DOCUMENT RESUME

ED 393 997 CE 071 298

AUTHOR Stevens, David W.
TITLE The School-to-Work Transition of High School and Community College Vocational Program Completers: 1990-1992. EQW Working Papers WP27.
INSTITUTION National Center on the Educational Quality of the Workforce, Philadelphia, PA.
SPONS AGENCY Office of Educational Research and Improvement (ED), Washington, DC.
PUB DATE 94
CONTRACT R117Q00011-91
NOTE 114p.
PUB TYPE Reports - Research/Technical (143)

EDRS PRICE MF01/PC05 Plus Postage.
DESCRIPTORS *College Graduates; Community Colleges; Educational Research; Educational Trends; *Education Work Relationship; Employment Level; Employment Patterns; *High School Graduates; High Schools; National Surveys; *Outcomes of Education; Research Methodology; Salary Wage Differentials; Tables (Data); Trend Analysis; Two Year Colleges; *Vocational Education
IDENTIFIERS Colorado; Florida; Missouri; Washington

ABSTRACT

The school-to-work transition of high school and community college vocational program completers in 1990-1992 was examined by analyzing administrative records and employment and earnings data of vocational program completers from state education agencies in Colorado, Florida, Missouri, and Washington. A consistently high percentage of vocational program completers at both the high school and postsecondary levels continued an uninterrupted affiliation with the same employer during the bridge period encompassing their last months in school and first few months after leaving school; however, substantial movement between/among employers during the first years after the former students left school was observed. Former students who continued with the same employer through the bridge period were consistently found to have higher earnings than their classmates while they were still in school, shortly after leaving school, and at the end of the postschool reference period. It was concluded that knowledge about a former student's occupational assignment within a place of employment is not needed to predict that employee's earnings; rather, awareness of the person's industry affiliation is an acceptable substitute for that purpose. (Forty tables/figures and 86 endnotes are included. Appended are additional information on the wage-record components examined and calculation of a full-time earnings threshold amount.) (MN)

The School-to-Work Transition of High School and Community College Vocational Program Completers: 1990-1992

by

David W. Stevens

Executive Director
The Jacob France Center
Merrick School of Business
University of Baltimore

"The School-to-Work Transition of High School and Community College Vocational Program Completers: 1990-1992"
EQW Catalog Number: WP27

The work reported herein was supported by the Education Research and Development Center Program, agreement number R117Q00011-91, CFDA 84.117Q, as administered by the Office of Educational Research and Improvement, U.S. Department of Education. The findings and opinions expressed in this document do not reflect the position or policies of the Office of Educational Research and Improvement or the U.S. Department of Education.

Contents

Acknowledgments

Dr. Jinping Shi, Senior Statistician, and Debra Warren, former Database Manager/Programmer/Analyst for The Jacob France Center, Merrick School of Business, University of Baltimore, are acknowledged as co-authors, with the single exception that they cannot be held responsible for any interpretive statements that are made. Until July 1993, Debra Warren had full responsibility for data acquisition and processing, which required her to learn the nuances of administrative data that had been acquired from 14 Federal and state agencies. She designed the database architecture and created the initial analytical datasets, which she and Dr. Shi then used to produce early descriptive tabulations and statistical estimates. Warren's successor, Liping Chen, collaborated with Dr. Shi in the final updating and refinement of the database. Lyn Zhao prepared all of the tables and figures that are included in this report. Kristy Wilson Axness managed the editorial and production stages of the report's final assembly. Professor Julia Lane, who is in the Economics Department at The American University, also contributed to the analytical stages of the research.

