu. Also, community college students may lack the necessary skills to differentiate between real and nominal income and are therefore most likely basing their decisions on nominal income. When this variable is transformed into the change in per capita income, it reflects the premise that potential students react to changes in per capita income rather than just the level of per capita income.

- *Total unemployment rate (UR) in county_i in year_t.*

There are few, if any, studies of enrollment that include variables for economic conditions that do not include at least one variable representing unemployment. However, the measures differ depending on the focus of the study. Polzin (1984) uses three measures of national and local (state and county) unemployment rates. Pennington et al. (2002) use the average national unemployment rate. The report by Montgomery College Institutional Research Office (1983) includes the unemployment rate but does not specify further. Sundberg (1998) considers the local unemployment rate as the only independent variable. The unemployment rate in each county is used in this study and can also be interpreted as the probability of getting a job, with the assumption that the

lower the unemployment rate, the higher the probability of being hired (Betts & McFarland, 1995).

Variables in time series analysis are often lagged as the effect of a change in an independent variable is not always immediate (Halcoussis, 2005). However, based on Pennington et al's (2002) finding that the impact of changes in the unemployment rate was seen immediately on community colleges enrollments, the unemployment rate is not lagged in this study.

- *Consumer Price Index for Honolulu (CPI).*

The consumer price index which is calculated by the U.S. Bureau of Labor Statistics is a measure of price changes over time and is also used to calculate cost-of-living adjustments (Miller, 2005). Pennington et al. (2002) include the national consumer price index as a measure of economic activity, as theirs is a national study. The Montgomery College Institutional Research Office (1983) includes the consumer price index for the Washington metropolitan area, which is the geographical area, covered by their study. It would be optimal for this model to include the consumer price index for each county. However, the consumer price index by county is not calculated; therefore the consumer price index for Honolulu-urban consumers is used for all counties. It is transformed into the change in the CPI to reflect the premise that potential students react to changes in the cost of living (in terms of increased prices) rather than just the level of the cost of living (prices).

- Minimum wage (WAGE) in county_i in year_t.

State law requires employers to pay the Hawai'i state minimum wage, which is higher than the federally mandated minimum wage. The wage is perhaps the most

important variable from a human capital perspective as it measures the foregone earnings or opportunity costs of college attendance and is included by Pennington et al. (2002), Betts and McFarland (1995) and other 4-year enrollment studies, (e.g. Corazzini et al. (1972), Hoenack and Weiler, (1979)). Pennington et al. (2002) use average hourly earnings of production workers while Betts and McFarland (1995) use three different measures calculated based on the age and education of workers. This model includes the minimum hourly wage in each county as a measure of the opportunity costs with the assumption that those making the decision to attend community college or work are relatively unskilled.

- *ACT 161*

This independent variable is a dummy or event variable which is added to the model to measure the impact of ACT 161, the act passed by the Hawai'i State Legislature in July, 1995 which enabled the individual campuses of the University of Hawai'i system to retain their own tuition revenue (see Page 6). One of the results of Act 161 was to increase the difference between tuition rates at the University of Hawai'i's 2-year and 4-year institutions. Tuition costs are not specifically included as an independent variable because although tuition varies greatly across the nation (Heller, 1996) it is very similar, if not the same, across community colleges in Hawai'i (University of Hawai'i Institutional Research Office, 2007). Polzin (1984) does not include tuition and fees, as previously mentioned, because there were only small differences during the time period analyzed and increases were implemented equally so that no relative changes in costs occurred. While tuitions have increased for students attending community colleges in Hawai'i, the increases have been implemented equally

across the seven community colleges, as they were in Montana, and therefore relative tuition costs across the community colleges in Hawai'i remain constant (University of Hawai'i Institutional Research Office, 2007)..

Discount rates, which are often used in models based on human capital theory, will not be used. It is assumed that community college students have relatively high discount rates as they appear to value the present more than the future and therefore the immediate opportunity costs of college attendance are more important (Betts & McFarland, 1995; Corazzini et al., 1972). Betts and McFarland (1995) found little difference between their estimations with discount rates of 10% and discount rates of 15%. This assumption is also based on evidence that community college students often cite changes in work schedules as reasons for leaving (Cohen & Brawer, 2003), indicating that work is more important and those with higher opportunity costs are more likely to attend college part-time (Stratton et al., 2004). In addition, recent tests of human capital theory suggest that students are unsure about how much post secondary education they will attain when making the initial decision to attend (Beattie, 2002).

Analyses

This study is primarily based on the conceptual model that enrollment is a function of the pool of potential students and economic conditions as proposed by Polzin (1984) in his study of enrollment in the University of Montana system. Polzin's (1984) model takes the general form:

$$E = f(P, X_i) \tag{1}$$

where E is enrollment, P is a measure of potential students, and the X_i 's represent measures of economic conditions. The dependent enrollment variables used are actual

(or headcount) Fall enrollment for four different groups: first-time freshmen, first-time freshman from Montana, undergraduate students who are not first time freshmen, and Montana undergraduates who are not first-time freshmen (Polzin, 1984). Three independent variables are used to quantify potential students. The independent variables for economic conditions include three different measures of unemployment rates (Polzin, 1984) and Montana per capita income in constant dollars (Polzin, 1984). As the time series includes years affected by the military draft, Polzin (1984) includes a dummy variable, which is 0 in the years before 1973 and 1 for the years after.

Polzin (1984) then extended the analysis to investigate a very similar model with the underlying concept that enrollment of first time freshmen from a specific county in a unit of the Montana university depends on the number of recent high school graduates in that county, relative costs of attendance, and local economic conditions (Polzin, 1984). However, there were only small differences in tuition and fees during the time period analyzed and increases were implemented equally so that no relative changes in costs occurred (Polzin, 1984). Thus, Polzin (1984) estimated a model where enrollment of first-time freshmen at each institution in the system is a function of the number of high school graduates in county_i (x_1) the average unemployment rate in county_i (x_2) and the distance between the county seat of county_i and the institution (x_3).

The following equation (2) for this study is thus predominantly based on the model used by Polzin (1984) and takes the form:

$$ENR_{it} = f (HS_{it}, PCY_{it}, UR_{it}, CPI_{it}, W_{it}, ACT 161) \quad (2)$$

The conceptual model proposes that enrollment (ENR) is a function of the number of graduating high school seniors (HS) and economic conditions (PCY-income,

UR-unemployment rate, CPI-Consumer Price Index and W- wage). ACT 161 is a dummy variable included to capture the influence of tuition increases at the community colleges and the difference between tuition at University of Hawai'i 2-year and 4-year institutions.

Thus, enrollment at community colleges in county_i in period_t is a function of the number of public high school graduates in county_i in period_t, the economic conditions in county_i in period_t and tuition/tuition differentials. The conceptual model is the same for the State of Hawai'i so that total enrollment at community colleges in the State of Hawai'i in period_t is a function of the total number of public high school graduates in period_t, the economic conditions in the State of Hawai'i in period_t and tuition/tuition differentials.

The characteristic property of a time series is the fact that the data are not generated independently, their dispersion varies in time, they are often governed by a trend and they can have seasonal variations or autocorrelation (Falk, 2006; Halcoussis, 2005; Statistics Solutions, 2007). So statistical procedures that suppose independent and identically distributed data have to be excluded from the analysis of time series (Statsoft, 2003). This means that methods that account for the above limitations must be utilized and so the user's application and preference will decide the selection of the appropriate technique (Falk, 2006). The fitting of time series models can be a challenging undertaking although new statistical software (such as SPSS Trends and SAS) have made the task simpler (Statistics Solutions, 2007). The model is, therefore, estimated, using the statistical package SPSS, for the four dependent variables: headcount enrollment (ENR-HC), full-time equivalent enrollment (ENR-FTE), per

capita headcount enrollment (ENR-PCHC), and per capita full-time equivalent enrollment (ENR-PCFTE), for each of the four counties; County of Hawai'i, City and County of Honolulu, County of Kauai, and County of Maui and for the State of Hawai'i, so that a total of 20 sets of results are available for analysis and comparison.

Preliminary Analysis

As previously acknowledged, there is often a problem with autocorrelation when estimating models using time series data. The SPSS Trends manual (2004) states that the only way to find out if time series data is suitable for analysis, using ordinary least squares regression, is to do the analysis and examine the residuals. Therefore, a total of twenty ordinary least squares (OLS) regressions were estimated (one for each of the four dependent variables, for the four counties and the state) and the t-values for the coefficients in each equation were tested for significance. The residuals were plotted to assess the assumption of normality and were found to be normally distributed as the points fell on, or close to, the diagonal line when the residuals were plotted on the horizontal axis and the expected value if the residuals were normal on the vertical axis (SPSS, 2004).

A problem of multicollinearity can occur, however, when two variables are so highly correlated that it is difficult to estimate reliable individual regression coefficients (Halcoussis, 2005). It was expected that the variables for economic conditions (PCY – per capita income, UR - unemployment rate, CPI – consumer price index, and W - wage) would be correlated in the regressions that were to be estimated as these variables tend to move in the same direction over the business cycle (Miller, 2005). Therefore, a correlation matrix for each set of economic variables was generated and the correlation

coefficients (r) and their signs examined to determine the nature of the relationship (positive or negative) and the degree of linear association between each dependent and independent variable and each pair of independent variables.

Correlation coefficients can take a value from +1 to -1, and the closer the coefficient is to 1 (+ or -), the more likely it is that the two variables being considered move together (Halcoussis, 2005). There is, however, no specific rule regarding what value of r signifies that multicollinearity is present, as some researchers say above .75 and others above .9 (Halcoussis, 2005). Nevertheless, preliminary analysis showed that high values of r were present indicating that the economic variables are significantly correlated. The correlated independent variables were then regressed on each other and the F-statistics were found to be significant, confirming the presence of multicollinearity (Halcoussis, 2005) which means that the two variables measure essentially the same thing. In order to eliminate the multicollinearity two of the independent variables, consumer price index and per capita income were transformed into the change in the consumer price index and the change in per capita income which reduced the higher r values (Halcoussis, 2005)³. It should be noted that both the changes in the consumer price index and per capita income are equivalent to the magnitudes of the increases in these variables as there were very few periods where decreases occurred.

In addition, the Durbin-Watson statistic, which can have values between 1 and 4, and measures first-order autocorrelation of the residuals, was generated and examined for each regression. Ordinary least squares analysis assumes that the residuals

³ The correlation matrices showing the r values before and after the transformation of the variables can be found in the Appendix.

are not correlated, but as the Durbin-Watson statistics showed that autocorrelation was present and the t-values were not significant, in the majority of the regressions, it was determined that ordinary least squares would not be the appropriate method for this analysis (SPSS, 2004).

In time series analysis, a first step is often to determine what type of model best fits the data. Therefore, the Expert Modeler, which is a tool within the SPSS statistical software and is specifically designed for handling time series data, was utilized to find the best-fitting models. This procedure identifies the best-fitting ARIMA or exponential smoothing model for one or more dependent variable series and eliminates the need to identify appropriate models through trial and error.

Preliminary analysis using the Expert Modeler tool determined that ARIMA (0,1,0), which is a random walk model; best fits the majority of this time series. ARIMA models are generally specified as ARIMA (p, d, q) where p is the autoregressive component, d is the integrated component and q is the moving average component (Statsoft, 2003). The $(d) = 1$ indicates in the ARIMA (0,1,0) model means that the only effect is a non-seasonal differencing to remove linear trend. The autocorrelation function is either constant or is balanced between positive and negative and the partial autocorrelation function is spiked only at lag 1 (Statistics Solutions, 2007).

