

DISSERTATION

THE ECONOMIC IMPACT OF
ATTENDING WESTERN IOWA TECH COMMUNITY COLLEGE

Submitted by

Julene H. Stoik

School of Education

In partial fulfillment of the requirements for

The degree of Doctor of Philosophy

Colorado State University

Fort Collins, Colorado

Summer 2004

UMI Number: 3143864

INFORMATION TO USERS

The quality of this reproduction is dependent upon the quality of the copy submitted. Broken or indistinct print, colored or poor quality illustrations and photographs, print bleed-through, substandard margins, and improper alignment can adversely affect reproduction.

In the unlikely event that the author did not send a complete manuscript and there are missing pages, these will be noted. Also, if unauthorized copyright material had to be removed, a note will indicate the deletion.

UMI[®]

UMI Microform 3143864

Copyright 2004 by ProQuest Information and Learning Company.

All rights reserved. This microform edition is protected against unauthorized copying under Title 17, United States Code.


ProQuest Information and Learning Company
300 North Zeeb Road
P.O. Box 1346
Ann Arbor, MI 48106-1346

COLORADO STATE UNIVERSITY

May 3, 2004

WE HEREBY RECOMMEND THAT THE DISSERTATION PREPARED UNDER OUR SUPERVISION BY JULENE H. STOIK ENTITLED: THE ECONOMIC IMPACT OF ATTENDING WESTERN IOWA TECH COMMUNITY COLLEGE BE ACCEPTED AS FULFILLING IN PART REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN EDUCATION AND HUMAN RESOURCE STUDIES.


Committee on Graduate Work



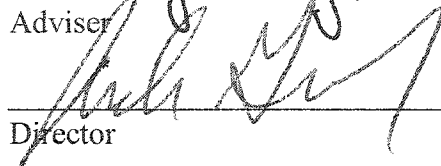
Marianne C Bickle



Co-Adviser



Adviser



Director

ABSTRACT OF DISSERTATION
THE ECONOMIC IMPACT OF
ATTENDING WESTERN IOWA TECH COMMUNITY COLLEGE

The purpose of this research was to design and conduct an economic impact study using Iowa unemployment insurance wage records for individuals who attended Western Iowa Tech Community College (WITCC). A secondary data analysis was conducted on actual wage earnings of program completers, leavers and applicants to the college during the academic years of 1994-1999. Quantitative methods answered the question, "To what extent do students benefit financially by attending WITCC as measured by their post college Iowa quarterly earnings?"

The findings indicated a relationship between educational attainments, as defined by community college attendance, and increased earnings. Those students who completed an entire program of study were earning more than those who completed some hours toward a program by the end of the 16 quarters covered by this study. Likewise, those who attended some community college were earning more than those who completed no post secondary education beyond high school.

The differences between the groups with varying levels of educational attainment were greater than earnings. There was also a relationship between greater formal educational attainment and working for fewer different employers over the course of the study. The completers of a program had fewer different employers than those who

attended some community college. Those that attended some community college had fewer different employers than those with no post secondary education.

Completers had greater wage gains between 2000 and 2002 than those who attended some college. Likewise those who attended some college had greater wage gains than those who attended no post secondary education.

The males earned more than the females in all comparisons but two. These two exceptions were in the gains in mean earnings between 2000 and 2002 for applicants and for AAS allied health program completers.

Julene H. Stoik
School of Education
Colorado State University
Fort Collins, CO 80523
Summer 2004

ACKNOWLEDGMENTS

In May 1998, as our daughter graduated from high school and began her college career, I started a journey of my own. With an “empty nest” and a supportive husband, I searched for a Graduate program that would allow me to grow in experience and knowledge to better serve community colleges. During the fall of 1999 I found such a program when I enrolled in the Community College Leadership Program at Colorado State University. There I met Dr. Timothy Gray Davies and the other members of the 1999 Cohort whom I would grow to respect and enjoy over the following five years of study.

Now as I complete the final stages of this journey and look back, I would be remiss if I did not recognize the many people who have made this journey possible and who have helped me along the way. First and foremost I wish to thank my family. My husband, Tony, has been supportive, understanding, and encouraging throughout this entire effort. Without that support and encouragement I could not have endured the many sacrifices that were necessary to complete this program. The solitary bike rides, the forlorn ball games, the weekends of lonely amusement were regretted and yet accepted by him for me to have this opportunity. Our daughter, Nicole, has given me inspiration. Our simultaneous college studies have given us a camaraderie that we have both enjoyed. The pride she has displayed in my efforts has been rewarding to me as a mother and as a

friend. My parents' enthusiasm and nurturing, as well as the love for learning they instilled in me throughout my entire life, have made this journey sweet and satisfying.

I would be remiss not to acknowledge my advisors and my graduate committee for the advice and effort they invested in me and my research. Dr. Timothy Gray Davies has provided countless opportunities for me to grow and learn; Dr. George Morgan has lent his time and knowledge of quantitative statistics to make my research reliable and valid; Dr. Marianne Bickle and Dr. Janice Friedel have given freely of their time, encouragement, and talents.

I want to thank my colleagues at Western Iowa Tech Community College. Without support from the administration, the research office and the information technology department, the design and data collection necessary for this research could not have been completed.

Finally, I want to thank all my friends and my Community College Leadership cohort for keeping me on track and for encouraging my efforts. This research and the journey I began five years ago would not have been as rewarding without all of the many people along the way who helped make it possible.

TABLE OF CONTENTS

Abstract of Dissertation	iii
Acknowledgments.....	v
 Chapter I – Introduction.....	 1
Background.....	1
Statement of Research Problem.....	3
Research Questions.....	6
Definitions of Terms.....	9
Delimitations/Limitations	10
Significance of the Study.....	13
Researcher’s Perspective	14
 Chapter II – Review of the Literature	 16
Introduction.....	16
Economic Impact Studies	19
Expenditure Impact Studies	19
Knowledge Impact Studies	26
Multi-faceted Models.....	34
Economic Impact Studies Based on Unemployment Wage Record Data	40
Legislative Perception Research.....	56
 Chapter III – Method	 65
Introduction.....	65
Research Design and Rationale	68
Participants and Sample.....	68
Data Collection	70
Measures	81
Data Analysis.....	84
 Chapter IV – Results.....	 87
Research Questions with Associated Statistical Analysis and Design	87
Detailed Results by Research Question	90
Summary of Findings.....	127

Chapter V – Discussion	134
Introduction.....	134
Summary of Findings.....	135
Interpretation of Data	154
Practical Conclusion Drawn in the Context of the WITCC Service Area.....	157
Implications for Further Research	163
References.....	169

LIST OF TABLES

Table 3.1	Stages of Status Group Refinement	77
Table 3.2	Statistical Variables Used for Each Status Group.....	79
Table 3.3a	Table of Programs in Associate of Applied Science Program Families.....	83
Table 3.3b	Table of Programs in Diploma Program Families	84
Table 4.1	Annual Fourth Quarter Median Wages of AAS Completers by Program Family	96
Table 4.2	Annual Fourth Quarter Median Wages of Diploma Completers by Program Family	99
Table 4.3a	Number, Means, and Standard Deviations for Number of Unique Employers as a Function of Gender and Status Group ..	99
Table 4.3b	Two-Way Analysis of Variance for Unique Number of Employers as a Function of Gender and Status Group	100
Table 4.4a	Number, Means, and Standard Deviations for Number of Unique Employers as a Function of Gender and Degree Type ..	101
Table 4.4b	Two-Way Analysis of Variance for Number of Unique Employers as a Function of Gender and Degree Type	102
Table 4.5a	Number, Means and Standard Deviations for Number of Unique Employers as a Function of Gender.....	103
Table 4.5b	Two-Way Analysis of Variance for Unique Number of Employers as a Function of Gender and Number of Hours Completed for the Leaver Status Group.....	103
Table 4.6a	Number, Means and Standard Deviations for Number of Unique Employers as a Function of Gender.....	104
Table 4.6b	One-Way Analysis of Variance for Unique Employers as a Function of Gender for the Applicant Status Group.....	104

Table 4.7a	Number, Mean Annualized 2000 Earnings, and Standard Deviations a Function of Status and Gender.....	105
Table 4.7b	Two-Way Analysis of Variance for Annualized 2000 Earnings as a Function of Gender and Status Group	106
Table 4.8a	Number, Means and Standard Deviations for Annualized 2000 Earnings as a Function of Status and Gender for Participants Employed Full Time (\geq \$3,330/Quarter).....	107
Table 4.8b	Two-Way Analysis of Variance for Annualized 2000 Earnings as a Function of Gender and Status Group for Participants Employed Full Time	108
Table 4.9a	Number, Mean Annualized 2002 Earnings, and Standard Deviations as a Function of Status and Gender	109
Table 4.9b	Two-Way Analysis of Variance for Annualized 2002 Earnings as a Function of Gender and Status Group	110
Table 4.10a	Number, Mean 2002 Annualized Earnings, and Standard Deviations as a Function of Status and Gender for the Group who were Employed Full Time (\geq \$3,330).....	111
Table 4.10b	Two-Way Analysis of Variance for Annualized 2002 Earnings as a Function of Gender and Status Group for the Group who were Employed Full Time.....	112
Table 4.11a	Number, Means, and Standard Deviations for Annualized 2000 Earnings as a Function of Degree and Gender for Completers ..	113
Table 4.11b	Two-Way Analysis of Variance for Annualized 2000 Earnings as a Function of Gender and Degree for Completers.....	114
Table 4.12a	Numbers, Means, and Standard Deviations for AAS Completers Who Worked Four Quarters of 2000 Broken Down by Program Family Groupings.....	115
Table 4.12b	Two-Way Analysis of Variance for AAS Graduates as a Function of Who Worked Four Quarters of 2000 Broken Down by Program Families	115
Table 4.13a	Number, Mean annualized 2002 Earnings and Standard Deviations as a Function of Degree and Gender for Completers.....	116

Table 4.13b	Two-Way Analysis of Variance for Annualized 2002 Earnings as a Function of Gender and Degree for Completers.....	117
Table 4.14a	Numbers, Mean Annualized Earnings, and Standard Deviations for AAS Completers Who Worked All Four Quarters of 2002 as a Function of Program Family Grouping	119
Table 4.14b	Two-Way Analysis of Variance for AAS Completers Who Worked Four Quarters of 2002 Broken Down by Program Families.....	119
Table 4.15a	Number, Annualized 2000 Earning Means, and Standard Deviations for Leavers Who Worked all Four Quarters of 2000 as a Function of Gender	120
Table 4.15b	Two-Way Analysis of Variance for Annualized 2000 Earnings as a Function of Gender and Number of Hours Completed for the Leaver Status Group.....	120
Table 4.16a	Number, Annualized 2002 Earning Means and Standard Deviations for Leavers Who Worked all Four Quarters of 2002 as a Function of Gender	121
Table 4.16b	Two-Way Analysis of Variance for Annualized 2002 Earnings as a Function of Gender and Number of Hours Completed for the Leaver Status Group.....	122
Table 4.17a	Number, Gain in Mean Earnings, and Standard Deviations as a Function of Gender and Status Group	123
Table 4.17b	Two-Way Analysis of Variance for Gain in Wages Between 2000 and 2002 as a Function of Gender and Status Group.....	124
Table 4.18a	Numbers, Means of Gain in Wages between 2000 and 2002, and Standard Deviations for AAS Completers Who Worked All Eight Quarters of 2000 and 2002, Broken Down by Program Family Groupings.....	125
Table 4.18b	Two-Way Analysis of Variance for AAS Completers Who Worked All Eight Quarters of 2000 and 2002, Broken Down by Program Families.....	126
Table 4.19	Overview of Statistical Results by Research Question.....	133
Table 5.1	Mean and Median Hourly Wages: All Occupations WITCC Service Area.....	159

Table 5.2 Study Findings within the Regional Context..... 160

LIST OF FIGURES

Figure 4.1	Median Quarterly Wages by Status Group for Individuals ≤ 30 Years of Age	91
Figure 4.2	Median Quarterly Wages by Degree Group for Completers Employed 1/1999-4/2002.....	93
Figure 4.3	Median Quarterly Wages by Program Families for AAS Completers	95
Figure 4.4	Median Quarterly Wages by Program Families for Diploma Completers.....	98

CHAPTER I

Introduction

Background

Forty of the fifty states' General Fund revenues experienced record declines in fiscal year 2001-02, resulting from a weakened national economy and exacerbated by the events of September 11, 2001 ("Forty States," 2002). Many states had begun to see revenues fall earlier than September 11, but the events of that day and the subsequent effects of them caused the economic downturn to strike much more quickly, catching veteran state policymakers and seasoned economic analysts off guard.

In Iowa the economy slowed so quickly that the Governor ordered a 4.3% across-the-board budget cut in response to downgraded revenue projections and called a special session of the Legislature on November 8, 2001, to restore necessary funding to immediate public safety needs and other priority issues. Iowa's budget cuts, however, did not end there. In February 2002, in response to further downgraded revenue projections, the Governor called for the use of \$120 million from the Economic Emergency Fund in order to prevent an additional 2.6% across-the-board cut to all general fund appropriations. After further negotiations with the Legislature, a compromise was reached which allowed using \$45 million from this "rainy day fund" while imposing additional cuts elsewhere in the budget but holding K-12 public education and community colleges harmless.

As state budget preparations for fiscal year 2002-03 began, many state agencies braced for additional reductions in appropriations. Lawmakers hoped that the cuts made in late February would be the final action needed, but found no relief to this difficult, if not impossible, situation. Again in early May, while putting the “final” details on the fiscal year 2002-03 budget, state troubles continued when income tax revenues fell short of projections because of higher than expected tax refunds. This phenomenon was due largely to the drop in the stock market after September 11, which reduced the capital gains tax revenues on which government depended. In Iowa, where state income taxes were due April 30, numbers showed tax collections down 23% over the previous year and refunds up more than 20% (“States Face New Budget Troubles,” 2002).

Lower than expected revenue forecast numbers resulted in two additional special sessions of the Legislature in early June 2002. At these sessions additional budget reductions and transfers from other state funds were made to make up a projected \$200 million shortfall. Now Medicare, K-12 public education, community colleges, and higher education were all up for reductions and bore the proportional reductions applied to other expenditures (“All States,” 2002).

These revenue woes were not unique to Iowa. Some 43 states had budget shortfalls, according to the National Conference of State Legislatures (“All States,” 2002). Iowa’s problems were widespread and were attributed to a slow national economy preceded by tax cuts in the 1990s that were based on overzealous predictions during an economic boom (“Misery,” 2002).

To make matters worse, few state leaders or budget analysts expected the picture to brighten in the near future. Painful gaps between spending needs and incoming

revenues were expected in 37 states according to the National Conference of State Legislatures ("All States," 2002). One particular new concern in these states was cash reserves. Many had already tapped surplus "rainy day" accounts that had been established during the economic boom years of the 1990s. In fiscal year 2000-01 state reserve funds were estimated at 10.4% on average of total budget spending. By the end of the 2001-02 fiscal year, these reserve funds had dropped to 3.4% ("New Budget Year," 2002).

Additional budget shortfalls in Iowa were predicted for fiscal year 2003-04. Although tax revenue receipt estimates were predicted to show a modest increase compared to the previous year, built-in and anticipated expenditure increases in school aid, Medicare, salary increases and others surpassed these increases by over \$400 million.

Throughout this downturn, state legislators were forced to prioritize needs from equally deserving yet competing demands for public resources. Education was subjected to increased scrutiny and was pitted against the need for increased funding for economic development, Medicare, correctional guards, public safety issues, and child welfare. As state budgets tightened higher education seemed particularly vulnerable to cuts.

Statement of Research Problem

How Iowa community colleges will continue to fare in this changed environment remains to be seen. The direction state funding takes will depend in large measure on the leadership exercised by state legislators. Given the current economic environment and a fear of a lengthy recovery, it may be difficult to sustain any long-range commitment to higher education without evidence of the economic impact a post secondary education has on workers who stay and live in Iowa. Because there has continued to be increased interest in economic development and job training to revive Iowa's unsteady economy,

programs and services that show the greatest potential for impacting the economy may be rewarded and supported more favorably in policy and funding decisions in the near future.

Unemployment Insurance records have been used by many states since the 1990s to provide assessment and accountability data of post secondary education for policy makers. Little use has been made of wage record data within the realms of postsecondary education in Iowa. It is time a pilot study using these data was conducted in Iowa to ascertain whether reliable, accessible proof of the benefits to individuals and the state can be provided by their use for a community college education. As Iowa grapples with budget and policy decisions that will spur economic growth, there will be a need for additional data about the impact post secondary programs and services have on local, state, and worker economies.

Limited research had been conducted on Iowa's community college system prior to 2002. Only one economic impact study had reported on the entire system of Iowa community colleges (Blong, 1982). This study was conducted using the Caffrey and Isaacs (1971) economic impact model and 1981-82 budget figures. It used short-term direct economic impact indicators exclusively for the purpose of providing a credible dollar assessment of the revenue generated by the existence of the 15 community colleges in their service areas and in the state of Iowa. This particular study used a multiplier of 1.9. The results of this study were based on the assumptions that the colleges produced additional economic growth through the existence of the institutions and their expenditures, through the salaries paid to employees and the impact they produced when spent in Iowa communities, and through the expenditures of the students while attending

the community colleges. These original expenditures to businesses and organizations in Iowa were recycled in the economy several times to generate an impact almost double their original value. An example of this impact for Western Iowa Tech Community College in Sioux City, Iowa, broke down to an impact of \$25,683,645 based on original expenditures of \$13,517,798 using this 1.9 multiplier.

No reference was made in this study to the knowledge impacts generated from community college graduates that continued to live and work in Iowa. The assumption that the education gained by these graduates would contribute to increased salaries and thus increased expenditures on local purchases and in taxes over their lives was totally ignored within this study. This was very limited in its assessment and is now outdated and of little use.

Iowa was fertile ground for new economic research. Through the leadership of the Association of Community College Trustees (ACCT) a model that included multiple economic impacts was developed by CCbenefits Inc. Eastern Iowa Community College District, where the author of the original Iowa economic impact study, Chancellor John T. Blong was President, served as a pilot institution for the development of this model and provided an example of how it could be applied in Iowa. Western Iowa Tech Community College (WITCC) was the first Iowa community college to commission CCbenefits Inc. to complete an updated multi-faceted economic impact study in Fall 2002. As a result of these two completed studies, most Iowa community colleges followed suit completing similar studies in Spring 2003. These new studies updated and greatly expanded economic impact information for Iowa's community colleges.

However, little information was provided by this model of the actual wage earnings of the students who attended an Iowa community college. For this reason a quantitative study was chosen that analyzes actual wages earned by Iowa workers who had some interaction with WITCC in the time between Fall 1994 and June 1999. This design was chosen because it provided actual Iowa wage information that will complemented and strengthened results from the economic impact study completed for WITCC by CCbenefits Inc. Specific information of this impact on actual Iowa wages could lend support and specificity to the CCbenefits Inc. economic impact study information and prove its claims. This information was collected and analyzed for Western Iowa Tech Community College for the purposes of providing additional supportive economic impact data and building a stronger case for an education at Iowa's community colleges.

Research Questions

1. What are the 1999 through 2002 median quarterly earnings for the WITCC completer, leaver, and applicant status groups in this study?
2. What are the 1999 through 2002 median quarterly earnings for the associate of arts, associate of applied science and diploma certificate degrees within the WITCC completer status group?
3. What are the 1999 through 2002 median quarterly earnings for the program family groupings of business, computer, allied health, mechanical, human service, and miscellaneous programs within the associate of applied science (AAS) degree completers?
4. What are the 1999 through 2002 median quarterly earnings for the program family groupings of business, computer, allied health, and mechanical programs within the diploma certificate degree completers?
5. For the three status groups of completers, leavers and applicants is there a difference between the three status groups in regard to the adjusted number of different employers? Is there a difference between the males and females in regard

- to the adjusted number of different employers? Is there an interaction of status group and sex in regard to the adjusted number of different employers?
6. For the status group of completers is there a difference between the three degree levels in regard to the adjusted number of different employers? Is there a difference between the males and females in regard to the adjusted number of different employers? Is there an interaction of degree and sex in regard to the adjusted number of different employers?
 7. For the status group of leavers is there a relationship between the number of hours completed and the adjusted number of different employers? Is there a difference between the males and females in regard to the adjusted number of different employers? Is there an interaction of number of hours completed and sex in regard to the adjusted number of different employers?
 8. For the status group of applicants is there a difference between the males and females in regard to the adjusted number of different employers?
 9. For the group who worked all four quarters of 2000 is there a difference between the three status groups (completers, leavers, applicants) in regard to the mean annualized 2000 earnings? Is there a difference between the males and females in regard to the mean annualized 2000 earnings? Is there an interaction of status and sex in regard to the mean annualized 2000 earnings?
 10. For the group who were employed full-time ($\geq \$3,330/\text{quarter}$) all four quarters of 2000, is there a difference between the three status groups in regard to the mean annualized 2000 earnings? Is there a difference between the males and females in regard to the mean annualized 2000 earnings? Is there an interaction of status and sex in regard to the mean annualized 2000 earnings?
 11. For the group who worked all four quarters of 2002 is there a difference between the three status groups (completers, leavers, applicants) in regard to the mean annualized 2002 earnings? Is there a difference between the males and females in regard to the mean annualized 2002 earnings? Is there an interaction of status and sex in regard to the mean annualized 2002 earnings?
 12. For the group who were employed full-time ($\geq \$3,330/\text{quarter}$) all four quarters of 2002, is there a difference between the three status groups in regard to the mean annualized 2002 earnings? Is there a difference between the males and females in regard to the mean annualized 2002 earnings? Is there an interaction of status and sex in regard to the mean annualized 2002 earnings?
 13. For the status group of completers who worked all four quarters of 2000 is there a difference between the three degree groups in regard to the mean annualized 2000 earnings? Is there a difference between the males and females in regard to the mean

annualized 2000 earnings? Is there an interaction of degree and sex in regard to the mean annualized 2000 earnings?

14. For the degree group of Associate of Applied Science (AAS) completers who worked all four quarters of 2000 is there a difference between the business, computer, allied health, mechanical, human service, and miscellaneous program families in regard to the mean annualized 2000 earnings? Is there a difference between the males and females in regard to the mean annualized 2000 earnings? Is there an interaction of program family and sex in regard to the mean annualized 2000 earnings?
15. For the status group of completers who worked all four quarters of 2002 is there a difference between the three degree groups in regard to the mean annualized 2002 earnings? Is there a difference between the males and females in regard to the mean annualized 2002 earnings? Is there an interaction of degree and sex in regard to the mean annualized 2002 earnings?
16. For the degree group of Associate of Applied Science (AAS) completers who worked all four quarters of 2002 is there a difference between the business, computer, allied health, mechanical, human service, and miscellaneous program families in regard to the mean annualized 2002 earnings? Is there a difference between the males and females in regard to the mean annualized 2002 earnings? Is there an interaction of program and sex in regard to the mean annualized 2002 earnings?
17. For the status group of leavers who worked all four quarters of 2000 is there a relationship between the number of hours completed and the mean annualized 2000 earnings? Is there a difference between the males and females in regard to the mean annualized 2000 earnings? Is there an interaction of number of hours completed and sex in regard to the mean annualized 2000 earnings?
18. For the status group of leavers who worked all four quarters of 2002 is there a relationship between the number of hours completed and the mean annualized 2002 earnings? Is there a difference between the males and females in regard to the mean annualized 2002 earnings? Is there an interaction of number of hours completed and sex in regard to the mean annualized 2002 earnings?
19. For the three status groups of completers, leavers and applicants who worked all eight quarters of 2000 and 2002 is there a difference in regard to the gain scores in wages made between 2000 and 2002?
20. For the program family groups who were Associate of Applied Science completers who worked all eight quarters of 2000 and 2002 is there a difference in regard to the gain scores in wages made between 2000 and 2002 for the business, computer, allied health, mechanical, human service and miscellaneous program families?

Definitions of Terms

Completer – a student who successfully completed the requirements of an Associate of Arts degree, an Associate of Applied Science degree or a diploma certificate (one-year) degree at WITCC during the 1998-99 academic year. The term “completer” may be used synonymously with the term “completer.”

Leaver – a student who registered and completed at least one credit hour through WITCC between Fall 1994 and June 1999, but who left Western Iowa Tech Community without completing a degree or certificate. These student’s records must also have been found as attending WITCC by the National Student Clearinghouse Enrollment Search conducted for this study. For purposes of this study, these students have not registered for a credit course since June 1999.

Applicant – an individual who filled in a WITCC application between Fall 1994 and June, 1999 with the intent of attending WITCC, but never registered for or attended a credit course. These individuals’ records were not found in the National Student Clearinghouse Enrollment Search conducted for this study. Based on these records they did not attend any post secondary education.

Formal education – education completed at an accredited institution of higher education for educational credits toward the completion of an approved educational program.

Economic impacts – either business volume impacts, human capital impacts or employment impacts (Gillum, 2001).

Economic impact analysis – a study that provides data concerning the financial contributions that an institution or organization has on its community, state, and student economies (Gillum, 2001).

The expenditure impact of a college – is the amount spent on sales and wages and the number of jobs generated by the operation of the institution on its region. These lead to increased regional income growth.

The knowledge impact of a college – is the transmission of knowledge and skills to students by attendance at the institution. This increases human capital which leads to higher productivity and greater earnings.

Human capital impact – the effect that education or training by an institution or organization has on the earning power of individuals (Gillum, 2001).

Local economy – the economy located in the geographic location of a particular institution or organization. The Iowa local economy for WITCC is composed of the multi-county area within its local tax levy.

State economy – the economy located in the specific state of a particular institution or organization. The state economy for WITCC is Iowa.

Sub-baccalaureate – the mid-skilled labor market that includes individuals who have at least a high school diploma but less than a baccalaureate degree (Grubb, 1996).

Delimitations/Limitations

There are other variables that can be measured than those used in this study. No attempt will be made to account for “forgone wages.” Forgone wages are those wages not earned because of college attendance. It was determined by this researcher not to consider forgone wages because data collected by the Institutional Research Office at

WITCC indicated that most students continue to work in some capacity, many maintaining full-time employment, as they attend college making it difficult to account for them (Online at http://www.witcc.com/research/reports/2001-2002_fact_book.pdf)

Likewise, no attempt will be made to address the issue of the appropriate discount rate as outlined by Garms (1977). Economists in studies to calculate the returns of education have failed to appreciate that money has a time value. A dollar received years in the future does not have the same value as a dollar today. The reasons for this vary from inflation, to the possibility of receiving investment interest, to the certainty of having that money at present or in the future.

This study also will not attempt to measure the social contributions (fewer smokers, fewer incarcerations, unemployment savings, etc.) or impact on citizenship (increased volunteer participation, increased voter participation) attendance at a community college has since such contributions are beyond the scope of this study and might inflate the estimates of the actual economic wage impact that a community college will have on its students.

The Iowa Workforce Development (IWD) Office maintains the wage records to be used for this research. There are several limitations of the Unemployment Insurance (UI) wage record system. This system includes records for Iowa workers only. Because Western Iowa Tech Community College is located on the northwestern border of Iowa and is contiguous to Nebraska and South Dakota, it is estimated by past placement report data (Online at <http://www.witcc.com/research/reports/placement2001-02.pdf>) that approximately 30% of all program completers work outside Iowa. Thus, not all wage records of students from Western Iowa Tech Community College will be contained in the

IWD system. Those wage records of workers outside Iowa will not be included in this study.

This system also does not contain wage records for workers who are self employed, employed by the government, in the military or unemployed. Unfortunately, this is a limitation of most state systems (Stevens, 1992).

Further, the reliability of these IWD wage records may also be a limitation because of reporting and entry errors. However, since they are reported by employers quarterly, they will be more reliable than self reported wage information and will indicate the impact that completing a program of study at WITCC has on an individual's earning power within Iowa more reliably than any other manner available.

The National Student Clearing House (NSCH) enrollment records were used by this study to determine the post secondary enrollment patterns of students to be included in this study. It was felt by the researcher that only the benefits of attending Western Iowa Tech Community College should be measured by this study. For this reason any student who was listed by the NSCH as having attended any other post secondary institution during the period of time this database has been maintained was excluded from participating in this study. Thus any student who graduated with a degree from WITCC and then transferred on to any other post secondary institution was not included. Likewise, a student who may have completed credit hours at another post secondary institution and then transferred into WITCC was not included in this study.

Because this database was started in 1993 and did not become inclusive of institutions beyond its original 30 pilot colleges until 1995, growing continuously in its inclusiveness from that time forward, it was decided by the researcher that students over

the age of 30 by January 1999 would be excluded from this study. Although some of the students 30 years of age and younger may have attended other institutions, the elimination of those over 30 years of age served to negate this limitation, by and large, and also eliminated the additional effects of years of on-the-job training. However, these enrollment records may pose further reliability limitations to this study.

Significance Of The Study

The challenge facing leadership in Iowa's community colleges now is to provide accurate research data concerning the economic impact that community colleges have on their students' wage earnings thus impacting economic development within the state. In economically robust times, when state revenue growth matched the increased funding needs of state assisted institutions, annual increases in state appropriations were taken for granted by college administrators. However, the economic downturn of the past years in the national and the state economies has left state legislators having to seriously grapple with funding decisions about these state supported programs for the first time since the early 1980s.

If these data existed a process of education could be developed to disseminate these data and demonstrate the value of community colleges to the viability of Iowa's economy. This information may prove beneficial to many audiences. It could result in a better-informed legislature that could make sound financial and policy decisions about the support received by Iowa community colleges in difficult economic times. It could inform and influence state legislators who make the appropriation and policy decisions that greatly impact higher education within the state of Iowa.

It could also inform the local citizenry and those considering additional education of the economic impact of an education from WITCC. It might even prove to be an enticement to future students to pursue additional education as a way to improve their lives. It could also serve as an additional accountability measure to instructors, students, alumni and supporters of the college.