This research could not have been conducted without the extraordinary dedication of the state agency personnel who epitomize the traditional value of "public service." Gratitude is expressed to Dr. Gregory P. Smith, former Coordinator of Institutional Research and Evaluation, Colorado Community College & Occupational Education System, and currently Vice President of Information Resources and Planning at the Community College of Denver, and his former colleague Jerry Lilliard; Dr. James Harris, Director, Colorado Occupational Information Coordinating Committee; Earl Hughes, Data Processing Coordinator, Colorado Department of Local Affairs; Jay J. Pfeiffer, Director, Florida Education and Training Placement Information Program, and his colleagues Duane Whitfield and Kelly Ungiaub; Dr. John R. Wittstruck, Associate Commissioner, Policy Analysis and Data Services, Missouri Coordinating Board for Higher Education; Allan Franklin, former Director, Missouri Division of Employment Security, and his colleagues Kenny Distler, Kay Raithel and Tom Righthouse; Loretta Seppanen, Manager for Research & Analysis, Washington State Board for Community and

Technical Colleges; and Jeffrey J. Jaksich, Manager, Special Studies Unit, Labor Market & Economic Analysis Branch, Washington State Employment Security Department.

Dr. James Maxey, Assistant Vice President and Senior Research Scientist, Institutional Services, Research Division, American College Testing Corporation, and Merine Farmer, Director of Research Services in ACT's Research Division, have also provided professional cooperation above and beyond the requirements of their organization.

Three people in the U.S. Department of Education have provided exemplary management support and professional advice to advance the quality and relevance of my research on this topic. David Goodwin, Program Analyst in the Department's Office of the Undersecretary, Planning and Evaluation Services, Postsecondary Education Division, recognized the value of administrative records for research of this type and managed the December 1992 publication of Measuring Employment Outcomes Using Unemployment Insurance Wage Records, which I co-authored with Peggy A. Richmond, Joseph F. Haenn, and Joan S. Michie. David Boesel, Director of the National Assessment of Vocational Education in the Office of Research within the Department's Office of Educational Research and Improvement, has been a steadfast supporter of this research project and a meticulous guide to advance the ultimate relevance of the research findings for practical legislative and management purposes. Dr. Charles Masten, an economist in the Office of Research, accepted project oversight responsibility shortly before initial results were provided to the National Assessment. His diligence and research competence and intuition have been invaluable assets through the six-month "stretch drive" to accomplish what appears in this monograph.

Finally, Nevzer Stacey, the Office of Educational Research and Improvement project officer for the University of Pennsylvania's National Center on the Educational Quality of the Workforce, and Robert Zemsky, Jo Anne Saporito, and Margaret R. Hoover—my management team at the National Center—have shepherded this project along in as unobtrusive and competent a manner as any researcher could wish for.

Executive Summary

For more than a century, the nation's agenda has been concerned with the accountability of vocational education programs. This monograph seeks to advance public understanding of one important aspect of such accountability—early employment and earnings outcomes for former students in public high school and postsecondary vocational education programs. The findings that appear here complement and refine previous contributions in two ways. The paper documents employment and earnings profiles through the end of 1992 for former students in high school and postsecondary vocational education programs who completed their studies during the 1989-90 or 1990-91 school year, and it also investigates the research implications of interstate differences in data element definitions. Both facets of the monograph should be of interest to elected officials, school administrators, and members of the research community, who struggle to interpret a profusion of data that are often ill-suited to answer any particular query.

Administrative records were acquired from state education entities in Colorado, Florida, Missouri, and Washington, each of which maintains a statewide management information system, and from the state employment security agency in each of these states. These administrative records, along with 1990 Census of Population five-percent Public Use Micro Sample data for each of the four states, ACT assessment records for students who participated in the assessment activity at a Colorado site, and survey data collected by Florida's Education and Training Placement Information Program and by Washington's State Board for Community & Technical Colleges, now comprise a multi-state consolidated database. Agency-specific agreements with each of the four states provide for future updating of this database.

The consolidated database contains quarterly employment records that provide comprehensive documentation of each former student's employer and industry affiliations and earnings beginning while they were still in school and extending through the end of

1992. This permitted investigation of the incidence of continued employment with the same business through the bridge period (i.e., the last few months while a former student was still in school and the early years of their employment after leaving school); analysis of labor market churning; plotting of the levels and trajectories of earnings growth paths during the reference years; and examination of the association of training-related employment and a former student's earnings.