In five cases the best fitting model is a Simple Exponential Smoothing model, which means that the data shows no trend or seasonality. The simple model is very similar to an ARIMA (0,1,0) model (SPSS, 2007). In two cases the best fitting model is an ARIMA (0,0,0) model. This model produces results almost the same as ordinary

least squares regression, meaning that the data exhibits stationarity before any transformation (SPSS, 2007).

Stationarity is a critical assumption of time series analysis, stipulating that the statistical descriptors, mean and variance, are invariant (Halcoussis, 2005; Statistics Solutions, 2007; Statsoft, 2003). The data cannot not have an upward or downward trend over time and any autocorrelation must be removed if necessary via differencing (Halcoussis, 2005). Differencing is reflected in the (*d*) parameter noted previously (Statsoft, 2003). A non-stationary variable causes misleading results as trend not controlled will lead to the non-stationary variable being given credit for the trend (Halcoussis, 2005). The regression will have a better fit than it really does and the non-stationary variable will appear to have more impact on the regression than it really does (Halcoussis, 2005).

The Expert Modeler tool selects for inclusion in ARIMA models those independent variables that have a statistically significant relationship with the dependent variable. Model variables are transformed where appropriate using differencing and/or a square root or natural log transformation. Differencing was the only transformation needed in the models identified for this analysis. The statistics generated includes the following goodness of fit measures: stationary R-squared, R-squared, Ljung-Box statistic, root mean square error, mean absolute percentage error, and the mean absolute error. Also, generated are the parameter estimates, t-values, p-values and the delay.

The stationary R-squared measures the goodness of fit of the model, with higher values indicating a better fit. The R-squared shows the amount of variance in the

dependent variable that can be explained by the independent variables (Halcoussis, 2005). For time-series data, however, the stationary R-squared is a better measure of goodness of fit than the R-squared because if the data is not stationary the R-squared will show a better fit than the model really has (Halcoussis, 2005). The Ljung-Box statistic, which is also known as the modified Box-Pierce statistic, provides an indication of whether the model is correctly specified and tests for overall randomness (SPSS, 2007). A significance value less than 0.05 implies that there is structure in the observed series which is not accounted for by the model (SPSS, 2007). The root mean square error, the mean absolute percentage error and the mean absolute error measure how much a dependent series varies from its model predicted level (SPSS, 2007). The root mean square error is expressed in the same units as the dependent series, the mean absolute percentage error is independent of the units used, and the mean absolute error is in the original series units (SPSS, 2007). A smaller value indicates a better fit for all three measures (SPSS, 2007). The delay shows the number of periods that elapse before the value of the independent variable affects the forecast if the model is applied and used to predict future values of the dependent variable (SPSS, 2007). It can also be interpreted as the amount of time it takes for the value of the independent variable to affect the dependent variable (SPSS, 2007).

Expected Outcomes – Theory

With respect to research question 1: what is the nature of the relationship between enrollment at the community colleges in each of the four counties in the State of Hawai‘i and the economic conditions in that county, human capital theory predicts that enrollment of community college students in each county should have a positive

relationship with the unemployment rate and per capita income, a negative relationship with the minimum wage rate (opportunity cost) and the consumer price index. A positive relationship between enrollment and the number of high school seniors is expected. Research question 2: how does this relationship differ by county will be addressed by looking at whether the expected outcomes listed above vary due to local conditions. The actual findings, analysis and discussion are found in Chapter 4.

CHAPTER 4

FINDINGS

The analysis brings together the findings resulting from the application of the statistical methods to the time series data as outlined in Chapter 3 to address the research questions:

1. What is the nature of the relationship between enrollment at the community colleges in each of the four counties in the State of Hawai'i and the economic conditions in that county?
2. How does this relationship differ by county?

In order to conduct analysis the following statistics were generated for each of the four dependent variables [headcount enrollment (ENR-HC), FTE enrollment (ENR-FTE), per capita headcount enrollment (ENR-PCHC), and per capita FTE enrollment (ENR-PCFTE)] for each of the four counties and the state: the stationary R-squared, R-squared, Ljung-Box statistic, parameter estimates, t-values, p-values and the delay. Summaries of these statistics are presented in the following tables. Although the R-squared is included, it should be noted that it is most useful when the series is stationary (SPSS, 2007). When there is trend in the data the stationary R-squared is a better measure of model fit with higher stationary R-square coefficients indicating better fitting the models (SPSS, 2007). The root mean square error (RMSE), the mean absolute percentage error (MAPE), and the mean absolute error (MAE) were estimated but the stationary R-squared was used as the primary measure of goodness of fit as it is the default method in SPSS. In addition, there were not major differences when using the RMSE, MAPE, and MAE to determine which models had a better fit. All six

independent variables (public high school graduates, the unemployment rate, the minimum wage, the change in per capita income, the change in the consumer price index, and Act 161) were included in the analyses for each county and the state, but only the significant variables are shown in the summaries. The summaries of the statistics are presented for each individual county in alphabetical order and then the results are interpreted and compared across counties and discussed collectively. Finally, the state results are presented and compared with the county results.

County of Hawai'i

Table 1: County of Hawai'i.

	Dependent Variable	Model Type	Stationary R ²	R ²	Ljung Box	Significant Variable	Parameter Estimate	Standard Error	t-value	Delay-Years
(1)	Hawai'i Headcount Enrollment	Arima (0,1,0)	0.437	0.848	0.58	Min Wage Act 161	355.82 -348.00	85.472 131.23	4.16*** -2.65*	1 0
(2)	Hawai'i FTE Enrollment	Arima (0,0,0)	0.776	0.776	0.32	Min Wage Act 161 Change in CPI	219.65 325.39 24.822	47.685 94.406 6.92	4.61*** 3.44*** 3.58***	1 0 3
(3)	Hawai'i Per Capita Headcount Enrollment	Simple	-0.004	0.642	0.16	-	-	-	-	-
(4)	Hawai'i Per Capita FTE Enrollment	Arima (0,1,0)	0.243	0.912	0.24	Min Wage	0.002	0.001	3.05**	1

*** p<0.001 ** p<0.01 * p<0.05

Table 1 presents the results of the four models for the County of Hawai'i. The models estimated for the dependent variables Hawai'i headcount enrollment (1) and Hawai'i per capita FTE enrollment (4) are both ARIMA (0,1,0) models which means

that non-seasonal differencing has removed the linear trend in the data. The stationary R-square's are 0.437 and 0.243 respectively which shows that the model for the dependent variable Hawai'i headcount enrollment is a better fit than the model for dependent variable Hawai'i per capita FTE enrollment. The statistically significant variables or predictors for Hawai'i headcount enrollment are the minimum wage ($p < 0.001$) and Act 161 ($p < 0.05$). The effect of the minimum wage on Hawai'i headcount enrollment is delayed by one year, that is as the minimum wage goes up, headcount enrollment follows. The only statistically significant variable for the dependent variable Hawai'i per capita FTE enrollment is the minimum wage ($p < 0.01$) which also has a delay of one year.

The best fitting model for the County of Hawai'i, based on the highest stationary R-squared (0.776) is that for the dependent variable Hawai'i FTE enrollment (2). It is an ARIMA (0, 0, 0) model which means that there is no trend in the data so the R-square coefficient is the same as the stationary R-square coefficient (0.776). This is also the best fitting model, based on the stationary R-square coefficients, of the twenty that were estimated. As there is no trend, the R-squared is reliable and therefore it can be determined that 77.6% of the variance in the dependent variable (Hawai'i FTE enrollment) is explained by this model. The Ljung-Box statistic is not significant ($p > 0.05$) for this or any of the models generated for enrollment in the County of Hawai'i, indicating that there is no structure in any of the observed series which is not accounted for by the models.

There are three statistically significant variables or predictors identified for the dependent variable Hawai'i FTE enrollment (2). They are: the minimum wage

($p < 0.001$), Act 161 ($p < 0.01$) and the change in the consumer price index ($p < 0.001$).

The delay for the change in the consumer price index is 3 years, which means that the effect of the change in the cost of living is not seen in the dependent variable (Hawai'i FTE enrollment) for three years. The effect of the minimum wage is delayed one year but the effect of Act 161 on Hawai'i FTE enrollment is immediate. This shows that the implementation of the policy had immediate affects on Hawai'i FTE enrollment.

The simple exponential smoothing model calculated for the dependent variable Hawai'i per capita headcount enrollment (3) can be discounted from any analysis as the stationary R-squared is negative which shows that the fit of the model is worse than the baseline model. In addition, no statistically significant variables are identified.

City and County of Honolulu

Table 2: City and County of Honolulu (Island of Oahu).

	Dependent Variable	Model Type	Stationary R ²	R ²	Ljung-Box	Significant Variable	Parameter Estimate	Standard Error	t-Value	Delay-years
(5)	Oahu Headcount Enrollment	Arima (0,1,0)	0	0.72	0.66	-	-	-	-	-
(6)	Oahu FTE Enrollment	Arima (0,0,0)	0.577	0.577	0.00	Oahu Unemployment Rate	393.2	81.435	4.83***	0
(7)	Oahu Per Capita Headcount Enrollment	Simple	-0.007	0.315	0.59	-	-	-	-	-
(8)	Oahu Per Capita FTE Enrollment	Arima (0,1,0)	0.256	0.974	0.36	Oahu Unemployment Rate	0.005	0.002	3.026**	0

*** $p < 0.001$ ** $p < 0.01$ * $p < 0.05$

Table 2 suggests there are only two models from the four models estimated for the dependent enrollment variables for community colleges in the City and County of Honolulu that can be used in analysis and they are for the two dependent FTE enrollment variables: Oahu FTE enrollment (6) and Oahu per capita FTE enrollment (8). Although an ARIMA (0,1,0) model is the best fit for the dependent variable Oahu headcount enrollment, the stationary R-squared is zero and no significant variables are identified. A simple exponential smoothing model which is very similar to an ARIMA (0,1,0) model is the best fit for the dependent variable Oahu per capita headcount enrollment (7). But the stationary R-squared in this case is negative, indicating that the model is a worse fit than the baseline model. This occurred also for Hawai'i per capita headcount (3), which is also a simple exponential smoothing model. The Ljung-Box statistics are not significant, but nevertheless these two models will not be considered in any analysis.

The remaining two estimations for the dependent variables Oahu FTE enrollment (6) and Oahu per capita FTE enrollment (8) both identify the unemployment rate for the island of Oahu as the only statistically significant variable ($p < 0.001$, $p < 0.01$). For the dependent variable Oahu FTE enrollment (6), the ARIMA (0,0,0) model has a stationary R-squared of 0.577 making this model the best fitting model estimated for the dependent enrollment variables for the City and County of Honolulu. The R-squared for this estimation is also 0.577 as there is no trend in the data as indicated by the ARIMA (0,0,0) model. However, the Ljung-Box statistic ($p = 0.000$) is significant which shows that there is structure in this series not accounted for in the model. The estimation for the dependent variable Oahu per capita FTE enrollment (8)

has a stationary R-squared of 0.256 and an R-squared of 0.974. The Ljung-Box statistic is not significant ($p=0.367$).

County of Kauai

Table 3: County of Kauai.