Researcher's Perspective

As a professional educator who has spent the past fourteen years at Western Iowa Tech Community College, this researcher has developed a deep respect and commitment to the role community colleges play in society. This has been gained through the administrative experiences in various programs throughout the college. These experiences started as a coordinator of business and human service programs for community and continuing education. In this role the researcher planned and collaborated with employers of local businesses and community organizations to design and deliver programming for employee and community audiences. This transitioned into serving as regional coordinator for Tech Prep and School to Work programs. Again the researcher planned and collaborated with employers of local businesses and community organizations. This now also included the employees of the twenty-six high schools and the four-year institutions of higher learning in the merged area to develop and deliver programming that could build a "seamless" educational system for future workers. Both of these roles dealt mostly with audiences that were external to Western Iowa Tech Community College.

When the college was successful in obtaining its second five-year grant through Title III-Strengthening Institutions of the Higher Education Act, the researcher was called

on to direct and coordinate the activities that would strengthen the student and program services within the institution. In the ensuing time additional responsibilities, which again required an external focus, were added. The most recent duties that have been assumed are those of Governmental Relations for Western Iowa Tech Community College. This recent focus will be most complemented by this study on the economic impact of Western Iowa Tech Community College on its student economies.

The responsibilities within this role have been to inform and influence the governmental delegations that represent WITCC at the local, state and federal levels. For the past four years this has involved regular meetings, communications and working relationships with our Federal, State and local elected officials. These relations are for the purpose of sharing information about WITCC and positively influencing public perceptions toward Western Iowa Tech Community College. In these dealings it has become increasingly apparent that there are many misconceptions and gaps of knowledge in the public's views of WITCC. One of these gaps is about the value of a community college education. Since many of these public audiences have no experiences with a community college directly or indirectly, the job of informing and influencing has become a prime directive of this researcher.

Over the past four years this researcher has been asked by state and local elected officials for objective data that proves the economic impact attendance at a community college, specifically Western Iowa Tech Community College, has on the earnings of students. If a more objective, thorough analysis of existing wage data were available it could be used to assist in informing key decision makers for the formulation of policy concerning funding and governance issues.

CHAPTER II

Review of the Literature

Introduction

The curricular functions of most state community college systems were prescribed by legislation to include “academic transfer preparation, vocational-technical education, continuing education, remedial education, and community service” (Cohen & Brawer, 1996, p. 21). Community colleges in Iowa were established to offer “educational opportunities and services” in each of the afore mentioned areas, but also included programs for in-service training and retraining of workers; programs for high school completion for students of post-high school age; programs for high school age students in vocational, technical training and in advanced college placement courses; and developmental education for persons who are academically or personally under prepared to succeed in their program of study (On line at <http://www.legis.state.ia.us/IACODE/2003/260C/1.html>).

State legislatures have long had growing expectations of the role of higher education in promoting economic development. States have charged their universities and community colleges to design and implement programs targeted specifically at developing new business and job growth, while also demonstrating the effectiveness of these efforts (Elliot, Stanford, & Meisel, 1988).

The economic impact of these functions would seem to take on much broader meaning now within the present economic context. The present environment has complicated an already difficult situation brought about by explosive enrollments of under prepared students, and a lack of reliable research data on the impact of a community college education on these students.

Community colleges have assumed an increasingly central role in the national education and training system because of the explosion in enrollments at community colleges from 1955 to 1995 (Kane & Rouse, 1999). This growth was powered primarily by an increase in first-time, first-year students and by an increase in the proportion of part-time students. These students faced significant challenges to their educational success. Traditionally the challenges these students brought to community colleges were met with fewer resources than existed at other institutions of higher education (Bailey, 2003a).

But despite the fact that community colleges served a larger share of students with greater challenges to their success, relatively little was known about the relationship that existed between community college coursework and future worker earnings. This lack of knowledge fueled the debate over the role of the community college in economic development referred to by Grubb (1996). Because two-year colleges had become the dominant institutions explicitly preparing students for the sub-baccalaureate labor market, the economic value of a community college and the jobs filled by those educated by community colleges had become paramount (Grubb, 1996). Grubb believed it was crucial to get the issue of economic benefits right because, “the debates about opportunities open to students following different postsecondary courses and about the appropriate role of

two-year colleges depend upon such results” (Grubb, 1996, p. 85). The challenge now, at this time of economic hardship, appears even more acute for community college leaders as they are called on to provide accurate research concerning the economic impact of community colleges.

The economic impact study has been widely used by colleges as a way to influence the public and to apprise it of the value colleges contribute economically to the local and state tax base, to the job market, to the livelihood of students, to the growth of the community in general. Indeed, there exists a large volume of literature that focuses on economic impact of higher education institutions in the United States.

As might be anticipated this body of information varies greatly and covers differing topics of interest. The majority of this literature, however, falls within three main headings: short-term expenditure impacts on local economies, long term knowledge impacts on human and industrial vitality, and mixed or multi-faceted models (Stokes & Coomes, 1998).

This chapter begins with a brief overview of studies that fall within these three categories. Special note is made within the multi-faceted section of a recently developed study conducted for the Iowa Community College system by CCbenefits, Inc. Next, an overview of a number of Federal, state, and local studies based on the use of unemployment insurance data which exist as a result of the Deficit Reduction Act in 1984 is included. These data are a comparatively recent source of economic impact research which will be used within this author’s research because of its ability to complement and add to existing information provided by other studies. Because most economic impact studies were conducted for the express purpose of legislative advocacy and marketing,

the chapter concludes with a brief section on research conducted to capture perceptions that exist within the legislative segment.

Economic Impact Studies

Many higher education institutions have commissioned formal studies to measure and report economic impacts from their existence on local and state service areas. El-Khawas (1986) as cited by Stokes and Coomes (1998) estimated that almost half of the colleges and universities in the United States had done economic impact studies of one kind or another. These have been popular marketing tools. Colleges and universities have benefited from such studies to convince corporate donors and legislative representatives of the value of supporting institutions for decades.

Several articles discussed methodological considerations of these economic impact studies and drew comparisons among the various models used (Stokes & Coomes, 1998; Elliot et al., 1988). Florax (1992) in Stokes and Coomes (1998) separated the existing economic impact studies into two basic categories: expenditure impact studies and knowledge impact studies. Stokes and Coomes made recommendations for which method might prove most beneficial for an institution based on several criteria. For some institutions multi-faceted studies, which combined the two basic categories Florax designated, were recommended

Expenditure Impact Studies

In the review conducted by Stokes and Coomes (1998) they acknowledged that confusion existed about what to include in expenditure impact studies. Their review found four major techniques were used to estimate expenditures: the income expenditure analysis; the economic base analysis; the input-output analysis; and the Caffrey-Isaacs

analysis, which was identified as the most widely used method for reasons cited later. All techniques were based in part on a multiplier effect where, because of the recycling of expenditure transactions multiple times within a region, an even larger increase in income was evidenced. The differences between the techniques were based on the definition of the monetary injection into the economy and the multiplier used to drive each model.

The first three techniques were based on theoretical constructs originated from works by noted economists and sociologists. John Maynard Keynes, Leontief, and Werner Sombart received special note. Within the *income expenditure model*, of which Stokes and Coomes (1998) sited twenty studies, the impact of the college expenditures depended both on the magnitude of the expenditures and the sector of the local economy in which the expenditure was originally made. Three examples were cited of metropolitan commuter colleges that produced multipliers that ranged from 1.56 to 1.82 times the original college expenditures. These studies further found job multipliers of 1.57, which lead to an increase in employment of 26%.

The economic base analysis studies were based on a methodology that divided an area into an exporting sector and a local production sector. The exporting sector was what the area provided for outside economies and included only nonlocal student spending. This did not include college expenditures that were generated from internal local sources as these did not add to the economic activity of the region. One of these studies, Smith and Bissonette (1989) as sited in Stokes (1998), estimated the benefit to cost ratio for non-local students on the economy of West Virginia to be 3.02 times the expenditure. This resulted in a benefit to the local economy three times greater than the original cost of the services.

Most of the *input-output studies* cited by Stokes (1998) occurred in the 1970s. Most of these estimated the impact of external research grant funds and Federal funds to a state. These studies produced results of spending multipliers that ranged from 1.27 to a high of 2.5 times the original input from grant and Federal funds.

The Caffrey and Isaacs model (1971) developed for the American Council of Education (ACE) was by far the most widely used model. This was intended to be a how-to-do-it model to show the economic interrelationships that existed between a college and its surrounding communities. Caffrey and Isaacs (1971) stated that there were many uses for the information generated from such a study.

It was pointed out that data concerning the economic character of a college would be useful in the occasional struggles that occur between institutions and those persons concerned with taxes or other economic factors in the local economy, in development of plans for the expansion of a college or university, in land-use studies, and in appeals to local business and industry to support higher education. (Caffrey & Isaacs, 1971, p. xi)

Although initially tested on only four-year and graduate colleges and universities, this model was well disseminated in the academic community and made a subsequent impact on community colleges as witnessed by the number of community college researchers who cited it in their research (Baldwin & Brann, 1997; Blong, 1982; Kaltenbach, 1979; Kinnick, 1982; Kiser, 1988; Romano & Herbert, 1985; Selgas, 1973; Zeiss, 1986).

The Caffrey and Isaacs model was complex and time consuming. Forty different linear cash flow models were developed in an attempt to estimate economic impact from seventy-eight measurable variables. It derived equations for data that were obtained from normal records kept by the college, local governments and businesses. But it also called

for obtaining local individual information through extensive survey methods and questionnaires.

Although cumbersome and resource intense the model identified and demonstrated the sum of all economic impacts on local businesses, on local governments and on local individuals generated in the economy by the existence of the college or university and did so in a credible, conservative manner. For the years of the 1970s and 1980s the use of this model dominated the research on economic development for colleges, universities and community colleges. The model was very strictly followed in the early years. These early studies showed strict adherence to the samples set out in the model. As time progressed into the 1980s, researchers began to pick and choose from the original model's equations and samples. Additional research was conducted on simplifying the model by Ryan (1983).

Ryan (1985) believed that an economic impact study proved beneficial because it provided comprehensive data for political purposes. It enabled community colleges to improve funding sources by careful documentation of four types of economic impact indicators. These were college expenditures, student expenditures, staff expenditures and jobs in the community generated as a result of the presence of the college.

Ryan was commissioned by the Research and Planning Committee of the Council of County Colleges in New Jersey to assist the New Jersey community college system make a clear economic case for increased local and state assistance during a period when state appropriations to these colleges did not keep pace with enrollment growth. New Jersey's community college full-time equivalent budget allocations steadily declined

because enrollments surpassed the numbers funded by the State while other segments of education made substantial gains.

Ryan (1983) developed a shortcut model for college administrators and researchers as part of an economic impact project conducted in New Jersey to help support the case for increased state and county funding to community colleges. This was an obvious attempt to simplify Caffrey and Isaacs's model and to modify it so it would be more applicable to community colleges. It omitted the necessity of collecting data through extensive and time-consuming survey research and relied more on information readily available through college, state and federal sources. Ryan believed it was impractical to use some of the sub models used by Caffrey and Isaacs (1971) because they contained little pertinence to two-year community colleges. These sub models included expenditures of fraternities and sororities along with expenditures of a variety of visitors to campus for athletic events, recreational events, and visits over a period of several days. Ryan built his model to accentuate simplicity and those areas most applicable to community colleges.

This model used categories of college-related local expenditures, determined the number of jobs attributable to the college, and also identified and used the income multiplier to determine indirect spending generated by a college's presence. It used ten information needs within the model and identified college sources for that information. It provided a step-by-step process and provided formulas for the necessary calculations.

Although Ryan's work did not reach the same level of status or use as the Caffrey and Isaacs's model, it was one of the most popular for community college studies. This is evidenced by the number of studies that have relied heavily on Ryan's

work (Andrews & Lillibridge, 1990; Head, 1994; Johnson Community College, 2001; Oakland Community College, 1992; Song, 1993; Saleh, 1988).

These studies produced impressive economic impact figures for the community colleges involved. Andrews and Lillibridge (1990) initiated a study to estimate the economic impact of El Paso Community College (EPCC) on the local service area of the college and on Texas. By using the Ryan model they produced results which indicated that considering all revenue sources, each dollar received and spent by EPCC resulted in \$4.90 of statewide economic impact. Represented another way, each dollar of state aid revenue to the college resulted in an economic impact of \$13.45 to Texas.

Head (1994) used a combination of three models to arrive at the economic impact of Piedmont Virginia Community College (PVCC) to its service area. Not only was the Ryan model used, but also the Eastern Association of College and University Business Officers (EACUBO) model and the Virginia Employment Commissioner's Impact Analysis (IMPAC) for the Commonwealth model. The EACUBO model was derived from the short cut Ryan model. Dr. Gene Winter of the Two-Year College Development Center for community colleges on the campus of the State University of New York essentially refined the Ryan model and EACUBO computerized it, making it more sophisticated and more accurate. The IMPAC model incorporated IMPLAN (Impact Analysis for Planning), a regional economic impact modeling system based solely on college expenditure data which excluded student expenditure data because it was assumed that most of the student purchases would have been part of the local economy, into the study. The direct economic impact of PVCC on the region was calculated at

\$12.4 to \$12.6 million. Thus PVCC's total estimated economic impact was \$24.8 million. For every dollar paid by the state, PVCC generated \$6.13.

Johnson County Community College (2001) economic impact study results accounted for over \$104 million of revenue to its community through the purchase of goods and services by the institution, the expenditures of its employees and its students. Taxpayers received a \$3.95 return on every dollar spent in support of the college.

The Oakland Community College (1992) study produced results indicating that for every dollar of local property tax support to Oakland Community College (OCC), an additional \$12.45 was generated in the local economy. Represented another way, every dollar of state aid to OCC produced \$19.55 in return to the state of Michigan.

Song (1993) calculated the total tangible economic impact of Dutchess Community College (DCC) to be \$92,526,212. For every tax dollar spent in support of DCC, \$13.10 was circulated in the local economy.

Saleh (1988) linked the economic impact results of the Texas Community Colleges to cuts in state appropriations of 10, 15, and 20 percent. These cuts would result in local economy reductions of \$6,153,951; \$9,230,943; and \$12,307,920, respectively. These reductions represented 2.8%, 3.55%, and 4.47% drops in the colleges' economic impact.

While these studies were of great value to higher education, they illustrated only the results that expenditures from the existence of the college had on the economy. Additional impacts were excluded from these studies limiting their effectiveness.

Knowledge Impact Studies

A different approach evident in the literature to measuring the impact of education was referred to as the knowledge impact or human capital investment approach. Under this approach the researcher viewed the money, time, and effort that an individual invested in an education and compared this against the return of this investment on average wage rates and improvements in lifestyle.

Pencavel (1991) provided a selective, non-technical review of research on the contributions of education to productivity and earnings. Within this review he paid special attention to the role of higher education and the labor markets of college-educated workers. He concluded that there was a clear, positive association between better schooling and higher earnings but made no attempt to compute the impact of this link.

Many studies within the past half-century, however, have tried to do just that. Stokes (1998) stated that many knowledge impact studies estimated the returns of education at the macroeconomic levels, but few estimated the impacts of individual colleges to its students. The macro studies established that the average college graduate had higher lifetime earnings than the average high school graduate.

The majority of research in this area focused on the effects of research universities and elite liberal arts colleges on students. These institutions had faculty with strong research orientations and had students who were largely residential, full-time, traditional age, nonworking, nonminority and middle or upper class social origins. Because of these qualifications research was easier to conduct within these environments.

With few exceptions in the early literature, however, relatively little was known about the impacts of a community college education on students' knowledge base and

earnings (Pascarella, 1999) leading to the continued debate over the labor-market returns of a community college education. However, because sub-baccalaureate education had grown substantially in the past thirty years and the group of workers trained by community colleges, defined by Grubb (1996) as mid-skilled or “sub-baccalaureate,” comprised the majority of the national labor force, community college student earnings began to take an increasingly central role in the national education and training system (Kane & Rouse, 1999).

According to Grubb,

While community colleges serve many goals and missions, their occupational purposes are central and virtually all their students enroll to enhance their employment, either directly or by later transferring to four-year College. Therefore, determining their employment effects is crucial to understanding what they accomplish (Grubb, 1996, p. 1).

In 1996 about 60% of the labor force had more than a high school degree but less than a baccalaureate degree (Grubb, 1996). Most growth trends and forecasts suggested growth of this segment to continue. The occupations that continually were predicted to have the highest growth rate within the U.S. job market included health technicians, marketing and sales, computer operators, technicians and related support—all typically community college degree programs. This was a labor market segment where education and training made a significant difference to earnings and employment options.

Community colleges and technical institutions prepared the largest proportion of the sub-baccalaureate workforce. This was not done without great controversy, however. A continuum existed from critics of and supporters for community colleges. This ranged from those who felt community colleges had failed to live up to the promises they made as “second chance” institutions and had instead tracked individuals away from the

promise and rewards of a four-year degree; to those who defended community colleges and proclaimed them teaching institutions that could do no wrong because of their egalitarian virtues (Grubb, 1996). This controversy raged in the absence of better information that could help support the benefits of the education and training at the sub-baccalaureate level and could contribute to the economic knowledge about a community college education.

Despite the size of the sub-baccalaureate labor market, comparatively little attention had been devoted to it. Information and research available about it was sparse and confusing. This was due in part to the confusion that surrounded the many different institutions that prepared individuals for mid-skilled jobs, to the diversity of education attained by individuals within these different institutions, and to the wide variety of occupations that composed the sub-baccalaureate labor market.

Community colleges, technical institutions, area vocational school, proprietary schools, short-term job training programs, and firm-based training all emphasized different training and occupations. These training programs often overlapped and were hard to distinguish from one another.

Likewise, the educational attainment of the individuals in the mid-skilled labor market varied greatly. This ranged from those with no more than a high school diploma, to those with either an associate degree or certificate, to those with “some college” but no credential. This latter group could have attended as few as one course at a community college to as many as three and one half years at a four-year institution.

Making it more confusing the jobs in the sub-baccalaureate labor market were varied and diverse. There were numerous groupings within this market. These groupings

included occupations that had been vocational from the beginning, such as machinist, drafter, and business occupations. Other groups were relatively new, such as electronic technicians and computer related occupations. Some of these predominated in manufacturing (CAD and automated manufacturing), others in the health field (licensed practical nurses, dental assistants, surgical technicians) and still others in business (accountants and administrative assistants) where each area required specialized skills and knowledge. Job titles at this level were highly ambiguous and were frequently mismatched with programs offered by educational institutions in the area.

These presented complications in conducting research within sub-baccalaureate education that were difficult to overcome. The high levels of non-completion in community college students generated the interpretation that these colleges had failed. Certainly some external pressures on community college students, like the lack of financial support and the demands of jobs and family, were responsible for them dropping out. Perhaps these students left when they completed enough coursework to pass the necessary licensing exams or demands of a new job; or perhaps these were “experimenters” who dropped out because college was not to their advantage or liking (Grubb, 1996). The nature of community colleges and the characteristics and enrollment patterns of the students they served made the study of community colleges extremely challenging.

Much of the early research within this category was conducted on several national data sets that were poorly controlled and failed to distinguish carefully among different categories of community college students and programs. These studies failed to distinguish between high school graduates, postsecondary non-completers, and

completers of specific sub-baccalaureate postsecondary programs. There have been a number of studies of these nationally representative data sets addressing the economic returns to community college degrees (Rouse, 1992; Kane & Rouse, 1995, 1999; Romano, 1986; Grubb, 1996, 1999a; Pascarella, 1999).

The data sets employed in these analyses were the National Longitudinal Study of the High School Class of 1972 (1986 follow-up), the National Longitudinal Study of Youth (1976 through 1983 high school graduates followed up in 1990), and the 1984, 1987, and 1990 cohorts from the cross-sectional Survey of Income and Program Participation, which included individuals between the ages of 25 and 64. The results of the studies that used these data clarified that completing an associate's degree did enhance employment wages significantly over high school graduates. These studies substantiated that completion of an associate's degree produced clear wage increase returns.

The findings of two studies deserved special note. Kane and Rouse (1995) found that a ten percent increase in earnings was realized by the average person who attended a two-year college even without completing an associate's degree compared to a person without any college. They further found that the returns per credit hour were similar for two and four-year colleges with each additional 30 credit hours increasing earnings by 4-6 percent. Romano (1986) stated in his study that under certain conditions the payoff for a two-year college degree could be higher than for a four-year degree. This was found for students who chose curricula that were directly related to job market possibilities and who experimented less with courses.

Results like these from national studies helped to resolve some of the debates over the role of a community college education to its students' livelihood. More recent studies on National data sets improved the ability of researchers to examine differences within the sub-baccalaureate category (Bailey, 2003b; Pascarella, 1999; Grubb, 1999b).

On average community college students who completed an associate's degree earned between 15 and 40 percent more than a high school graduate with no postsecondary education. The economic value of one year of studies in a community college was about equivalent to the value of a year of baccalaureate-granting college or university (Bailey, 2003b).

There was great uncertainty, however, about the benefits of certificates and lesser attendance (Grubb, 1999b). Few of these studies examined certificate programs and fewer still examined the effects of some community college attendance without earning a certificate. Small amounts of postsecondary education did benefit some individuals, but the return was substantially smaller than for the associate's degree and was highly varied depending on the individual courses and occupations.

Pascarella (1999) took results of many published reports which used these data and computed an average economic benefit to an associate's degree when contrasted to a high school degree. He found that men with an associate's degree had on average an 18% advantage in annual earnings over those with a high school diploma. Women had a 26% advantage on average over their high school counterpart. The corresponding median family income advantage of a householder with an associate's degree versus a high school diploma was 133%.

Five additional trends emerged from this analysis. First, the economic return to an associate's degree varied considerably by field of study with the largest payoffs in the technical business and health fields. Second, the returns of an academic associate's degree without a transfer to a four-year college could be uncertain. Third, the return to an associate's degree was highest when employment was related to the field of study. Fourth, there was greater economic return to completing a specific coherent program of study than there was to taking two years' worth of community college courses without completing a credential. Finally, the economic returns from both associate's degrees and vocational certificates were more pronounced for women than for men.

The results from these National studies showed there was a clear benefit to the completion of an associate's degree with great uncertainty about the benefits of completing a certificate, and of completing some coursework (Grubb, 1999b). The more "formal" the schooling was the better. The baccalaureate degree was superior to an associate's degree, which was superior to a certificate or taking some coursework.

Unfortunately, national data sources could not sort out the different types of institutions. As a result data were simply averaged to describe the overall effect with no particular meaning for any specific institution (Grubb, 1999b) or any particular program. They revealed little about whether completion of a specific program enhanced opportunities for employment and the earnings associated with the jobs in the program area (Grubb, 1999b).

One early exception was a study conducted by Blair, Finn and Stevenson (1981) that used data from the 1972 Postcensal Manpower Survey conducted for the National Science Foundation by the U. S. Bureau of the Census. This survey used a sample design

that focused on persons who reported scientific, engineering, or technician occupations to the 1970 Census of Populations. Respondents were classified using multidimensional criteria which included current occupations, education, and training. This study focused on those classified as full-time technicians. These technicians were divided into groups by educational backgrounds. It compared those with associate's degrees against technicians with other educational backgrounds. The analysis of these data showed that the increment of earnings associated with completion of the two-year associate's degree was significantly greater than the increment for the category of some college. The relative earnings gained from an associate's degree was approximately twice as large as the earnings gained from one year of college and 50% larger than the earnings gained from two years or more years of college. However, the relative earnings gained from a bachelor's degree were more than twice that from the associate's degree.

Another exception was Stokes and Graney (2000) who studied a specific institution and found the total knowledge impact of Jefferson Community College (JCC) in Louisville, Kentucky, to be worth \$168 million for the 1993-94 academic years which broke out on average to an estimated individual lifetime earning value of \$127,000 more for a JCC completer than that of a high school graduate. These studies resolved some debates over the role of community colleges and provided some guidance to policy makers and leaders for support of programs, but they also raised additional issues as they pertained to specific local institutions.

Other issues centered on effects of schooling on minorities, displaced workers and older students; on the effects of credentials by fields of study; on the effects of finding related employment; on the results by type of institution; and on the issues of timing.

National results did not reflect evidence about specific programs at individual community colleges and did not reflect the conditions specific to individual states or labor markets.

As community colleges became ever greater players in the national system of postsecondary education, there remained a serious danger that the absence of more and better research data would lead to educational policymakers relying on unsubstantiated beliefs, stereotypes and inaccuracies as they made policy and funding decisions for community colleges. Existing studies provided rough guidance to policy-makers trying to decide what kinds of programs to support. National data were much less valuable than data about specific states and specific institutions to individual state legislators and individual students trying to contemplate their options. National results had to be reinterpreted for state policy-makers to reflect individual state conditions since community college systems differ as do labor markets from state to state. While thought provoking, the absence of systematic research evidence left most policy makers to rely on unsubstantiated beliefs and stereotypes when making judgments about educational effectiveness and funding priority of community colleges.

Multi-faceted Models

Stokes and Coomes (1998) offered one of the most extensive and logical compendiums on the various ways to categorize the different methods of estimating college economic impacts and to analyze which application best suited individual institutions. This work categorized methods as expenditure impact or knowledge impact and provided recommendations for which methods might prove most advantageous for an institution based on several criteria. It identified several categories of institutions by metropolitan status (yes or no), origin of students (non-local or commuters), and primary

mission (research or teaching) and made several recommendations based on the combination of these categories. The study identified categories that most institutions would fall within based on these characteristics. In some cases they recommended multifaceted studies that combine expenditure and knowledge impacts be considered in the study of one institution.

They concluded that metropolitan commuter colleges had low expenditure impacts and large knowledge impacts. This was based on the facts that the students they served were drawn from the local area where most of their expenditures would have remained whether in college or not, and where they remained as alumni to reside and work to contribute locally with greater lifetime productivity and earnings. These institutions should focus on knowledge influences.

They concluded that metropolitan non-local colleges would benefit from both high expenditure and high knowledge impact studies. These colleges drew students from long distances adding to local outlays and the alumni continued to reside in the community adding knowledge impacts as well. These institutions could reliably focus on either expenditure or knowledge influences or both.

Non-metropolitan commuter colleges would be better served to rely on knowledge impact studies in an economic analysis. Their regions would need to be defined carefully so the impacts of the graduates could be considered using large regions and whole states as the best boundaries in most instances. While non-metropolitan non-local colleges would be best served by expenditure impact studies because they drew students from long distances but few remained in the region to enhance the local economy.

Most recently literature in community college trade journals included information on the creation of a new model by CCbenefits Inc. This model was created for the purpose of providing multiple economic impact data to individual colleges. Lazarick (2001) provided an overview of the multiple economic impacts included in the CCbenefits' model. He introduced this "innovative model" and provided an interactive web site address for further information.

Two economists who had long experience with economic impact studies created this model. It was unveiled at the Association of Community College Trustee's (ACCT) Nashville convention in October 2001. Funded by ACCT, the economists painstakingly assembled past economic studies, elaborate census data, and detailed information from seven community colleges to create a model that estimated the return on investment from these colleges.

The findings of these studies reported a rate of return on a dollar invested in the seven community colleges studied which ranged from a low of 9.9 percent to a high of 26.8 percent. The benefit-cost ratios showed that \$1 spent at a community college produced private and social benefits ranging from \$1.90 to \$4.30 (Lazarick, 2001). The private benefits were the higher earnings captured by the students as a result of the education they received, while the social benefits were on health (reduced absenteeism, fewer smokers, fewer alcohol abusers), on crime (fewer incarcerations, crime victim savings and added productivity) and on unemployment benefits (welfare and unemployment savings).

The website contained limited details of the methodology, a database of literature reviews, and templates of the reports generated for community colleges in the initial

pilot. These colleges were Beaver Community College, Pennsylvania; Eastern Iowa Community College District, Iowa (Christoffersen & Robison, 2000); Martin Community College, North Carolina; McHenry Community College, Illinois; Walla Walla Community College (Christoffersen & Robison, 2001), Washington; Everett College, Washington; and Yavapai Community College, Arizona. A Startup Kit was available through this website for a review of the information that was needed for an economic development study through this service.

Tailored analysis was offered for individual community colleges or whole state systems for approximately \$5,000 to \$6,000 per college. These were to be used

“for the purpose of preparing arguments for specific election issues (voting on a referendum, for example). A referendum to increase the levy in a CC district, for example, will be backed up with targeted and documented results on the likely returns from the investments made. Or, a referendum to decrease the levy could be contested with targeted and documented results on the probable decreases in the private and social returns.

Special reports aimed at the private sector can also be generated. This routine invokes subsets of model parameters for the purpose of articulating well-documented arguments to generate greater private sector interest in funding specific contract training at the CCs.” (On line at <http://www.ccbenefits.com/AboutCCB/AboutStart.htm>)

The CCbenefits Inc. model introduced a new set of social data elements to the results of an economic impact study. These elements included an estimate of medical savings, crime savings, welfare savings, and unemployment savings per year generated as a result of education.

Two perspectives were considered in the return on investment throughout the CCbenefits Inc. reports generated for individual community colleges. The broad perspective was one where all benefits were counted regardless of recipient. These included the increased earnings of students, plus external benefits associated with savings

on health care, reduced expenditures on crime and reduced welfare and unemployment expenditures and costs associated with absenteeism from work. The narrow perspective was one where general accounting perspectives were followed and counted only benefits that accrued back to state and local governments in the form of book or accounting revenue. These were further defined as benefits that could be entered into the books of state and local governments.

CCbenefits Inc. claimed its results were based on solid economic theory, carefully drawn relationships, and national and local education related data. However, the methods of calculating the various economic impact figures were not revealed in materials reviewed and were listed as “proprietary”.

This study attempted to answer the question, “How did the community college district economy and the state benefit from the presence of the community college?” The results were explained in terms of expenditure impacts to the region served by the college. Operating and capital expenditures of the institution were stated in millions of dollars spent locally and numbers of jobs created. Accumulated contributions of past college instruction in the region were listed in millions of dollars generated in annual earnings to the region and numbers of jobs created.

From a student perspective, for every credit completed at a community college a student earned on average dollar amount more per year for every year in the workforce. Lifetime earnings were calculated over a 44-year period for those leaving with a two-year degree. For every full year attended an additional amount was earned. From an investment standpoint each student enjoyed a return on their investment of time and money, with every \$1 of tuition and fees invested returning additional dollars in future

earnings. The payback period for the educational investment was calculated and stated in years.

Studies using this model demonstrated that the average annual earnings of students with a 1-year diploma were approximately \$29,779. These same studies showed the average earnings for someone with an associate's degree were approximately \$35,021. These amounts were compared to someone with a high school degree in each of the studies.