The analysis answers four questions. The first is "What relationships exist among concurrent work and schooling, the ease of transition from school to work, and the stability of a former student's affiliation with their first employer after leaving school?" The answers to the multiple parts of this question are that a consistently high percentage of vocational program completers, at both the high school and postsecondary levels, continued an uninterrupted affiliation with the same employer through the bridge period, which challenges the traditional concept of a transition *from* school *to* work; that those who sustained this relationship through these bridge months also stay longer with their first employer after leaving school (considering only the post-school part of this affiliation) than do their classmates who found new jobs after leaving school; and that those who persisted with an employer through the bridge months were less likely than their classmates to have moved from one employer to another during one-and-a-half and two-and-a-half year reference periods. Together these findings document the importance, when vocational education's performance is investigated, of accounting for employment status both before and after a student leaves school.

The second question addressed is "What patterns of repeated employer-to-employer mobility are revealed?" The analysis found substantial movement between and among employers during the first years after students left school. Completers of high school vocational programs exhibit higher rates of churning (i.e., movement between employers) than do completers of community college vocational programs. There is no consistent difference in churning pattern between completers of vocational programs and their classmates who completed a non-vocational curriculum. Further, males are more likely than their female classmates to have changed employers during the reference years after leaving school.

The third question addressed is "How are these combinations of concurrent and initial post-school employment related to the level and growth-path of a former student's earnings?" Former students who continued with the same employer through the bridge period were consistently found to have higher earnings than their classmates while they were still in school, shortly after leaving school, and at the end of the post-school reference period (October to December 1992). The interplay of a former student's sex, program of study, continuing education, and full-time versus part-time employment status clouds an attempt to offer a definitive interpretation of these earnings profiles. Similarly, the independent and joint contributions of credit hours and credentials received to an explanation of observed earnings differences are difficult to distinguish.

The fourth question addressed is "How important is knowledge of the relationship between a former student's vocational education program and subsequent occupational classification as a factor in explaining earnings differences?" The evidence provided indicates that knowledge of a former student's occupational assignment is not needed to predict that employee's earnings. Awareness of a former student's industry affiliation is an acceptable substitute for this purpose;

this information is available in each state's administrative records.

These findings reflect a pervasive strength in the nation's public vocational education systems. Former students who have completed vocational programs in public high schools, area vocational-technical schools, technical colleges, and community colleges find and keep jobs, and their annual earnings are often higher in the early years after leaving school than are the earnings of their classmates who completed a non-vocational curriculum.

Acknowledgment of this pervasive strength emphasizes the belief of predecessors that public education in the United States is a heterogeneous enterprise. Each submission of supporting evidence to the court of public opinion can be countered with examples of difference—or an absence of difference—that challenge the endorsement of systemic vigor. Substantial separation of the sexes within vocational programs persists, as does segregation of special populations, which results in early and sustained differences in earnings. Completers of vocational programs in public high schools earn more than their non-vocational classmates, but members of either group who do not continue their education at the postsecondary level are in clear jeopardy of failing to clear the hurdle of economic self-sufficiency through employment.

Mobility, seen as a key to advancement, is often touted as a fundamental strength of the U.S. economy. Unsettling evidence about the accuracy of this cornerstone of national pride is revealed here—at least the question of whether this privilege is available to those who are leaving school in the 1990s. The analysis illustrates the widening chasm between a rising earnings path for those who persist with a particular employer and the level trajectory of earnings for those who exhibit a pattern of repeated movement between employers.