	Dependent Variable	Model Type	Stationary R ²	R ²	Ljung-Box	Significant Variable	Parameter Estimate	Standard Error	t-value	Delay-years
(9)	Kauai Headcount Enrollment	Arima (0,1,0)	0.414	0.823	0.276	Change in Kauai Per Capita Income	0.67	0.021	3.20**	2
(10)	Kauai FTE Enrollment	Arima (0,1,0)	0.315	0.724	0.872	-	-	-	-	-
(11)	Kauai Per Capita Headcount Enrollment	Arima (0,1,0)	0.375	0.906	0.908	Change in Kauai Per Capita Income	0.000****	0.000****	3.03**	2
(12)	Kauai Per Capita FTE Enrollment	Arima (0,1,0)	0.000	0.876	0.908	-	-	-	-	-

**** As these results are very small they have been rounded to zero.

*** $p < 0.001$ ** $p < 0.01$ * $p < 0.05$

As Table 3 indicates the two estimations for the County of Kauai that identify significant variables are both ARIMA (0,1,0) models and are both for headcount enrollment dependent variables. The best fitting model is for the dependent variable Kauai headcount enrollment (9) with a stationary R-squared of 0.414, an R-squared of 0.823, and an insignificant Ljung-Box statistic (0.276). The change in per capita income is significant ($p < 0.01$) with a delay of 2 years. The only other model that identifies a statistically significant variable is the ARIMA (0,1,0) model for the dependent variable Kauai per capita headcount (11). The stationary R-squared is 0.375,

the R-squared is 0.906 and there is an insignificant Ljung-Box statistic (0.908). The change in per capita income is significant ($p < 0.01$) for this model also and delay is the same as for Kauai headcount enrollment at two years. The estimates generated for the dependent variables Kauai FTE enrollment (10) and Kauai per capita FTE enrollment (12) showed no statistically significant variables. The stationary R-square coefficients are 0.148 and zero respectively and the R-square coefficients are 0.712 and 0.876. The Ljung-Box statistics are insignificant ($p > 0.05$).

County of Maui

Table 4: Maui County

	Dependent Variable	Model Type	Stationary R ²	R ²	Ljung-Box	Significant Variable	Parameter Estimate	Standard Error	t-value	Delay-years
(13)	Maui Headcount Enrollment	Arima (0,1,0)	0.310	0.922	0.732	Maui Unemployment Rate	58.875	19.718	2.986**	0
(14)	Maui FTE Enrollment	Arima (0,1,0)	0.377	0.924	0.256	Maui Unemployment Rate Change in the CPI	23.045 29.601	10.637 7.643	2.166* 3.873***	4 3
(15)	Maui Per capita Headcount Enrollment	Arima (0,1,0)	0.432	0.781	0.418	Maui Unemployment Rate	0.001	0.000****	3.760***	0
(16)	Maui Per capita FTE Enrollment	Arima (0,1,0)	0.126	0.901	0.911	Maui Unemployment Rate	0.001	0.000****	2.603*	0

**** As these results are very small they have been rounded to zero.

*** $p < 0.001$ ** $p < 0.01$ * $p < 0.05$

Table 4 indicates that the County of Maui is the only county where results are available from all four of the models estimated. The best fitting model for all four dependent enrollment variables for the County of Maui are ARIMA (0,1,0) models. The estimation for the dependent variable Maui headcount enrollment (13) has a stationary R-squared of 0.310. The R-squared for this model is 0.922, and the Ljung-Box statistic is insignificant (0.732). Only one independent variable is identified as significant and that is the Maui unemployment rate ($p < 0.01$) with no delay.

The estimation for the dependent variable Maui FTE enrollment (14) with a stationary R-squared of 0.377 has the next best fit. The R-squared for this model is 0.924, and the Ljung-Box statistic is insignificant (0.256). Two independent variables are identified as statistically significant: 1) the Maui unemployment rate ($p < 0.05$) with a delay of 4 years and 2) the change in the consumer price index ($p < 0.001$) with a delay of 3 years.

The model for the dependent variable Maui per capita headcount enrollment (15) has the best fit with a stationary R-squared of 0.432, the R-squared is 0.781, and the Ljung-Box statistic is insignificant (0.911). The Maui unemployment rate is identified as the only statistically significant variable ($p < 0.001$) and there is no delay in its effect.

The estimation for the remaining dependent variable, Maui per capita FTE enrollment has a stationary R-squared of 0.126. The R-squared is 0.901, and the Ljung-Box statistic is insignificant (0.911). Once again, the Maui unemployment rate is the only independent variable is identified as statistically significant ($p < 0.05$) and there is no delay in its effect.

Comparison by County

It is apparent that several different variables affect enrollment significantly and that there are differences between which economic variables affect enrollment in the individual counties. In addition, some of these variables have the expected relationships and some do not.

The models estimated for the County of Hawai'i show the most variety of significant variables but even so the minimum wage stands out, as it is significant in all three of the useable estimations. For the County of Kauai, the change in per capita income is the only significant variable and only affects the two headcount enrollment variables. The County of Maui and the City and County of Honolulu where the local unemployment rate is clearly the most important economic variable show the most similarity. However, the effects of the local unemployment rates are stronger in the County of Maui as the Maui unemployment rate is significant for all four enrollment dependent variables. In the City and County of Honolulu the local unemployment rate is significant for two estimations, but as the Ljung-Box statistic is significant in one of these estimations, caution should be used when using the results for analysis.

The relationship between the dependent variables Oahu FTE enrollment and Oahu per capita FTE enrollment and the Oahu unemployment rate is positive. This shows that a decreasing unemployment rate (or conversely an increase in the level of employment) leads to decreases in enrollment and vice versa as human capital theory, some previous research and the anecdotal evidence predicts. As the unemployment rate decreases, the probability of getting a job increases, and student FTE enrollment decreases. In addition, during times of low unemployment, employers will pay higher

wages in order to attract workers. The effect of the unemployment rate (or the level of employment) on Oahu FTE enrollment and Oahu per capita FTE enrollment is immediate as shown by the delay of zero. FTE enrollment was included in the models as a dependent variable for all counties as headcount enrollment may not fully capture student's enrollment behavior. In particular because 60.2% of students attending community colleges in Hawai'i in Fall 2006 were enrolled part-time (University of Hawai'i Institutional Research Office, 2007). The decrease in the unemployment rate or the increase in the probability to get a job at higher pay may cause those students that are already part-time to further cut down their credit load and those that were full-time students may be induced to enroll on a part-time basis. This result reinforces the premise that students may continue to enroll during periods of low unemployment so that headcount enrollment is not necessarily affected. But, as shown by the lack of significance of the unemployment rate on the dependent variables Oahu headcount enrollment (1) and Oahu per capita headcount enrollment (3), students in the aggregate appear to be enrolling for fewer credits or courses.

The signs on the parameter estimates for the Maui unemployment rate are positive also indicating a direct relationship between the unemployment rate in the County of Maui and all the Maui dependent enrollment variables. This shows that a decreasing unemployment rate in the County of Maui leads to decreases in all types of enrollment in the same manner as it does for FTE enrollment in the City and County of Honolulu. As the unemployment rate decreases, the probability of being able to get a job increases, and student enrollment decreases. It appears that the same situation could be occurring in the County of Maui as in the City and County Honolulu in that during

times of low unemployment, employers will pay higher wages in order to attract workers even if they are relatively unskilled. It is also possible that there are more jobs available in the County of Maui and the City and County of Honolulu. Similarly to FTE enrollment in the City and County of Honolulu there is no delay in the effect of the unemployment rate for the dependent variables Maui headcount enrollment (13), Maui per capita headcount enrollment (15) and Maui per capita FTE enrollment (16) but interestingly there is a relatively long 4 year delay in the effects of the unemployment rate on the dependent variable Maui FTE enrollment (14). As previously mentioned, FTE enrollment was included as a dependent variable for all counties as headcount enrollment may not fully capture student's enrollment behavior. The delayed effect of the unemployment rate on Maui FTE enrollment when there is no delay for Maui headcount enrollment further justifies the necessity of including FTE enrollment as a dependent variable. In this case it indicates that it takes some time for FTE enrollment to adjust to changes in the unemployment rate. However, 4 years is a long delay which may indicate that there is another explanation.

The difference in the length of time for adjustment may be due to students seizing the opportunity to take a higher paying job immediately thus having an immediate effect on Maui headcount enrollment. Nevertheless some students will continue to enroll and may even take more courses in an effort to achieve their goals more quickly. Eventually, however, as these students do reach their goal, the effects of the decreasing unemployment rates begin to impact Maui FTE enrollment.

The only other variable that is significant in the County of Maui is the change in the consumer price index which is strongly significant ($p < 0.001$) for the dependent

variable Maui FTE enrollment. So in the County of Maui the level of unemployment as measured by the Maui unemployment rate is the most important economic variable affecting student's enrollment decisions.

The situation for the City and County of Honolulu is very similar even though no significant variables were identified for the dependent variables, Oahu headcount enrollment (5) and Oahu per capita headcount enrollment (7). Therefore, the unemployment rate is the economic variable driving enrollment in both the City and County of Honolulu and the County of Maui. It is interesting that this similarity occurs in light of the different choices available to students in the City and County of Honolulu as opposed to those students residing in the County of Maui. There are no 4-year public institutions located in the County of Maui, although there is a University Center and Maui Community College recently began offering one 4-year degree: Bachelor of Applied Science in Applied Business and Information Technology (ABIT) (University of Hawai'i, 2007a). There are two 4-year University of Hawai'i institutions located on the island of Oahu (City and County of Honolulu): University of Hawai'i at Mānoa and University of Hawaii-West Oahu and some private 2-year and 4-year institutions offering a wide variety of programs and degrees. It may be, however, that having the choice to attend other institutions is irrelevant if potential community college students do not qualify to attend the 4-year institutions so that the decision is simply between attending community college or working. It is also interesting that the effect of the unemployment rate on enrollment is immediate in both the City and County of Honolulu and the County of Maui except for the relatively long 4 year delay in the effect on Maui FTE enrollment.

Unemployment rates for the County of Kauai and the County of Hawai'i have been consistently higher than the rates in the City and County of Honolulu and the County of Maui during the period covered by this study (Laney, 2006). This may have some bearing on why the unemployment rates in the Counties of Kauai and Hawai'i are not significant in any of the models estimated for those counties. In addition, the unemployment rate may not be significant for the County of Hawai'i due to the demographics on that island. The island of Hawai'i, which is commonly called the "Big Island" because of its size, is divided into two main areas: East Hawai'i and West Hawai'i. The main population center for East Hawai'i is the Hilo area and for West Hawai'i it is the Kailua-Kona-South Kohala area. These centers are separated by distances and highway conditions that make commuting between the two on a regular basis (e.g. to attend college) difficult. Hawai'i Community College is located in Hilo (East Hawai'i), but anecdotal evidence suggests that economic activity is greater in West Hawai'i. This dichotomy causes a situation where the County of Hawai'i unemployment rate (as it is an average) is perhaps inaccurate for both areas: overstating the unemployment rate in West Hawai'i and understating it in East Hawai'i. If it is the case that there is more economic activity in West Hawai'i and thus the unemployment rate is actually less in West Hawai'i than in East Hawai'i, then the probability of getting a job in West Hawai'i is higher than in East Hawai'i. As previously mentioned Hawai'i Community College is located in Hilo (East Hawai'i) so the unemployment rate for the Hilo area may have been a better measure but unfortunately it is not available.

The demographics of the County of Hawai'i discussed above can lead to the conclusion that all of the models estimated may better reflect the behavior of students in

the Hilo area than those residing elsewhere on the island. There is a University Center in West Hawai'i but it is very small. In addition, students residing outside of the Hilo area may have access to distance learning through the internet or other technology. It should be noted that the 4-year University of Hawai'i-Hilo is also located in East Hawai'i. Interestingly, however, the economic variables appear to explain more of the variance ($R\text{-square} = 0.776$) in the dependent variable in the estimation for Hawai'i FTE enrollment than for any other estimation. However, it should be kept in mind that the $R\text{-square}$ coefficients for the other estimations are likely to be inaccurate.