From a taxpayer standpoint the annual investment of state and local support dollars in the community college produced a good return. These returns were broken down to include avoided costs for improved health-related savings of fewer smokers and fewer alcohol abusers, reduced incarceration rates resulting in savings from reduced arrest, prosecution, jail and reform costs, and reduced welfare/unemployment costs within the broad perspective. Within the narrow perspective it was assumed that without this support the college would not exist. The results indicated a rate of return for every \$1 of tax money received. A total number of credit and noncredit hours of training infused into the workforce, thus enhancing the area wages and salaries within the region served by the community college directly and indirectly, was also calculated within these studies (Christoffersen & Robinson, 2002).

These results demonstrated that community colleges were sound investments and contributed to the local and state economies. It is too early to determine the impact the CCbenefits Inc. model may have on the cumulative research and literature that relates to community college economic impact, but it serves as one more example of the interest that exists in these data.

Other researchers also were ingenious in their own right in gaining access to information to perform research for individual institutions. Several other recent studies utilized labor market data of student outcomes along with other broadly defined economic impact characteristics to determine multi-faceted indicators of a community college based on the economic impact of the expenditures made by the institution and the impact of the education on individual students (Grosset, Hawk, Irwin, & Obetz, 1995; Stokes, 2000).

The literature abounds with these three major categories of short-term expenditure impacts, long-term knowledge impacts and mixed model economic impact studies. All studies covered differing topics of interest and varied as to the information they portrayed. There seemed not to be a great deal of standardization between them except that they were meant as a means to influence the many publics served by the institutions that commissioned them.

Economic Impact Studies based on Unemployment Insurance Wage Record Data

Federal education policy moved rapidly in the 1980s and 1990s toward an emphasis on measuring performance as an indicator of program accountability. The Job Training Partnership Act of 1982 imposed new data requirements for monitoring and conducting follow-up studies for program evaluation. The Carl D. Perkins Vocational and Applied Technology Education Act of 1990 required states to develop performance measures and standards for vocational education at the secondary and postsecondary levels. The Higher Education Act of 1985 strengthened the role of states in reviewing eligibility of institutions seeking to participate in Federal student aid programs. Institutions subjected to review were required to meet established state standards, which

in the case of programs whose objectives were preparation for employment included assessment of students' earnings and employment. The advent of the Workforce Investment Act of 1999 necessitated the development of data gathering within specific program areas leading states closer to the advent of statewide data gathering and dissemination discussions.

"Consumer rights" information was also required by this legislation. Prospective students and their parents wanted to know what kinds of results could be expected from investments of time, money and effort. Employment opportunities in specific occupational fields and future earning potential were questioned.

To meet these increasing demands for accountability a national, reliable, cost-effective, and accurate method of tracking outcomes of educational programs was needed to monitor the transition of program participants among different education, employment and assistance programs, (e.g. welfare, food stamps, unemployment) over time. One possible solution resulted from the advent of the Deficit Reduction Act of 1984. Effective September 1988, employers in all states were required to submit quarterly wage reports to a state agency for the administration of the state's unemployment compensation laws. In reality three-fourths of the states were already collecting quarterly wage reports in the administration of unemployment compensation programs (Steven, 1992). As a result of this mandate, however, all states collected Unemployment Insurance (UI) wage data and required employers to report the employee's social security number and the total amount of earnings during an annual quarter of employment. Employers were assigned and reported by a unique employer identification number, geographic code and an industry affiliation.

This legislation also played a key role in defining the balance between the collection agency's interests, the need to protect the confidentiality of the individual and his or her employer, and the broader public concerns about education. It cleared the way for states to improve the collection of data on students (Stevens, 1992). By allowing colleges and states to link identification numbers of students in various educational institutions to like identification numbers in Unemployment Insurance (UI) wage records it made information available on earnings over long periods of time, allowing longitudinal analyses of specific student bodies within specific educational programs as they progressed through the workforce.

In the 1980s and 90s the federal government and state departments explored the value of Unemployment Insurance records in examining trends regarding former students in the workplace. It was believed these research findings could be used by policymakers to determine employment and earnings outcomes of former vocational students, to assess changes in the performance of vocational students over time, to measure the performance of institutions providing job and vocational training, and to assess the performance of various programs and categories of students (Stevens, 1992). Practitioners could also use these procedures to track placement outcomes of students, to evaluate effectiveness of curriculum and to make adjustments in curriculum and placement counseling with students.

While the collection of this information through UI data was conceptually simple, it required a great deal of cooperation among state and local programs making it a highly political process. However, despite a number of inherent problems the potential uses of

state and local data were promising. Unemployment Insurance record studies highlighted state-level and local efforts across the country to meet desired ends.

Most of the early studies focused on the use of UI records for JTPA performance management and for tracking post-college employment rates and wages. The National Commission for Employment Policy (1992) submitted a report of findings and recommendations on using UI wage record data for performance management of programs under the Job Training Partnership Act (JTPA). It addressed the technical and administrative issues involved in taking advantage of UI records. It showed the usefulness of the wage data to measure long-term effectiveness of JTPA services and documented a cost savings of over \$2 million annually.

Several national studies were undertaken to explore the feasibility of using state UI wage record data to measure the labor market performance of students enrolled in proprietary institutions and community colleges. One of the most comprehensive and well written studies was done by Stevens (1992). This study used social security numbers to match student and employment records of approximately 11,000 students in two states. The primary sources of data used were post-program employment and earnings found in the states' unemployment insurance wage records.

The chief findings of this study follow:

1. The use of the existing UI records resulted in the identification of nearly 80% of the former students.
2. The study generated a wide range of findings comparing the student employment and earnings of different schools, different genders, different grade point averages, different program majors, and program completers and non-completers. Specifically,

the study found clear and consistent differences in the job placement rates of students attending different schools.

3. It consistently illustrated that completers earned more than non-completers and that this gap in earnings increased over time.
4. It found UI wage records would need to be supplemented to determine hourly wage rates and whether the job a former student held was in a related field to his or her training.
5. It found the cost of matching student record to UI record data to be substantially less than the cost of collecting survey data.
6. It concluded that student record systems often limited the ability to exploit all the possible uses of UI data. These records needed to ensure that race, gender, program of study, grade point average, credits earned, and other needed characteristics were included in the student records.
7. The study further admonished that confidentiality rules must be established to protect the privacy of students and employers.

This study concluded that UI wage records were a viable strategy to improve the assessment of educational programs. It recommended that future applications be tested at the state level.

A study of 13 states' efforts was conducted by the National Center for Research in Vocational Education (Jarosik & Phelps, 1992). UI wage record data were used as a tool for improving educational accountability and assessing the impact of education on the work force in this study. The states involved in this study were Alaska, Arizona, Colorado, Florida, Illinois, Indiana, Missouri, New Hampshire, Oklahoma, Texas,

Virginia, Washington, and Wisconsin. The conclusions reached from the examination of these states' use of UI wage record data were that most states saw these UI data as a significant improvement over traditional follow-up studies. Several states were planning to use the data as broad indicators of education and training accountability. Again the development of safeguards to protect confidentiality was mentioned as a major concern.

Mundhenk (2000) reported on statewide reporting requirements and federal accountability standards in the Workforce Investment Act of 1998 and the reauthorization of the Carl D. Perkins Vocational and Applied Technology Education Act in California, Florida, Illinois, Massachusetts, Texas, and Washington during a roundtable sponsored by the American Association of Community Colleges to explore the feasibility of using unemployment insurance data to document the success of community colleges in providing a trained workforce to their communities, states and the nation.

Policymakers started looking at UI records as a data collection and dissemination system to help answer questions about employment status of former students, long-range outcomes such as job retention and earnings growth of former vocational education students, average earnings of former students by selected program or institution across the states, employment and earnings of completers and non-completers of the same program of study, and factors such as grade point average and gender that affect long-term earnings gains was questioned.

Vocational education administrators started looking at UI records for institutional planning and management decisions. Questions like the following emerged: Do employment and earnings outcomes over time indicate a need for change in a program? How do demographics affect employment and earnings among programs? What are the

initial and long-term earnings gains after program completion? Should changes in the curricula of various programs be made based on data of program completers? Are there specific programs that are weakest based on UI data? Does the UI data for students who do not complete a program reflect a need for improvement in program or student services?

Seppanen (1995) reported on 20 states that established procedures which required colleges to link identification numbers of students in various educational institutions with the identification number of UI wage records. This information, available over long periods of time, allowed for longitudinal analysis of the economic impact on earnings rather than follow-up analysis typical of the National methods.

Many of these states (Grubb, 1999a) began improving the collection of data on individual students. California, Washington, Florida, North Carolina (Jurado & Wolff, 1982), and Texas all gathered data based on Unemployment Insurance (UI) records and all took different approaches demonstrating different possibilities for state and local use. Grubb's analysis of these five states showed that the economic benefits of sub baccalaureate education were clear for students with an associate's degree or a certificate. Many of these results showed that the benefits materialized within three years of leaving education with long-term effects that may be even greater.

Florida, considered the pioneer in developing a follow-up strategy with UI wage record data (Sanchez & Laanen, 1998b), gathered performance measures from several systems and broke them into a common three-tier measurement system. Measurements were applied across all workforce education and development programs at progressively detailed levels. Tier 1 measured outcomes for all workforce education system-wide. Tier

2 looked at program level measurements such as postsecondary education. Tier 3 examined program operations and management and outcome measurements demanded by federal and state agencies (Peterman, 1999).

Florida developed a statewide system, the Education and Training Placement Information Program (FETPIP), which relied on the administrative databases of several state and federal agencies to collect follow-up data on former student and program participants. The former students included all public school system high school graduates and dropouts, all community college associate degree and vocational students, all secondary and postsecondary vocational students, all state university system graduates, adult education and General Educational Development (GED) students, selected private vocational school graduates, state college and university graduates, all Job Training Partnership Act program participants, welfare reform participants, unemployment insurance claimants and correctional system releases (Pfeiffer, 1994).

In 1992 Florida adopted an accountability system that included ten measures. It included one process-type measure, an enrollment rate for targeted populations. It also included output measures of completion, leaver rates, and student gains in basic and academic skills. There were five outcome measures which included completer and leaver job placement rates, earning levels at the specific program level, as well as at the institutional level. Each measure included separate calculations for targeted populations, such as disabled and disadvantaged students (Pfeiffer, 1994).

In addition to establishing performance measures, the Florida Workforce Act inaugurated a performance-based funding incentive. Within this program community colleges and school districts could receive additional funds as an incentive for certain

postsecondary vocational programs which led to high-skill, high-wage, high-demand occupations. Four levels of placement were established as the basis of outcome payouts. Level 1 was for a placement in any job or postsecondary education enrollment at a higher level. Level 2 was for job placement that fell within the \$7.50-\$9.00 per hour range in designated high-skill occupations. Level 3 was for placements in jobs that paid above \$9.00 per hour. Level 4 dealt with employment retention a year after initial employment. The general scheme of the funding formula was an 85% local base amount with a 15% calculation based on performance awards (Pfeiffer, 1994). Simply put, local entities could earn a larger amount each year if they had larger numbers of completions from longer-length programs or placements in higher-wage jobs.

Azari (1996) studied a population of over 14,000 Washington State community college graduates and course completers from the 1987-88 academic year. Graduates were defined as completing all requirements of a specific vocational program. Course completers were defined as former students who completed 10 or more credits in a specific vocational program without completing a certificate or degree. These results showed 96% of the participants were positively placed five years after completing the community college program. After five years, 72% were employed in related fields to the vocation program of study. Students who completed degrees or certificates earned higher salaries than those who did not, with salaries up to 46% higher than non-completers.

Seppanen (1994) worked with the Washington State Board for Community and Technical Colleges to report job placement rates for graduates of these programs. Uniquely, the Data Linking for Outcomes Assessment Program developed in Washington contained the number of hours a student had worked in a quarter (Seppanen, 1995). Data

collected through the use of UI record data showed Washington community college system and individual college placement rates that consistently exceeded the set standard of 80% of graduates in jobs or in future training. Graduates of the 1991-92 cohort revealed an overall job placement rate of 85%. Of the employed graduates 82% were in a job related to their field of study and for every three of these graduates, there was one non-graduate who obtained employment in a training related industry. With respect to salaries, the median hourly rate was \$10.00/hour. Most of the non-graduates left college in their first year of study. When earnings per hour were analyzed for non-graduates in the health field, non-graduates as opposed to graduates received \$2.00 an hour less. In the service occupations and in mechanics and repairs, earning gaps between non-graduates and graduates was about 20 cents an hour; for administrative support it was 30 cents an hour; and for all other areas, except sales, it was 60 cents an hour.

A specific case study of Bellevue Community College (BCC) in Washington State (Hutchison, Kline, Mandt, & Marks, 1998) reported on activities conducted in partnership with regional businesses that played a key role in identifying and developing high-wage programs locally. Differences between state and local analysis of UI wage data led BCC to recognize that earnings data on its graduates should be gathered locally as well as at the state level to provide a full picture of data needed to justify new program starts and to check on the usefulness of state data. Further, earnings data were found to be important not only to satisfy accountability requirements at the state and federal level, but also to convince students and parents of the attractiveness of changing traditional fields and emerging occupations.

Measurable outcomes of attending a North Carolina Community College were reported by Gracie (1998). North Carolina established a multivariable collection system, called the Common Follow-up System, which grew to become a five-year complete record of individual enrollments in education, training and placement programs which included demographic and unemployment insurance wages for individuals before, during and after training. This system was mandated by state legislation directing the State Board of Community Colleges to develop performance standards for appropriate critical success factors and to develop a model for colleges to use in determining institutional effectiveness (Gracie, 1998). Seven critical success factors and thirty-three measures of program success were established. Outcome measures from the vocational-technical, college transfer and continuing education sectors were collected from college completers and non completers on program and college satisfaction, goal attainment and employment rates, and from employers on their satisfaction with community college graduates.

Classifications were established for exit completers, exit non completers, comeback completers, and comeback non completers. Within these categories overall, exit non completers had the highest earnings immediately after leaving college with the greatest range of initial quarterly earnings among the four groups. Older students had higher annual earnings than younger age groups in each student status group.

However, the mean quarterly earnings of exit completers increased at a faster rate from quarter one to quarter four after leaving college than the other groups. The exit completers had the highest earnings among all students under age twenty-five. The exit completer who earned a vocational associate's degree, diploma, or certificate reported higher quarterly earnings than one who earned an academic associate's degree. The

vocational associate's degree completer earnings also increased at a faster rate than any other degree holder group.

North Carolina continued to use analysis of the data generated for response to economic initiatives such as School-to-Work, Tech Prep, Work-First, Job Ready, and One Stop Centers (Gracie, 1998). Continued examination of participants' cost by program, return on investments and welfare avoidance in addition to measuring reduction in duplication of effort enhanced the value of the quality of the delivery systems and led to more effective strategic investments in higher education and economic development.

Jack Friedlander, in conjunction with the California Community Colleges Chancellor's Office (CCCCO), pioneered early efforts in California in the field of UI data research (Laanen, 1998). A pilot study in 1992-93 examined outcomes for Santa Barbara City College and Grossmont College and concluded that the Post-Education Employment Tracking System (PEETS) established for tracking employment rates and earnings of community college program completers and leavers was cost-effective and efficient (Friedlander, 1996).

To refine the PEETS system a follow-up study investigating outcomes over a four year period was conducted at 18 California community colleges for students who either completed a program in 1992 or 1993 or stopped attending in 1991 or 1992. A completer was a student who received a certificate or associate's degree, whereas a leaver was a student who had completed some units but did not receive a certificate or associate degree. Data were aggregated in the following categories: zero units or noncredit, 0.01-11.99 units, 12-23.99 units, 24+ units, certificate, and AA degree. Students who were concurrently enrolled in K-12 during the cohort year, enrolled in any university program

during the two years following the cohort year, and enrolled in any community college following the end of the cohort year were excluded. Students who were employed by the military or federal government, self-employed, unemployed or not in the workforce were also excluded from the data set.

The Chancellor's Office decided to use median annual earnings instead of the average earnings because the median was a more stable statistic and not influenced by extreme outliers. Annual earnings were derived by summing earnings for those working all four quarters (Laanen, 1998). The percentage changes in median annual earnings from students' last year in college to third year out of college were reported. Data compared students who were under twenty-five years of age with those 25 and older.

Among these students certificate completers under 25 showed the greatest change three years out (101.4%). They had the highest median annual earnings (\$22,539). The second largest gain in median annual earnings was among students who completed an associate's degree (100.4%). Findings supported the notion of the strong positive relationship between percentage gains and educational attainment.

For older students the pattern was similar but the magnitude was substantially lower. The gains among certificate completers were 18.5% and among associate degree completers were 34.7%. A plausible explanation for the differences between the two levels was that the older students were making higher wages when they attended college. The data clearly showed the disparity between younger and older students' median earnings. The older student, with years more experience, showed post-college gains which were not as exaggerated. However, findings supported the notion that a positive

relationship existed between gains and educational attainment level regardless of age (Friedlander, 1996).

A similar California study conducted with a target population who were either completers or leavers during the 1991-92 academic year by Sanchez & Laanen (1998a) compared students' earnings during the first year out of college to the third year out of college. These results showed that gains were evident across all levels but largest for certificate and associate degree completers. Although positive gains of 6% to 10% were evident among the different categories of leavers, they were determined to not be substantial. Certificate completers experienced a 15% gain in earnings from the first year to the third year out, while associate's degree completers experienced an 11% gain respectively. In examining the data by age, students under twenty-five experienced substantial gains across all educational levels with students who completed 24 or more units experiencing a 27% gain from first to third year out, a 25% gain for certificate completers and a 28% gain among associate's degree completers. Students over 25 compared very differently. These gains were very small across all groups with a 10% gain for both certificate and associate's degree completers.

Vocational majors were identified as having completed at least 12 units within a vocational program area. Overall these vocational majors experienced a 14% gain from first to third year out post-college earnings. An interesting pattern was evident among these vocational majors. In terms of first year out to third year out earnings the students who completed 24 or more units experienced a 16% gain, with certificate completers slightly lower (15%) and vocational associate degree completers lower yet (12%). Three years out, however, students with certificates or associate's degrees had higher earnings

that ranged from \$28,000 to \$32,000. Completion of a vocational certificate or associate's degree greatly increased students' post-college earnings compared to taking units.

Luan (1996) collected data from a study specific to Cabrillo College (CC) in California and analyzed it for the twelve vocational majors of fire protection, radiological technology, nursing, dental hygiene, electronic technology, computer science, and business programs. A summary of his findings showed that the data provided through UI records yielded critical information regarding the employment status and earnings of students who attended Cabrillo College.

Specifically, he reported that 77% of all students attending CC were working, students who received a degree or certificate reported the highest salary gains over time, the wages of students from different vocational programs could be documented and student earnings increased over time. The study also found that Latino students were able to make significant salary gains after receiving a certificate or degree from CC and that economically disadvantaged students clearly improved their economic standing by attending CC. It was suggested that this information be used at the local level to assist in recruitment, career planning, program review, educational planning, resource allocation, and assisting students in particular programs with employment.

Most of the findings from these state and local studies confirmed those of the national studies (Grubb, 1999a). They found that the economic benefits of sub-baccalaureate education were clear. The variation in benefits among different fields of study was confirmed in many states while the benefits of small amounts of community college coursework remained unclear. Additionally, the results from these studies showed

that the benefits of a community college education materialized relatively quickly, within three years of leaving college with long-run effects being even greater. The results generally did not consider the substantial differences reflected by motivation, ability and labor market experience. Differences between the experiences of men and women, dimensions of family background, race, ethnicity, and ability were largely missing or not considered. Grubb (1999a) warned that political pressures to show accountability and performance standards might force states to develop overly simple analysis of these data leading to a distorted or misrepresented view of local experiences and creating local college opposition. However, he predicted that the uses of UI data would expand and continue to develop though the process would be slow and uneven.

Foote (1998) published an annotated bibliography of materials from the ERIC system that focused on the economic benefits of obtaining a community college degree which included national studies that used UI wage records. Mundhenk (2000) described the value of UI wage record data to meet federal and state accountability requirements. In a forward of this white paper, George R. Boggs, President of the American Association of Community Colleges, endorsed the use of UI records also as a way to document the value a community college adds to its communities.

The use of UI data had inherent weaknesses and strengths. The collection of the data required a great deal of interagency cooperation among state and local programs. It proved to be a highly political process that necessitated discussions of who would control the data and what purposes the data would fill. The data were limited in their coverage to those individuals who stayed and worked in the state. Some individuals who remained in state could not be matched with UI data if they were self-employed or were in jobs not

covered by Unemployment Insurance. Data that could be used to control for some causes of variation such as family background, high school preparation, or ability were not always available within this system. However, despite these limitations the promise of the relative consistency and reliability of these data expanded the potential uses of state and local data to such areas as program improvement, identification of high-wage, high growth programs, accountability, marketing, and performance-based funding (Grubb, 1999a).

As the reauthorization of Perkins III, the Higher Education Act, and the Workforce Investment Act in 2004-05 approaches, relevant accountability systems that produce appropriate descriptors of performance will once again gain national significance. Grubb (1999a) concluded that pressures for accountability would continue to increase. As federal legislation and state accountability demands mounted, the use of UI records would likely expand, though the process would not be smooth or fast.

Legislative Perception Research

It was apparent from the review of literature that many economic impact studies were completed for legislative advocacy and marketing. These were completed for the express purpose of influencing those who made policy in an effort to positively influence these policy decisions and the associated funding decisions. Yet very few researchers had ventured into the political-economic arena (Caswell, 1988; Ruppert, 2001; Gillum, 2001). Few had tried to ascertain what impact this information might have on legislators.

Caswell (1988) conducted a study to capture perceptions of employees at Dallas County Community College District after an unusually harsh legislative session that resulted in cuts of 5% of the state allocations for Texas community colleges. Focus

groups were conducted to determine perceptions of selected employees concerning appropriate strategies for a college legislative advocacy program. Results showed that support for an economic impact study was the most pronounced of the strategies tested with 90% rating this as “very helpful.” This strategy was followed by college-level grass roots involvement at 78% approval, state level advocacy at 77% approval, and public opinion polls at 60% approval. Because of this study Dallas County Community College District determined to undertake an economic impact study immediately. One of the advantages cited for this action was that the media could then be utilized to highlight the economic value of the colleges. It was felt the economic impact study would provide a language by which to communicate with the various publics at the local and state level.

Ruppert (2001) developed a survey in consultation with staff from the National Education Association and conducted 64 phone interviews with state legislators considered to be “insightful, knowledgeable and influential in matters pertinent to higher education policy issues” (p. 47). The purpose of the survey was to elicit the personal perceptions of these state legislative leaders about higher education in their states. The objectives of this study were to ascertain what state legislative agendas were for higher education in the near future, to determine what strategies and policy decisions state legislatures were most likely to adopt to meet this agenda, and to clarify the political, social, and economic factors that influence legislative decisions. Higher education was defined as education or training beyond the high school level and included two- and four-year public and private colleges and universities. This study was completed mid year 2001 before the events of September 11, 2001, and the accompanying economic turmoil.

Still forecasts for the future showed uncertainty about where the U. S. economy was headed and there were clear signs of a slowdown.

Key findings of the study identified state's economic development as the most strategic need on the minds of state legislators. Economic development interests were seen as driving policy and funding decisions for higher education. Legislators felt higher education must contribute to these efforts by strengthening and diversifying the economy through research efforts; by preparing and training a high skilled, high-wage workforce; by providing convenient and relevant business training responsive to industry needs; and by raising the level of educational attainment within the state by expanding learning opportunities.

Improving the responsiveness of the higher education system and accommodating changing demands for access to high education were specifically identified as challenges faced by higher education. Public two-year community colleges and technical schools were seen as being the most responsive to state and local education and training needs of all the segments of higher education. Legislators felt an emphasis needed to be placed on additional degree programs aligned with state's economic needs within community colleges. However, this emphasis was often offset by worries that instruction centered too much on workforce training thus jeopardizing academic and intellectual development. Concerns were voiced on both sides of this issue which showed differing perceptions and beliefs about what the emphasis of higher education should be.

Because of this lack of agreement within legislative minds toward higher education, legislative policy decisions focused on expanding capacity in the entire system, thus providing greater management flexibility and strengthening institutional

quality for all higher education. These middle of the road choices allowed for all perceptions, but also maximized the need for the greatest resources, making no distinction between the different types of higher education.

Even as these interviews were being conducted the economy was slowing. Many legislators voiced a concern within this study as to the competing demands for public resources and the need for increased scrutiny to prioritize among them. Legislators recognized the impending need to confront the differing values associated with higher education and to make decisions to whom funds should be distributed (Ruppert, 2001) but failed to identify what issues and information would be helpful in making those decisions. Most recognized that more attention had been focused on inputs as opposed to outputs when it came to funding higher education. The current level of funding for higher education and the ability of colleges and universities to provide for themselves through tuition and fees, research grants and gifts were influential in funding decisions for higher education. However, most forecasted that in the future this type of thinking would need to be refocused more on outcomes, rather than the input measures presently being used.

Ruppert (2001) predicted that the future of higher education in an environment of declining resources remained to be seen. She offered three possible scenarios related to higher education. The first scenario depicted higher education as suffering. Education was seen as a “budget maker” funded on what remained after other necessary expenditures and appropriations were determined. The second scenario was one of hope where higher education made its own case to legislators of the link between itself and the economy. It made informing legislators of its role in economic development its mission. Within this scenario legislators understood that funding higher education could provide

economic stability and vitality. The final scenario represented a fundamental change in the way legislatures operate. Within this context budget did not drive policy, but rather policy drove budget. Here goals and priorities became most important and were determined before funding decisions were made. In either of the final two scenarios economic impact information data could be seen as helpful for making a case for support.

Gillum (2001) focused on legislative perceptions of Casper College in Wyoming. His research provided evidence for the need of reliable data and information to support the economic impacts of community colleges. Gillum (2001) compared legislator perceptions to actual wage record data and short-term economic impact data to determine the validity of legislative perceptions.

The Casper College legislators' perceptions of the benefit that attending Casper College had on a student's enhanced employment and earning ability were classified into five basic categories: "clear and convincing benefit," "graduated benefit" where the benefit was attributable because of type of program or length of time, "qualified benefit" where benefits were attributed to some but not all students, "improved job skills" where the benefit was seen as improving job skills and advancement in current position, and "small investment" where the small cost of the education made it easy for a return on the investment.

Gillum found that few legislators had a single, clear perception that categorized them in one and only one category. Rather the legislators held varied perceptions that ranged across the entire spectrum of these categories. Further, Gillum found that the legislators, no matter how clear their perceptions, had no reliable estimate of how much of a difference a Casper College education might make. They were unwilling to even

volunteer statements about this difference holding to “feelings” that education would result in an ability to obtain a better paying job over not attending college. These legislators wanted to believe that attending college was beneficial but had no hard data to support these beliefs. Gillum concluded that hard data were needed to refute or support these beliefs.

By gathering actual wage record data on students who obtained a degree or certificate from Casper College, Gillum (2001) was able to compare program completers to a matched group of non-completers. This presented an accurate picture of the actual impact of college program completion. He found that completing a course of study at Casper College had a positive impact on earning power. That impact was immediate and increased over time. On average for the three graduating classes used it was shown to be \$7,670/year over the control groups.

When these same legislators were asked how the economies of the local county and state were impacted by the existence of the community college, six major themes emerged. These themes were “enhances local economy,” “job training value,” “education value,” “economic development,” “cultural enhancement,” and “community enhancement.” Again there was no unified perception among the legislators as to the short-term economic impact of Casper College.

Two areas drew the closest perceptual agreement. Those were the value of the college to the local economy and the significant role the college played in job training. Even then, however, preparing a local workforce was not seen as a dominant factor in the value of the college to the local economy and few legislators discussed the role of the college in support of state and local economic development efforts. When asked for

specifics as to college expenditures, college budget, and direct and indirect job creation legislative perceptions indicated a general lack of foundational knowledge.

The topic of “brain drain” or out migration of program completers produced as varied perceptions as the other topics discussed. These perceptions were classified into eight categories: “a portion would stay,” “there should be an ability to return,” “certain segments are leaving,” “there should be freedom to move,” “in-migration,” “prerequisite to staying in state,” “speculation,” “uncertainty.” The comments illustrated a similar philosophical debate as that evident in Ruppert’s (2001) work. Ruppert discovered widely held beliefs of whether the goal of higher education should be job training or academic enhancement. Gillum discovered widely held beliefs as to whether completers should be required to work in the state in order to help it develop economically or if the state should be the one to take responsibility to develop good jobs to entice completers to stay in state.

Gillum (2001) concluded that the legislative perceptions were anything but data driven. Legislators displayed a general and specific lack of knowledge about Casper College impacts. This indicated that the individuals making the key decisions about the funding of the college were not familiar enough with its impacts on its local, state and student economies. Gillum recommended that data and information be developed that would document the interaction between the college and its economies to share and educate its legislative delegation. Clearly more research must be completed on the impact economic studies of individual community colleges would have on policy makers.

Summary

Grubb stated that “preparation of the sub-baccalaureate labor force has been an orphan of public policy, relatively neglected compared to other areas” (Grubb, 1996, p.

200). He blamed the traditions of local control and institutional autonomy enjoyed by community colleges for the lack of clearly articulated policies at the local, state and federal level. He predicted that the changes of the past thirty years would continue to make the need for policy initiatives requiring governmental action increasingly serious.

The advent of the reauthorization of key federal higher education and workforce legislation may provide a new impetus for the development of more clearly articulated policies and thus greater accountability in higher education. If the community colleges in Iowa are to operate within this new system of public policy, valid, reliable data that is effective and efficient must be piloted and developed.

Iowa Unemployment Insurance Records have been used as a source of data to provide accountability within the Job Training Programs which must comply with provisions of the Workforce Investment Act. Employment and quarterly wage information is used within this context. These UI records are used additionally within Iowa's state plan to provide accountability for the Carl Perkins outcome measures. Within this plan employment of college program completers was tracked at the second and fourth quarters after graduation through the use of wage records. However, actual quarterly wages were not used in this plan and only program completers' employment status was measured.