As distinctions between vocational and academic curricula fade, coupled with a blurring of the definition of an occupation, it is pertinent to ask: "What facets of the educational enterprise should be related to what competency requirements in the workplace?" The emerging modular approaches to competency certification promise to replace the traditional notion of a vocational program. This will exacerbate the difficulty of aligning school offerings with employer requirements in a practical way. The sensitivity of employer requirements to changing market conditions multiplies the difficulty that is encountered in trying to carry out this alignment. Together, these forces provide an incentive to place greater reliance on the use of administrative records that provide only industry affiliation information (not occupational information) to document employment and earnings outcomes, and they diminish the relevance of costly—and often flawed—measures of *relatedness* for vocational education performance measurement purposes.

The next phase of the author's research program on this topic will add survey-based information about on-the-job education, training, and performance to the multi-state consolidated database of information about former students in the nation's public high school and postsecondary vocational education programs. This refinement will support a pioneering analysis of complementarities between competencies acquired in school and human capital enhancement in the workplace and of circumstances in which worksite learning can substitute for school offerings.

Chapter One: Introduction

Background

Support for public education in the United States is inequitable and tenuous, and gaps in the public understanding of school performance only contribute to this ambivalence. Elected officials, school administrators, parents, and students all struggle to interpret a profusion of data that are often ill-suited to answer any particular query.

The accountability of vocational education has been on the nation's agenda for more than a century.[1] This monograph seeks to advance public understanding of one important aspect of such accountability in the United States—early employment and earnings outcomes for former students in public high school and postsecondary vocational education programs.[2]

The study was designed to answer four questions:

1. What relationships exist among concurrent work and schooling, the ease of transition from school to work, and the stability of a former student's affiliation with their first employer after leaving school?
2. What patterns of repeated employer-to-employer mobility are revealed?
3. How are these combinations of concurrent and initial post-school employment related to the level and growth-path of a former student's earnings?
4. How important, as a predictor of post-school earnings, is knowledge of the relationship between a former student's vocational education program and subsequent occupational classification?

Given the available administrative data sources, vocational/non-vocational comparisons are provided whenever possible. Many previous studies have investigated similar questions.[3] However, this monograph complements and refines previous contributions in two ways:

- by documenting employment and earnings profiles through the end of 1992 for former students in high school and postsecondary vocational education programs who completed

their studies during the 1989-90 and 1990-91 school years[4] and
- by documenting interstate differences in data element definitions and emphasizing the importance of these differences from a research perspective.

An Overview[5]

Two state-level sources of administrative records comprise the consolidated database used to derive the findings that appear in Chapters Two through Five:[6]

- data acquired from state education entities in Colorado, Florida, Missouri, and Washington—each of which maintains a statewide management information system and
- administrative records received from the state employment security agency in each of these four states.

Each of the next four chapters covers a different aspect of the early transition period. Chapter Two focuses on the actual transition—or, bridge—year that includes the last few months of a student's enrollment in a vocational program and the months immediately following each former student's vocational program completion. Chapter Three concentrates on the stability of immediate post-school employer affiliation. Chapter Four explores the former students' earnings growth paths and how these are related to continuity of employment with a particular enterprise. Chapter Five investigates the training relatedness issue and the importance of this relationship as a predictor of earnings level and growth. Chapter Six summarizes the findings that emerge in these chapters, draws conclusions based on this new evidence, and describes refinements of these findings that are already underway.

Data Sources

The method used to produce the findings that appear in this paper can be refined or replicated for other populations of former students.[7] Use-specific strengths and weaknesses of the administrative records should be balanced before attempting to undertake a research activity of this kind.