The only statistically significant variable identified for the dependent variables Kauai headcount enrollment (9) and Kauai per capita headcount enrollment (11) is the change in per capita income. It is interesting that it is only the headcount dependent variables that are affected. The signs on the parameter estimates are both positive indicating a direct relationship between changes in per capita income and the measures of headcount enrollment. As the changes in income increase, headcount and per capita headcount enrollment at Kauai Community College increase and vice versa. As the change in per capita income measures the ability to pay for college, it appears that unlike the County of Maui and the City and County of Honolulu, the ability to pay is more important to the enrollment decision in the County of Kauai than the unemployment rate or the probability of getting a job. The ability to pay for college is thus the most important economic factor driving enrollment in the County of Kauai.

Kauai Community College is relatively small with a headcount enrollment of 1059 in Fall 2005, the last year covered by this study (University of Hawai'i Institutional Research Office, 2007) and is the only University of Hawai'i institution

located in the County of Kauai. The effects of changes in per capita income on enrollment in the County of Kauai are not immediate. It takes two years for the changes in per capita income to effect the independent headcount enrollment variables.

The ability to pay is also more important than the local unemployment rate in the County of Hawai'i. Unlike the County of Kauai, however, it is the minimum wage in the County of Hawai'i rather than changes in per capita income that appears to be measuring the ability to pay. As in the County of Kauai, the effects are also delayed but only for one year. The minimum wage which is strongly significant ($p < .01$) for 3 of the 4 dependent variables: Hawai'i headcount enrollment (1), Hawai'i FTE enrollment (2), and Hawai'i per capita FTE enrollment (4) was included in the models to be a measure of the opportunity costs of attending college. Particularly the minimum wage was thought to be a good measure of the opportunity costs in the form of foregone earnings as it is likely that potential community college students making the decision whether to work or attend college have minimal skills. However, if the minimum wage was a good measure of the opportunity costs of community college attendance, it would have a negative relationship with enrollment. But the signs on the minimum wage estimates generated for the three dependent variables Hawai'i headcount enrollment (1), Hawai'i FTE enrollment (2), and Hawai'i per capita FTE enrollment (4) are all positive. This may indicate that students do indeed attend community colleges in order to attain a higher wage than the minimum, reinforcing the human capital theory that students invest in themselves to attain higher earnings in the future.

Another reason, however, may be that the minimum wage is not an accurate measure of the opportunity costs or the foregone earnings but is measuring the ability to

pay for college. As previously stated (see p.46), human capital theory recognizes family income (sometimes expressed as the education and occupation of the father) as an important factor in the enrollment decision (Becker, 1993). In this case, however, as many community college students are independent their own income is more likely to measure the ability to pay. If, as previously assumed, potential community college students making the decision whether to work or attend college have minimal skills and therefore are more likely to have minimum wage jobs an increase in the minimum wage increases their ability to pay. The delay in the effect for one year reinforces this premise as the minimum wage does not increase annually and therefore it takes time for students to adjust to the change.

It's likely that the minimum wage is not statistically significant for the City and County of Honolulu and the County of Maui because the unemployment rates for those two counties are the lowest causing most workers to receive wages above the minimum. Many of the jobs are also in the service industry which means that tips can often be a part of the compensation received. Therefore, in these circumstances it is unlikely that the minimum wage will accurately measure the opportunity costs.

The implementation of Act 161 is only statistically significant ($p < 0.01$) in the County of Hawai'i and only for the dependent variables Hawai'i headcount enrollment (1) and Hawai'i FTE enrollment (2). The sign on the parameter estimate for Act 161 is negative for the dependent variable Hawai'i headcount enrollment (1). As Act 161 had the effect of raising tuition, this means there is an inverse relationship between tuition and headcount enrollment which is to be expected given that every student demand study referred to in the literature review (e.g. Corazzini et al., 1972, Jackson &

Weathersby, 1975, Leslie & Brinkman, 1987) found an inverse relationship between price (tuition) and the number of students enrolled. However, the sign is positive on the parameter estimate for Act 161 when estimating for the dependent variable Hawai'i FTE enrollment (2). In addition to having the effect of raising tuition at community colleges, Act 161 also increased the differential between tuition at community colleges and at University of Hawai'i 4-year institutions. As there is a 4-year institution in close proximity to Hawai'i Community College, some students may switch from the 4-year institution to the community college for lower level courses if the tuition at the 4-year institution increases. However, there are not enough of these students to offset the decreases in headcount enrollment due to increasing tuition but it does have the effect of increasing FTE enrollment. As Act 161 represents tuition increases and/or increases in tuition differentials between 2-year and 4-year institutions, it appears that in the County of Hawai'i it is not just the ability to pay, but also the amount that has to be paid that are important.

The relationship between the change in the consumer price index and Hawai'i FTE enrollment is positive, showing that changes (increases) in the cost of living have a positive effect on FTE enrollment, but after a relatively long delay of three years. This indicates that students may observe increasing prices over time and choose education or in some cases engage in vocational training in order to receive higher wages and salaries in order to be able to pay these higher prices. In addition, the fact that the change in the consumer price index is not a significant variable for the dependent variable Hawai'i headcount enrollment (1), but is for the dependent variable Hawai'i FTE enrollment (2) may mean that those students who are enrolling are taking more

credit hours in order to decrease the time necessary to attain their education goals so that they can join the workforce.

The County of Maui and the County of Hawai'i are the only two counties where the change in the consumer price index is statistically significant (both p -values < 0.001) and in both cases the change in the consumer price index was statistically significant for the estimations for the dependent variables for FTE enrollment. Even the delay of 3 years for the effect to have an impact is the same in both counties. This result is especially interesting as the data for the consumer price index is for Urban-Honolulu as it is the only consumer price index available that covers the entire period of this study. It is possible that the actual cost-of-living is different (higher) outside of the City and County of Honolulu as anecdotal evidence suggests, but the changes are similar across counties. At least, this may be true for the Counties of Maui and Hawai'i as the change in the consumer price index is not statistically significant for the County of Kauai.

There is no similarity evident in the significant variables for headcount enrollment across the counties. The local unemployment rate is significant for the dependent FTE enrollment variables in the City and County of Honolulu and the County of Maui and the change in the consumer price index is significant for the dependent FTE variables in the Counties of Hawai'i and Maui. Act 161 is also significant for the County of Hawai'i but not for any other county. An interesting point to note, however, is that there is no trend evident in the time series data for the dependent FTE variables for the County of Hawai'i and the City and County of Honolulu.

FTE enrollment was included as a dependent variable in order to gain more insight as it was thought that during economic downturns headcount enrollment may stay relatively stable but students may enroll for less credits/courses so FTE enrollment might be a better measure of student's actual enrollment behavior. But more or less the same variables are significant for headcount and FTE enrollment. However, changes in the independent variables generally have a more immediate effect on headcount enrollment whereas FTE enrollment takes longer to adjust as shown by the delays which range up to a high of 4 years for the unemployment rate to have an effect on Maui FTE enrollment.

Per capita headcount enrollment was included as a dependent variable to correct for normal population growth and the interaction between population growth and the economic variables. Although high school graduates were included as an independent variable to represent a group of potential students, community college students are from many different age groups and it was hoped that using per capita headcount enrollment as a dependent variable would capture the age diversity of community college students in the State of Hawai'i. However, little if anything is gained from its inclusion. The estimations for the County of Hawai'i and the City and County of Honolulu per capita headcount enrollment show no significant predictors. The significant variables for the Counties of Kauai and Maui per capita headcount enrollment are the same as for headcount enrollment.

Per capita FTE enrollment was included as a dependent variable for the same reasons that per capita headcount enrollment was included and similarly to per capita headcount enrollment, little is gained from its inclusion. The results are very similar to

those from FTE enrollment. The difference being that the change in the consumer price index is significant in the Counties of Hawai'i and Maui for FTE enrollment but not for per capita FTE enrollment.

State of Hawai'i

Table 5: State of Hawai'i

	Dependant Variable	Model Type	Stationary R ²	R ²	Ljung-Box (Sig)	Significant Variable	Parameter Estimate	Standard Error	t-value	Delay-Years
(17)	State Headcount Enrollment	Arima (0,1,0)	0.420	0.853	0.581	State Unemployment Rate	490.69	242.7	2.022*	0
(18)	State FTE Enrollment	Simple	-0.019	0.598	0.499	-	-	-	-	-
(19)	State Per Capita Headcount Enrollment	Arima (0,1,0)	0.169	0.830	0.147	Min Wage	-0.007	0.003	-0.269**	5
(20)	State Per Capita FTE Enrollment	Arima (0,1,0)	0.072	0.942	0.988	State Unemployment Rate	0.007	0.003	2.367*	0

*** p<0.001 ** p<0.01 * p<0.05

The model was estimated for the State of Hawai'i to provide additional perspective to the results found on the individual county level. On a statewide basis, the ARIMA (0,1,0) model estimated for the dependent variable State headcount enrollment (17) is the best fitting model. The stationary R-squared is 0.420, R-squared 0.853 and the Ljung-Box statistic is insignificant (0.581). The state unemployment rate is significant at (p<0.05).

The estimation for the dependent variables State FTE enrollment is a simple exponential smoothing model and no significant variables are identified. However, State per capita headcount enrollment is an ARIMA (0,1,0) model with a stationary R-squared of 0.169 and an R-squared of 0.830. The Ljung-Box statistic is insignificant (0.147). The minimum wage is the only significant variable ($p < 0.01$) but there is a relatively long delay of 5 years.

In the two estimations where the state unemployment rate is statistically significant it has the expected positive relationship with the dependent enrollment variables (State headcount enrollment and State per capita FTE enrollment). Statewide headcount enrollment and per capita FTE enrollment falls as the unemployment rate decreases and vice versa. The local unemployment rate is only statistically significant ($p < 0.01$) for the dependent headcount enrollment variable in the County of Maui (Maui headcount enrollment) but it is significant in both the City and County of Honolulu ($p < 0.01$) and the County of Maui ($p < 0.05$) for the dependent per capita FTE enrollment variables (Oahu per capita FTE enrollment and Maui per capita FTE enrollment). As the majority of the population (71%) resides on the island of Oahu in the City and County of Honolulu, this result is not unexpected. In addition, the County of Maui has 11% of the total population so these counties combined account for 82% of the population. Also, the community colleges in these counties have the largest enrollment. This is likely overshadowing the counties of Hawai'i and Kauai in these estimations for the entire state. The effect of the unemployment rate statewide is immediate as it is for all other estimations where it is statistically significant except for the dependent variable

Maui FTE enrollment, where the time for adjustment to occur is a relatively long 4 years.

The minimum wage is significant ($p < 0.05$) in the estimation for the dependent variable State per capita headcount enrollment (18) and it is interesting that in this case it has the expected negative relationship to enrollment. This is contrary to the results for the County of Hawai'i, the only individual county where the minimum wage is statistically significant ($p < 0.001$). The relationship between the dependent variables Hawai'i headcount enrollment, Hawai'i FTE enrollment, and Hawai'i per capita FTE enrollment and the minimum wage is positive. This led to the conclusion that in the County of Hawai'i the minimum wage is not measuring the opportunity costs or the foregone earnings of attending college but rather the ability to pay. On a statewide level, however, it appears that the minimum wage is measuring the opportunity costs, at least for per capita headcount enrollment. There is, however, a relatively long delay of 5 years for the minimum wage to affect the dependent variable State per capita headcount enrollment. This possibly can be attributed to the length of time it takes for students to realize what their opportunity costs actually are.