There is an opportunity for the use of these UI records for greater accountability and for an expansion of the existing data of the economic impacts an education at a community college in Iowa exerts on its students. The stage is set for a pilot study which would use Unemployment Insurance records to show the actual impact of a community college education on student earnings in the state of Iowa. A local model that uses actual

wage records could greatly strengthen and support the finding of the recently completed CCbenefits Inc. economic impact study of Iowa's Community Colleges and could serve as a pilot which would provide data for future policy considerations.

CHAPTER III

Method

Introduction

This research used quantitative methods to answer the research question, “To what extent do students benefit financially by attending WITCC as measured by their post college Iowa quarterly earnings?” The approach used was a secondary data analysis of actual wage record data for program completers, leavers, and applicants at Western Iowa Tech Community College in Sioux City, Iowa. These wage record data were matched with additional demographic and educational data contained in the college student management information system (MIS). The combined wage records and educational demographic records were analyzed to determine specific answers to the following questions:

1. What are the 1999 through 2002 median quarterly earnings for the WITCC completer, leaver, and applicant status groups in this study?
2. What are the 1999 through 2002 median quarterly earnings for the associate of arts, associate of applied science and diploma certificate degrees within the WITCC completer status group?
3. What are the 1999 through 2002 median quarterly earnings for the program family groupings of business, computer, allied health, mechanical, human service, and miscellaneous programs within the associate of applied science (AAS) degree completers?
4. What are the 1999 through 2002 median quarterly earnings for the program family groupings of business, computer, allied health, and mechanical programs within the diploma certificate degree completers?

5. For the three status groups of completers, leavers and applicants is there a difference between the three status groups in regard to the adjusted number of different employers? Is there a difference between the males and females in regard to the adjusted number of different employers? Is there an interaction of status group and sex in regard to the adjusted number of different employers?
6. For the status group of completers is there a difference between the three degree levels in regard to the adjusted number of different employers? Is there a difference between the males and females in regard to the adjusted number of different employers? Is there an interaction of degree and sex in regard to the adjusted number of different employers?
7. For the status group of leavers is there a relationship between the number of hours completed and the adjusted number of different employers? Is there a difference between the males and females in regard to the adjusted number of different employers? Is there an interaction of number of hours completed and sex in regard to the adjusted number of different employers?
8. For the status group of applicants is there a difference between the males and females in regard to the adjusted number of different employers?
9. For the group who worked all four quarters of 2000 is there a difference between the three status groups (completers, leavers, applicants) in regard to the mean annualized 2000 earnings? Is there a difference between the males and females in regard to the mean annualized 2000 earnings? Is there an interaction of status and sex in regard to the mean annualized 2000 earnings?
10. For the group who were employed full-time (>\$3,330/quarter) all four quarters of 2000, is there a difference between the three status groups in regard to the mean annualized 2000 earnings? Is there a difference between the males and females in regard to the mean annualized 2000 earnings? Is there an interaction of status and sex in regard to the mean annualized 2000 earnings?
11. For the group who worked all four quarters of 2002 is there a difference between the three status groups (completers, leavers, applicants) in regard to the mean annualized 2002 earnings? Is there a difference between the males and females in regard to the mean annualized 2002 earnings? Is there an interaction of status and sex in regard to the mean annualized 2002 earnings?
12. For the group who were employed full-time (>\$3,330/quarter) all four quarters of 2002, is there a difference between the three status groups in regard to the mean annualized 2002 earnings? Is there a difference between the males and females in regard to the mean annualized 2002 earnings? Is there an interaction of status and sex in regard to the mean annualized 2002 earnings?

13. For the status group of completers who worked all four quarters of 2000 is there a difference between the three degree groups in regard to the mean annualized 2000 earnings? Is there a difference between the males and females in regard to the mean annualized 2000 earnings? Is there an interaction of degree and sex in regard to the mean annualized 2000 earnings?
14. For the degree group of Associate of Applied Science (AAS) completers who worked all four quarters of 2000 is there a difference between the business, computer, allied health, mechanical, human service, and miscellaneous program families in regard to the mean annualized 2000 earnings? Is there a difference between the males and females in regard to the mean annualized 2000 earnings? Is there an interaction of program family and sex in regard to the mean annualized 2000 earnings?
15. For the status group of completers who worked all four quarters of 2002 is there a difference between the three degree groups in regard to the mean annualized 2002 earnings? Is there a difference between the males and females in regard to the mean annualized 2002 earnings? Is there an interaction of degree and sex in regard to the mean annualized 2002 earnings?
16. For the degree group of Associate of Applied Science (AAS) completers who worked all four quarters of 2002 is there a difference between the business, computer, allied health, mechanical, human service, and miscellaneous program families in regard to the mean annualized 2002 earnings? Is there a difference between the males and females in regard to the mean annualized 2002 earnings? Is there an interaction of program and sex in regard to the mean annualized 2002 earnings?
17. For the status group of leavers who worked all four quarters of 2000 is there a relationship between the number of hours completed and the mean annualized 2000 earnings? Is there a difference between the males and females in regard to the mean annualized 2000 earnings? Is there an interaction of number of hours completed and sex in regard to the mean annualized 2000 earnings?
18. For the status group of leavers who worked all four quarters of 2002 is there a relationship between the number of hours completed and the median annualized 2002 earnings? Is there a difference between the males and females in regard to the median annualized 2002 earnings? Is there an interaction of number of hours completed and sex in regard to the median annualized 2002 earnings?
19. For the three status groups of completers, leavers and applicants who worked all eight quarters of 2000 and 2002 is there a difference in regard to the gain scores in wages made between 2000 and 2002?
20. For the program family groups who were Associate of Applied Science completers who worked all eight quarters of 2000 and 2002 is there a difference in regard to the gain scores in wages made between 2000 and 2002 for the business, computer, allied health, mechanical, human service and miscellaneous program families?

Research Design and Rationale

A quantitative study was chosen that analyzed actual wages earned by Iowa workers 30 years of age and younger who had some interaction with WITCC in the time between Fall 1994 and June 1999. This design was chosen because it provided actual Iowa wage information that complemented and strengthened results from an economic impact study completed for WITCC by CCbenefits, Inc. a year prior to the start of this study. The economic impact study completed by CCbenefits, Inc. provided data based on national and regional information, which determined the return on investment to taxpayers and students based on these data. However, it did not provide actual wage information of the impact of attending WITCC.

In the present research the long-term wage records collected by the Iowa Workforce Development Department (IWD), which comply with Unemployment Insurance Compensation provisions, were used to indicate the impact attending Western Iowa Tech Community College had on the future earnings of program completers and program leavers who worked in Iowa when compared to applicants who never attended any post secondary educational institutions. Actual Iowa quarterly earnings were used to provide an impact of attending and completing a program at Western Iowa Tech Community College.

Participants and Sample

There were three major groupings of participants within this study: completers, leavers, and applicants. Information was initially retrieved from the college MIS system on all students who attended or applied to attend WITCC inclusive of Fall 1994 through June 1999. Within these categories information was queried in the following categories:

student number, social security number, first name, middle name, last name, birth date, age, sex, race, marital status, first term, goal at entry, last date of attendance, disability status, program of study, type of student, credits attempted, credits completed, cumulative grade point average (cumgpa).

Completers were defined as students who completed an approved credit program of study at WITCC during the 1998-99 academic year. These consisted of students who successfully completed a two-year associate's degree, a two-year associate of applied science degree and a one-year diploma certificate program in the three graduating classes in August 1998; December 1998; and May 1999. The data file extracted from the student information system for this group initially yielded 557 completers (Table 3.1).

Leavers were defined as students who attended WITCC during the academic year of 1994-95 through June 1999, but for one reason or another did not complete an entire program of study. These students may have completed any number of credits at WITCC as long as they completed no fewer than one credit. They applied for admission to the college and registered for credit courses. The data file originally extracted from the student information system for this group yielded 23,999 students (Table 3.1). It was later learned this group needed further delineation which will be explained later in this chapter.

Applicants were defined as individuals who applied for entrance to WITCC between Fall 1994 and June 1999, but for one reason or other never registered or attended courses. The data file extracted from the student information system originally yielded 1,447 applicants (Table 3.1). This data file was further delineated and will be explained later in this chapter.

Data Collection

The initial student files for these three groups, pulled from the management information system at WITCC, were sent first to the National Student Clearinghouse (NSCH). This is a nonprofit association founded by the higher education community for the purpose of streamlining the student record verification process for colleges and universities, students and alumni, lending institutions, employers, and other organizations. No universal database of post secondary enrollment information was available prior to 1993 when the Clearinghouse began with 30 pilot colleges. Initial post secondary enrollment patterns during the first years of its existence included only information from these pilot colleges. By 1995 and 1996 information within the Clearinghouse database was more inclusive of post secondary institutions nationwide. Further information on these services may be accessed at www.studentclearinghouse.org.

An enrollment search was conducted by NSCH to provide specific, accurate and up-to-date information on post secondary enrollment patterns of WITCC students for this study. This search gave electronic access to a database containing current and historical enrollment records of more than 40 million postsecondary students over 2,700 post-secondary institutions. These institutions represented approximately 91% of the currently enrolled students in the United States with records being continually updated. The type of information layout needed to request data from this organization was available on the website. This information included choice of media, diskette/FTP/tape/cartridge characteristics for transfer of data, general requirements for data, and detail on record layout.

Information was received from the National Student Clearinghouse to WITCC that yielded the names of the post-secondary institutions attended by the student, the institutional level of the institutions attended, the start term at each post-secondary institution attended, the transfer records and whether more than one transferring institution was found and the current enrollment status of the student. These data were accompanied by a response file which specified the data elements and how they were arranged. Along with this description came directions for creating an enrollment search file in Excel software.

A total student record request of 26,003 records was sent to the National Student Clearinghouse. Records not found in the National Student Clearinghouse database totaled 12,885, with 13,118 records found. Of the 13,118 records found by the NSCH, a yield of 7,729 non transfers and 5,389 transfers was determined. This meant that 5,389 of the students attending post secondary institutions had attended more than one institution transferring among them. The non transfers were students who had attended one and only one post secondary institution.

A follow up question was sent to the NSCH asking additional information on the 12,885 records not found in the database. These students were coded as "Z" in the returned file. Since there were so many, it was asked if the researcher could confidently conclude that these students never attended WITCC or any other post secondary institution beyond high school in the United States. The response from the regional contact confirmed that the researcher could comfortably conclude these students did not attend school beyond high school from 1995 to the present time. Since these students had

applied to WITCC within the years of 1994-1999 the researcher felt confident that most applicants 30 and younger would be covered by the NSCH database.

These National Student Clearinghouse data were printed. The student names were then matched with the college MIS data which had been transferred to an Excel spreadsheet. Within all three groups those students who attended any other institution other than WITCC were deleted from the data to be used for this study.

All applicants were then checked and had to have been categorized as never attending a postsecondary education institution by the National Student Clearinghouse Enrollment search to be included. All leavers were then checked and must have been recognized by the NSCH search as only attending WITCC. All completers were checked and could not have attended another post secondary institution before, during or after completing a program of study at WITCC. This left only students who attended WITCC or no postsecondary institution at all. This resulted in the following number of participants in each group: applicants, 984; leavers, 10,810; completers, 448 (Table 3.1).

The social security numbers from these three groups were then prepared in separate files for transmission to the Iowa Workforce Development Department (IWD) in Des Moines, Iowa. A Memorandum of Understanding between Western Iowa Tech Community College and the Workforce Development Office had been signed earlier by the President of the college and the attorney representing IWD. This Memorandum laid out the terms for the transfer of data between the two organizations and the nature of confidentiality to be observed in its use. It further designated the researcher as the point of contact for all data transfer and use.

Wage records were reported in Iowa to the Iowa Workforce Development (IWD) Department by employers to assist the state in conducting labor market research in various employment fields and to provide the necessary documentation for awarding Unemployment Insurance compensation. One of the major functions of these data was to calculate Unemployment Insurance rates for the state. These records were kept for the most recent 16 quarters of a calendar year for all Iowa employees who were not in the military, not employed in government, not self employed or unemployed. These data were already used by the college for the purpose of reporting student outcome data for the Job Training Programs. The Memorandum of Understanding for this study was an extension of that use.

Social Security numbers were the only identifier used by IWD. Thus these data sent to them were in three groups: applicant social security numbers, leaver social security numbers, and completer social security numbers. The final groups sent to IWD were 984 applicants, 10,810 leavers, and 448 completers (Table 3.1). For each record found IWD charged \$.05. The process for the transmission of these data was laid out by IWD. It was conducted by the Information Technology department at WITCC in the same format as employees' wage records from the college were transmitted to IWD quarterly for entry into this system.

From the records sent to IWD, wage record information was returned for 716 applicants (72.8%), 4,533 leavers (41.9%) and 411 (92%) completers. On closer review of these records it was noted than anywhere from one quarter to as many as 16 quarters of wages were returned on each student. The returned numbers did not indicate a full four

years of wages for every student. Many of the wage data records on these students were incomplete and showed periods of no wages.

Information returned from the IWD system included student social security number, wages for the quarter, employer name, employer address, employer federal identification number, the NAICS (North American Industry Classification System) identifier for the employer, the quarter the wages were paid, and an "IA" identifier for Iowa. Many individuals had more than one employer who paid wages to them during any one quarter. These were not added together so total wages for any one quarter were not tallied in many cases.

This IWD wage record information was transferred from the returned data file to an Excel spreadsheet. Selected demographic data from the college MIS system and the IWD wage records were then merged into an Excel workbook with separate sheets for each of the three groups using student social security number to match them. Because these data were very large it was decided to merge only certain reliable demographic data fields. These fields were different for each group. For applicants these demographic data included social security number, student number, birth date, sex, and program of interest at application. These were transferred and matched to quarterly wage records, the employer federal identification number, and the quarter they were paid. For leavers these demographic data included the student social security number, student number, birth date, age, sex, program of study, hours attempted, hours completed, and cumgpa. These were transferred and matched to quarterly wage records, the employer federal identification number and the quarter they were paid. For completers these demographic data included student social security number, student number, birth date, age, sex, first term of

attendance, program and degree completed in academic year 1998-99, cumgpa. These were transferred and matched to quarterly wage records, the employer federal identification number and the quarter they were paid.

Random checks of the demographic student information were conducted by the researcher on all three groups after this transfer to verify that data were correct. Because the data on the leaver group appeared questionable, an additional query of the college MIS system was done for this group at this time. The inconsistencies discovered among the leaver group were in the areas of hours attempted, hours completed, and cumgpa. These inconsistencies were a concern so the 4,533 student numbers identified in this leaver group were run through the college MIS system a second time. This was done to gain accurate information on the hours attempted, hours completed and cumgpa, as well as to guarantee that these students had attended credit programs within the time between Fall 1994 through June 1999, with two additional stipulations. At this time it was also stipulated that these students could not have attended a credit class at WITCC since June 1999. In other words, these students were definite leavers and had not returned for additional schooling after June 1999. Additionally these students could not have graduated from a program at WITCC prior to Fall 1994.

This query produced some interesting results. A large group of these students had continued to attend classes after June 1999, so were deleted from the study. Additionally, a group of approximately 117 of these students were prior graduates of a program at WITCC and had returned for additional coursework during the years indicated. These, too, were deleted from the leaver group.

This query resulted in a list of 2,366 leavers for which IWD wage records were found and reliable data fields for the hours attempted, hours completed and cumgpa for each of these students were verified. At this time it was noted that many of these students in the leaver group had attempted and completed zero hours of credit. It was then determined that students with less than one completed credit would be dropped from the study. This resulted in a total group of 1,395 leavers.

After this experience with the leavers, it was decided to run a similar query for the applicant group to ensure that they had not completed a program of study prior to Fall 1994 and to verify application date. The results of this query showed that 14 applicants were either presently attending classes at WITCC or were planning to start in Fall 2003. These were deleted from the study along with any applicants who did not apply within the stated dates of Fall 1994 through June 1999. This left a final group of 654 applicants.

Because information on program of study, degree obtained, and cumulative grade point average was verified personally by the researcher on the completer group, an additional query was not conducted on them. During this verification it was found that some of these completers continued to attend courses at WITCC in other programs of study after graduation in the 1998-99 academic years. These were not deleted from the study. However, it must be recognized by the reader that some of the completers included in this study might have been employed and attended additional courses of instruction after graduation from a program in 1998-99.

Table 3.1

Stages of Status Group Refinement

Status Group	Initial MIS Data Query	NSCH Query	IWD Wage Match	Second MIS Data Query	Individual ≤ 30 Years of Age
Completers	557	448	411	409	317
Leavers	23,999	10,810	4,533	1,395	787
Applicants	1,447	984	716	654	483
Total #	26,003	12,242	5,660	2,458	1,587

The data from the college MIS system and the wage record data from IWD now indicated information for 654 applicants, 1,395 leavers and 409 graduates (Table 3.1). Review of the wage record information from IWD revealed many cases where wages were received from several employers within the same quarter. Total quarterly wages had not been calculated in these cases. It was also noted that numbers of wage entries varied from case to case depending on the number of employers per quarter and the number of quarters employed in Iowa. Within a 16 quarter period the number of entries per student could vary from 1 to 50 separate wage entries indicating wages paid over a period of only one quarter by one employer to wages paid over a period of 16 quarters by as many as 18 employers. The data for a group of 70 individuals from each group were reformatted manually in a new Excel spreadsheet that included the data fields described below. These data were then analyzed. It was determined this format would yield the necessary analysis to answer the research questions.

Because the manual process was so labor intensive and prone to error, the existing data for the three groups was reformatted using SAS (Online at <http://www.SAS.com>) software and then transferred to SPSS (Statistical Program for Social Sciences) software

for analysis. All descriptive, difference, and associational processes and analyses were done by SPSS software and analyzed by the researcher.

When all data were reformatted by the SAS software each of the 409 reformatted completer's records contained a randomly assigned identification number, a status number, birth date, sex, program of study with the degree completed in academic year 1998-99, cumulative grade point average, actual Iowa total quarterly wages for the quarters employed in Iowa during the first/second/third/fourth quarters in the years of 1999/2000/2001/2002, the number of employers per quarter who paid those wages and the total number of employers who paid wages within the employed quarters (Table 3.2). It was at this time, after verifying the reformatting process, that all personal identification references were removed from the records. This ensured strict confidentiality of all student and wage data.

Each of the 1,395 reformatted leaver's records contained a randomly assigned identification number, a status group number, birth date, sex, program of study, attempted credits, completed credits, cumulative grade point average, actual Iowa total quarterly wages for the quarters employed in Iowa during the first/second/third/fourth quarters in the years of 1999/2000/2001/2002, the number of employers per quarter who paid those wages and the total number of employers who paid wages within the employed quarters (Table 3.2).

Each of the 654 reformatted applicant's records contained a randomly assigned identification number, a status group number, birth date, the program of study identified at application, sex, start term, actual Iowa total quarterly wages for the quarters employed in Iowa during the first/second/third/fourth quarters in the years of 1999/2000/2001/2002,

the number of employers per quarter who paid those wages and the total number of employers who paid wages within the employed quarters (Table 3.2).

Table 3.2

Statistical Variables Used for Each Status Group

Variables	Completers	Leavers	Applicants
Status	X	X	X
Birth date	X	X	X
Gender	X	X	X
Degree	X		
Hours completed		X	
Quarterly wages (1999-2002)	X	X	X
Total # employers	X	X	X
Annual wages (2000 & 2002)	X	X	X
Gain in Wages	X	X	X

These reformatted data gave the first glimpse of comparable total quarterly Iowa wage records and total number of employers over the 16-quarter period for the three groups. The impact of living and working in a tri-state region became apparent at this time. Sioux City, Iowa, is immediately bordered by South Sioux City, Nebraska, and North Sioux City, South Dakota. Major employers within the Siouxland region may reside in any of the three states making jobs readily available to the individuals in this study. The three states are separated only by a river. It was noted that many of the individual Iowa wage records were not complete with 16 quarters of wages. Individuals appeared to maintain Iowa employment for a period of time, then leave to work in another state and later return to the state within this four-year period. Analyses of

descriptive data run of all of the reformatted variables helped to determine the measures for this research.

Descriptive measures were initially run on many variables. Mean, median, minimum, maximum and skewness were run for the following dependent variables: 16 quarterly measures of Iowa wages, 16 quarterly measures of number of Iowa employers, 1 measure of total adjusted unique Iowa employers, annual wages for those employed all four quarters of 2000 or 2002, annual wages for those employed full time ($\geq \$3,330/\text{quarter}$) all four quarters of 2000 or 2002, and gain in wages between the year 2000 and 2002 for those employed all eight quarters of those two years. These measures were run for each group separately and also for the entire group of participants overall.

Additional descriptive measures were run on each independent variable. For educational attainment frequency distributions were run for the degrees completed by the completers and the hours completed for the leavers. Where appropriate a frequency distribution, mean, median, minimum, maximum, and skewness of age were run for each group separately and overall. Also sex broken down by the number of males and females were displayed in a frequency distribution for each status group and overall.

Initial descriptive charts of median quarterly wages of all completers, leavers and applicants produced results that were met with some concerns from the researcher. From a review of these data it was determined that the outliers within the leaver and applicant groups were causing an unfair comparison between the groups as they existed with all ages represented. After studying the group demographics it was determined to divide each group into two age categories: those 30 or younger, and those over 30 years of age. This age division produced groups where 70% of all graduates, 50% of all leavers, and

65% of all applicants fell within the age range of 30 years of age or younger. Because the data from the National Student Clearinghouse was incomplete or non-existent before 1995 many of the participants identified in this study over 30 years of age could have attended other post secondary institutions and received degrees from them before enrolling or applying to Western Iowa Tech Community during the years of this study. Because of this it was determined to further limit the participants used in this study to those 30 years of age or younger on January 1999. This decision, by and large, eliminated the possibility of any gain in wages that resulted from education received from another post secondary institution or from on-the-job training. It further eliminated age as an independent variable. The final number of 30 years of age or younger participants within the study now totaled 1,587. This was broken into 483 applicants, 317 graduates, and 787 leavers (Table 3.1).

Measures

The dependent variables used in this study were median quarterly Iowa wage earnings for the 16 quarters of 1999-2002, number of unique Iowa employers during the quarters employed, mean annual wages for individuals employed all four quarters of 2000 or 2002, mean full time annual wages for those who earned \$3,330 or more all four quarters of 2000 or 2002, and gain in annual wages from 2000 to 2002 for those employed all eight quarters of these two years.

The independent variables were attribute variables. They included status group, educational attainment (degree attained or number of hours completed), program families in which a degree was attained, and gender. Each of these had several levels. Status was the three levels of completer, leaver, or applicant.

Educational attainment had three levels for completers. These were based on the degree completed at WITCC, which was an Associate's of Arts (AA) degree, an Associate of Applied Science (AAS) degree, or a one-year diploma (D) certificate. A separate attribute variable for leavers was also based on educational attainment but this had multiple levels based on the hours of credit completed at WITCC. These varied from 1 to as many as 60 and were ordered from low to high. Because the applicants had no post secondary experience and did not attend schooling beyond high school, this group had no additional educational attainment variable.

A third independent variable was the program family in which either the Associate of Applied Science (AAS) or Diploma (D) degree was earned. Because many of these technical programs had too few graduates to yield reliable data, "like" programs were combined into program families. Within the AAS degree completers group, the programs were combined into six separate program families (Table 3.3a). Within the diploma degree completer group, the programs were combined into four separate program families (Table 3.3b). No program families were able to be determined for the AA degree since this was a transfer degree and very similar for all in this degree category. The AAS and D program families are represented in Table 3.3a and 3.3b.

Table 3.3a

Table of Programs in Associate of Applied Science Program Families

Business	Computer	Allied Health	Mechanical	Human Service	Miscellaneous
Accounting Specialist	Computer Programmer	Associate Degree Nursing	Telecommunication Electronic Technology	Child Care Supervision and Management	Band Instrument Repair Technology
Administrative Assistant-Legal	Desktop Publishing Technology	Occupational Therapy Assistant	Architectural Construction Engineering Technology	Police Science Technology	Horticulture and Landscaping Technology
Administrative Assistant-Medical	Microcomputer Specialist	Physical Therapy Assistant	Auto Collision Repair Technology		Agri-system Technology
Administrative Office Management			Automotive Technology		
Management Specialist			Biomedical Electronic Engineering Technology		
Marketing Management			Diesel Technology		
			Electronic Engineering Technology		
			Mechanical Engineering Technology		

Table 3.3b

Table of Programs in Diploma Program Families

Business	Computer	Allied Health	Mechanical
Clerical Bookkeeping	Graphic Communications	Practical Nursing	Air Conditioning, Heating and Refrigeration
Secretary	Software Technician	Dental Assisting Surgical Technology	Carpentry Electrician Plumbing and Sheet Metal Welding

Gender was the other attribute independent variable. Gender had two levels, male and female. Age was not used because of the decision to use only individuals 30 years of age or younger.

Data Analysis

This research was a comparative research approach with twenty difference research questions. The groups were compared to determine differences in the dependent variables of median quarterly earnings for each of the 16 quarters, number of unique employers over the period of employment, mean annual wages in 2000 for those employed all four quarters of that year, mean full time wages for those employed at \$3,330 or more each of the four quarters of 2000, mean annual wages in 2002 for those employed all four quarters of that year, mean full time wages for those employed at \$3,330 or more each of the four quarters of 2002, and the gain in wages between 2000 and 2002 for those employed all eight quarters of these two years.

Factorial ANOVA, ANCOVA or one-way ANOVA were used to determine the difference between the groups. The general questions to be answered was, "Were these groups statistically different?" and "If so, what independent variables produced this significant difference?"

The independent variables determined the groups compared. One independent variable was the three levels of status. These were completer, leaver, or applicant. A second independent variable was educational attainment. This was different for the three status groups. Within the completers a comparative approach was used to determine a difference in earnings for the three different levels of degree attainment. Here the degree levels of Associate's of Arts (AA), Associate of Applied Science (AAS), and Diploma (D) were the independent variable. An additional independent variable was used within the AAS and D degree groups of the completers. This independent variable was program family of "like" programs. Additionally, educational attainment for the leavers was measured in number of completed hours which was used as an independent variable. No educational attainment level was available for the applicants so none was used.

The final independent variable was gender. The difference in dependent variables between the males and females was measured and analyzed.

Factorial ANOVAs, ANCOVA, and one-way ANOVA were used to determine differences between the groups as determined by the independent variables and any interaction among them. If the ANOVA or ANCOVA produced a statistically significant difference between the groups tested, other follow-up procedures were selected which were similar to a post hoc test to determine where the actual significant difference existed and determine the relative contributions of the different independent variables.

Additionally, wage gains were determined between workers in the three status groups who had all eight quarters of wages in calendar year 2000 and year 2002. The number of participants in this part of the analysis was smaller than in the other segments of analysis. This analysis used only individuals who had reported wages for all four quarters in 2000 and all four quarters in 2002. Mean annual wages were determined for those two years. Then wage gains were examined and compared to determine if the investment in higher education at WITCC had an impact on the change in earning power of these individuals.

CHAPTER IV

Results

This chapter starts with a restatement of the 20 research questions answered by this study. Following each question is a brief sentence stating the descriptive analysis or factorial design associated with it. Specific analysis and interpretation of the statistical results for each of the research questions is then provided. At the end of the chapter a general overview of the findings is provided along with the results in chart format as a summary and review of the specific statistical findings.

Research Questions with Associated Statistical Analysis and Design

1. What are the 1999 through 2002 median quarterly earnings for the WITCC completer, leaver, and applicant status groups in this study? A descriptive analysis will be given.
2. What are the 1999 through 2002 median quarterly earnings for the associate of arts, associate of applied science and diploma certificate degrees within the WITCC completer status group? A descriptive analysis will be given.
3. What are the 1999 through 2002 median quarterly earnings for the program family groupings of business, computer, allied health, mechanical, human service, and miscellaneous programs within the associate of applied science (AAS) degree completers? A descriptive analysis will be given.
4. What are the 1999 through 2002 median quarterly earnings for the program family groupings of business, computer, allied health, and mechanical programs within the diploma certificate degree completers? A descriptive analysis will be given.
5. For the three status groups of completers, leavers and applicants is there a difference between the three status groups in regard to the adjusted number of different employers? Is there a difference between the males and females in regard to the adjusted number of different employers? Is there an interaction of status group and

sex in regard to the adjusted number of different employers? The results of a 2x3 factorial ANOVA will be given.

6. For the status group of completers is there a difference between the three degree levels in regard to the adjusted number of different employers? Is there a difference between the males and females in regard to the adjusted number of different employers? Is there an interaction of degree and sex in regard to the adjusted number of different employers? The results of a 2x3 factorial ANOVA will be given.
7. For the status group of leavers is there a relationship between the number of hours completed and the adjusted number of different employers? Is there a difference between the males and females in regard to the adjusted number of different employers? Is there an interaction of number of hours completed and sex in regard to the adjusted number of different employers? The results of an ANCOVA with one continuous variable, the number of hours completed, and one dichotomous variable, gender, will be given.
8. For the status group of applicants is there a difference between the males and females in regard to the adjusted number of different employers? The results of a one-way ANOVA will be given.
9. For the group who worked all four quarters of 2000 is there a difference between the three status groups (completers, leavers, applicants) in regard to the mean annualized 2000 earnings? Is there a difference between the males and females in regard to the mean annualized 2000 earnings? Is there an interaction of status and sex in regard to the mean annualized 2000 earnings? The results of a 2x3 factorial ANOVA will be given.
10. For the group who were employed full-time (>\$3,330/quarter) all four quarters of 2000, is there a difference between the three status groups in regard to the mean annualized 2000 earnings? Is there a difference between the males and females in regard to the mean annualized 2000 earnings? Is there an interaction of status and sex in regard to the mean annualized 2000 earnings? The results of a 2x3 factorial ANOVA will be given.
11. For the group who worked all four quarters of 2002 is there a difference between the three status groups (completers, leavers, applicants) in regard to the mean annualized 2002 earnings? Is there a difference between the males and females in regard to the mean annualized 2002 earnings? Is there an interaction of status and sex in regard to the mean annualized 2002 earnings? The results of a 2x3 factorial ANOVA will be given.
12. For the group who were employed full-time (>\$3,330/quarter) all four quarters of 2002, is there a difference between the three status groups in regard to the mean annualized 2002 earnings? Is there a difference between the males and females in regard to the mean annualized 2002 earnings? Is there an interaction of status and sex

in regard to the mean annualized 2002 earnings? The results of a 2x3 factorial ANOVA will be given.