- Student records and employment and earnings records are confidential. Each type of record is subject to state-specific and federal laws that affect their availability.[8] These laws prohibit release to the public of any information that identifies a former student or a former student's employer. Assurance that neither party will be identified directly is inadequate. Indirect identification—for example, revealing the earnings of one African-American female graduate of an engineering technology program—must be avoided as well.
- The common identifier on student records and on employment and earnings records is a former student's social security number. This identifier is not used by all high schools and postsecondary institutions.[9]
- Each type of administrative record has been designed for other purposes, so that definitions frequently differ among educational programs, levels, and states.
- The employment and earnings records cover most, but not all,[10] paid employees in a state. Currently, detection of out-of-state employment requires either duplication of a within-state crossmatching procedure with each state that is of interest, or some other follow-up approach (e.g., a telephone or mail survey).
- Each administrative record of employment and earnings[11] includes a quarterly earnings amount, an employer identification code, and an industrial classification code. The reported earnings figure is defined as *total wages paid to the employee in all pay periods within the reference*

quarter.[12] Most states do not require the reporting of an employee's hours or weeks of work that can be associated with this quarterly earnings amount.[13]

- The quarterly records of employer-specific employee affiliation and earnings do not contain any occupational information.[14]

The Remaining Chapters

The findings that emerge in Chapters Two through Five are based entirely on these student and employment and earnings administrative records. The consolidated database from which these findings were culled is described on the next page.

The chapters that follow have been organized to satisfy multiple reader interests. Most readers are expected to be interested in the entire sequence of events that begins in Chapter Two with the bridge year, which includes both the last few months of a student's enrollment in a vocational program and the first months of their post-schooling exposure to labor market opportunities, and continues in subsequent chapters to explore the continuity of employer-specific affiliation (Chapter Three), earnings growth-paths (Chapter Four), and the relatedness of a former student's employment and previous vocational program (Chapter Five). However, if a reader is interested only in high school or postsecondary outcomes, each chapter includes separate sections for these two educational levels. Other readers may be interested in state-specific findings, so each table and figure clearly identifies the reference state for every data element.

This monograph was written to appeal to readers with diverse interests, which include vocational education administration, management and regulatory oversight, legislative authority, and research curiosity.

Chapter Two: The Bridge Year

Introduction

This chapter focuses on the one-year period that includes the final months of a student's enrollment in a vocational program and the first months following their completion of this program.[15] The message here is direct: knowledge about a former student's employment status and affiliation both before and after leaving school is required to properly interpret employment and earnings data that are often identified as education outcomes alone.[16]

A principal finding that emerges is that concurrent school enrollment and work is often followed by continued affiliation with the same employer after leaving school. A second important finding is that the former students who exhibit this continuity of employer affiliation pre- and post-program completion have significantly higher average earnings at the end of this bridge year than the earnings of their classmates who established new business ties after leaving school. This earnings advantage appears in every state and level vocational-nonvocational comparison of bridge-year earnings.

Answers to the following questions appear in this chapter.

1. What percentage of completers were already employed[17] *before* leaving school?
2. What percentage of those who were employed before leaving school *continue with the same employer* for more than three months after leaving school?
3. What percentage of those who did not work during the final months of school enrollment experience at least a three-month delay in starting work in the state in which they attended school?
4. How are differences in employment status before leaving school and continuity of affiliation with the same employer related to differences in earnings levels at the end of the bridge year?

Eleven figures appear in this chapter. Four pairs of figures compare vocational and non-vocational transition patterns for state and level groups; two figures depict community college vocational program completers only;

and one figure illustrates how the features of this four-state database of administrative records can be used to reveal aspects of the school-to-work transition that have been poorly informed speculation until now (e.g., continuity of employment with a particular business, and how this persistence is reflected in earnings at the end of the bridge year).

A Reader's Guide to Interpreting the Figures in this Chapter. Each figure title is in the upper left corner and consists of four lines. The first title line identifies the state data source; only one state's data are presented in each figure. The second title line identifies the school level, either high school or community college.[18] Only one school level is shown in each figure. The third title line identifies the school year during which each of the former students completed their vocational or non-vocational program, with only one school-year cohort included in each figure.[19] The fourth title line identifies the relevant program: vocational or non-vocational.

Each figure should be read from left to right, since this reflects the time path of administrative record coverage. The boxed number in the upper left-hand corner of each figure, just below the figure's four-line title, is the universe of students in the state/level/year/program population. This is the total number of reported completers; no sampling or censoring has occurred.