High School Graduates

The only independent variable that is not significant in any of the estimations is the number of public high school graduates. Although community college students are not the stereotypical, just graduated from high school, 18 year old (Weber, 2004), high school graduates still represent a sizable pool of potential students so it is somewhat surprising that there is no significant relationship between any individual county enrollment variable and public high school graduates. An examination of the going rate

of high school students to University of Hawai'i Community Colleges, however, assists in explaining the lack of significance. In Fall 2006, the going rate of high school graduates to community colleges located in the State of Hawai'i was 21.5% (University of Hawai'i, 2007b). However, this is an average so there are differences by county with the County of Kauai (which does not have a 4-year institution) having the highest rate at 28.0% (University of Hawai'i, 2007b). The rate on Oahu (City and County of Honolulu) is 21%, County of Maui 19.5%, and the County of Hawai'i 16.8% (University of Hawai'i, 2007b). Besides community colleges, high school graduates in Hawai'i have the choice of attending either private or public 4-year institutions or they can leave the state for higher education. It should be noted that the going rate to University of Hawai'i 4-year institutions is only 10.6%, nearly 10% lower than the going rate to community colleges (University of Hawai'i, 2007b). However, of high school graduates choosing to leave the state for higher education in Fall 2004, only 2.7% (66 students) left to go to institutions other than 4-year degree granting institutions (US Department of Education National Center for Education Statistics, 2006).

Summary

In response to the first research question, the findings show that there is a relationship between economic conditions and enrollment at the community colleges in each of the four counties in the State of Hawai'i and therefore the null hypothesis that there is no relationship is rejected. The null hypothesis is also rejected for the second research question, as comparisons show that the relationship does differ by county. In addition, there is no unique economic variable that affects any specific

type of enrollment dependent variable which reconfirms that different conditions exist in different counties.

There is also a relationship between economic conditions and enrollment on an aggregated statewide basis. The difference between the relationship of the minimum wage to enrollment at the county level and at the state level shows that statewide analysis may obscure county level conditions. This provides further justification that analysis needs to be conducted for each individual county. The implications of the findings for theory, practice, and for future research are presented in Chapter 5.

CHAPTER 5

CONCLUSION

The results from the data analysis reveal that there is a relationship between economic conditions and enrollment at community colleges in Hawai'i and that the relationship does differ by county as different economic indicators are influencing enrollment. There is also a relationship between economic conditions and enrollment on an aggregated statewide basis. These findings generally support the widely accepted belief that when economic conditions are good, enrollment at community colleges decreases and vice versa.

The unemployment rate is the most prevalent economic variable affecting enrollment at the community colleges in the Counties of Maui and the City and County of Honolulu, the change in per capita income affects enrollment in the County of Kauai, and the minimum wage has the most effect in the County of Hawai'i. Although, the change per capita income and the minimum wage both appear to be measuring the ability to pay for college as they have a positive relationship with enrollment. The minimum wage also affects per capita enrollment statewide but in this case it is measuring the opportunity costs or the foregone earnings, not the ability to pay as in this case the minimum wage has an inverse relationship with enrollment. The unemployment rate is the most important economic indicator statewide.

This chapter explains the relevance of this study in the context of the existing empirical literature, followed by a discussion of the implications for community college

administrators and/or enrollment managers in Hawai'i, for human capital theory, and for further research.

Relevance of the Study

The general purpose of this study was to add to the existing literature on the *relationship between economic conditions and enrollment at community colleges in Hawai'i*. No comprehensive study such as this has ever been undertaken within the state. The only previous study relating to the State of Hawai'i was conducted 30 years ago and focused primarily on the effect of tuition increases at the 4-year University of Hawai'i at Manoa. It was classified as a case study of an institution with no close competitors (Leslie & Brinkman, 1987).

The existing research regarding enrollment at community colleges using national data provides an overall picture or an average across the entire country (Betts & McFarland, 1995; Pennington et al., 2002). By studying enrollment at the regional level (New England region), Betts and McFarland (1995) narrowed the focus. The Wyoming Community College Commission study (1999) narrowed the focus even further to a state level and then still further to the individual community colleges within the state. Sundberg (1998) and the Montgomery College Institutional Research Office (1983) also studied individual institutions. This study fits in at the same level as the Wyoming Community College Commission (1999), as it focuses at the county level but does incorporate some statewide analysis. So in addition to achieving its stated purpose, this study has also added to the existing literature regarding the relationship of economic conditions to enrollment at community colleges in general.

The majority of the literature regarding the effects of economic conditions on enrollment focuses primarily on 4-year institutions although a few studies have investigated the relationship between economic conditions and community college enrollment. However, because there are only a few such studies, it is difficult to make meaningful comparisons or conclusions. As detailed in the literature review (Chapter 2), the only independent economic variable common to all the quantitative research conducted using community college data is an unemployment rate, but the same measure of the unemployment rate is not used in previous studies.

The study conducted by Betts and McFarland (1995) found significant positive relationships between national unemployment rates and national FTE enrollment and regional (New England) unemployment rates and regional FTE enrollment. Similarly this study found positive relationships between the state unemployment rate and per capita FTE enrollment, between the Maui unemployment rate and both measures of FTE enrollment, and between the Oahu unemployment rate and both measures of FTE enrollment. Although these results are similar, in that they show a positive relationship between college enrollment and unemployment rates, it is once again difficult to draw conclusions, as the relative sizes of the areas covered by the studies are very different. The individual counties in Hawai'i are relatively small, and even the state of Hawai'i is much smaller than the New England region (which is comprised of the states of Maine, New Hampshire, Vermont, Maryland, Rhode Island, and Connecticut). However, it can be concluded that the results of the analysis regarding the state and the two individual counties (County of Maui and City and County of Honolulu) are the same as the national and New England regional results found by Betts and McFarland (1995) with

respect to FTE enrollment. The local unemployment rate was not found to have any effect on FTE enrollment in the Counties of Hawai'i and Kauai.

It is perhaps more beneficial to compare the Hawai'i state results with the results from a study that also focused on one state. The Wyoming Community College Commission (1999) conducted research on enrollment at community colleges located in different counties in Wyoming and at the state level. A strong and significant positive relationship was found between the unemployment rate and headcount enrollment, which is the only enrollment measure used, at the overall community college system level in Wyoming. This study likewise shows that there is also a positive relationship between headcount enrollment and the state unemployment rate in the state of Hawai'i. But the Wyoming Community College Commission (1999) did not use its state unemployment rate, but rather the number of unemployed in the primary feeder county for each college. It is not clear if the unemployed from counties other than the feeder counties were included, although this may not have any effect on the end result. Further, the study in Wyoming concluded that there was not a significant relationship between the number of unemployed in each county and the level of headcount enrollment at the college located in that county. This is in contrast with the results in the County of Maui where headcount enrollment and FTE enrollment were found to have a positive relationship with the local unemployment rate. As in the Wyoming study, however, no significant relationship was found between unemployment and headcount enrollment measures in the other Hawaiian counties (Hawai'i, Honolulu and Kauai).

Sundberg (1998) focused on just one community college in the state of Illinois and found a small correlation between total credit hours, a measure which is similar to

FTE enrollment, and unemployment rates, no correlation with baccalaureate hours and unemployment rates, and the highest correlation between non-baccalaureate hours (vocational) and unemployment rates. There is confusion, however, regarding which unemployment rate Sundberg (1998) actually used. Nonetheless, if the results of the individual counties in Hawai'i are compared with the results Sundberg (1998) obtained using total credits hours as the dependent enrollment variable and the results from this study using FTE enrollment, the results are not conclusive. The unemployment rate has no effect on FTE enrollment in the Counties of Hawai'i and Kauai but it does in the County of Maui and in the City and County of Honolulu. But, there are four community colleges located in the City and County of Honolulu so the comparison is not between individual colleges in that case. Sundberg's (1998) results from using baccalaureate and vocational hours cannot be compared because no comparable measures were used in this study with respect to baccalaureate or vocational hours.

Pennington et al. (2002) used more economic variables than the models discussed above where only the unemployment rate is in evidence. However, although Pennington et. al. (2002) used national time series data, only partial correlation analysis was conducted. Besides headcount enrollment, Pennington et. al. (2002), calculated per capita headcount enrollment to correct for normal population growth and the interaction between population growth and the economic variables. The relationship between unemployment rates and headcount enrollment measures in Hawai'i are positive where the unemployment is statistically significant.

The relationship between the consumer price index and the headcount enrollment measures was not found to be significantly correlated with either enrollment

measures in the study conducted by Pennington et. al. (2002). The consumer price index was transformed into the change in the consumer price index for this study and similarly it is not statistically significant for any headcount enrollment variables. It was significant for the Counties of Hawai'i and Maui FTE enrollment measures. Other variables used in Pennington et. al. (2002), such as gross domestic product, was not included in this study.

Heller (1996) conducted a study using cross-sectional and time-series data at the national level which primarily focused on the relationship between tuition and enrollment levels. However, Heller (1996) did include a measure for unemployment rates and found that enrollment in community colleges were positively related to unemployment rates as it was where the unemployment rate was significant in this study.

So with respect to the studies conducted using community college data there is wide divergence in the scope of the study, the variables, and the measurements used. To summarize: Pennington et al. (2002) and the Wyoming Community College Commission (1999) use total headcount enrollment, although Pennington et. al. (2002) did create per capita headcount enrollment. Betts and McFarland (1995) used national FTE enrollment. Sundberg (1998) used total credit hours and divided them up into different categories. Like Pennington et. al. (2002) this study examined headcount enrollment and per capita headcount enrollment. In addition, this study examined FTE enrollment and created a variable for per capita FTE enrollment. Pennington et al. (2002) and Betts and McFarland (1995) used national time series data, while Sundberg (1998) and the Wyoming Community College Commission (1999) used local time

series data. Similarly this study used time series data but at the local level. However, while the data is all time series, the models and methods used are very different. Pennington et al. (2002) only calculated partial correlations, Sundberg (1998) and the Wyoming Community College Commission (1999) used linear regression analysis, Betts and McFarland (1995) used an income maximization model, Montgomery College Institutional Research Office (1983) used a combination of partial correlation and regression analysis and this study uses ARIMA models.

As these studies use different models and methods it is difficult to integrate the findings. The results from the studies using the unemployment rate as the measure for economic conditions as it is the only economic variable common to all show: Betts and McFarland (1995) found significant positive relationships between unemployment rates and enrollment nationally and in New England; the Wyoming Community College Commission (1999) found a strong and significant positive relationship at the overall community college system level but insignificant results at the individual college level; Sundberg (1998) found a low correlation between total credit hours and unemployment rates, no correlation with baccalaureate hours and unemployment rates, and the highest correlation between non-baccalaureate hours (vocational) and unemployment rates; Montgomery College Institutional Research Office (1983) found no significant relationship between local unemployment rates and enrollment; and Pennington et al. (2002) found positive and significant correlations at the national level between unemployment and total enrollment and also between unemployment and per capita enrollment. This study finds the unemployment rate significant for the City and County of Honolulu, the County of Maui and statewide, but finds other economic variables

important in the other counties. The minimum wage is important in the County of Hawai'i and the change in per capita income in the County of Kauai. Thus, the findings are mixed depending on the level that serves as the unit of analysis.