13. For the status group of completers who worked all four quarters of 2000 is there a difference between the three degree groups in regard to the mean annualized 2000 earnings? Is there a difference between the males and females in regard to the mean annualized 2000 earnings? Is there an interaction of degree and sex in regard to the mean annualized 2000 earnings? The results of a 2x3 factorial ANOVA will be given.
14. For the degree group of Associate of Applied Science (AAS) completers who worked all four quarters of 2000 is there a difference between the business, computer, allied health, mechanical, human service, and miscellaneous program families in regard to the mean annualized 2000 earnings? Is there a difference between the males and females in regard to the mean annualized 2000 earnings? Is there an interaction of program family and sex in regard to the mean annualized 2000 earnings? The results of a 2x3 factorial ANOVA will be given.
15. For the status group of completers who worked all four quarters of 2002 is there a difference between the three degree groups in regard to the mean annualized 2002 earnings? Is there a difference between the males and females in regard to the mean annualized 2002 earnings? Is there an interaction of degree and sex in regard to the mean annualized 2002 earnings? The results of a 2x3 factorial ANOVA will be given.
16. For the degree group of Associate of Applied Science (AAS) completers who worked all four quarters of 2002 is there a difference between the business, computer, allied health, mechanical, human service, and miscellaneous program families in regard to the mean annualized 2002 earnings? Is there a difference between the males and females in regard to the mean annualized 2002 earnings? Is there an interaction of program and sex in regard to the mean annualized 2002 earnings? The results of a 2x3 factorial ANOVA will be given.
17. For the status group of leavers who worked all four quarters of 2000 is there a relationship between the number of hours completed and the mean annualized 2000 earnings? Is there a difference between the males and females in regard to the mean annualized 2000 earnings? Is there an interaction of number of hours completed and sex in regard to the mean annualized 2000 earnings? The results of an ANCOVA with one continuous variable, the number of hours completed, and one dichotomous variable, gender, will be given.
18. For the status group of leavers who worked all four quarters of 2002 is there a relationship between the number of hours completed and the mean annualized 2002 earnings? Is there a difference between the males and females in regard to the mean annualized 2002 earnings? Is there an interaction of number of hours completed and sex in regard to the mean annualized 2002 earnings? The results of an ANCOVA with

one continuous variable, the number of hours completed, and one dichotomous variable, gender, will be given.

19. For the three status groups of completers, leavers and applicants who worked all eight quarters of 2000 and 2002 is there a difference in regard to the gain scores in wages made between 2000 and 2002? The results of a 3x2 ANOVA will be given.
20. For the program family groups who were Associate of Applied Science completers who worked all eight quarters of 2000 and 2002 is there a difference in regard to the gain scores in wages made between 2000 and 2002 for the business, computer, allied health, mechanical, human service and miscellaneous program families? The results of a 6x2 ANOVA will be given.

Specific results for each of the research questions will now be given in detail.

Later in this chapter these results will be summarized. The table at the end of the chapter will serve as an overview of the specific statistical results to guide the reader's comprehension of the following statistical findings.

Detailed Results by Research Question

Research Question 1: What are the 1999 through 2002 median quarterly earnings for the WITCC completer, leaver, and applicant status groups in this study?

Median quarterly wages of all individuals 30 years of age or younger were calculated by status group for the 16 quarters of 1999, 2000, 2001, and 2002. This included the wages of only those employed in Iowa within these quarters.

Within the total applicant group of 483, for any given quarter the median quarterly wage was inclusive of anywhere from a high of 366 individuals in third quarter 1999 to a low of 278 individuals in fourth quarter 2002. Within the total completer group of 317, for any given quarter the median quarterly wage was inclusive of anywhere from a high of 254 individuals in first quarter 2000 to a low of 212 individuals in second quarter 2002. Within the total leaver group of 787, for any given quarter the median quarterly wage was inclusive of anywhere from a high of 590 in third quarter 1999 to a

low of 493 in fourth quarter 2002. Figure 4.1 represents the median quarterly wages by status group of those employed over the 16 quarters of this study.

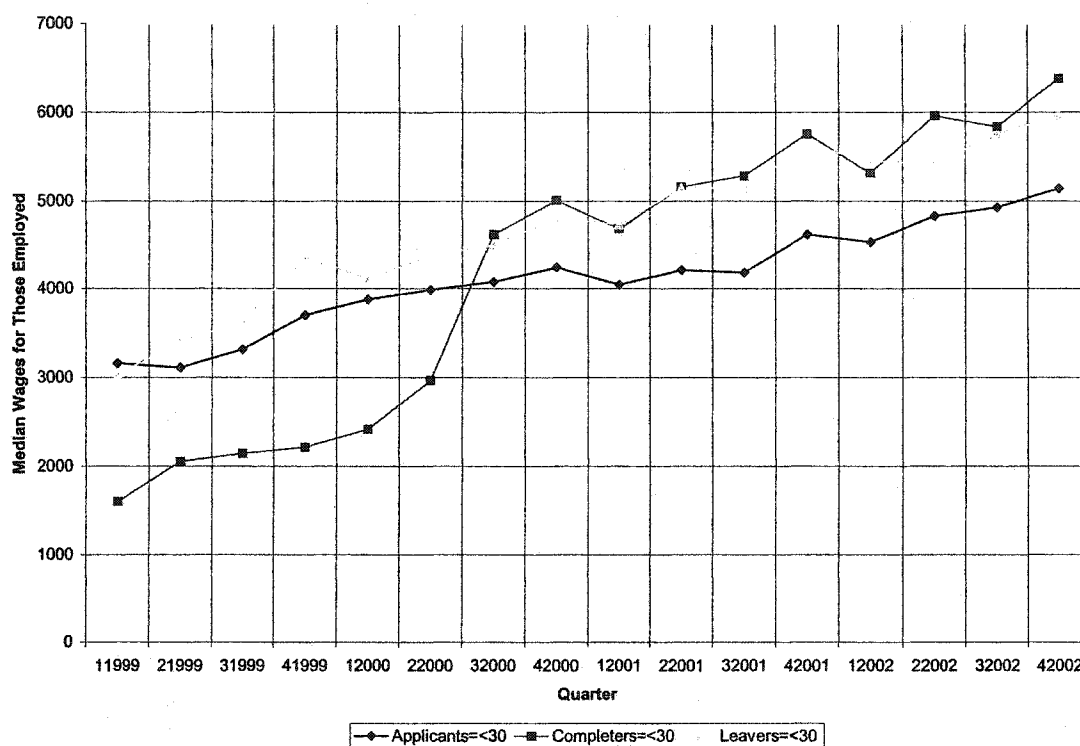


Figure 4.1. Median quarterly wages by status group for individuals ≤ 30 years of age.

Figure 4.1 represents the median quarterly wages by status group of the individuals 30 years of age and younger employed in Iowa with some wages. In the first quarter of 1999 (1/1999) the applicant median was \$3,156, the completer median was \$1,599, and the leaver median was \$3,023. In the first quarter of 2000 (1/2000) the applicant median was \$3,882, the completer median was \$2,414, and the leaver median was \$4,106. In the first quarter of 2001 (1/2001) the applicant median was \$4,047, the completer median was \$4,682, and the leaver median was \$4,731. After this quarter the completers earned more than the other groups during all quarters but 1/2002, at which time the leavers earned approximately \$130 more than the completers. In 1/2002 the applicant median was \$4,536, the completer median was \$5,320, and the leaver median

was \$5,452. In 2/2002 the applicant median was \$4,829, the completer median was \$5,959, and the leaver median was \$5,426. In 3/2002 the applicant median was \$4,929, the completer median was \$5,841, and the leaver median was \$5,748. In the final quarter of 4/2002 the applicant median wages were \$5,142, the completer median wages were \$6,380, and the leaver median wages were \$5,972.

Leavers earned more than applicants all quarters but the first (1/1999). Also leavers earned more than completers eight of the sixteen quarters, the first six quarters consecutively (1/1999-2/2000) and then again in 1/2001 and 1/2002. Applicants earned more than the completers the first six consecutive quarters (1/1999-2/2000). However, completers earned more than both leavers and applicants eight of the sixteen quarters, in 3/2000, 4/2000, 2/2001, 3/2001, 4/2001, 2/2002, 3/2002, and 4/2002.

Research Question 2: What are the 1999 through 2002 median quarterly earnings for the associate of arts, associate of applied science, and diploma certificate degrees within the WITCC completer status group?

Median quarterly wages of the 317 completers 30 years of age or younger were calculated by degree group for the 16 quarters of 1999, 2000, 2001, and 2002. This included the wages of only those employed in Iowa within these quarters.

Within the total Associate of Arts (AA) degree group of 23, for any given quarter the median quarterly wage was inclusive of anywhere between a high number of 18 individuals in 1/2000 to a low number of 13 individuals in 1/1999. Within the total Associate of Applied Science (AAS) group of 240, for any given quarter the median quarterly wage was inclusive of anywhere between a high of 196 individuals in 1/2000 to a low of 156 individuals in 4/2002. Within the total diploma (D) degree group of 54, for

any given quarter the median quarterly wage was inclusive of anywhere between a high of 46 in 3/2000 to a low of 36 in 2/1999. Figure 4.2 represents the median quarterly wages by degree group for the completers employed over the 16 quarters of this study.

Figure 4.2 represents the median quarterly wages by degree group of the completers 30 years of age or younger employed in Iowa with some wages. In the first quarter of 1999 (1/1999) the AA median was \$1,627, the AAS median was \$1,629, the D median was \$1,473. AA and D median wages exceeded AAS median wages during the quarters of 2/1999, 4/1999, 1/2000. From 2/2000 on through 4/2002 AAS and D median wages exceeded AA median wages. During these quarters the median wages of the AAS and D degree groups were very similar, within \$200 to \$400 of each other. In 3/2002,

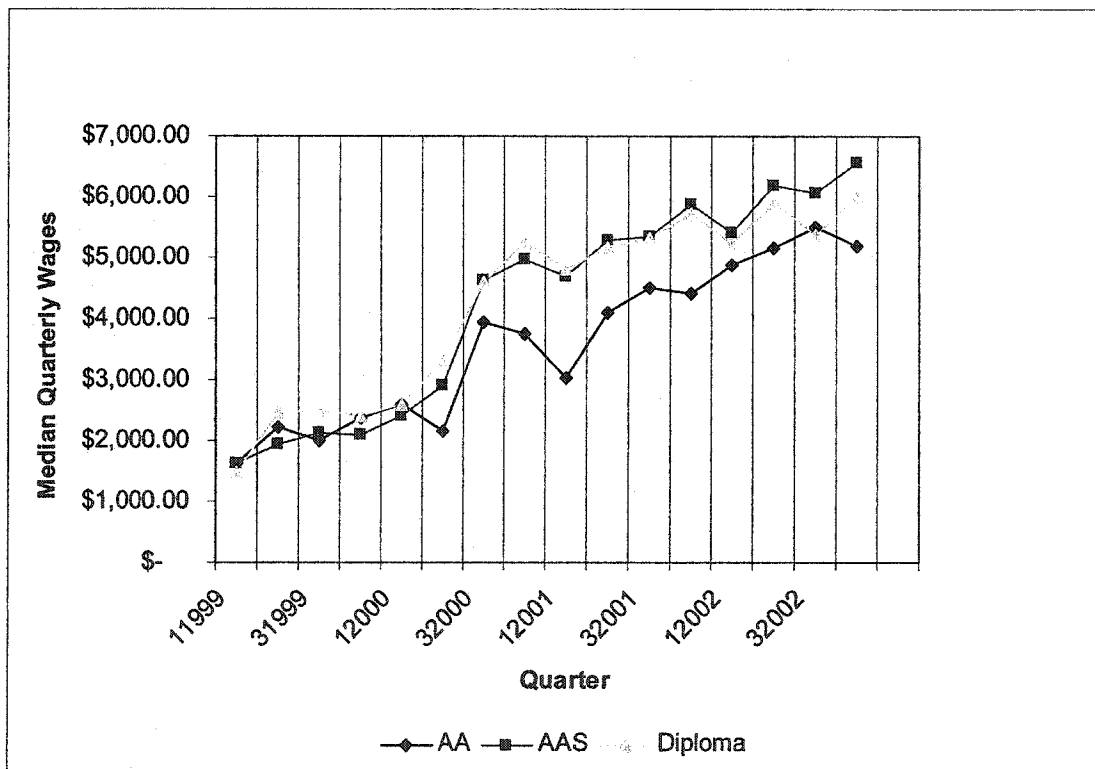


Figure 4.2. Median quarterly wages by degree group for completers employed 1/1999-4/2002.

however, this difference increased dramatically with the AAS degree group median (\$6,061) exceeding the D degree group median (\$5,371) by close to \$700. In 4/2002 this difference dropped to around \$550 with the AAS degree group earning more than the diploma degree group. In 4/2002 the median wages for AA completers was \$5,173, for AAS completers it was \$6,563, and for D completers it was \$6,014.

Research Question 3: What are the 1999 through 2002 median quarterly earnings for the program family groupings of business, computer, allied health, mechanical, human service, and miscellaneous programs within the associate of applied science (AAS) degree completers?

Which program families accounted for this growth in wages in the completer AAS degree group? When broken into program family groups, the 240 AAS degree awardees were represented as follows: 38 in the business program family, 29 in the computer program family, 86 in the allied health program family, 24 in the human service program family, 29 in the mechanical program family, and 18 in the miscellaneous program families.

The AAS business programs included accounting, legal administration, medical administration, business management and marketing completers. The AAS computer programs included computer programming, desktop publishing and microcomputer completers. The AAS allied health programs included associate degree nursing, occupational therapy assistant and physical therapy assistant completers. The AAS mechanical programs included telecommunication, architectural engineering technician, automobile collision technician, automobile technician, biomedical technician, diesel mechanic technician, electrical technician, and mechanical engineering technician

completers. The AAS human service programs included child care and police science completers. The AAS miscellaneous programs included band instrument repair technician, horticulture, and agri-business completers (Table 3.3a).

The median quarterly wages of these six groups of AAS program families is represented in Figure 4.3. The numbers of individuals in each of the AAS program family groups varied over the 16 quarters of this study. These numbers varied accordingly by program family as follows: 23-32 individuals in business, 17-23 individuals in computer, 64-75 individuals in allied health, 13-21 individuals in human service, 18-26 individuals in mechanical, and 8-15 individuals in miscellaneous AAS program groups. Many of these program family groups were too small to make any specific analysis of results.

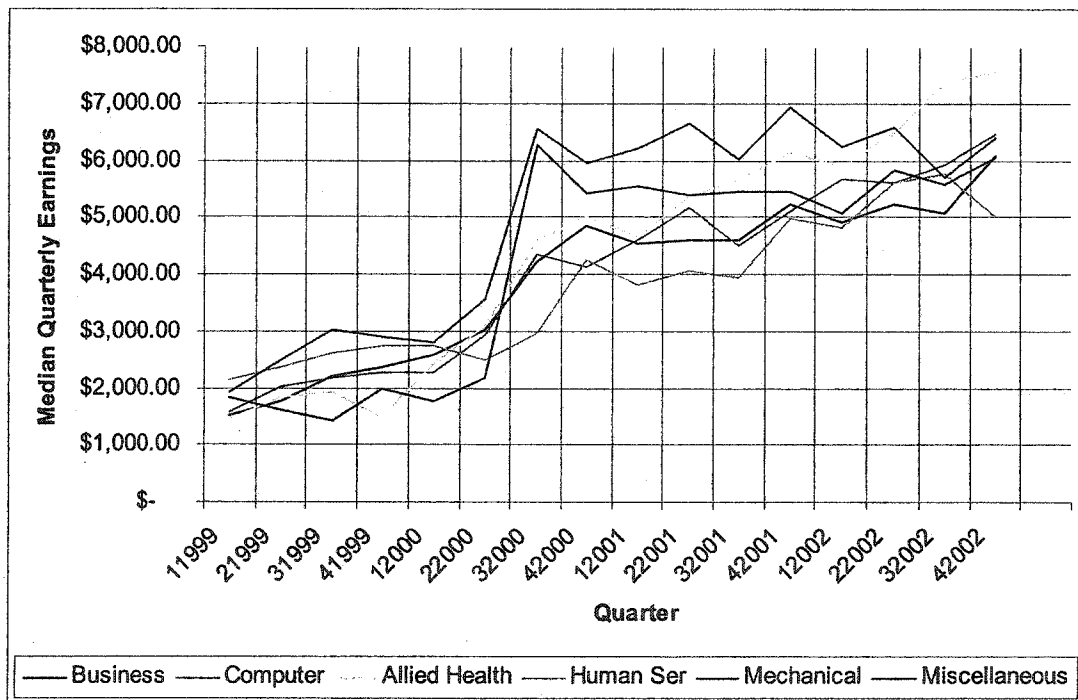


Figure 4.3. Median quarterly wages by program families for AAS completers.

Overall allied health and mechanical AAS degree completers earned more than the other program groups. The human service AAS degree completers earned less than the other program groups.

Table 4.1

Annual Fourth Quarter Median Wages of AAS Completers by Program Family

Program Family	4/1999	4/2000	4/2001	4/2002
Business-AAS	\$2,351	\$4,837	\$5,237	\$6,069
Computer-AAS	\$2,253	\$4,127	\$5,104	\$6,455
Allied Health-AAS	\$1,493	\$5,020	\$6,131	\$7,545
Human Services-AAS	\$2,741	\$4,247	\$4,965	\$5,018
Mechanical-AAS	\$2,895	\$5,962	\$6,919	\$6,380
Miscellaneous-AAS	\$1,983	\$5,431	\$5,459	\$6,034

Table 4.1 represents the fourth quarter median wages over the four year period for each of the program families. Each program family gained in wages over the four year period. The allied health program family showed the most significant growth. It produced increases of approximately \$1,000 or more in quarterly wages over each of the final three years. Computer and mechanical AAS program families also produced significant steady growth over each of the final three years.

Research Question 4: What are the 1999 through 2002 median quarterly earnings for the program family groupings of business, computer, allied health, and mechanical programs within the diploma (D) certificate degree completers?

Which program families accounted for the growth in the completer diploma degree group? When broken into program family groups, the 54 diploma degree completers were represented as follows: six in the business program family, five in the computer program family, 23 in the allied health program family, and 18 in the mechanical program families. The numbers of individuals in each of the diploma program family groups varied over the 16 quarters of this study. These numbers varied accordingly by program family as follows: 4-6 individuals in business, 1-4 individuals in computer, 16-21 individuals in allied health, and 11-15 individuals in mechanical program groups. None of these groups were large enough to make specific analysis of the results.

The diploma business programs included first year accounting, clerkbook, and secretarial completers. The diploma computer programs included graphic design and software technician completers. The diploma allied health programs included licensed practical nursing, dental assistant and surgical technician completers. The diploma mechanical programs included air conditioning technician, carpentry, electrician, heating/plumbing technician, and welding completers (Table 3.3b).

The median quarterly wages of these four groups of diploma program families is represented in Figure 4.4. Overall allied health and mechanical diploma degree awardees earned more than the other groups. Initially in 2000 it was interesting to note that the overall median wages for diploma completers in the allied health and mechanical program families was greater than for the AAS completers. These differences were very small as was the size of the diploma program family group members. Again allied health and mechanical diploma program family completers seemed to earn more than business and computer program

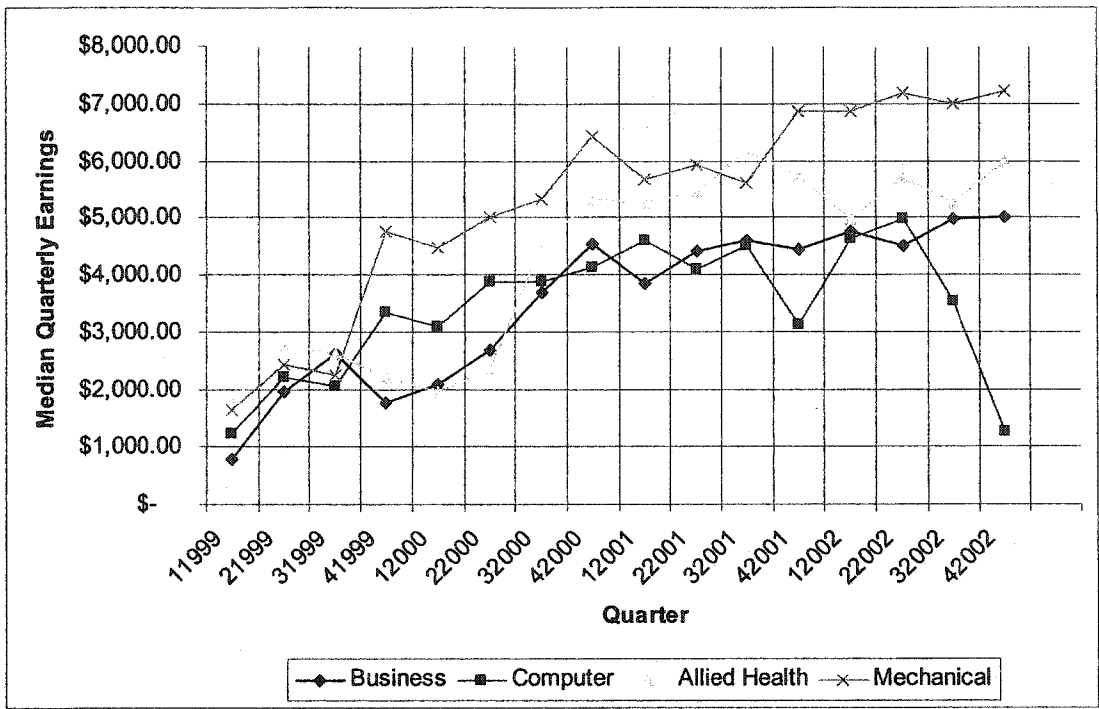


Figure 4.4. Median quarterly wages by program families for diploma completers.

family completers. The computer program family earnings fell off significantly the final quarter when the number in that group dropped to one individual.

Table 4.2 represents the fourth quarter median wages over the four year period for each of the program families. Each program family (except the computer program family which decreased to one member) gained in wages over the four year period by approximately \$600 over a three year period. These diploma degree gains seemed to increase at a slower rate than AAS degree program families.

Table 4.2

Annual Fourth Quarter Median Wages of Diploma Completers by Program Family

Program Family	4/1999	4/2000	4/2001	4/2002
Business-D	\$1,772	\$4,522	\$4,431	\$5,021
Computer-D	\$3,332	\$4,130	\$3,108	\$1,245
Allied Health-D	\$2,214	\$5,327	\$5,734	\$5,994
Mechanical-D	\$4,760	\$6,412	\$6,879	\$7,202

Research Question 5: For the three status groups of completers, leavers and applicants is there a difference between the three status groups in regard to the adjusted number of different employers? Is there a difference between the males and females in regard to the adjusted number of different employers? Is there an interaction of status group and sex in regard to the adjusted number of different employers?

Table 4.3a shows the number, mean number of unique employers, and standard deviations for the males and females for the three status groups of applicants, completers

Table 4.3a

Number, Means, and Standard Deviations for Number of Unique Employers as a Function of Gender and Status Group

Status	Males			Females			Total		
	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>
Applicants	224	7.15	5.82	254	6.83	5.79	478	6.98	5.80
Completers	107	5.22	4.00	210	5.08	3.17	317	5.13	3.47
Leavers	352	6.20	5.19	435	6.23	4.94	787	6.22	5.05
Total	683	6.36	5.28	899	6.13	4.89	1582	6.23	5.06

and leavers. Completers worked for an average of about five different employers, the leavers worked for on average more than six and the applicants worked for on average

about seven different employers. There did not seem to be too much difference as to the mean number of unique employers between males (6.36) and females (6.13).

Table 4.3b shows there was not a statistically significant interaction between gender and status for mean number of unique employers ($p=.838$). Also for the effect of gender there was not a statistically significant difference between the males and females as to mean number of unique employers throughout the period of employment ($p=.611$). Looking at the effect of status group, however, there was a statistically significant difference between the status groups as to mean number of unique employers, $F(2, 1576) = 11.953, p<.001$. A little over one percent of the variance in the number of unique employers could be predicted by status group. Eta for status group was .123 which, according to Cohen (1988), is a small effect.

Table 4.3b

Two-Way Analysis of Variance for Unique Number of Employers as a Function of Gender and Status Group

Variable and Source	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	<i>eta</i>
# of employers					
Status	2	302.21	11.953	<.001	.123
Gender	1	6.54	.259	.611	.000
Status*Gender	2	4.45	.176	.838	.000
Error	1576	25.28			

Post-hoc tests indicated that there were statistically significant differences for two of the three pairs of status comparisons. These were between the completers and applicants ($p<.001$) and between the completers and leavers ($p=.002$), with completers having the fewer number of different employer in both cases. When the effect sizes for these differences were calculated both were small, according to Cohen (1988).

Completers statistically had fewer different employers over the quarters employed in this study.

Research Question 6: For the status group of completers is there a difference between the three degree levels in regard to the adjusted number of different employers? Is there a difference between the males and females in regard to the adjusted number of different employers? Is there an interaction of degree and sex in regard to the adjusted number of different employers?

Table 4.4a shows the number, mean number of unique employers, and standard deviations for the three completer degree groups. The associate's of arts degree group (5.37), the associate of applied science (5.06), and diploma (5.32) degree groups varied little in mean number of unique employers. Note that males with AAS degrees appeared to have fewer unique employers (4.86) than did males with AA (5.69) or Diploma degrees (6.13), but this was not a statistically significant difference. Females with diploma degrees seemed to have fewer unique employers (4.68) than females with AA (5.16) or AAS degrees (5.15), but again this was not statistically proven. Males (5.22) and females (5.08) overall seemed to vary little.

Table 4.4a

Number, Means, and Standard Deviations for Number of Unique Employers as a Function of Gender and Degree Type

Degree	Males			Females			Total		
	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>
AA	9	5.69	3.44	14	5.16	2.21	23	5.37	2.69
AAS	74	4.86	3.37	166	5.15	3.27	240	5.06	3.29
Diploma	24	6.13	5.68	30	4.68	4.04	54	5.32	4.43
Total	107	5.22	4.00	210	5.08	3.17	317	5.13	3.47

Table 4.4b shows that there was not a statistically significant interaction between gender and degree type ($p=.260$) for the mean number of unique employers so the pattern of differences mentioned above were not supported by statistics. Looking at the effects of gender, there was also not a statistically significant difference between genders ($p=.357$). Likewise, looking at the effects of degree type, there was not a statistically significant difference between degree types ($p=.691$). Gender and completer degree type did not statistically influence the number of different employers after all.

Table 4.4b

Two-Way Analysis of Variance for Number of Unique Employers as a Function of Gender and Degree Type

Variable and Source	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	<i>eta</i>
# of employers					
Degree	2	4.47	.369	.691	.045
Gender	1	10.28	.850	.357	.055
Degree*Gender	2	16.37	1.354	.260	.095
Error	311	12.09			

Research Question 7: For the status group of leavers is there a relationship between the number of hours completed and the adjusted number of different employers? Is there a difference between the males and females in regard to the adjusted number of different employers? Is there an interaction of number of hours completed and sex in regard to the adjusted number of different employers?

Table 4.5a shows the number, mean number of unique employers, and standard deviation for the males and females in the leaver status group. There did not seem to be any difference in the number of different employers for the males (6.20) and females (6.23) in this analysis.

Table 4.5a

Number, Means and Standard Deviations for Number of Unique Employers as a Function of Gender

Males			Females			Total		
<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>
352	6.20	5.19	435	6.23	4.94	787	6.22	5.05

Table 4.5b shows there was not a statistically significant interaction between gender and number of credits completed ($p=.277$) by leavers as to mean number of unique employers. Looking at the effects of gender ($p=.496$) and completed credits ($p=.885$), there also were no statistically significant differences. There was no relationship between gender and number of hours completed as it pertained to the number of different employers in this sample of leavers. It seemed that neither of these factors mattered much.

Table 4.5b

Two-Way Analysis of Variance for Unique Number of Employers as a Function of Gender and Number of Hours Completed for the Leaver Status Group

Variable and Source	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	<i>eta</i>
# of employers					
Gender	1	11.83	.464	.496	.032
Cmptcred	1	.54	.021	.885	.000
Gender*cmptcred	1	30.18	1.183	.277	.141
Error	783	25.52			

Research Question 8: For the status group of applicants is there a difference between the males and females in regard to the adjusted number of different employers?

Table 4.6a shows the number, mean number of unique employers, and standard deviations for the males and females in the applicant status group. There seemed to be little difference between the males (7.15) and the females (6.83) as to the number of different employers during their employment. Table 4.6b shows there was no statistically significant difference ($p=.549$) between the males and females in the applicant status group in regard to the mean number of unique employers.

Table 4.6a

Number, Means and Standard Deviations for Number of Unique Employers as a Function of Gender

Males			Females			Total		
<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>
224	7.15	5.82	254	6.83	5.79	478	6.98	5.80

Table 4.6b

One-Way Analysis of Variance for Unique Employers as a Function of Gender for the Applicant Status Group

Variable and Source	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	<i>eta</i>
Gender	1	12.105	.359	.549	.032
Error	476	33.690			

Research Question 9: For the group who worked all 4 quarters of 2000 is there a difference between the three status groups (completers, leavers, applicants) in regard to the annualized 2000 earnings? Is there a difference between the males and females in regard to the annualized 2000 earnings? Is there an interaction of status and sex in regard to the annualized 2000 earnings?

Table 4.7a shows the number, mean annualized 2000 earnings, and standard deviations for the males and females by status group. Males seemed to earn more than females in all three status groups by approximately \$5,000 annually. Completers seemed to earn less than applicants or leavers by approximately \$2,000-4,000 annually respectively.