The three circled numbers that are stacked vertically to the right of the completer population number break this universe into three groups:

1. those who were employed during the first full quarter after leaving school;[20]
2. those who were employed, but with a three month or longer delay; and
3. those who were not employed in the same state in which they attended school through the end of the current reference period.[21]

Together, these three groups include all members of the designated program completer population—everyone is counted. These three groups, in turn, have been divided into seven smaller subgroups, which again reflect the original total number of completers in the reference population. These seven subgroups are displayed in the circles that are to the immediate right of the three larger groups.

The definitions of these subgroups, from top to bottom, are:

1. former students who were affiliated with the same employer prior to, and for more than three months after, program completion—this is a key percentage to trace from figure to figure throughout the chapter;
2. former students who were employed during their final months in school and during the quarter immediately following program completion but with a different employer affiliation;
3. former students who were not employed during the final months of school but who were employed immediately after leaving school;
4. former students who were employed during their final months in school but who were not employed after program completion until more than three months had elapsed;
5. former students who were not employed during the final months of school and who were not employed after program completion until more than three months had elapsed;
6. former students who were employed during their final months prior to program completion but who were not employed through the end of the reference period; and
7. former students who were not employed either immediately before or during the reference period.

The first and seventh percentages in this seven-circle stack are likely to be of great interest to many readers. The percentage shown in the top circle represents those members of the program completer population who retained an employer affiliation before and after leaving school. These former students may have tested the market for competing offers, but they did not change employers coincident with completion of their program. The percentage shown in the bottom circle in this stack represents those who had not been captured in the state's employment and earnings records either immediately before, or for many months after, program completion.

The dollar amounts that appear in the four boxes to the immediate right of these stacked circles are the average quarterly earnings for the designated subgroups during their last months in school—what is referred to elsewhere as the *pre-earnings* level. The number in parentheses to the right of each of these dollar amounts is the *standard error of the calculated average earnings amount*. These numbers can be used by any reader to decide with confidence whether any pair of reported average earnings levels can actually be said to differ.[22]

The final group of five stacked boxes on the far right of each figure contains the average quarterly earnings amounts for the designated subgroups during the first quarter of 1991 or 1992, depending upon the state, level, year, or program reference group.

Again, these 11 figures are intended to describe the timing and completeness of the flow of these former students from school to work and to offer a hint of the early earnings differences that appear among subgroups of these populations. The multivariate analysis which appears later addresses why these differences occurred.