The relationship between tuition and enrollment which is evident in all student demand models is confirmed in the County of Hawai'i, as there is an inverse relationship between Act 161 and headcount enrollment in the county of Hawai'i. As Act 161 is not a direct measure of tuition and no direct measure was included, the lack of significance for Act 161 with respect to other measures of enrollment and in other counties should not be interpreted to mean that the inverse relationship between tuition and enrollment levels does not exist in those counties. In addition, Act 161 has a positive relationship with FTE enrollment in the County of Hawai'i as it also serves as a measure of the differential between community colleges tuition and tuition at University of Hawai'i 4-year institutions.

Nonetheless, this study serves to reaffirm many of the results of these community college studies and also generally reaffirms the widely held belief that when economic conditions are bad, enrollment at community colleges will grow (Betts & McFarland, 1995; Pennington et al., 2002; Sundberg, 1998). In this case, however, the belief may be better stated more narrowly: if the local (county level) economic conditions are bad, enrollment levels at community colleges in that county will grow.

Implications for Community Colleges in Hawai'i

The results have important implications for enrollment managers at community colleges in the state of Hawai'i to consider. The fact that the number of high school graduates shows no significant effect on enrollment indicates that either recruitment

efforts targeting this group are ineffective and/or insufficient. It also confirms what we already know: that students enrolling at community colleges are not the stereotypical 18 year old high school graduate, half are older than 24 nationwide (Cohen & Brawer, 2003). In the state of Hawai'i, the mean age of students enrolled in Fall 2006 at community colleges was 25.2 years (University of Hawai'i Institutional Research Office, 2007). Even so, as high school graduates are easily identified, more aggressive recruitment and marketing strategies aimed at this demographic could prove successful.

Stronger connections with K-12 have already been suggested as a strategy to encourage students to enroll at community colleges (McClenney, 2004), and Hawai'i has already moved in this direction with the establishment of a dual-enrollment program (Running Start) in 2000 which is operated in conjunction with the State Department of Education (Haig, 2002). Presently, all seven community colleges participate in the program which allows high school students to enroll in college courses for credits which can be applied to both the high school diploma and college degree (University of Hawai'i, 2006). Headcount enrollment has more than tripled since Fall 2002, when 66 Running Start students enrolled for courses at participating community colleges (K. Jaycox, personal communication, February 14, 2007). This number increased to 259 in Fall 2006 (K. Jaycox, personal communication, February 14, 2007). While dual enrollment programs are provided as means to encourage high school students to continue to college, there is no guarantee that these students will continue at community colleges (McClenney, 2004). Further study is needed to see how many students in the Running Start program do continue to enroll in community colleges in Hawai'i.

The results of this study also confirm that retention of existing students is critical for keeping enrollment at adequate levels. Community colleges in Hawai'i have an average three-year graduation rate of 14% (University of Hawai'i Institutional Research Office, 2007). The highest is 19% at Hawai'i Community College and the lowest is 8% at Windward Community College (University of Hawai'i Institutional Research Office, 2007). The overall rate is 6% lower than the benchmark average of 20% (University of Hawai'i Institutional Research Office, 2007). But 25.5% of community college students in the state of Hawai'i do continue after the third year (University of Hawai'i Institutional Research Office, 2007). Sixteen percent of women and 12% of men graduate eventually (University of Hawai'i Institutional Research Office, 2007). Hispanics and Caucasians have the highest average graduation rates, but Asians have the highest average continuation and success rates (University of Hawai'i Institutional Research Office, 2007). Success is determined by adding the graduation and continuation rate. The success rate for women is 42%, which is higher than for men (37%) (University of Hawai'i Institutional Research Office, 2007). The transfer rate of students from Hawai'i community colleges to University of Hawai'i's 4-year institutions was 14.1% in 2001 (University of Hawai'i Institutional Research Office, 2007).

Retention has long been a goal of enrollment managers at community colleges (Ritze, 2006). In their efforts to retain students, many community colleges have initiated student services and activities such as child care, tutoring, single parent support, etc. (Cohen & Brawer, 2003), but this is costly (Lee & Cleary, 2004). For example, as women make up approximately 58% of community college enrollees, there have been

suggestions that institutions should pay attention to their special needs (Bryant, 2001). Retention strategies include specialized orientation and academic advising, focused on the specific issues women face, as well as day care services that are more readily available (Bryant, 2001). However, these all add additional cost (Bryant, 2001). Community colleges in Hawai'i offer some of these services but may need to refine or refocus their efforts (Lee & Cleary, 2004; University of Hawai'i Institutional Research Office, 2007).

So retention is deemed vital for stabilizing enrollment and high school graduates are an easily identifiable group, thus easier to target for marketing. Sundberg (1998) claims judicial marketing strategies can overcome the fluctuations caused by changing economic conditions. But other potential students are not easily identifiable so the question remains as to what other marketing strategies can be utilized and which groups could or should be targeted. This means enrollment managers need to identify their potential students.

Some of demographics are known. In Fall 2006, there was a total of 25,260 students enrolled at the seven community colleges located in Hawai'i. Almost 42% (10581) of these students were male, 57.9% (14620) were female and there is no gender data on 59 students (0.2%). Approximately 40% (10057) of students attended full-time and the rest 60.2% (15203) attended part-time but there is no breakdown of full-time/part-time attendance by gender (University of Hawai'i Institutional Research Office, 2007). The average student age is 25.2 years, a few years younger than the national average of 29 years (University of Hawai'i Institutional Research Office, 2007). The majority of these students (90.4%) are residents of Hawai'i and 66.4% of the

total student population is classified as Asian/Pacific Islander. The predominant minority groups nationwide, African Americans and Hispanics, only account for 1.1% and 2.1% respectively and the white, nationwide majority group only accounts for 15.6% of students (University of Hawai'i Institutional Research Office, 2007). All seven community colleges in Hawai'i are classified as Asian American and Pacific Islander-Serving Institutions (AAPI) (Laanan & Starobin, 2004).

Besides the demographics, enrollment managers need to be aware of the goals that Hawai'i's community college students aspire to which are as varied as they are at the national level. Almost 47% of the students in Fall 2006 listed their objective as an Associate in Arts Degree, 26.1% aspired to an Associate of Science degree. Only 2.4% listed their goal as a Certificate of Achievement and Completion (University of Hawai'i Institutional Research Office, 2007). 47 per cent of students declare majors in the *General and Pre-professional areas*, 28.7% in *Career and Technical Education*, but 10.6% are unclassified. 13.9% are taking courses at campuses other than their primary campus (University of Hawai'i Institutional Research Office, 2007).

As it appears that more potential students are already working, it's possible that contacting employers and trying to increase the amount of contract on-the-job training or workshops may be a viable option. Workforce development is a key objective in the community college's strategic plans and individual colleges create specific programs, often short-term, to train students for employment in shortage areas (University of Hawai'i, 2006). Anticipated need areas in the local labor markets should also be considered when any new programs are being contemplated (University of Hawai'i, 2007b).

Community colleges across the nation are now placing more emphasis on recruiting international students (Krupnick, 2007). Six hundred and sixty students attending community colleges in Hawai'i in Fall 2006 listed a foreign permanent home address (University of Hawai'i Institutional Research Office, 2007). Five hundred and fifty-seven of these attended community colleges in the City and County of Honolulu (University of Hawai'i Institutional Research Office, 2007). Just ten years earlier in 1996 there were 262 students who listed a foreign permanent address and 214 of these were in the City and County of Honolulu (University of Hawai'i Institutional Research Office, 2007). College leaders claim international students bring both culture, and money to campus (Krupnick, 2007). Perhaps more importantly for the enrollment managers, tuition rates for international students are higher than for residents and international students are attracted to community colleges as their tuition rates for international students are still lower than at four-year institutions (Krupnick, 2007).

Unlike the community colleges on the outer islands, the four community colleges in the city and county of Honolulu do face competition from each other, although there have been attempts not to duplicate programs. Nevertheless, as conditions vary by county, it is the responsibility of each community college to identify its own strengths, develop programs that fit the needs of their students and market these programs accordingly in order to attract and retain students.

Implications for Human Capital Theory

There are problems inherent in applying human capital theory in general, and in particular, to the enrollment decisions of individual community college students. While the direct costs (tuition, books, etc.) may be relatively easy to measure in dollar terms,

estimation of foregone earnings may be more inaccurate, and foregone earnings are the primary component of costs (Stratton et al., 2004). It can also be difficult to separate costs for human capital investment from personal consumption spending (Becker, 1964). However, the difference is that consumption provides instant gratification while investment in human capital goes beyond that (Noland, Davis, & Kelly, 2007). Estimating the appropriate discount rate poses problems (Betts & McFarland, 1995) which is partially why discount rates were not included in this study.

Standard human capital theory assumes a full-time commitment to human capital formation (Stratton et al., 2004). But the situation for community college students across the nation and in Hawai'i is more complex. In Fall 2006, 39.8% of community college students in Hawai'i attended full-time, and the rest (60.2%) attended part-time (University of Hawai'i Institutional Research Office, 2007). Nationally, 54% of community college students work fulltime and 30% work part-time which means a total of 84% are attending college on a part-time basis (Weber, 2004; Wilson, 2004). In addition, 20 % of community college students do not see themselves as students but rather employees seeking education (Hamm, 2004). Regardless of the demographic location, part-time versus fulltime enrollment affects direct costs as tuition is generally lower for part-time enrollment but the time to graduate is longer which increases the indirect or opportunity costs (Stratton et al., 2004). In addition, the full-time student is not acquiring work experience which is a component of human capital in the form of on-the-job training even when it not explicit (Stratton et al., 2004). Full-time workers who are part-time students are more likely to be in career-related jobs thus possibly gaining more human capital, than full-time students who work part-time around their

class schedule (Stratton et al., 2004). It should also be noted that human capital is not only acquired through formal education but can include competencies learned, in the home, on the job (but not necessarily through specific on-the-job training), and around the community (Douglass, 1997).

Economists don't deny the existence of non-monetary values but focus on outputs that can be measured in dollars (Douglass, 1997). However, some opportunity costs are difficult to measure in dollar terms. For example, opportunity costs may be determined by household responsibilities rather than by employment (Stratton et al., 2004). More household responsibilities may cause a delay in enrollment or encourage part-time status (Stratton et al., 2004). Women with young children may chose to enroll part time or delay enrollment until their children are at least of school age (Stratton et al., 2004). Although household responsibilities are more often associated with women, married men and men with children may feel pressure to be breadwinners now, as they have higher current opportunity costs in the form of earnings they would have to forgo (Stratton et al., 2004). Therefore, they may not enroll at all or enroll part time (Stratton et al., 2004). In periods of economic restructuring, workers who are laid off or unemployed and are potential candidates for retraining face a relatively low opportunity cost of their time and may reap substantial gains to further investments in education (Douglass, 1997).

It is possible that the level of opportunity costs may also be a function of academic ability (Stratton et al., 2004). Less able students need more time to study in order to maintain an acceptable GPA (Stratton et al., 2004). Becker (1993) found that there is a correlation between ability and education and tried to separate innate ability

from the effects of education (Douglass, 1997). There are other links between ability and education. Students who demonstrate more ability in high school are more likely to attend 4-year institutions (Hoachlander, Sikora, & Horn, 2003). They also receive scholarships to attend college which affects the direct costs of college attendance (Hoachlander *et al.*, 2003). In addition, there are less ability-based scholarships for 2-year institutions than there are for 4-year institutions (Cohen & Brawer, 2003). However, more able people are more likely to invest in themselves (Becker, 1993). But it is younger people who are more likely to invest in human capital, and they have a tendency to be more unaware of their abilities and the available investment possibilities than their older counterparts (Becker, 1993). Human capital theory itself recognizes that individual decisions are made with a great deal of uncertainty (Beattie, 2002), mostly related to the difficulties measuring key variables such as future income or the appropriate interest (discount) rate (Becker, 1993).