Table 4.7a

Number, Mean Annualized 2000 Earnings, and Standard Deviations as a Function of Status and Gender

Status Group	Males			Females			Total		
	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>
Applicants	107	\$21,674	9085	145	\$16,240	9391	252	\$18,547	9628
Completers	60	\$19,505	6995	137	\$15,256	6947	197	\$16,550	7215
Leavers	186	\$23,788	12026	251	\$18,673	9377	437	\$20,850	10872
Total	353	\$22,419	10567	533	\$17,133	8931	886	\$19,239	9953

Table 4.7b shows that there was no statistically significant interaction between gender and status group for annualized 2000 earnings ($p=.818$). Looking at the effect of status group, however, there was a statistically significant difference between the three status groups as to mean annualized 2000 earnings, with leavers earning more than completers, $F(2, 880)=11.200, p<.001$. Eta for status was .158, which according to Cohen (1988) is a small effect. Eta squared indicates that 2.5 percent of the variance in mean annualized 2000 earnings was attributed to status group.

Post hoc tests indicated that the difference between only two of the three pairs of comparisons between status groups were statistically significant. There were significant differences between the leavers and completers ($p<.001$) and also between the leavers and applicants ($p=.003$), with the leavers earning more in both cases. The effect size was

medium between the leavers and completers ($d=.4$) and was small between the leavers and the applicants ($d=.2$).

Table 4.7b

Two-Way Analysis of Variance for Annualized 2000 Earnings as a Function of Gender and Status Group

Variable and Source	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	<i>eta</i>
Status	2	1,013,557,900	11.200	<.001	.158
Gender	1	4,416,934,501	48.807	<.001	.230
Status*Gender	2	18,146,600	.201	.818	.000
Error	880	90,498,717			

For the effect of gender, there was also a statistically significant difference with males earning more than females as to mean annualized 2000 earnings, $F(1, 880)=48.807, p<.001$. Eta for gender was .230, which according to Cohen (1988) is a small to medium effect. Eta squared indicates that 5.3 percent of the variance in mean annualized 2000 earnings was attributed to gender.

Research Question 10: For the group who were employed full-time ($\geq \$3,330$ /quarter) all four quarters of 2000, is there a difference between the three status groups in regard to the annualized 2000 earnings? Is there a difference between the males and females in regard to the annualized 2000 earnings? Is there an interaction of status and sex in regard to the annualized 2000 earnings?

Table 4.8a shows the number, mean 2000 annualized earnings, and standard deviations for the males and females who were employed full-time all four quarters of 2000 by status group. It is important to note the difference between this question and the

previous one. The comparison made in this research question is for those with full time wages each of the four quarters of 2000, where the last question was for those with some wages, no matter how large or small all four quarters. Full time wages were defined as \$3,330 or more for each of the four quarters. Leavers again seemed to earn more than both applicants and graduates. Males seemed to earn more than females in all categories. Within the completer group the difference between the earnings of males and females seemed to be the least but this group also earned the least of all three groups.

Table 4.8a

Number, Means and Standard Deviations for Annualized 2000 Earnings as a Function of Status and Gender for Participants Employed Full Time (\geq \$3,330/quarter)

Status Group	Males			Females			Total		
	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>
Applicants	68	\$26,633	9324	52	\$24,928	9324	120	\$25,894	7903
Completers	25	\$23,731	5527	34	\$23,269	5527	79	\$23,464	6032
Leavers	127	\$28,984	6986	121	\$25,965	6986	248	\$27,511	9009
Total	220	\$27,660	7471	207	\$25,261	7471	427	\$26,498	8452

Table 4.8b shows that there was no statistically significant interaction ($p=.516$) between gender and status group for mean annualized earnings of the status groups employed full-time all four quarters of 2000. Looking at the effect of gender there was not, in fact, a statistically significant difference ($p=.071$) between the genders on mean annualized 2000 earnings when employed full time so the differences noted above as to gender were most probably due to chance.

Looking at status, however, there was a statistically significant difference between the three status groups for mean annualized full time 2000 earnings, $F(2, 421)=5.925$, $p=.003$. Eta for status was .164, which according to Cohen (1988), is a small effect. Eta

squared indicated that 2.7 percent of the variance in annualized 2000 earnings was attributed to status group.

Table 4.8b

Two-Way Analysis of Variance for Annualized 2000 Earnings as a Function of Gender and Status Group for Participants Employed Full Time

Variable and Source	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	<i>eta</i>
Status	2	407,254,628	5.925	.003	.164
Gender	1	225,083,442	3.275	.071	.089
Status*Gender	2	45,564,516	.663	.516	.055
Error	421	68,736,386			

Post hoc tests indicated that only one of the three pairs of comparisons between the status groups was statistically significant. There was a significant difference between the leavers and the completers ($p=.001$) with the leavers earning approximately \$4,000 more than the completers. The effect size was medium between the leavers and the completers ($d=.47$) in this sample. There was not a statistically significant difference between the leavers and the applicants.

Research Question 11: For the group who worked all four quarters of 2002 is there a difference between the three status groups (completers, leavers, applicants) in regard to the annualized 2002 earnings? Is there a difference between the males and females in regard to the annualized 2002 earnings? Is there an interaction of status and sex in regard to the annualized 2002 earnings?

Table 4.9a shows the number, mean annualized 2002 earnings, and standard deviations for the males and females by status group. Looking at mean annual salaries for

all workers with some wages two years later, it appeared that the completers “caught up” with the leavers and surpassed the applicants. Completers’ and leavers’ mean annualized wages were approximately the same with both surpassing the applicant wages. Males’ mean annual 2002 wages seemed to be approximately \$4,000 more than the females’ in all three status groups and overall. The completers and the leavers earned approximately \$25,000 annually while the applicants earned about \$22,000 annually.

Table 4.9a

Number, Mean Annualized 2002 Earnings and Standard Deviations as a Function of Status and Gender

Status Group	Males			Females			Total		
	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>
Applicants	108	\$24,288	9801	117	\$20,427	16365	225	\$22,280	13722
Completers	61	\$28,693	10011	124	\$24,290	10131	185	\$25,742	10276
Leavers	182	\$28,814	13225	241	\$23,656	12739	423	\$25,875	13185
Total	351	\$27,400	11887	482	\$23,035	13193	883	\$24,874	12834

Table 4.9b shows there was no statistically significant interaction between gender and status group on mean annualized 2002 earnings ($p=.816$). Looking at the effect of gender, there was a statistically significant difference between the genders on mean annualized 2002 earnings with males earning more than females, $F(1, 827)=21.980$, $p<.001$. Eta for gender was .161, which according to Cohen (1988) is a small effect. Eta squared indicated that 2.6 percent of the variance in annualized 2002 earnings was attributed to gender.

Looking at the effect of status group, there was also a statistically significant difference between the three status groups on mean annualized earnings, $F(2, 827)=8.019$, $p<.001$. Eta for status was .138, which according to Cohen (1988) is a small

effect. Eta squared indicated that 1.9 percent of the variance in mean annualized 2002 earnings was attributed to status group.

Table 4.9b

Two-Way Analysis of Variance for Annualized 2002 Earnings as a Function of Gender and Status Group

Variance and Source	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	<i>eta</i>
Status	2	1,266,261,043	8.019	<.001	.138
Gender	1	3,470,697,924	21.980	<.001	.161
Status*Gender	2	32,114,281	.203	.816	.000
Error	827	157,902,114			

Post hoc tests were run for status because there were three possible groupings. These tests indicate that only two of the three pairs of comparisons were statistically significant. There were statistically significant differences between the applicants and the completers ($p=.001$) and also between the applicants and the leavers ($p<.001$), with the applicants earning significantly less than both the completers and the leavers. The effect size in both cases was small to medium.

Research Question 12: For the group who were employed full-time ($\geq \$3,330$ /quarter) all four quarters of 2002, is there a difference between the three status groups in regard to the annualized 2002 earnings? Is there a difference between the males and females in regard to the annualized 2002 earnings? Is there an interaction of status and sex in regard to the annualized 2002 earnings?

Table 4.10a shows the number, mean 2002 annualized earnings, and standard deviations for the males and females by status group who worked full time all four

quarters at a salary of \$3,330 or above. Again the comparison was made for full time wages, not just some wages, for each of the four quarters of 2002. Males seemed to earn more than females in each of the three status groups. The leavers seemed to earn more than the applicants and the completers overall by status group. The leavers' mean annual wages were approximately \$31,000, the completers' were approximately \$29,000 and the applicants' were approximately \$28,000.

Table 4.10a

Number, Mean 2002 Annualized Earnings, and Standard Deviations as a Function of Status and Gender for the Group who were Employed Full Time (=>\$3,330/quarter)

Status Group	Males			Females			Total		
	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>
Applicants	77	\$28,460	7798	64	\$27,667	7798	141	\$28,100	13842
Completers	54	\$30,675	8669	94	\$27,727	8669	148	\$28,802	8867
Leavers	137	\$33,017	10923	165	\$28,962	10923	302	\$30,801	11471
Total	268	\$31,236	9844	323	\$28,346	9844	591	\$29,656	11557

Table 4.10b shows there was no statistically significant interaction between gender and status group on mean annualized full time 2002 earnings ($p=.379$). Looking at the effect of gender, however, there was a statistically significant difference between the genders for full time mean annualized 2002 earnings with males earning more than females, $F(1, 585)=6.544, p=.011$. Eta for gender was .105, which according to Cohen (1988) is a small effect. Eta squared indicated that 1.1 percent of the variance in mean annualized 2002 earnings was attributed to gender.

Looking at status, there was also a statistically significant difference between the three status groups on mean annualized full time earnings found, $F(2, 585)=3.417, p=.033$. Eta for status was .110, which according to Cohen (1988) is a small effect. Eta

squared indicated that 1.2 percent of the variance in annualized 2002 earnings was attributed to status group.

Table 4.10b

Two-Way Analysis of Variance for Annualized 2002 Earnings as a Function of Gender and Status Group for the Group who were Employed Full Time

Variance and Source	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	<i>eta</i>
Status	2	446,258,265	3.417	.033	.110
Gender	1	854,752,312	6.544	.011	.105
Status*Gender	2	126,831,539	.971	.379	.055
Error	585	130,615,506			

Post hoc tests indicated, however, that only one of the three pairs of status comparisons was statistically significant. There was a significant difference only between the applicants and the leavers ($p=.013$) with the applicants earning significantly less than the leavers (\$2,700) annually. Other differences mentioned between the leavers and the completers were most probably due to chance.

Research Question 13: For the status group of completers who worked all four quarters of 2000 is there a difference between the three degree groups in regard to the annualized 2000 earnings? Is there a difference between the males and females in regard to the annualized 2000 earnings? Is there an interaction of degree and sex in regard to the annualized 2000 earnings?

The remaining research questions used mean annual wage comparisons for individuals who earned some wages, no matter how large or small. Table 4.11a shows the number, mean 2000 annualized earnings, and standard deviations for the males and females in the completer status group by degree type. There was very little difference

between the mean annualized 2000 wages of the three degree groups. The total mean annualized earnings for each of the degree groups varied by only approximately \$500. Males in all three degree groups and overall seemed to earn more than females.

Table 4.11a

Number, Means, and Standard Deviations for Annualized 2000 Earnings as a Function of Degree and Gender for Completers

Degree Group	Males			Females			Total		
	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>
AA	4	\$17,278	10783	5	\$15,672	10783	9	\$16,386	8444
AAS	41	\$19,675	7152	112	\$15,309	7152	153	\$16,479	7530
Diploma	15	\$19,630	4681	20	\$14,854	4681	35	\$16,901	5448
Total	60	\$19,604	6947	137	\$15,256	6947	197	\$16,550	7215

Table 4.11b shows there was no statistically significant interaction between gender and degree for mean annualized 2000 earnings ($p=.832$). Looking at the effect of gender, there was a statistically significant difference between the genders for mean annualized 2000 earnings $F(1, 191)=3.902, p=.050$. Overall males earned more than females. Eta for gender was .141, which according to Cohen (1988) is a small effect. Eta squared indicated that 2 percent of the variance in annualized 2000 earnings was attributed to gender.

Looking at the effect of degree type, however, there was no significant difference between the degree types on mean annualized 2000 earnings in this sample. Because the sample sizes were so small within the degree types associated with the AA and diploma it was difficult to draw any inferences from these results.

Table 4.11b

Two-Way Analysis of Variance for Annualized 2000 Earnings as a Function of Gender and Degree for Completers

Variance and Source	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	<i>eta</i>
Degree	2	4,722,298	.096	.909	.032
Gender	1	192,533,363	3.902	.050	.141
Degree*Gender	2	9,106,874	.185	.832	.045
Error	191	49,343,303			

Research Question 14: For the degree group of Associate of Applied Science (AAS) completers who worked all four quarters of 2000 is there a difference between the business, computer, allied health, mechanical, human service, and miscellaneous program families in regard to the annualized 2000 earnings? Is there a difference between the males and females in regard to the annualized 2000 earnings? Is there an interaction of program family and sex in regard to the annualized 2000 earnings?

Table 4.12a shows the number, mean annual 2000 earnings, and standard deviations for AAS completers broken down by program family groupings. Because of the small sample sizes it was difficult to make any inferences from the program family data. Overall males seemed to again earn more than females in each program family but this did not prove to be a statistically significant difference.

Table 4.12b shows there were no significant differences either in the interaction between program family and gender ($p=.559$), in the effects of program family ($p=.938$), or in the effects of gender ($p=.085$). Thus the apparent gender differences were most probably due to chance.

Table 4.12a

Numbers, Means, and Standard Deviations for AAS Completers who Worked Four Quarters of 2000 Broken Down by Program Family Groupings

Program Families	Males			Females			Total		
	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>
Business Programs	3	\$19,529	9318	22	\$15,646	4786	25	\$16,112	5380
Computer Programs	8	\$22,215	13,456	9	\$11,302	6001	17	\$16,437	11347
Allied Health	2	\$18,649	6999	64	\$15,621	7724	66	\$15,713	7671
Human Service	4	\$18,114	8011	8	\$13,844	8128	12	\$15,268	7998
Mechanical	15	\$19,523	4872	1	\$21,833		16	\$19,671	4743
Miscellaneous	8	\$19,299	6048	2	\$16,144	1831	10	\$18,612	5524
Total	40	\$19,818	7739	106	\$15,194	7042	146	\$16,461	7503

Table 4.12b

Two-Way Analysis of Variance for AAS Graduates as a Function of Who Worked Four Quarters of 2000 Broken Down by Program Families

Variance and Source	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	<i>eta</i>
2000 Earnings					
Program Family	5	13,670,227	.252	.938	.095
Gender	1	162,867,005	3.004	.085	.148
Family*Gender	5	42,817,628	.790	.559	.170
Error	134	54,211,929			

Research Question 15: For the status group of completers who worked all four quarters of 2002 is there a difference between the three degree groups in regard to the annualized 2002 earnings? Is there a difference between the males and females in

regard to the annualized 2002 earnings? Is there an interaction of degree and sex in regard to the annualized 2002 earnings?

Table 4.13a shows the number, mean 2002 annualized earnings, and standard deviations for the males and females in the completer status group by degree type. Overall AAS completers seemed to earn more than AA and D completers in 2002, and overall males seemed to earn more than females by approximately \$4,400 in this sample. The differences between males and females within each of the three status groups seemed to be the least within the AAS completer group with the males earning approximately \$2,300 more than the females. The gender difference within the AA group seemed to be approximately \$11,000 and within the diploma group seemed to be approximately \$9,000.

Table 4.13a

Number, Mean annualized 2002 Earnings and Standard Deviations as a Function of Degree and Gender for Completers

Degree Group	Males			Females			Total		
	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>
AA	5	\$31,308	10161	9	\$19,084	842	14	\$23,450	10513
AAS	42	\$27,984	9767	93	\$25,696	10046	135	\$26,408	9981
Diploma	14	\$29,884	11143	22	\$20,474	9870	36	\$24,134	11235
Total	61	\$28,693	6995	124	\$24,290	10131	185	\$25,742	10276

Table 4.13b shows there was no statistically significant interaction between gender and degree for mean annualized 2002 earnings ($p=.069$). Looking at the main effect of gender, there was a statistically significant difference between the genders for mean annualized 2002 earnings with males earning more than females, $F(1, 179)=12.432$, $p=.001$. Eta for gender was .255, which according to Cohen (1988) is a small to medium

effect. Eta squared indicated that 6.5 percent of the variance in mean annualized 2002 earnings was attributed to gender.

Looking at the effect of degree type there was no statistically significant difference between the degree types for mean annualized 2002 earnings in this sample. Because the sample sizes were so small within the degree types associated with the AA and diploma, it was difficult to draw any conclusions beyond these samples.

Table 4.13b

Two-Way Analysis of Variance for Annualized 2002 Earnings as a Function of Gender and Degree for Completers

Variance and Source	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	<i>eta</i>
Degree	2	45,912,417	.461	.631	.071
Gender	1	1,237,261,436	12.432	.001	.255
Degree*Gender	2	269,697,750	2.710	.069	.170
Error	179	99,518,469			

Research Question 16: For the degree group of Associate of Applied Science (AAS) completers who worked all four quarters of 2002 is there a difference between the business, computer, allied health, mechanical, human service, and miscellaneous program families in regard to the annualized 2002 earnings? Is there a difference between the males and females in regard to the annualized 2002 earnings? Is there an interaction of program and sex in regard to the annualized 2002 earnings?

Table 4.14a shows the number, mean annual 2002 earnings, and standard deviations for AAS completers broken down by program family groupings. The allied health program family mean was more than that of the other program families. Because

of the small sample sizes in most program families it was difficult to make many inferences beyond this for program family groups. It seemed that males earned approximately \$2,000 more than females annually. The largest discrepancies in mean annual earnings between males and females seemed to be in the human service and computer program families where males earned approximately \$12,000-\$14,000 more annually than females. The smallest difference in mean annual earnings between males and females seemed to be in the mechanical program family.

Table 4.14a

Numbers, Mean Annualized Earnings, and Standard Deviations for AAS Completers Who Worked All Four Quarters of 2002 as a Function of Program Family Grouping

Program Families	Males			Females			Total		
	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>
Business Programs	4	\$27,248	7200	16	\$21,152	7047	20	\$22,371	7325
Computer Programs	9	\$34,620	12688	7	\$19,869	7792	16	\$28,166	12933
Allied Health	1	\$33,758		56	\$28,714	9622	57	\$28,802	9559
Human Service	5	\$27,703	3250	6	\$15,780	3115	11	\$21,200	6917
Mechanical	14	\$25,602	9672	2	\$25,079	1557	16	\$25,537	9015
Miscellaneous	7	\$21,522	6150	0			7	\$21,522	6150
Total	40	\$27,548	9773	87	\$25,636	9567	127	\$26,238	9655

Table 4.14b shows there were no statistically significant difference in the interaction between AAS program family and gender ($p=.403$). There was also no statistically significant difference found for the effect of AAS program family ($p=.187$). Those differences mentioned above could most probably be due to chance or the small number of members in each program family. There was, however, a statistically significant difference between the genders on mean annualized 2002 earnings with males earning more than females, $F(1, 116)=7.362, p=.008$. Eta for gender was .245, which

according to Cohen is a small to medium effect. Eta squared indicated that approximately 6 percent of the variance in 2002 annualized earnings was attributed to gender.

Table 4.14b

Two-Way Analysis of Variance for AAS Completers who Worked Four Quarters of 2002 Broken Down by Program Families

Variance and Source	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	<i>eta</i>
2002 Earnings					
Program Family	5	120,708,710	1.525	.187	.249
Gender	1	582,661,229	7.362	.008	.245
Family*Gender	4	80,268,620	1.014	.403	.184
Error	116	79,143,191			

Research Question 17: For the status group of leavers who worked all four quarters of 2000 is there a relationship between the number of hours completed and the annualized 2000 earnings? Is there a difference between the males and females in regard to the annualized 2000 earnings? Is there an interaction of number of hours completed and sex in regard to the annualized 2000 earnings?

Table 4.15a shows the number, mean annualized 2000 earnings, and standard deviations for the males and females in the leaver status group who worked all four quarters of 2000. Males seemed to earn more than females by approximately \$5,000 annually.

Table 4.15a

Number, Annualized 2000 Earning Means, and Standard Deviations for Leavers Who Worked all Four Quarters of 2000 as a Function of Gender

Males			Females			Total		
<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>
186	\$23,788	12026	251	\$18,673	9377	437	\$20,850	10872

Table 4.15b shows there was no statistically significant interaction ($p=.807$) between gender and the number of hours completed within the leaver status group who worked all four quarters of 2000. For the leavers with different numbers of hours completed, there was also no statistically significant difference ($p=.200$) for mean annualized 2000 earnings.

Table 4.15b

Two-Way Analysis of Variance for Annualized 2000 Earnings as a Function of Gender and Number of Hours Completed for the Leaver Status Group

Variance and Source	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	<i>eta</i>
Annual 2000 Earnings					
Gender	1	1,734,186,117	15.468	<.001	.184
Cmptcred	1	1,847,780,029	1.648	.200	.063
Gender*cmptcred	1	6,666,061	.059	.807	.000
Error	433	112,117,009			

However, for the main effect of gender there was a statistically significant difference, $F(1, 433)=15.468$, $p<.001$, with males earning more annually than females. Eta for gender was .184, which according to Cohen is a small to medium effect. Eta

squared indicated that approximately 3 percent of the variance in mean annual 2000 earnings was attributed to gender.

Research Question 18: For the status group of leavers who worked all four quarters of 2002 is there a relationship between the number of hours completed and the annualized 2002 earnings? Is there a difference between the males and females in regard to the annualized 2002 earnings? Is there an interaction of number of hours completed and sex in regard to the annualized 2002 earnings?

Table 4.16a shows the number, mean 2002 annualized earnings, and standard deviations for the males and females in the leaver status group who worked all four quarters of 2002. Again two years later it seemed males in the leaver status group earned more than females annually by approximately \$5,000.

Table 4.16a

Number, Annualized 2002 Earning Means and Standard Deviations for Leavers who Worked all Four Quarters of 2002 as a Function of Gender

Males			Females			Total		
<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>
182	\$28,814	13225	241	\$23,656	12739	423	\$25,875	13185

Table 4.16b shows there was no statistically significant interaction ($p=.829$) between gender and the number of hours completed within the leaver status group who worked all four quarters of 2002. For the effect of number of hours completed there was still no statistically significant difference between the leavers ($p=.438$) for mean annual 2002 earnings.

Table 4.16b

Two-Way Analysis of Variance for Annualized 2002 Earnings as a Function of Gender and Number of Hours Completed for the Leaver Status Group

Variable and Source	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	<i>eta</i>
Annual 2002 Earnings					
Gender	1	1,397,274,046	8.305	.004	.138
Cmptcred	1	101,484,737	.603	.438	.032
Gender*cmptcred	1	7,892,012	.047	.829	.000
Error	419	168,251,228			

However, for the main effect of gender there was again a statistically significant difference, $F(1, 419)=8.305, p=.004$, with males earning more annually than females. Eta for gender was .138, which according to Cohen is a small effect. Eta squared indicated that approximately 2 percent of the variance in mean annual 2002 earnings was attributed to gender.

Research Question 19: For the three status groups of completers, leavers and applicants who worked all eight quarters of 2000 and 2002 is there a difference in regard to the gain scores in wages made between 2000 and 2002?

Table 4.17a shows the numbers, gain in mean earnings between 2000 and 2002, and standard deviations for the status groups and genders as regards to the mean gain in wages between 2000 and 2002. The completers seemed to gain approximately \$4,500 more than either of the other two status groups. Males and females within the leaver status group seemed to gain about the same in annual earnings. Interestingly, the females in the applicant group seemed to gain more than the males, while in the completer status group males seemed to gain more than females.

Table 4.17a

Number, Gain in Mean Earnings, and Standard Deviations as a Function of Gender and Status Group

Status Group	Males			Females			Total		
	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>
Applicants	76	\$3,076	7282	93	\$4,865	17396	169	\$4,061	13791
Completers	41	\$9,816	7212	97	\$8,884	9783	138	\$9,161	9079
Leavers	134	\$4,742	9464	189	\$4,452	9082	323	\$4,572	9229
Total	251	\$5,067	8765	379	\$5,688	11939	630	\$5,440	10784

Tables 4.17b shows there was no statistically significant interaction ($p=.491$) between gender and status group in the mean gain in wages between 2000 and 2002 for those who worked all eight quarters of 2000 and 2002. There was also no statistically significant difference between males and females ($p=.842$) in the mean gain in wages so the above comments which noted differences between the genders were not statistically justified.

For the main effect of status group, however, there was a statistically significant difference in mean gain of wages between the status groups, $F(2, 624)=10.356, p<.001$. Eta for status group was .179 which, according to Cohen (1988), is a small effect. Eta squared indicated that 3 percent of the variance in gain scores was due to status group.

Post-hoc tests indicated that there were statistically significant differences between the completers and the leavers ($p<.001$) and between the completers and the applicants ($p<.001$) with completers gaining more statistically than both of the other groups.

Table 4.17b

Two-Way Analysis of Variance for Gain in Wages Between 2000 and 2002 as a Function of Gender and Status Group

Variable and Source	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	<i>eta</i>
Gain in Wages					
Status	2	1,170,073,364	10.356	<.001	.179
Gender	1	4,489,671	.040	.842	.000
Status*Gender	2	80,563,788	.713	.491	.045
Error	624	112,987,076			

Research Question 20: For the program family groups who were Associate of Applied Science completers who worked all eight quarters of 2000 and 2002 is there a difference in regard to the gain scores in wages made between 2000 and 2002 for the business, computer, allied health, mechanical, human service and miscellaneous program families?

Table 4.18a shows the number, mean gain in earnings between 2000 and 2002, and standard deviations for AAS completers who worked all eight quarters of 2000 and 2002 broken down by program family groupings. Although there were only female participants in the allied health program family, it should be noted that wage gains within this program family were approximately \$12,500. This program family earned more than all other program families. In all other families, males seemed to gain more than females. It should be noted that females within the human service program family actually seemed to lose in annual earnings while the males in this category gained approximately \$5,000.

Table 4.18a

Numbers, Means of Gain in Wages Between 2000 and 2002, and Standard Deviations for AAS Completers who Worked All Eight Quarters of 2000 and 2002 Broken Down by Program Family Groupings

Program Families	Males			Females			Total		
	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>
Business Programs	3	\$10,601	5987	13	\$5,884	5542	16	\$6,786	5742
Computer Programs	6	\$13,437	8096	4	\$4,403	3577	10	\$9,823	7902
Allied Health				49	\$12,465	9394	49	\$12,465	9394
Human Service	3	\$9,975	5101	4	-\$ 242	5813	7	\$2,091	5834
Mechanical	9	\$4,526	5075	1	\$4,296		10	\$9,407	5111
Miscellaneous	6	\$4,526	2699	0			6	\$3,526	2699
Total	27	\$8,851	6357	71	\$9,975	9134	98	\$9,665	8443

Table 4.18b shows there was no statistically significant interaction ($p=.937$) between gender and AAS program family for the mean gain in wages between 2000 and 2002 for those 30 and younger who worked all eight quarters of 2000 and 2002. Looking at the effect of gender there was a statistically significant difference between males and females in mean gain in wages, $F(1, 88)=3.971, p=.049$, with females earning more than males due exclusively to the gain in allied health programs. If it had not been for this large gain in earnings within the allied health field, the gain for females would have lagged behind the gains for males overall. As it was, overall gains for females seemed to be approximately \$1,000 more than overall gains for males. Eta for gender was .207 which, according to Cohen (1988), is a small to medium effect. Eta squared indicated that 4 percent of the variance in gain scores was due to gender.

For the effect of program family there was also a statistically significant difference, $F(5, 88)=4.361, p=.001$. Eta for program family was .446 which, according to

Cohen (1988), is a large effect size. Eta squared indicated that 20 percent of the variance in wage gains was due to program family.

Post-hoc tests indicated that there were statistically significant differences between the program families of allied health and human services ($p=.002$) where gains differed by approximately \$10,000, and allied health and miscellaneous programs

Table 4.18b

Two-Way Analysis of Variance for AAS Completers Who Worked All Eight Quarters of 2000 and 2002, Broken Down by Program Families

Variance and Source	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	<i>eta</i>
Gain in Earnings					
Program Family	5	269,489,674	4.361	.001	.446
Gender	1	245,427,275	3.971	.049	.207
Family*Gender	3	8,528,265	.138	.937	.224
Error	88	61,797,375			

($p=.010$) where gains differed by approximately \$9,000. In both cases allied health program gains were significantly more than the human service and miscellaneous program family gains. The effect sizes, according to Cohen (1988), of both these gains were very large.

Summary of Findings

- a. When median quarterly wages of the three status groups (completers, leavers, applicants) were compared over the 16 quarters, applicants and leavers earned more than completers during the first six quarters of 1999 and 2000. These were the quarters completers were attending college, completing a degree, and entering the

workforce. However, by the third quarter of 2000 (3/2000), the completer median quarterly wages either equaled or surpassed those of the leavers and exceeded those of the applicants.

- b. When median quarterly wages of the three degree groups (AA, AAS, D) of completers were compared over the 16 quarter, they were similar during the first six quarters of 1999 and 2000. However, by the third quarter of 2000 (3/2000) the diploma and AAS degree quarterly wages surpassed those of the AA degree group. During the final three quarters of 2002, the AAS degree wages surpassed those of the diploma degree group.
- c. When median quarterly wages of the AAS degree group were divided by program family classification, the mechanical program showed a steep increase and exceeded the earnings of all other AAS program families by the third quarter of 2000 (3/2000) until 2/2002. By that quarter (2/2002), all program family median quarterly wages were exceeded by the allied health program family.
- d. When median quarterly wages of the diploma degree group were divided by program family classification, the mechanical program family earned more than all other programs by the fourth quarter of 1999 (4/1999) and continued to earn more than the other program families throughout the remaining quarters. The allied health program family group took second place in median quarterly wages within these program family groups by the third quarter of 2000 (3/2000).
- e. The only significant difference associated with the different groups as to the number of unique employers was found between the three status groups. Completers worked for fewer different employers over the period of the 16 quarters. They seemed to be

more steadily employed than leavers or applicants. The leavers and applicants worked for more different employers over the 16 quarters, changing jobs more frequently and working more different jobs than did the completers.