Future income or the expected earning stream can be difficult to estimate. Students often make decisions regarding their future occupations based on present market needs, particularly shortage areas where wages are relatively high (Betts & McFarland, 1995). In some cases by the time these students are qualified to actually work in these areas, market wages have fallen (Betts & McFarland, 1995). The earnings stream is also affected by age or the number of years a person intends to work (Beattie, 2002).

Models using human capital theory use various methods to estimate discount rates for college students. Discount rates are used to calculate the present value of future earnings (Becker, 1993). For example, in their study of community college students,

Betts and McFarland (1995) use as a proxy the present discounted value of earnings of employed workers in the given educational level while recognizing that the earnings of older workers today may not reflect what younger workers will earn in the future. But the methods used to determine rates of return in model estimations are highly unlikely to be utilized by community college students (Beattie, 2002). They do not have or seek the necessary information and often have not acquired any knowledge of or the skill to use such methods (Beattie, 2002).

Rates of return differ among individuals based on whether they are present or future oriented (Betts & McFarland, 1995). Evidence suggests that students from lower socioeconomic backgrounds have higher subjective discount rates of time preference (value the present more than the future) (Betts & McFarland, 1995). Many community college students are from lower socioeconomic groups, but there are other indications that community college students have relatively high discount rates. Changes in work schedules are often cited by students as a reason to leave community colleges (Cohen & Brawer, 2003), which indicates that work is considered a higher priority. In turn, this indicates that they value the present more than the future and that the immediate opportunity costs or the earnings they would have to give up to attend college are more important (Betts & McFarland, 1995; Corazzini et al., 1972). Betts & McFarland (1995) found little difference in the probability of enrollment when utilizing relatively high discount rates of 10% and 15% in their estimations.

Discount rates are also affected by whether the human capital to be acquired is specific or general (Scheiding, 2000). The human capital literature often distinguishes between "specific" and "general" human capital. Specific human capital refers to skills

or knowledge that is useful only to a single employer or industry, whereas general human capital (such as literacy) is useful to all employers (Scheidig, 2000).

Economists view firm specific human capital as inherently risky, since firm closure or industry decline lead to skills that cannot be transferred (Scheidig, 2000). The type of human capital an individual chooses to accumulate depends on the expected rate of return (Scheidig, 2000). Assuming an individual is aware of the risks of specific capital accumulation the rate of return would have be higher than for general capital accumulation (Scheidig, 2000).

But perhaps an even greater problem lies in the variables that are not directly included in the calculation of present costs and future benefits but which do have an impact, not only in the decision-making process but also in the outcome (in terms of educational attainment and subsequent earnings). Some sociologists claim that much of the application of human capital theory neglects to examine how individual characteristics such as, gender, race, and class may cause students to react differently (Beattie, 2002). Some students from lower socioeconomic groups are also often motivated by the attainment of status rather than higher future income alone (Beattie, 2002). There is also evidence that rates of return differ in urban areas when compared to rural areas (Noland et al., 2007). However, Becker (1993) states that there are differences in gains within and between groups and although community college students are not specifically mentioned, some of his comments as outlined below, can be applied as relevant to their situation.

Becker (1993) refers to differences in opportunity. Opportunity here is defined as the availability of funding and the costs of funds for investment in schooling (Becker,

1993). Although investments in college education are often seen as a means to improving long-term economic prospects, the question of whether potential students have opportunities to make these investments has long been a focus of research at the intersection of higher education policy and economics (Seftor & Turner, 2002). For example, those with parents who went to college have more opportunity than those whose parents did not (Becker, 1993). Parents who attended college are likely to have higher incomes and are therefore more able to fund a college education for their children and are more likely to consider it a priority (Becker, 1993). These parents also provide social and/or cultural capital in that they discuss their college experiences, the benefits of going to college, and provide an understanding support network (Scheiding, 2000). Efforts have been made in some studies using human capital theory to control for the effects of family background, including parents and in-laws education and income but found it had only a modest effect (Douglass, 1997). Regardless, community college students are often the first generation in their family to attend college and therefore lack not only the social and/or cultural capital but also financial support (Cohen & Brawer, 2003). Students from low socioeconomic backgrounds may place greater weight on the costs of college attendance which they may find prohibitive (Beattie, 2002). Consequently many potential community college students have few assets and lack access to credit markets to borrow for education (Seftor & Turner, 2002). The problem is that they offer no collateral, have no credit record, cannot make payments easily when enrolled, have little current income and are simply poor credit risks if standard measures are applied (Cohen & Brawer, 2003). Federal financial aid programs providing grants and loans may have an especially large impact on these

students if they are able to access them (Seftor & Turner, 2002). Nevertheless, inequality of opportunity leads to inequality in human capital (Scheiding, 2000).

Human capital theory predicted that the enrollment of community college students in each county would have a positive relationship with the unemployment rate and per capita income, a negative relationship with the minimum wage rate (opportunity cost or foregone earnings) and the consumer price index. Regardless of all the limitations and problems inherent with the application of human capital theory, particularly to community colleges as previously described, the findings of this study generally support human capital theory.

The unemployment rate, which is a significant variable for Oahu FTE enrollment and Oahu per capita FTE enrollment and for all dependent enrollment variables in the County of Maui, is the most frequently used variable in the literature to represent economic conditions. It has the expected positive relationship with enrollment. This reinforces human capital theory especially when interpreting the unemployment rate as representing the probability of getting a job. The increase in wages that can occur as unemployment rates fall and employers have to offer higher wages to attract workers means that the opportunity costs of college attendance (in the form of foregone earnings) increases and more students are likely to choose work over education. Also, lower unemployment rates and higher wages lead to lower reenrollment probabilities for those who interrupt their undergraduate education (Stratton et al., 2004).

The change in per capita income has a positive relationship with the two headcount enrollment measures in the County of Kauai. This is consistent with human

capital theory because income is considered a measure of the ability to pay for college (Becker, 1993). The minimum wage, however, which is included as a measure of the opportunity costs of college did not have the expected relationship. It is statistically significant for three measures of enrollment in the County of Hawai'i: Hawai'i headcount enrollment, Hawai'i FTE enrollment, and Hawai'i per capita FTE enrollment but the relationship is positive. This may indicate that students residing in the County of Hawai'i do indeed attend community colleges in order to attain a higher wage than the minimum, reinforcing the human capital theory that students invest in themselves to attain higher earnings in the future. However, it could be measuring the ability to pay for college in the County of Hawai'i. If this is the case, it is acting in the same manner as the change in per capita income is in the county of Kauai. If the minimum wage is measuring the opportunity costs, as it was expected to do, the relationship between the minimum wage and enrollment would be negative. The minimum wage is not significant in any other county estimation. This does not mean that human capital theory is incorrect regarding the expected relationship between the opportunity costs and enrollment, but rather that a different and better measure for the opportunity costs needs to be identified. As previously mentioned, opportunity costs can include non-monetary considerations making accurate measurement a challenge. On a statewide basis, however, the minimum wage is statistically significant and has the expected negative relationship with state per capita headcount enrollment as predicted by human capital theory. Community colleges in the Counties of Kauai and Hawai'i may want to hold some focus groups to find out what is motivating their students behavior with respect to income.

The change in the consumer price index also does not have the expected relationship with the enrollment variables where it is found to be significant. Theory predicts that the relationship between these variables is inverse, as prices increase enrollment decreases. As the cost of living increases potential students may have to work in order to pay the increasing costs and therefore enrollment decreases. This may be the case for headcount enrollment. However, the change in the consumer price index is not significant for headcount enrollment, but has a positive relationship with FTE enrollment only in the Counties of Hawai'i and Maui. This can happen if some students sacrifice now and take more credits in order to finish their program in less time so that they can join the work force. If this is the case, the outcome actually reinforces the main premise of human capital theory that students will sacrifice now for higher future earnings. There is also a 3-year delay in the effect of increases in the cost-of-living on FTE enrollment in both counties which indicates that time is needed for the adjustment process to occur.

So while there are some results from this study that may appear to contradict human capital theory and there are many limitations as outlined above regarding applying human capital theory to decisions made by community college students, this study generally supports the main tenets of human capital theory.

Implications for Future Research

As the first comprehensive study of economic conditions and enrollment at Hawai'i's community colleges, this research provides some answers but also raises questions and identifies areas where additional investigation is needed. The results show that changes in local economic conditions in each county impact both headcount and

FTE enrollment at the community college(s) in that county and that different economic indicators are influencing enrollment by county. Further study is needed to refine the models. In addition, other factors such as financial aid which affect the decision to enroll at a community college in Hawai'i need to be investigated and their impact ascertained.

Some of the twenty models estimated in this study did not identify any significant variables, mostly due to the inability to find a viable model to fit the data. Of the models estimated that identified significant variables, only one had a reliable R-squared as there is no trend in this subset of the time series. The amount of variance explained by the significant independent variables is approximately 77% for Hawai'i FTE enrollment leaving 33% of the variance unexplained. Approximately 58% of the variance for the City and County of Honolulu FTE enrollment is explained by the significant independent variables, but this model had a significant Ljung-Box statistic and therefore the result may not be reliable. The stationary R-square coefficient for the other models was lower, but stationary R-square coefficients show the goodness of fit of the model and not the amount of variance explained. Thus, a model with a low stationary R-squared may fit better than a model with a relatively high R-squared, particularly if there is trend in the time series (SPSS, 2007). Further investigation, that is outside the scope of this study, with respect to how well these models actually forecast the dependent variable needs to be conducted in order to determine how "good" these models are.

There is also a problem with the use of economic variables in general. When economic conditions are good, the unemployment rate falls, nominal per capita income

rises, and consumer prices have a tendency to rise (Miller, 2005). The minimum wage is set by government, so although not directly linked to economic activity, it is calculated based on the cost-of-living (Miller, 2005). When prices begin to rise, pressure is put on the government to raise the minimum wage. Other income payments such as Social Security and military retirement benefits are adjusted according to changes in the national consumer price index (Miller, 2005). Although some of the economic variables used in this study were transformed in order to reduce multicollinearity some correlation still exists. While it can be concluded that economic conditions do affect enrollment, further study may be able to further separate the effects of each economic variable on enrollment.

Linked with this problem is that of determining an accurate measure of the opportunity cost, in the form of foregone earnings and in total. The minimum wage proved to be a poor measure of foregone earnings in the County of Hawai'i, but other income measures are highly correlated and much of the income data used in other studies is only available at the national level. Future research needs to identify opportunity costs more accurately. In addition, as noted previously (p. 96), some opportunity costs cannot be measured in dollars, and therefore future research may use qualitative methods as a means to determine what students' opportunity costs are and how they are factored into their decision-making

It is also necessary to investigate the role of non-economic factors in the enrollment decision. The best fitting model as described above left 33% of the variance unexplained which means that there must be other factors that need to be taken into consideration. The role of financial aid was excluded from this study, but its effect

should be quantified if possible and included, as it changes the price of tuition. Perhaps more importantly from a human capital viewpoint, it may reduce the number of hours a student has to work in order to pay for college.