- f. When looking at only those employed all four quarters of 2000 with some wages, a significant difference was found in 2000 mean annual wages between the status groups and also between the genders. The mean annual wages for 2000 were greater for the leavers than for the other two status groups of completers and applicants. Moreover, status group had a medium effect on the relationship between the annual wages of the leavers and completers and a small effect on the relationship between the annual wages of the leavers and the applicants. Because completers were defined in this study as having completed their program within the 1998-99 academic year, the year 2000 was the first year many of them entered the workforce full time.
- g. Also of importance was the difference found between the mean annual 2000 wages of the females and males who had some wages all four quarters of 2000. Males earned more than females in all groups except the AAS program family groups. Gender did not make a statistical difference between the males and females within the different AAS program families. In the leaver and completer status groups and the AA and diploma degree groups, gender produced a small effect with males earning more than females.
- h. When looking at only those with full time mean annual wages all four quarters of 2000 (those greater than \$3,330 each of the four quarters), status group membership had a large effect on annual wages for the leaver and completer groups. Leavers significantly earned more than completers. There was no significant difference found

between the genders of the different status groups, however, when full time mean annual 2000 earnings were used.

- i. Turning to the wages earned two years later by those employed with some wages all four quarters of 2002, significant differences were found once again between the three status groups for mean annual wages. However, this time the statistically significant differences were found between the completers and applicants and between the leavers and applicants, with applicants earning statistically less than the other two status groups. The pattern for the genders was quite consistent to what was found in annual 2000 wages with one difference. In every case (between the status groups, between the degree groups of completers, and between the leavers based on the number of hours completed) males earned more than the females. However, now, two years later, a statistical difference was also seen between males and females in the AAS program family groups. This had not been statistically significant in mean annual 2000 wages, but was now. Gender had a small effect size, according to Cohen (1988), but still males in all groups were paid statistically more in wages than females during this time.
- j. When mean annual wages for those employed full time ($\leq \$3,330/\text{quarter}$) all four quarters of 2002 were compared, status group and gender both produced significant results. This time there was only a statistical difference between the leaver and applicant status group as to mean annual 2002 full time wages. Leavers earned statistically more than applicants. Completers seemed to catch up to the leavers and exceeded the applicants. Males, however, continued to earn more than females in the leaver and completer status groups.

- k. When mean gains in annual wages from annual 2000 to annual 2002 for those employed all eight quarters of the two years were compared, the greatest gain scores were made by the completer status group. This comparison examined those employed all eight quarters of 2000 and 2002 so the same group of individuals was compared as to the gain in wages during this time. Within the three status groups, completers gained more than both leavers and applicants. This could be due to the fact that completers were new to the workforce in 2000 just having completed their programs of study, or it could be due to the additional educational attainment. Further study of these groups over an additional time period would be necessary to determine the cause of this greater wage gain for the completers.
- l. Within the completer groups of AAS program family degree groups, gain scores from 2000 to 2002 produced some large effect sizes, according to Cohen (1988). Statistically significant differences were found between the allied health program group and both the human service and miscellaneous program groups. Allied health AAS graduates gained more than all other program family groups but statistically gained more than the human service and miscellaneous program completers. Within these AAS program families, gender also produced some statistical differences with males gaining more than females statistically in all groups but the allied health group.
- m. It was interesting that no statistically significant interactions between different independent variables were found in any of the research question results. Interaction occurs when one independent variable has different effects on a dependent variable when considered in combination with another independent variable. The only way to know if conditions are different statistically when two independent variables are

considered together is to perform the proper analysis, which is a two-factor ANOVA. Since no interactions were found within this study it was safe to assume that the independent variables produced main effects in their own right.

Table 4.19 presents an overview of the statistical findings for the research questions. It lists the dependent variables across the top of the table and the independent variables along the left side. The individual research question number is placed at the intersect associated with the dependent and independent variables inherent to that question. The asterisk after the research question number denotes whether the statistical test produced a significant result between those groups at the $p=.05$ level or less. In general, if the calculated value of the inferential statistical test is relatively large, the p or probability will be small. If the probability is less than the preset alpha level of .05, the results are reported as statistically significant. It is then that the possibility of no difference or no relationship can be rejected. This means that the results are most likely not due to chance.

If there was a statistically significant difference found, the results are listed in Table 4.19 in three different ways according to the statistical effect size of the relationship between the variables. Effect size can be thought of as the strength of the relationship between the independent variable and the dependent variable. This strength may be small, medium or large. It is important to remember that “statistical” and “practical” significance are not the same thing. Effect size does not necessarily measure the practical importance of a finding. Important practical effects depend on the specific variables being studied and must be looked at within the context of that area.

In Table 4.19 if the relationship between the dependent and independent variable was found to have a small statistical effect, as determined by Cohen (1988), the groups are listed in all small letters using greater than (>) or less than (<) signs to show the direction of the group results. If the relationship was found to have a medium statistical effect, as determined by Cohen (1988), the groups are shown in bold italics print using symbols to show the direction of the results. If the relationship was found to have a large statistical effect, as determined by Cohen (1988), the groups are shown in all capital letters using symbols to show the direction of the results.

Table 4.19

Overview of Statistical Results by Research Question

Independent Variables	# of Unique Employers	Mean Annual Wages-2000	Mean F-T Annual Wages-2000	Mean Annual Wages-2002	Mean F-T Annual Wages-2002	Wage Gains (2000-2002)
3 Status Groups	#5* completer<leaver completer<applicant	#9* <i>leaver>completer</i> leaver>applicant	#10* <i>leaver>completer</i>	#11* completer>applicant leaver>applicant	#12* leaver>applicant	#19* completer>leaver completer>applicant
3 Degree Groups	#6	#13		#15		
6 AAS Program Families		#14		#16		#20* AH>HS AH>MISC
4 Diploma Program Families						
# of Completed Hours	#7	#17		#18		
Gender	#5, #6, #7, #8	#9* m>f #14 #13* m>f #17* m>f	#10	#11* m>f #15* m>f #16* m>f #18* m>f	#12* m>f	#19 #20* m<f
Interaction of Variables	#5, #6, #7	#9, #13, #14, #17	#10	#11, #12, #15, #16, #18	#12	#19, #20

Note. * designates differences that are statistically significant at $p \leq 0.05$. Large effect sizes are in all capital letters. Medium effect sizes are in bold italics. Small effect sizes are in all lower case letters.

CHAPTER V

Discussion

Introduction

The purpose of this research was to design and conduct an economic impact study using actual Iowa wage information of individuals who attended Western Iowa Tech Community College to build a stronger case for support of an education at Iowa's community colleges. Through the use of Iowa Workforce Unemployment Insurance (UI) records, which reflected quarterly wages actually paid by Iowa employers, a secondary data analysis was conducted to measure the economic effects attendance at WITCC had on the actual wage earnings of program completers, leavers and applicants associated with the college during the academic years of 1994-1999. This type of study, known as a knowledge impact study because it attempted to measure the increase in human capital as a result of the transmission of knowledge and skills gained by attendance at an institution, was chosen because it would complement and validate results from other economic research completed by WITCC.

Quantitative methods were used to answer the research question, "To what extent do students benefit financially by attending WITCC as measured by their post college Iowa quarterly earnings?" Actual wage record information was matched with demographic and educational data contained in the college student management information system to determine specific answers to twenty research questions. These

questions were organized to determine differences in median quarterly wages during the 16 quarters of 1999-2002, in the number of unique employers individuals in the study worked for during this four year period, in mean annual wages for both those employed with some wages all four quarters and also for those employed with full time wages all four quarters of 2000 and of 2002, and in mean wage gains between 2000 and 2002 for different groups of completers, leavers and applicants to WITCC.

Following is a brief review of the results from this research study. These results will be compared and contrasted to results found in the literature reviewed for this study. Because descriptive analysis was used along with statistical analysis, every attempt has been made within the description of the results to clearly represent statistically significant results. Upon casual reflection about the data many of the results seemed to be important without actually producing statistically significant results. Both observations, those that seemed significant and those that actually were statistically significant, are represented throughout this section. After a description of the research results additional contextual labor market wage information of the area being studied is presented. Practical significance of these statistical findings is discussed within this labor market context. This chapter concludes with some implications and recommendations which were derived from this study and which have importance if further analysis of these results is to be made.

Summary of Findings

As a result of this study it was possible to quantitatively answer each of the twenty research questions. Since quantitative tests of factorial ANOVA, ANOVA and ANCOVA were run with actual data, statistical guides of probability and effect size were

used to determine if the results could largely be due to chance or whether a relationship existed which would allow this hypothesis to be discarded and would assume some direct differences among the test groups. These differences might be small, medium or large based on the strength of the relationship between the variables used. However, it is important to remember that statistically significant differences might not be practically significant. A statistical difference might not have any practical application. Important practical differences can only be determined by looking at them in the context of the area being studied.

The data set forth in chapter 4 made it possible to answer each of the twenty research questions identified in Chapter 1 for any statistically significant differences. Table 4.19 on page 134 set forth these statistical results in table form and organized them according to the dependent and independent variables associated with them. This chapter looks at these research questions grouped by the dependent variable common to them and analyzes them for statistical results accordingly.

Question 1, 2, 3, & 4: These four research questions looked at the differences in median quarterly wages over the 16 quarters of 1999-2002 between the three status groups of completers, leavers and applicants (#1); between the three completer degree groups of associate of applied science, associate's of arts, and diploma completers (#2); between the six AAS degree program families of business, computer, allied health, human service, mechanical and miscellaneous (#3); and between the four diploma degree program families of business, computer, allied health and mechanical (#4).

Question 1: Although the leaver and applicant status groups earned more than the completer status group during the first six quarters of this study, the completers surpassed

both of the other status groups' median quarterly earnings within four quarters of completion of a degree at WITCC. Likewise, the leavers earned more than the applicants all but the first quarter of this study.

As Grubb (1999a) showed in his analysis of UI records from the five states of California, Florida, Washington, North Carolina and Texas, students benefit economically from completion of an associate's degree or one year diploma degree. What's more these benefits materialize within three years of leaving college. Azari (1996) also found in his study of 14,000 Washington State community college completers and leavers, those students who completed degrees earned higher salaries than those who did not. Further Gracie (1998), who studied exit non completers and exit completers in North Carolina, found exit non completers (leavers) had the highest earnings immediately after leaving college but were soon surpassed by exit completers. The quarterly earnings of these exit completers proved to increase at a faster rate from quarter one to quarter four after leaving college than the other group of exit non-completers.

The present study found that those who attended WITCC (completers and leavers) earned more than those who completed no additional post secondary education beyond high school (applicants). Also there seemed to be a relationship between more formal education and increased earnings. Those who completed an entire program of study (completers) were earning more than those who completed some hours toward completion of a program of study (leavers) by the end of the study. Additional wage record data over a longer period of time would be beneficial to establish that there was a relationship between formal educational attainments, more for completion than for mere attendance, and increased earnings.

Question 2: All three degree groups of completers (AA, AAS, D) started out by earning approximately the same quarterly median wages. As the diploma completers finished their one year degree and entered the work force, their median quarterly earnings equaled or surpassed those of the other two degree groups. By the second quarter of 2000 (2/2000) the completers with technical associate of applied science (AAS) and diploma (D) degrees earned more than the associate's of arts (AA) completers and continued to earn more than them during most of the rest of the study. During the final seven quarters of the study (2/2001 through 4/2002) the AAS technical completers appeared to surpass the technical diploma completers in median quarterly wages.

Since an AA degree is intended to transfer as the first two years of a four year degree, those who stopped out and did not complete the intended degree seemed not to benefit as much as those who completed an entire degree. Pascarella (1999) found that the returns of an academic associate's degree without a transfer to a four-year college were uncertain. Also diploma one-year technical degree completers earned more initially than AAS two year technical degree completers. However, this difference seemed to disappear with AAS completers earning more than diploma completers during the final quarters of this study.

These findings were supported by those of Gracie (1998) who found that exit completers with a vocational associate's degree or diploma degree had higher earnings than completers who earned an academic transfer associate's degree and did not continue on to a four-year institution. Also Gracie found that the vocational associate's degree completer (AAS) increased at a faster rate than any other degree holder (D, AA).

Question 3: Because of the small numbers of members in some of the AAS program family groups it was difficult to make too many inferences from this set of data. However, completers with allied health AAS degrees earned more than all other program families during the final quarters of the study when median quarterly earnings were considered. Completers with mechanical AAS degrees (technicians) also seemed to earn more than all the remaining program families. Completers with computer AAS degrees seemed to earn more during the final quarters than the business, human service and miscellaneous AAS degree completers when median quarterly wages were used to determine differences. Other results should probably not be inferred to other groups because of the small numbers in each group.

The finding that allied health and mechanical AAS degree completers would earn more than the other AAS degree completers was supported by the findings of Pascarella (1999). He found that the economic return to an associate's degree varied considerably by field of study with the largest payoffs in the technical and allied health fields.

Question 4: Most diploma program family groups began this study with very similar median quarterly wages. All diploma groups in this study were surpassed at the end of the first year (4/1999) by the mechanical diploma completers and remained below the quarterly earnings of the mechanical diploma completers for the remainder of the study. Computer and business diploma program completers remained steady as to median quarterly wages throughout most of the remainder of the study, but were surpassed by the allied health program completers shortly thereafter (3/2000). By the end of the study completers with diplomas in the mechanical degree program family seemed to earn more than the allied health diploma degree group who seemed to earn more than the business

and computer diploma completers. Again because of the small number of individuals within each of these diploma groups these results may not be inferred to other groups beyond this study. Additionally, no literature was reviewed for this study to support any expected results for one-year diploma completers.

Question 5, 6, 7 & 8: These four questions dealt with the difference between and within the different levels of educational attainment as to the number of unique employers held by each. The different levels of educational attainment were the three different status groups (#5), the three different degree groups (AA, AAS, D) within the completer group (#6), the number of hours completed within the leaver group (#7), and between the males and females in the applicant group (#8) since they had no additional educational attainment. The number of unique employers held by these groups during this study was compared as noted above.

During the initial data entry the researcher noticed that many individuals in the study worked for more than one employer. In fact many worked for as many as 5-6 employers within any given quarter. It seemed from a quick check that the completers held the same job longer and worked for fewer different employers over the course of the 16 quarters covered by this study.

A way to measure and compare the number of unique employers held by different groups was devised by adding for each participant all the different employers an individual was employed by during the quarters of the study. This total number of employers was then divided by the number of quarters that individual was employed to determine an average number of unique employers for each. This average was then multiplied by 16. As the different groups were compared this “adjusted” number of

unique employers, was used to determine a mean number of unique employers for each group. Through this process the number of different employers was normalized and compared.

For the different groups compared in these questions, statistically significant results were found only between the three status groups of completers, leavers and applicants. No other significant results were found. Essentially it was found that the completers were more steadily employed than the leavers and the applicants with no statistical difference between the males and females. This steady employment was determined by the fact that completers were employed by fewer employers than leavers and applicants over the 16-quarter period of the study.

Using statistical measures it was determined that the group of completers, male and female alike, worked for approximately 5 unique employers over the four year period. The leaver group worked for approximately 6 unique employers and the applicant group worked for approximately 7 different employers over the four-year period. Within each of the status groups the number of different employers for each individual varied but when taken as a whole, completers worked for the same employer longer and changed between employers less frequently.

The researcher found no literature that reviewed research on this variable, but the literature reviewed for this study supported the fact that employment increased with educational attainment (Stevens, 1992). However, the result that the number of different employers decreased with an increase in educational attainment was not expected.

Questions 9, 13, 14 & 17: These four questions dealt with the difference in mean 2000 annual wages for those in the different educational attainment groups listed

previously. The number and composition of these groups varied from other research question groups because, to be considered for these questions, an individual must have been employed with some wages all four quarters of 2000.

Statistically significant differences in mean annual 2000 wages were found for the three status groups with the leavers earning more than both the completers and the applicants (#9). These differences were stronger between the leavers and the completers than between the leavers and the applicants. There were no statistically significant differences found between the three degree groups (#13), the different AAS program families (#14), or the leavers according to the number of hours completed (#17).

The differences in mean annual 2000 earnings between the status groups in question nine was expected because of the proximity of annual 2000 to the completion of a program of study in 1999 for the completers. These findings are consistent with the findings of Gracie (1998) who found leavers had the highest earnings immediately after leaving college. Both the leavers and the applicants had more time than the completers to establish themselves in a job with some earnings.

When gender was used in these questions to determine differences among the males and females in each of these groups, males statistically earned more than females in all but question #14. Here a statistical difference between the males and females in the different AAS program family groupings was not found. Literature indicated that females benefited more from formal education than males (Pascarella, 1999); with males who earned an associate's degree having on average an 18% advantage in annual earnings over males with only a high school degree; and females with associate's degrees having a 26% advantage over females with only a high school degree.

Question 9: First, the three status groups (completers, leavers, applicants) were compared for mean annual 2000 earnings. For those who earned some wages all four quarters of 2000, the leaver group had the highest mean annual wages at approximately \$20,850. This amount was statistically more than for the applicant group at approximately \$18,550 and than the completer group at approximately \$16,550. However, because the completer group earned approximately \$4,000 less than the leaver group and approximately \$2,000 less than the applicant group in wages during this year, the effect size of these differences was medium between the leaver and the completer groups and was small between the leaver and the applicant groups. These results again support those of Gracie (1998) with exit non completers earning more immediately upon leaving college.

Males statistically earned more than females in most groups with some wages in all four quarters. Overall, males earned approximately \$22,500 annually and females earned approximately \$17,100 annually. Even when considered within the different status groups, males earned more than females in all three groups. Males earned approximately \$5,500 more than females in the applicant status group; they earned approximately \$5,000 more than females in the leaver group and earned approximately \$4,300 more than females in the completer group.

Question 13: Second, the three degree groups of completers (AA, AAS and D) were compared for mean 2000 annual wages. For those who earned some wages all four quarters of 2000, the diploma degree group seemed to have the highest mean annual wages at approximately \$16,900. This amount was not statistically more than for the

AAS group at approximately \$16,480 or than for the AA group at approximately \$16,400.

Males statistically earned more than females in these groups. For all males and females with degrees, males earned approximately \$19,500 annually and females earned approximately \$15,250 annually. Even when considered within the different degree groups males earned more than females in all three groups. Males earned approximately \$4,300 more than females in the AAS degree group; they earned approximately \$4,800 more than females in the diploma group and earned approximately \$1,600 more than females in the AA group.

Question 14: Third, the six different program families (business, computer, allied health, human services, mechanical, miscellaneous) within the AAS degree group were compared for mean 2000 annual wages. There were no statistically significant differences in mean annual 2000 wages found between these six program families. For those who earned some wages all four quarters of 2000, the mechanical group seemed to have the highest mean annual wages at approximately \$19,700. This amount was not statistically more than for all the other groups or for the business group that seemed to be the lowest paid group, at approximately \$16,100.

Males did not statistically earn more than females in the group of AAS program families. Males earned approximately \$19,800 annually and females earned approximately \$15,200 annually but these differences were not statistically significant even though males seemed to earn more than females in all but the allied health program family group. No gender differences were found to be statistically significant in this research question but these results and those from 2002 did not seem to support

Pascarella's (1999) findings, which found a greater advantage to females than males for higher educational attainment.

Question 17: Finally, the mean annual 2000 earnings for the status group of leavers were compared according to the number of hours they completed at WITCC. There were no statistically significant differences in mean annual 2000 wages found between leavers based on their completed number of hours. Sanchez and Laanen (1998a) had found positive gains of 6%-10% among the different levels of leavers based on the number of units completed. These were determined not to be substantial, however, so no significant differences were expected in the present study either.

However, males statistically earned more than females in this group with some wages all four quarters. Males earned approximately \$23,800 annually and females earned approximately \$18,700 annually. Males earned approximately \$5,000 more than females annually in the leaver status group. No literature reviewed looked at gender differences other than for community college completers.

Question 10: To determine whether educational attainment of the three status groups might make more of a difference if a different analysis of earning was made, question 10 dealt with the difference in full time annual 2000 earnings between the completers, leavers and applicants. Full time wages were defined as working 40 hours a week for 52 weeks of the year at minimum wage. This amounted to \$3,330/quarter or more for all four quarters of 2000. This quarterly amount had been used in an earlier study done in California by Jack Friedlander (1996) so was adopted for this study as well.

The leaver group again seemed to have higher mean annual earnings at approximately \$27,500 than the applicant group at approximately \$25,900, but these were

not found to be statistically significant differences. The leaver groups mean annual earnings at approximately \$27,500 were also more than the completer group at approximately \$23,500, but this time the difference was found to be statistically significant. The effect size of the differences between the leaver and the completer group was medium at approximately \$4,000/year. This might again be explained, however, by the fact that some of the completer group was still attending college and by the fact that the leavers and the applicants had been out in the workforce at least one year by this time (Gracie, 1998).

When gender was a consideration for those with full time earnings all four quarters of 2002, males did not statistically earn more than females. This was a change from the group with some wages in question nine. Overall, males seemed to earn approximately \$27,700 and females earned approximately \$25,300 annually. The difference between males and females was less than for those with some wages and not statistically significant, but males still seemed to earn more than females. The difference between the earnings of males and females seemed to be apparent in all three status groups with the smallest difference between the genders in the completer group but these differences, also, were not found to be statistically significant.

Questions 11, 15, 16, & 18: In these four questions the differences between the different levels of educational attainment were examined two years later in 2002. Again the groups that had some wages all four quarters of 2002 were examined and compared within the three status groups (#11), within the three degree groups (#15), within the six AAS program family groups (#16) and within the leaver group by number of hours completed (#18) at WITCC.

Previously the differences in mean annual 2000 earnings between the status groups in question nine had been explained to exist because of the time proximity to completion of a program of study by completers. Both leavers and applicants had had more time to establish themselves in the workforce in 2000. These questions (#11, #15, #16, #18) examined whether that difference disappeared as completers had more time to establish themselves in the work force.

The answer seemed to be yes. In the time between 2000 and 2002 the completer status group “caught up” with the leavers and surpassed the applicants. Median quarterly wages from previous questions showed that by the final quarters of 2002 completer median wages even seemed to surpass those of the leavers. It also seemed that AAS wages caught up and surpassed those with diploma and AA degrees.

Previously the overall gender differences in the questions dealing with mean annual wages during 2000 were not fully expected. Literature indicated that females benefited more from formal education than males (Pascarella, 1999). In 2002 as the benefit of education had more time to become evident, it was hoped that the difference in mean annual wages between the genders might disappear for the groups with higher educational attainment.

This was not the case, however. Gender differences between male and female wages within the different educational attainment groups continued into 2002 and became even more obvious within some AAS program families with males continuing to earn more than females. This difference seemed to diminish overall with higher educational attainment in the allied health fields but continued within the other specific AAS program families.

Question 11: First, the three status groups (completers, leavers, applicants) were compared. For those who earned some wages all four quarters of 2002, completers had a mean 2002 annual wage of approximately \$25,750. This amount was statistically more than for the applicant group at approximately \$22,300 annually, but not statistically more than for the leaver group at approximately \$25,850. It seemed the completers caught up with the leavers and now both the leaver and the completer mean annual 2002 wages were statistically more than the applicant. The difference between the applicant group and the other two status groups was now approximately \$3,500. Statistically all differences between the applicant group and the other two status groups were a small effect.

The benefits of community college attendance were apparent within the results of this question. Grubb (1999b) had found small amounts of post secondary education benefited individuals, but found that return to be smaller than for an associate's degree. Kane and Rouse (1995) had found a ten percent increase in earnings was realized by the average person who attended a community college when compared to a person without any college even without completing a degree. Stevens (1992) found completers earned more than non-completers and further found the gap in earnings between leavers and completers increased over time.

Males again statistically earned more than females in the groups with some wages all four quarters of 2002. For all males and females, males earned approximately \$27,400 annually and females earned approximately \$23,000 annually. Even when considered within status groups, males earned more than females in all three groups. Males earned approximately \$3,800 more than females in the applicant status group; they earned

approximately \$5,000 more than females in the leaver group and earned approximately \$4,400 more than females in the completer group.

Question 15: Second, the three degree groups of completers (AA, AAS, D) were compared for mean 2002 annual wages. For those with degrees who earned some wages all four quarters of 2002, the AAS group seemed to earn the highest mean 2002 annual wages at approximately \$26,400. This amount was not found to be statistically more than for the diploma group at approximately \$24,100 or than for the AA group at \$23,450.

However, males again statistically earned more than females. For males and females in the completer groups, overall, males earned approximately \$28,700 annually and females earned approximately \$24,300 annually. Even when considered within degree groups, males earned more than females in all three groups. Males earned approximately \$2,300 more than females in the AAS degree group; they earned approximately \$8,400 more than females in the diploma group and earned approximately \$11,200 more than females in the AA group. This group of AA completers was quite small. These results should not be used to infer to other groups outside this study.

Again the results found by Pascarella (1999), that the economic returns of both an associate's degree and vocational diploma were more pronounced for women than men were not reflected in these findings.

Question 16: Third, the six different program families (business, computer, allied health, human services, mechanical, miscellaneous) within the AAS degree group were compared for mean 2002 annual wages. There were no statistically significant differences in mean annual 2002 wages found between these six AAS program groups. For those who earned some wages all four quarters of 2002, the allied health group seemed to have

the highest mean annual wages at approximately \$28,800. This amount was not statistically more than any of the other program groups even for the miscellaneous group, which was the lowest earning group at \$21,500.

Again males statistically earned more than females in these groups. For males and females overall, males earned approximately \$27,550 annually and females earned approximately \$25,660 annually. Even when considered within program family groups, males earned more than females statistically in all groups but the allied health group. Males earned approximately \$15,000 more than females in the computer program group and approximately \$12,000 more than females in the human service program group, both of which showed the greatest disparity of the program groups. Within the allied health group there was only one male so this comparison may not be valid.

Question 18: Finally, the mean annual 2002 earnings of the status group of leavers were compared according to the number of hours they completed at WITCC. There were no statistically significant differences in mean annual 2002 wages found between the leavers based on their completed number of hours.

Again, however, males statistically earned more than females. For all males and females, males earned approximately \$28,800 annually and females earned approximately \$23,650 annually. Males earned approximately \$5,000 more than females in this leaver status group. This was similar to the findings in question 17 when comparing 2000 mean annual wages.

Question 12: Again to determine whether educational attainment might make more of a difference if a different analysis of earning was made, question 12 dealt with the difference in full time mean annual 2002 wages between the three status groups. Full

time wages were again defined as working 40 hours a week for 52 weeks of the year at minimum wage. This amounted to approximately \$3,330/quarter for all four quarters of 2002 as referenced in the literature by Friedlander (1996).

When tests were run on these groups there seemed to be a relationship between status groups and mean annual wages for those employed full time during all four quarters of 2002. This time the leaver group had statistically higher mean annual earnings at approximately \$30,800, than the applicant group at approximately \$28,100. But this time that difference was not statistically more than the completer group's mean annual earnings at \$28,800. The effect size of the differences between the leaver and the applicant group was small at approximately \$2,700/year. It seemed that the completers were benefiting from the additional time in the work force and perhaps even from their greater educational attainment.

When gender was a consideration for those with full time earnings all four quarters of 2002, males statistically earned more than females. This was a change from the 2000 group with full time wages in question 10. For males and females overall with full time wages all four quarters of 2002, males earned approximately \$30,700 and females earned approximately \$28,100 annually. The difference between males and females was more in 2002 than in 2000 and statistically significant. Now, in 2002 males statistically earned more than females in all status groups. This difference between the earnings of males and females was seen in all three status groups with the smallest difference between the genders in the applicant group. Within this group of full time applicants, males earned only approximately \$800 more than females.

This overall gender difference was not expected. Literature had indicated that females benefited more from formal education than males (Pascarella, 1999); the researcher had not expected to find this continued disparity between the female and male earnings in all status groups.

Questions 19 & 20: These two questions examined the gain in wages between 2000 and 2002 for those who worked all eight quarters of these two years. The gain scores, as the mean gain in wages was called, were compared between the three status groups (#19) and between the AAS program family groups (#20).

As expected the completers' gain score was significantly more than those of the other two status groups. The completers gained approximately \$9,000 between 2000 and 2002 while the applicants and the leavers gained approximately \$4,000 and \$4,500 respectively. The difference between the completers and the other two status groups was of a small statistical effect.

Laanen (1998) found completers showed the greatest gains three years after college also. His findings supported the notion of the strong positive relationship between gains and educational attainment. Sanchez and Laanen (1998a) compared earnings during the first year out of college to the third year out of college and found that gains were evident across all levels but largest for completers. They found that although positive gains of 6% to 10% were evident for leavers they were not statistically significant. Substantial statistical gains of 25% to 28% were found, however, for diploma and associate's completers. They found completion of a vocational degree greatly increased post college earnings compared to taking some courses. Luan (1996) collected data on

twelve vocational majors at Cabrillo College in California. He found completers reported the highest gains in wages with those earnings increasing over time.

It seemed that there was little effect for gender overall within these gain score comparisons. In other words both males and females gained approximately the same in wages between 2000 and 2002, with females actually gaining more than males in the applicant group by approximately \$1,800. This gain by females in the applicant group offset greater gains by males within the completer and the leaver groups so that there was a comparable gain score overall between the genders.

Question 20: When the greater gain scores of completers were compared within the six different AAS program family groups some interesting results were produced, with both program family and gender producing some statistically significant results. At first glance the gain scores for the allied health AAS program family were the most significant. This gain score from 2000 to 2002 was approximately \$12,500. When it was noted that no males were represented in this family these results acted to skew overall gender results toward the female side. Also within the human services AAS program family, the gain scores were significant but for another reason. Within this group the gain scores were approximately \$2,100 overall. But on closer look it was noted that females in this program family actually had an approximate negative \$250 gain score and males an approximate positive \$5,000 gain score. Also there were differences between the genders in the other four program groups with males earning more than females by \$5,000 to \$9,000 in the business, mechanical, and the computer program family respectively. In the miscellaneous program family only males were represented skewing the male gain scores overall. This miscellaneous program family also had the smallest gain scores at \$3,500.

When taken in combination female gain scores were statistically more than male gain scores by approximately \$1,100. This is wholly attributable to the female gains in AAS allied health programs. Also within the three program groupings of allied health, miscellaneous and human services, because of the large gain score in allied health programs and the small gain scores in miscellaneous and human services programs these differences were very large statistically. Because of the small numbers of individuals in the gender groups within the program families these results should not be inferred beyond these groups to other groups.

Interpretation of Data

Overall the data was interpreted that there was an economic benefit to an individual who attended WITCC. Those students who attended the college (completers and leavers) seemed to benefit financially by that attendance. This could have been due to a number of factors but one of those factors was definitely attendance at WITCC. As a result of these factors they earned more as measured by IWD wage records than non-attendees (applicants). Further, within the first three years of receiving a degree, completers' growth in earnings exceeding that of leavers' and applicants'. Leavers' growth in earnings exceeded that of applicants'. This gain in earnings for the leavers and completers seemed to be equal for both males and females. Both genders benefited about the same extent as measured by gains in earnings over the three years after attendance.

There also was an economic benefit to an individual by attending WITCC, as measured by number of unique employers. This benefit also seemed to be related positively to more "formal" education. Completers worked for fewer employers over the initial three years after completing their education than did leavers and applicants, and

leavers worked for fewer employers over this time than did applicants. This might be a significant economic benefit in the form of health insurance, retirement benefits and other job related benefits like additional education not able to be measured by quarterly wage records in this study. Also because completers seemed to work for employers longer and more reliably, they might actually benefit from more overtime, from steady annual earning increases, and from documentation on a work record or resume leading others to perceive them as having better work skills and habits.

Results from the comparisons made in this study between the degree groups were statistically inconclusive. Because only three years of wage records were available, it was difficult to find conclusive economic differences between the three degree groups of AAS, AA and D. However, by the end of this study quarterly wage records seemed to support current literature findings, which hold that initially diploma completers earned more than AAS and AA completers. But over time AAS completers surpassed diploma completers, further exceeding them in earnings the longer they were in the work force. Also these hold that technical completers (AAS and D) earned more than academic (AA) completers who did not go on to complete a four year baccalaureate degree. Pascarella (1999) found the greatest economic payoffs in the technical and health fields. And also found the returns of an AA degree without a transfer to a four-year college to be uncertain. These results were becoming evident by the final years of this study but additional wage records of these groupings would need to be collected to confirm these findings as conclusive.

Literature had been very vague and inconclusive on the topic of an economic benefit to attending “some” community college coursework until recently. Early studies

led to the belief that high levels of non-completion in community college students could be interpreted that colleges had failed these students. First, most economic studies were conducted only on completers because they seemed to be easier to track. Second, the definition of “leaver” was vague and inconsistent making this group a “hodge podge” of differing educational attainment levels. Third, because so few studies had been done on community college leavers even though their numbers sky rocketed, critics pointed to this low retention rate and used it as fuel to criticize the institutions these students attended. These high levels of non-completion had been interpreted as a failure of community colleges rather than as one of success.

More recent studies, while confirming completion of a degree to be most beneficial financially, found that small amounts of postsecondary education did benefit some individuals, the more “formal” the schooling the better (Grubb, 1999b). Within this current study leavers were clearly defined as individuals who attended only WITCC and no other postsecondary institution within the 1994 to 1999 time period. It was further determined that these leavers did not complete any “formal” program of study but did definitely complete some coursework successfully at WITCC before the end of 1999. These same leavers did not return to any formal educational setting within the next three years when wage records were collected and examined. In other words, these leavers attended and completed coursework at only WITCC.

During every quarter after the first (1/1999) these leavers earned more than the applicants and by statistically significant amounts showing a consistent economic advantage. This economic advantage over the applicant group was evident throughout the study in quarterly earnings and in fewer unique numbers of employers. These findings

show a correlation of greater economic benefit to attending but not completing a community college degree.

This study also showed a disparity in wage earnings between males and females at every level. Males earned more than females within every comparison but two. Those exceptions were in the AAS allied health program field, the “great equalizer” for female completers, and among the applicant group where female gains in earnings were significantly more than males. These findings were in direct contrast to those of Pascarella (1999) who found men with associate degrees to have an average of 18% more in annual earnings over those with a high school diploma and women to have an average of 26% more in annual earnings than their high school counterparts.

Results of this study then indicated a relationship between formal education and a positive economic impact to the Iowa students who attended WITCC. This economic impact led to higher, more consistent wages which in turn could lead to an improved economic impact within the region and the state of Iowa. Because of the size of the overall status groups in this study it is possible to infer some of these results to other Iowa community college students.

Practical Conclusions Drawn in the Context of the WITCC Service Area

Earlier in chapter four it was stated that statistical results might not be the same as practical results. This was explained to point out that statistical findings did not always have practical implications and had to be examined within the context of a practical application of those findings. Within this study, then, a practical context must be defined.

Table 5.1 presents hourly wage information gathered and disseminated from the Iowa Workforce Development Department, which can give this study a regional context

in which to view the practical significance of the findings from it. A great deal of caution must be taken not to use this regional data as a comparison with the data from the study. They are not comparable data elements. The controls taken within the present study were not present in the regional contextual data.

First, in the present study of the economic impact of an education at WITCC, only individuals 30 years of age and younger were included. In 2002 these individuals were relatively new to the workforce, many in their first jobs and young in comparison to the regional data. The regional data from IWD included all ages, even 40 and 50 year olds who were veterans to their jobs, who had many years in the workforce and who were at the top of the salary scale; or were the very individuals contained in this study. Second, in the Iowa Region 12 data, all education levels were represented. These hourly wages might be earned by individuals with less than a high school diploma or by individuals with an advance degree. Third, all occupations were included in the regional data. These wages might have been earned by a production worker or by plant owners. In the present study some of these same disparities in workers might exist within the leaver status group but most probably did not exist yet within the completer and the applicant status groups. In both cases, however, one similarity did exist. With both the regional data and with the data in this study, it was impossible to know if these were part time or full time wages. They were simply hourly wages and were inclusive of all wages paid.

In other words, the data from the present study had a much narrower field of participants than the data from the regional Iowa Workforce Development Department that is used as a context to bring some practical application to the study data. Much caution should be taken not to use the regional data and the study data as a comparison.

The regional data was merely offered to give a practical context for the wage findings of the present study. Although these limitations existed it was the best contextual data available at this time and allowed a rough context in which to relate the findings from the present study.

Table 5.1

Mean and Median Hourly Wages: All Occupations WITCC Service Area

WITCC Service Area		
Location Name	Mean Wage	Median Wage
Cherokee County	\$13.37	\$11.88
Crawford County	\$13.27	\$12.15
Ida County	\$12.66	\$10.72
Monona County	\$12.68	\$ 9.30
Plymouth County	\$13.88	\$12.11
Woodbury County	\$13.47	\$11.22
Iowa Region 12 (6 Counties)	\$13.47	\$11.38
Sioux City MSA	\$13.52	\$11.23
Iowa Statewide	\$14.48	\$12.00

Source: Iowa Wage Survey 2002, Iowa Workforce Development

Table 5.1 reports the mean and median hourly wages of all workers in the six county regions in Iowa served by WITCC. The average of this six-county area is represented in the “Iowa Region 12 (6 Counties)” line, which has been indicated in bold print. The median hourly wages in Table 5.1 must be converted to median quarterly wage amounts and mean annual 2002 wage amounts for any contextual meaning with study data. This was done by multiplying the median or mean hourly wage by 40 hours per week and then either multiplying that median weekly wage by 13 to come up with a quarterly median wage or by 52 weeks to come up with an annual mean earning. This

result for Iowa Region 12 equaled approximately \$5,900 in median quarterly earnings and approximately \$28,000 in mean annual earning for 2002.

During the final quarter of 2002 (4/2002) completers earned approximately \$6,380 in median quarterly wages. Leavers earned approximately \$5,970 in median quarterly wages and applicants earned approximately \$5,140 in median quarterly wages. The completers seemed to rank above the regional comparison in median quarterly earnings, the leavers were equal to the regional averages and the applicants seemed to rank below the regional averages. Within this quarter the completers in the study earned 24% more than the applicants in median quarterly wages and the leavers in the study seemed to earn 16% more than the applicants. These quarterly wages are illustrated in the column titled "Median Quarterly 2002 Wages" of Table 5.2.

Table 5.2

Study Findings within the Regional Context

Group	Quarterly 2002 Median Wages (4/2002)	Annual 2002 Mean Wages (all wages)	Mean Annual 2002 Wages (full time)
Area 12	\$5,900	\$28,000	
Completers	\$6,380	\$25,740	\$28,800
Leavers	\$5,970	\$25,875	\$30,800
Applicants	\$5,140	\$22,280	\$28,100

During the final year (2002) of this study, two annual mean wage comparisons were calculated. This was done because it was known that many individuals in the region held jobs simultaneously in Iowa and in an adjoining state because of the proximity of jobs available in Iowa, Nebraska and South Dakota within the Siouxland region.

The present study compared mean annual wages of all individuals with some Iowa wages in the study, no matter how large or small, all four quarters of 2002; and also

compared mean annual wages of only those individuals who were determined as working full-time (\$3,330/quarter) all four quarters of 2002. These mean annual wage amounts were different and are represented in the middle and in the far right hand column of Table 5.2 respectively.

Annual mean Iowa wages of all individuals with some wages, which is represented in the middle column of Table 5.2, would most probably be inclusive of those who held jobs in the different states as well as in Iowa. This amount might not reflect the total true annual earnings of those individuals. However, this context would probably be the most consistent in both the IWD data used within the present study and the Iowa Wage Survey data used to frame the context for the WITCC region. No control was taken to determine part time or full time workers in either data set. Again it would not be proper to make comparisons between the data from this study and the data from IWD that gave a regional picture. But by using the regional data as a context within which to set the results of this study the validity of the study data is seen in a relative context and validated.

Another context that could be used to determine the practical significance of this study's results, is the context determined for WITCC by CCbenefits Inc. in its recent economic impact study completed for the college. In a summary compiled by CCbenefits, Inc. for Western Iowa Tech Community College, it stated, "Studies demonstrate that education increases lifetime earnings. The average annual earning of students with a 1-year diploma is \$29,779 or 16% more than someone with just a high school diploma. The average earning of someone with an Associate Degree is \$35,021 or 36.5% more than a student with just a high school diploma or GED (Christoffersen & Robinson, 2002)."

Within the present study when quarterly median wages from 4/2002 were used to compare differences between the three main status groups, completers earned 24% more than applicants with only a high school degree, and leavers earned 16% more than applicants. When quarterly median wages from 4/2002 were used to compare between the three degree groups and those of the applicants in the present study, the following results were produced: applicants earned approximately \$5,140 in median quarterly wages during 4/2002, AA completers earned approximately \$5,170 in median quarterly wages during the same quarter, AAS completers earned approximately \$6,560 and diploma completers earned approximately \$6,010. Converting these to annual earnings by multiplying them by four produces \$20,560 annually for applicants, \$20,680 annually for AA completers, \$26,240 annually for AAS completers and \$24,040 annually for diploma completers. Comparing the earnings of these applicants with those of the AAS completers produced a 27.6% higher earning by the AAS completers than the applicants. Comparing these applicant figures with those of the diploma completers produced a 16.9% higher earning by the diploma completers than the applicants.

Any direct comparison between the CCbenefits, Inc. study results and this study's results could not be supported but again the validity of the present study data results were supported within this economic impact study context. If AAS completer earnings continued to increase over applicant earnings as was observed during the present study, it would be feasible that their earnings could be supported within the CCbenefits, Inc. study context results of Associate's completers' earnings being 36.5% more than a high school graduate. It is also feasible that the diploma completers would surpass the predictions of 16% made by the CCbenefits, Inc. study, since the present study showed diploma

graduates at 16.9% higher earnings than high school graduates at the end of this study. Also leavers within the present study were already earning 16% above the applicant status group. These benefits of some community college attendance add a completely new perspective to the CCbenefits, Inc. study.

The CCbenefits, Inc. study goes on to state, "After leaving college, the average WITCC student will spend 44.3 years in the workforce. The student who leaves with a two-year college degree will earn \$414,059 more than someone with just a high school degree or GED (Christoffersen & Robinson, 2002)." Using just the completer and applicant median quarterly wages from 4/2002 and assuming those wages were earned by a 30 year old who had roughly 32 years remaining in the workforce, a \$1,600 difference was calculated between the completer and applicant quarterly wages in the present study for 4/2002. By multiplying this by four quarters an annual difference between the applicant and completer in this study of \$6,400 was calculated. By then multiplying this by 32 additional years in the workforce until retirement, an approximate total of \$205,000 in lifetime earnings could be realized by the completer over the applicant with a high school diploma at the present salary rate. Additional research over a longer time would have to be conducted to determine if the context set by the CCbenefits, Inc. economic impact study was relative to the present study. This could be feasible but it was impossible to determine if this context was valid to the present study.

Implications for Further Research

This study had many implications for further research. Some of the major ones from the researcher's perspective will be listed here.

First and foremost, this research proved the validity, value and relative ease of the use of IWD quarterly wage records as a workforce training research tool. These records had been used for many years in Iowa in a limited capacity to track workforce training initiatives. They had been used as an assessment tool for Federal Workforce Investment Act funds in training displaced workers, in training welfare recipients and in other categorical workforce training programs. Also the Iowa Department of Education (IDE) had used these records to track employment of community college completers for the purposes of meeting Federal Carl D. Perkins Vocational Technical Education Act accountability measures. The IDE had not, however, used the wages reported within these records. They had used only the presence of wages to report employment status. This present study gave further applications for these wage record data and supported the premise that it was time to expand the use of these records to other workforce training initiatives; and further, that it was time to explore the use of additional components of these records (such as wage information, use of employer industry grouping information, location information of the employer, etc) to expand the data, knowledge, and understanding of what education in Iowa is doing to benefit its workforce economies. This information could then be used to improve workforce programs in Iowa, not only for Federal accountability, but also to better the livelihoods of the workers, to improve the services offered to Iowa businesses, and to better serve the many publics touched by them. These records could be used to provide data to improve the efficiency and the effectiveness of training and education for many more workforce initiatives.

The use of these IWD wage records could serve not only as a useful tool for community college programs but also for all postsecondary educational programs in

Iowa. Quarterly wage record use within Iowa and in cooperation with other states in the United States, could give the public and key policy makers a tool whereby to measure the economic impact of different educational programs thus helping in decision making for those who will enter these programs and helping in decision making for those who support the various educational initiatives. This data could build a case for different programs and lend further evidence of support when a choice among them is necessary.

A wider, more extensive use of these wage record data could also prove or disprove some of the implications of this study beyond just one community college in Iowa. Because WITCC is located in Sioux City, Iowa, which is on the uppermost western border of Iowa and in direct proximity to two other states, it was most probable that the full benefits of a community college education were not revealed in this study. WITCC was probably not the best community college in Iowa in which to conduct this study. Too many inferences had to be made as to whether individuals were working across state lines or crossing back and forth between state borders in different job markets. A community college located more in the central part of Iowa would most likely capture more reliable research information that would reveal better economic impact data as to the extent a community college education impacts the lives of its citizens, its various regions and the state of Iowa.

Indeed because different regions of the state are unique in their own right it might be beneficial to conduct research using IWD wage records at all of the 15 community colleges in Iowa so a greater benefit could be gained through cooperation and comparison across the entire state community college network. This would allow a more valid analysis of the economic impact of different programs and degrees at the community

colleges resulting in better information to inform students of their options before enrolling in specific programs. This work with a larger number of completers from similar programs would allow a greater volume of economic information for career guidance purposes and for program improvement purposes. These wage records could be a viable tool, along with many other measures already gathered, in which to improve educational programs and in which to furnish better information to the publics whom they serve. This information could be used both at the local level and at the state level for many different purposes. Hutchison, Kline, Mandt, and Marks (1998) recommended that UI wage data be gathered at both the local and state level so a full picture of data to justify new program development and to check the usefulness of state data would be possible. Further, earning data could then be used to satisfy Federal accountability requirements at the state level, but also to convince students and parents of the attractiveness of changing traditional fields and entering emerging occupations.

Additionally a longer period of study time than the 16 quarters used in this study would be desirable. If wage record data could be accessed on a continuous basis, completers and leavers could be tracked over a greater period of time after leaving the college. At the end of this study completers were just beginning to earn more than leavers. It would be important to know if this gain in wages continued over the next three years. Also it would be useful to know if the AAS completers continued on course to earn more than their diploma counterparts. Grubb (Grubb, 1999a) showed that the benefits of completing a degree at a community college materialized within three years of leaving education, but he also found that the long-term effects of this education may be greater

over time. If continued wage data could be studied this and many other factors could be determined.

Throughout this study individuals dropped in and out of the workforce. It was impossible to decipher what caused this. Some workers could have continued to live in Iowa but exited the job market. Some of them could have become self-employed. Some of them could have departed the state for “greener pastures” to find employment that was more suited to their needs or that furnished higher wages. Retention of the workforce and continuous employment in Iowa could also be studied by an expansion of the use of these wage records.

Further information could be gathered on those workers who remain in Iowa to see if students who attended colleges worked within their program of study. If these students did work within their program of study it would be interesting to see if they earned higher wages than those who did not. Also it would be possible to determine if the programs of study were preparing the necessary workers for the industries available within the region. These patterns and others could be discovered through the expanded use of wage record data and from cooperation developed across state lines with other wage record systems. This data could prove very beneficial to economic development efforts of regions, of the state, and could improve efforts to retain and grow a workforce which was skilled and robust.

Throughout this study the disparity of earnings between males and females was apparent. Males continuously were shown to earn more than females in this study. These findings were a grave concern to the researcher, a woman employed in the regional workforce. An expansion of the use of wage record data might help further analyze why

this disparity occurred. Was it because females entered lower paying careers? Was it due to the fact that women were being paid less to do the same job as men while completing the same tasks? Was it because some women needed to work part time because of childcare or other needs? Until better data is available no knowledge will exist as to the many reasons of this disparity.

Wage earning data could be used to better educate students and parents of the attractiveness of changing from the traditional fields and of entering new and emerging occupations. It could be very useful to assist at the local level in recruitment, career planning, program review, resource allocation, and assisting students with employment. Also a further assessment of achieving higher grades and a possible impact on earnings might prove to be an incentive to students to apply more effort to learning while in college. These wage data and their many applications would find many local and state applications once access to them was ensured, standardized, and used over a period of extended time.

REFERENCES

- All states slammed by revenue loss. (2002, May 26). *The Sioux City Journal*, p. A3.
- Andrews, W., & Lillibridge, F. (1990). *El Paso Community College economic impact study*. El Paso, TX: El Paso Community College. (ERIC Document Reproduction Service No. ED322979)
- Azari, C. E. (1996). Measuring student outcomes in postsecondary vocational education: Using wage record data. *Community College Review*, 24, 37-51.
- Bailey, T. R. (2003a). Community colleges in the 21st century: Challenges and opportunities. *Community College Research Center Brief*, 15, 1-4.
- Bailey, T. R. (2003b). Director's column. *CCRC Currents: Community College Research Center*, April, p.1.
- Baldwin, A., & Brann, H. I. (1997). *The economic impact of Miami-Dade Community College on the local Dade County economy*. Miami, FL: Miami-Dade Community College. (ERIC Document Reproduction Service No. ED 422 997)
- Blair, L. M., Finn, M. G., & Stevenson, W. (1981). The returns to the associate degree for technicians. *Journal of Human Resources*, 16, 449-458.
- Blong, J. (1982). *Iowa economic impact study*. Unpublished study conducted for the Merged Area Superintendent's Association, and Iowa Association of Community College Trustees, Office of Community College Affairs, The University of Iowa, IA.
- CCbenefits. Online at <http://www.ccbenefits.com/AboutCCB/AboutStart.htm>
- Caffrey, J., & Isaacs, H. (1971). *Estimating the impact of a college or university on the local economy*. Washington, DC: American Council on Education.
- Caswell, J. (1988). *A study to determine desirable strategies for legislative advocacy*. Dallas, TX: Dallas County Community College District. (ERIC Document Reproduction Service No. ED 301 231)
- Christophersen, K., & Robison, M. H. (2000). *The socio-economic benefits generated by community colleges. Illustrated with a case study of Eastern Iowa Community*

- College District case study in the state of Iowa.* Economic Modeling Specialists Inc.
- Christophersen, K., & Robison, M. H. (2001). *The socio-economic benefits generated by Walla Walla Community College, state of Washington.* (Online) CCBenefits Inc.: <http://www.ccbenefits.com>
- Christophersen, K., & Robison, M. H. (2002). *The socio-economic benefits generated by Western Iowa Tech Community College, State of Iowa.* CCBenefits Inc.
- Cohen, C. M., & Brawer, F. B. (1996). *The American community college.* San Francisco, CA: Jossey-Bass, Inc.
- Cohen J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Elliot, D. S., Stanford, L. L., & Meisel, J. B. (1988). Measuring the economic impact of institutions of higher education. *Research in Higher Education*, (28) 1, 17-33.
- Foote, E. (1998). Sources and information: Economic benefits of a community college degree. *New Directions for Community Colleges*, 104, 103-111.
- Forty states report budget shortfalls for 2002 fiscal year. (2002, April 1). *Higher Education and National Affairs*, 51, 3.
- Friedlander, J. (1996). *Using wage record data to track the post-college employment rates and wages of California community college students.* Santa Barbara, CA: California Community Colleges. (ERIC Document Reproduction Service No. ED 390 507)
- Garms, W. (1977). *Financing community colleges.* New York, NY: Teachers College Press.
- Gillum, F. E. (2001). *Legislative perceptions of the economic impact of Casper College on the state of Wyoming, Natrona County, and its students: An examination of the reality of those perceptions.* Unpublished doctoral dissertation, Colorado State University, Fort Collins.
- Gracie, L. W. (1998). Measurable outcomes of workforce development and the economic impact of attending a North Carolina community college. In J. R. Sanchez & F. S. Laanan (Eds.), *Determining the economic benefits of attending community college* (No. 104, Winter Ed., pp. 53-60). San Francisco, CA: Jossey-Bass Publishers.
- Grosset, J., Hawk, T., Irwin, B., & Obetz, W. (1995). *Economic impact characteristics of the Community College of Philadelphia. Institutional Research Report No. 87.* Philadelphia, PA: Philadelphia Community College. (ERIC Document Reproduction Service No. ED 411 932)

- Grubb, W. N. (1996). *Working in the middle*. San Francisco, CA: Jossey-Bass Inc.
- Grubb, W. N. (1999a). The economic benefits of pre-baccalaureate education: Results from state and local studies. *Community College Research Center Brief, 3*, 1-4.
- Grubb, W. N. (1999b). The economic benefits of sub-baccalaureate education: Results from national studies. *Community College Research Center Brief, 2*, 1-8.
- Head, R. B. (1994). *The economic impact of Piedmont Virginia Community College upon its service region* (Report No. 2-94). Charlottesville, VA: Office of Institutional Research and Planning. ERIC Document Reproduction Service No. ED 368 437)
- Hutchison, K. R., Kline, S. S., Mandt, C., & Marks, S. L. (1998). Partnering to identify and support high-wage programs. In J. R. Sanchez & F. S. Laanan (Eds.), *Determining the economic benefits of attending community college* (No. 104, Winter Ed., pp. 61-76). San Francisco, CA: Jossey-Bass Publishers.
- Iowa Code. Online at <http://www.legis.state.ia.us/IACODE/2003/260C/1.html>
- Iowa Legislative Fiscal Bureau. (2003, January 16). *State of Iowa General Fund Budget FY 2002 through FY 2003* (Issue Review). Des Moines, Iowa: Prouty.
- Jarosik, D., & Phelps, L. A. (1992). *Empowering accountability for vocational-technical education: The analysis and use of wage records*. Berkley, CA: National Center for Research in Vocational Education. (ERIC Document Reproduction Service No. ED 351 527)
- Johnson County Community College (2001). *The economic impact of Johnson County community college on Johnson County*. Overland Park, KS: Office of Institutional Research. (ERIC Document Reproduction Service No. ED 463 034)
- Jurado, E. A., & Wolff, W. W. (1982). *Expansion of the North Carolina unemployment insurance individual wage report to include occupational detail: A study of a consolidated approach to occupational data collection*. Raleigh, NC: North Carolina State Occupational Information Coordinating Committee. (ERIC Document Reproduction Service No. ED 230 711)
- Kaltenbach, J. C. (1979). *An extension of economic impact techniques to the public community college*. Unpublished doctoral dissertation, Saint Louis University, St. Louis, MO.
- Kane, T. J., & Rouse, C. E. (1995). Labor-market returns to two- and four-year college. *The American Economic Review*, 85, 600-614.

- Kane, T. J., & Rouse, C. E. (1999). The community college: Educating students at the margin between college and work. *Journal of Economic Perspectives*, 13, 63-84.
- Kinnick, M. K. (1982). *Oregon Community College economic impact study: A guidebook*. Gresham, OR: Mount Hood Community College. (ERIC Document Reproduction Service No. ED 222 233)
- Kiser, C. (1988). *The economic role of Central Community College: Impact on the area communities*. Grand Island, NE: Central Community College. (ERIC Document Reproduction Service No. ED 301 257)
- Laanen, F. S. (1998). Descriptive analysis of students' post-college earnings from California Community Colleges. In J. R. Sanchez & F. S. Laanan (Eds.), *Determining the economic benefits of attending community college* (No. 104, Winter Ed., pp. 77-88). San Francisco, CA: Jossey-Bass Publishers.
- Lazarick, L. (2001, Winter). A measure of success: ACCT unveils new economic model that puts solid numbers on the value of community colleges. *Trustee Quarterly*, 10-14.
- Luan, J. (1996). *Using wage record data to measure the success of students in the labor market: A longitudinal study of former Cabrillo College occupational education students' employment and wages (Cohorts 1990 and 1991)*. Aptos, CA: Cabrillo College. (ERIC Document Reproduction Service No. ED 405 938)
- Misery has company. (2002, May 20). *The Des Moines Register*, pp. A6.
- Mundhenk, R. T. (2000). *Institutional effectiveness and unemployment insurance data* (White Paper). Washington, D.C.: American Association of Community Colleges.
- National Commission for Employment Policy. (1992). *Using unemployment insurance wage-record data for JTPA performance management* (GPO No: Y e.Em 7/3:10/91-07). Washington, D. C.: U. S. Government Printing Office.
- New budget year brings same old worries to states. (2002, July 21). *The Sioux City Journal*, p. A11.
- Oakland Community College (1992). *Economic impact study, 1992*. Farmington, MI: Oakland Community College. (ERIC Reproduction Service No. ED 353 012)
- Pascarella, E. T. (1999, June/July). New studies track community college effects on students. *Community College Journal*, 8-14.

- Pfeiffer, J. J. (1994). *Student follow-up using automated record linkage techniques: Lessons from Florida's Education and Training Placement Information Program (FETPIP)*. Florida: Education and Training Placement Information Program. (ERIC Document Reproduction Service No. ED 371 813)
- Pencavel, J. (1991, Fall). Higher education, productivity, and earnings: A review. *Journal of Economic Education*, 330-359.
- Peterman, D. (1999). *Measuring the economic benefits of community college attendance using community college, unemployment insurance and state agency data* (ERIC Digest). Washington, D.C.: Office of Educational Research and Improvement. (ERIC Document Reproduction Service No. ED 433 076)
- Romano, R., & Herbert, N. (1985). *The economic impacts of the college on the local economy*. Binghamton, NY: Broome Community College. (ERIC Document Reproduction Service No. ED 253 293)
- Romano, R. M. (1986). What is the economic payoff to a community college degree? *Community/Junior College Quarterly*, 10, 153-164.
- Rouse, C. E. (1992). The other college: The economic benefits of community colleges. (Doctoral dissertation, Harvard University, 1992). *Dissertation Abstracts International*, 53, 1601.
- Ruppert, S. S. (2001). *Where we go from here: State legislative views on higher education in the new millennium*. (On-line) National Education Association <http://www.nea.org/he/leg-news/gofrom.pdf>
- Ryan, G. J. (1983). *Handbook for conducting a study of the economic impact of a community college*. Lincroft, NJ: Brookdale Community College. (ERIC Document Reproduction Service No. ED 233 755)
- Ryan, G. J. (1985). A shortcut to estimating economic impact. *Community/Junior College Quarterly*, 9, 197-214.
- Saleh, A. M. (1988). The local economic impact of alternative state budget reductions for selected Texas community colleges (Doctoral dissertation, University of North Texas, 1988). *Dissertation Abstracts International*, 49 (06A), 1354.
- Sanchez, J. R., & Laanan, F. S. (1998a). *Assessing the post-college earnings of students: Benefits of attending California community colleges-Methods, analysis, and implications* (AIR 1998 Annual Forum Paper). California: AIR Forum. (ERIC Document Reproduction Service No ED 422 822)
- Sanchez, J. R., & Laanan, F. S. (1998b). *Determining the economic benefits of attending community college*. San Francisco, CA: Jossey-Bass Publishers.

- Selgas, J. W. (1973). *The impact of the college on the local economy* (Research Report No. 11). Harrisburg, PA: Harrisburg Area Community College. (ERIC Document Reproduction Service No. ED 072 779)
- Seppanen, L. (1994). *Job placement rates for graduates of Washington community and technical college vocational programs* (Research Report No. 94-7). Olympia, Washington: Washington State Board for Community and Technical Colleges. (ERIC Document Reproduction Service No ED 382 255)
- Seppanen, L. (1995). Linkages to the world of employment. *New Directions for Institutional Research*, 87, 77-91.
- Song, L. (1993). *The economic impact of Dutchess Community College*. Poughkeepsie, NY: Office of Planning and Institutional Research. (ERIC Document Reproduction Service No. ED 363 672)
- States face new budget troubles as tax returns come in lower than expected. (2002, May 5). *The Sioux City Journal*, p. A2.
- Stevens, D. W. (1992). *Measuring employment outcomes using unemployment insurance wage records*. Washington, D. C.: Research and Evaluation Associates, Inc. (ERIC Document Reproduction Service No. ED 354 345)
- Stokes, K., & Coomes, P. (1998). The local economic impact of higher education: An overview of methods and practice. *AIR Professional File*, 67, 1-13.
- Stokes, K., & Graney, C. M. (2000). *The impact of Jefferson community and technical colleges on the metropolitan Louisville economy*. Jefferson Community College.
- Zeiss, P. A. (1986). *The economic impact of Pueblo Community College, 1985-86*. Pueblo, CO: Pueblo Community College. (ERIC Document Reproduction Service No. ED 275 381)
- Western Iowa Tech Community College fact book. Online at http://www.witcc.com/research/reports/2001-2002_fact_book.pdf
- Western Iowa Tech Community College placement report. Online at <http://www.witcc.com/research/reports/placement2001-02.pdf>