Leslie & Brinkman (1987) define student demand models as applications of the economic theory of demand where the level of enrollment is a function of tuition (the price), the income of the buyer (the student or the student's family), the tuition charged by other institutions and students' preferences (Leslie & Brinkman, 1987). This study is not a student demand model, but the role of other institutions may need to be more explicitly included in future models. Tuition and tuition differentials between University of Hawai'i 2-year and 4-year institutions are included in the form of the dummy variable, ACT 161. Tuition at the community colleges was excluded because it is the same across the community colleges in the majority of cases. Nevertheless a more specific measure of the tuition at substitute institutions may shed more light on the role of tuition in decision-making. There are 4-year University of Hawai'i institutions located in the City and County of Honolulu and the County of Hawai'i (University of Hawai'i, 2007a). In all counties, there are some private institutions, some of which predominantly offer their courses through distance education, so not only should future research include tuition at these alternatives but also their proximity to centers of population and the existing community colleges. In the County of Hawai'i, as previously discussed, the 4-year institution is in close proximity to the community college, so both are distant from a main population area: Kailua-Kona. In the City and County of Honolulu, the four community colleges and the two 4-year institutions are all within commuting distance. There is additional cost to choosing an alternative in the

Counties of Kauai and Maui, where no University of Hawai'i 4-year institutions are located, as room and board would have to be added if students from there attended 2-year or 4-year institutions in other counties. This becomes a complicated issue and can lead to the conclusion that not only the economic conditions differ by county but the non-economic factors differ also. Again, qualitative research may be helpful in ascertaining students' preferences regarding alternatives and what factors influence those preferences.

Conclusion

A first conclusion drawn from this study is that there is a relationship between economic conditions and enrollment at community colleges in each of the four counties located in the state of Hawai'i. A second conclusion is that there are differences in the economic variables that impact each county and the state in general. Finally, this study indicates that the enrollment decision is a complex one involving many variables. So it provides a foundation for further research on the complex issue of student enrollment at community colleges in Hawai'i.

As the first comprehensive study of economic conditions and enrollment at community colleges in Hawai'i this study serves to inform enrollment managers and/or administrators. *It reinforces what is considered to be their widely held belief that enrollment increases when economic conditions are poor and decreases when economic conditions are good. But it also provides details regarding which economic variables are the most important in their county and which type of enrollment is affected. This information assists them in facing the challenges that arise from open-door policies and*

dwindling state appropriations so that community colleges in Hawai'i can continue to provide quality programs with access for all.

APPENDIX

As shown by the tables below, transforming the variables from the Consumer Price Index (CPI) to the Change in the CPI and Per Capita Income to the Change in Per Capita Income removes some significant correlations and/or lessened the correlation between the variables.

There is no specific rule but generally if the correlation coefficient is: between

- -1.0 to -0.7 there is a strong negative association
- -0.7 to -0.3 there is weak negative association
- -0.3 to +0.3 there is little or no association
- +0.3 to +0.7 there is weak positive association
- +0.7 to 1.0 there is strong positive association (Simon, 2008)

Table 6: Correlation Matrix for the County of Hawai'i (before variable transformation)

		Minimum Wage	Unemployment Rate-County of Hawai'i	Consumer Price Index	Per Capita Income-County of Hawai'i
Minimum Wage	Pearson Sig. (2-tailed) N	1 33	.467** .006 33	.978** -.000 33	.973** .000 33
Unemployment. Rate – County of Hawaii	Pearson Sig. (2-tailed) N	.467** .006 33	1 33	-.524** .002 33	-.609** .000 33
Consumer Price Index	Pearson Sig. (2-tailed) N	.978** -.000 33	-.524** .002 33	1 33	.983** .000 33
Per Capita Income-County of Hawai'i	Pearson Sig. (2-tailed) N	.973** .000 33	-.609** .000 33	.983** .000 33	1 33

** Correlation is significant at the 0.01 level (2 tailed)

Table 7: Correlation Matrix for the County of Hawai'i (after variable transformation)

		Minimum Wage	Unemployment Rate-County of Hawai'i	Change in the Consumer Price Index	Change in Per Capita Income-County of Hawai'i
Minimum Wage	Pearson Sig. (2-tailed) N	1 33	.467** .006 33	-.142 .430 33	.159 .378 33
Unemployment. Rate – County of Hawaii	Pearson Sig. (2-tailed) N	.467** .006 33	1 33	-.446** .009 33	-.536** .001 33
Change in the Consumer Price Index	Pearson Sig. (2-tailed) N	-.142 .430 33	-.446** .009 33	1 33	.210 .242 33
Change in Per Capita Income-County of Hawai'i	Pearson Sig. (2-tailed) N	.159 .378 33	-.536** .001 33	.210 .242 33	1 33

** Correlation is significant at the 0.01 level (2 tailed)

Table 8: Correlation Matrix for the City and County of Honolulu (before variable transformation)

		Minimum Wage	Unemployment Rate-City & County of Honolulu	Consumer Price Index	Per Capita Income-City & County of Honolulu
Minimum Wage	Pearson Sig. (2-tailed) N	1 33	-.646** .000 33	.978** .000 33	.973** .000 33
Unemployment Rate - City & County of Honolulu	Pearson Sig. (2-tailed) N	-.646** .000 33	1 33	-.733** .000 33	-.740** .000 33
Consumer Price Index	Pearson Sig. (2-tailed) N	.978** .000 33	-.733** .000 33	1 33	.993** .000 33
Per Capita Income-City & County of Honolulu	Pearson Sig. (2-tailed) N	.973** .000 33	-.740** .000 33	.993** .000 33	1 33

** Correlation is significant at the 0.01 level (2 tailed)

Table 9: Correlation Matrix for the City and County of Honolulu (after variable transformation)

		Minimum Wage	Unemployment Rate- City & County of Honolulu	Change in the Consumer Price Index	Change in Per Capita Income- City & County of Honolulu
Minimum Wage	Pearson Sig. (2-tailed) N	1 33	-.646** .000 33	-.142 .430 33	.199 .267 33
Unemployment Rate - City & County of Honolulu	Pearson Sig. (2-tailed) N	-.646** .000 33	1 33	-.399* .021 33	-.487** .004 33
Change in the Consumer Price Index	Pearson Sig. (2-tailed) N	-.142 .430 33	-.399* .021 33	1 33	.544** .001 33
Change in Per Capita Income- City & County of Honolulu	Pearson Sig. (2-tailed) N	.199 .267 33	-.487** .004 33	.544** .001 33	1 33

** Correlation is significant at the 0.01 level (2 tailed)

* Correlation is significant at the 0.05level (2 tailed)

Table 10: Correlation Matrix for the County of Kauai (before variable transformation)

		Minimum Wage	Unemployment Rate-County of Kauai	Consumer Price Index	Per Capita Income-County of Kauai
Minimum Wage	Pearson Sig. (2-tailed) N	1 33	-.15 .935 33	.978** .000 33	.973** .000 33
Unemployment. Rate - County of Kauai	Pearson Sig. (2-tailed) N	-.015 .935 33	1 33	-.055 .763 33	-.122 .499 33
Consumer Price Index	Pearson Sig. (2-tailed) N	.978** .000 33	-.055 .763 33	1 33	.991** .000 33
Per Capita Income-County of Kauai	Pearson Sig. (2-tailed) N	.973** .000 33	-.122 .499 33	.991** .000 33	1 33

** Correlation is significant at the 0.01 level (2 tailed)

Table 11: Correlation Matrix for the County of Kauai (after variable transformation)

		Minimum Wage	Unemployment Rate-County of Kauai	Change in the Consumer Price Index	Change in Per Capita Income-County of Kauai
Minimum Wage	Pearson Sig. (2-tailed) N	1 33	-.15 .935 33	-.142 -.430 33	.116 .520 33
Unemployment. Rate - County of Kauai	Pearson Sig. (2-tailed) N	-.15 .935 33	1 33	-.420* .015 33	-.544** .001 33
Change in the Consumer Price Index	Pearson Sig. (2-tailed) N	-.142 -.430 33	-.420* .015 33	1 33	.394 .023 33
Change in Per Capita Income-County of Kauai	Pearson Sig. (2-tailed) N	.116 .520 33	-.544** .001 33	.394 .023 33	1 33

** Correlation is significant at the 0.01level (2 tailed)

* Correlation is significant at the 0.05level (2 tailed)

Table 12: Correlation Matrix for the County of Maui (before variable transformation)

		Minimum Wage	Unemployment Rate-County of Maui	Consumer Price Index	Per Capita Income-County of Maui
Minimum Wage	Pearson Sig. (2-tailed) N	1 33	.638** .000 33	.978** .000 33	.973** .000 33
Unemployment. Rate - County Of Maui	Pearson Sig. (2-tailed) N	.638** .000 33	1 33	.669** .000 33	-.707** .000 33
Consumer Price Index	Pearson Sig. (2-tailed) N	.978** .000 33	.669** .000 33	1 33	.989** .000 33
Per Capita Income-County of Maui	Pearson Sig. (2-tailed) N	.973** .000 33	-.707** .000 33	.989** .000 33	1 33

** Correlation is significant at the 0.01level (2 tailed)

Table 13: Correlation Matrix for the County of Maui (after variable transformation)

		Minimum Wage	Unemployment Rate-County of Maui	Change in the Consumer Price Index	Change in Per Capita Income-County of Maui
Minimum Wage	Pearson Sig. (2-tailed) N	1 33	.638** .000 33	-.142 -.430 33	.170 .345 33
Unemployment. Rate – County of Maui	Pearson Sig. (2-tailed) N	.638** .000 33	1 33	-.267 .133 33	-.454** .008 33
Change in the Consumer Price Index	Pearson Sig. (2-tailed) N	-.142 -.430 33	-.267 .133 33	1 33	.270 .129 33
Change in Per Capita Income-County of Maui	Pearson Sig. (2-tailed) N	.170 .345 33	-.454** .008 33	.270 .129 33	1 33

** Correlation is significant at the 0.01 level (2 tailed)

Table 14: Correlation Matrix for the State of Hawai'i (before variable transformation)

		Minimum Wage	Unemployment Rate-State	Consumer Price Index	Per Capita Income-State
Minimum Wage	Pearson Sig. (2-tailed) N	1 33	-.583** .000 33	.978** .000 33	.973 .000 33
Unemployment. Rate – State	Pearson Sig. (2-tailed) N	-.583** .000 33	1 33	-.665** .000 33	-.689** .000 33
Consumer Price Index	Pearson Sig. (2-tailed) N	.978** .000 33	-.665** .000 33	1 33	.993** .000 33
Per Capita Income-State	Pearson Sig. (2-tailed) N	.973 .000 33	-.689** .000 33	.993** .000 33	1 33

** Correlation is significant at the 0.01 level (2 tailed)

Table 15: Correlation Matrix for the State of Hawai'i (after variable transformation)

		Minimum Wage	Unemployment Rate-State	Consumer Price Index	Change in Per Capita Income-State
Minimum Wage	Pearson Sig. (2-tailed) N	1 33	-.583** .000 33	-.142 -.430 33	.116 .520 33
Unemployment. Rate – State	Pearson Sig. (2-tailed) N	-.583** .000 33	1 33	-.429* .013 33	-.586** .000 33
Consumer Price Index	Pearson Sig. (2-tailed) N	-.142 -.430 33	-.429* .013 33	1 33	.512** .002 33
Change in Per Capita Income-State	Pearson Sig. (2-tailed) N	.116 .520 33	-.586** .000 33	.512** .002 33	1 33

** Correlation is significant at the 0.01 level (2 tailed)

* Correlation is significant at the 0.05 level (2 tailed)

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