The High School Student's Transition: The Class of 1990-91

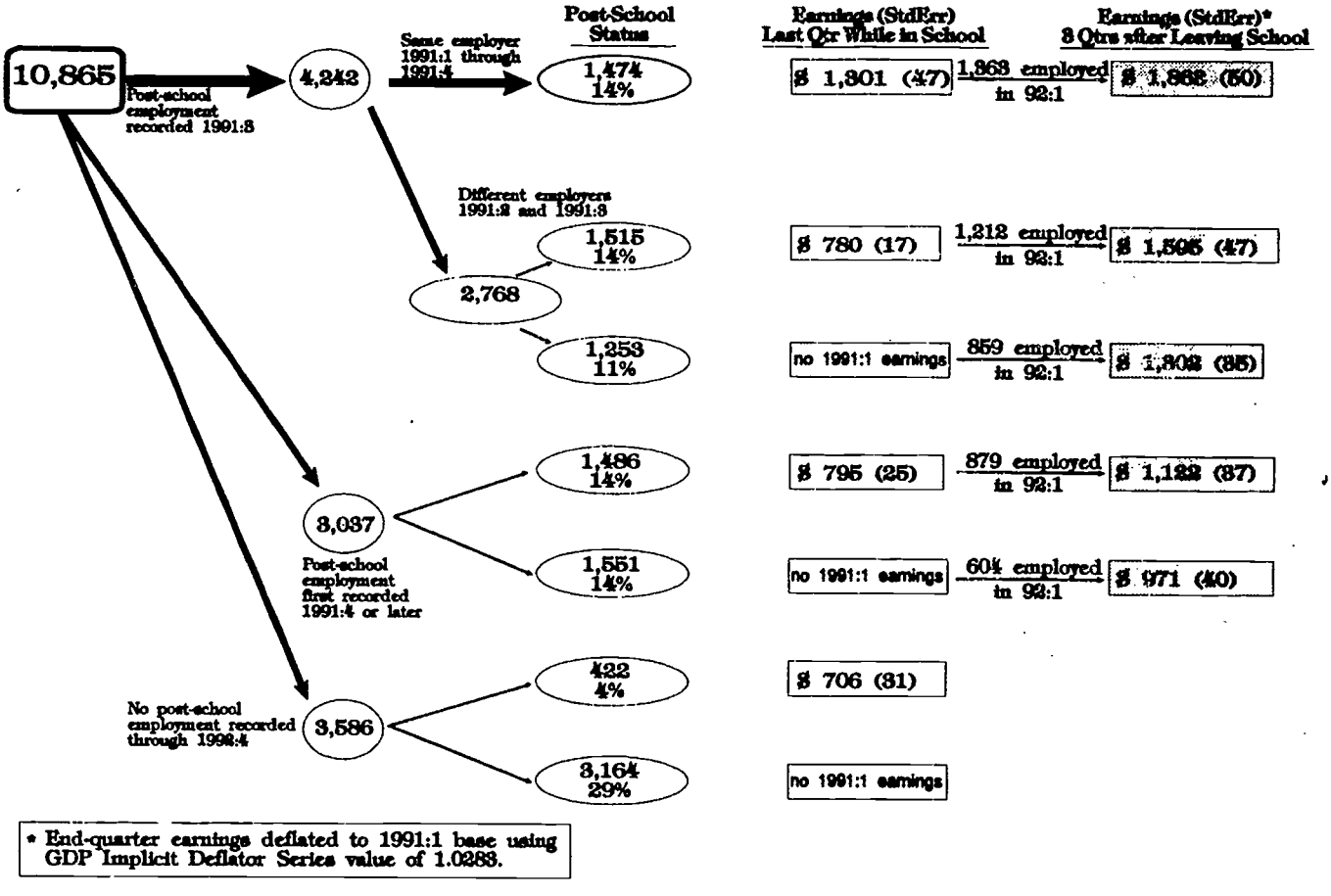
Introduction. The four figures in this section trace the transition from high school to work for four groups of former students: (1) the universe of 1990-91 public high school vocational program completers in Colorado; (2) non-vocational Colorado high school seniors who took the ACT assessment in 1990-91; (3) the universe of 1990-91 public high school vocational program completers in Florida; and (4) a random stratified sample of Florida high school non-vocational graduates in 1990-91.

The comparison of transition flows for Florida's 1990-91 high school vocational and non-vocational program completers is direct—the universe of vocational completers is available to be compared with a random stratified sample of non-vocational program completers. Colorado's non-vocational comparison group includes only those high school seniors who took the ACT assessment in 1990-91, which has an unknown effect on the transition flow that is observed.[23]

Colorado's High School Class of 1990-91 Vocational Program Completers. Figure 1 shows the transition from school to work for the universe of 10,865 vocational program completers in Colorado public high schools in 1990-91. One out of every seven of these former high school students worked for the same employer before and for more than three months after leaving school. One-third of these vocational program completers did not work for a Colorado employer at any time between July 1, 1991, and December 31, 1992, and only four percent of these former students were employed by a Colorado employer while they were still in high school. The remaining members of the

Figure 1

COLORADO
HIGH SCHOOL
1990-1991
VOCATIONAL PROGRAM COMPLETERS

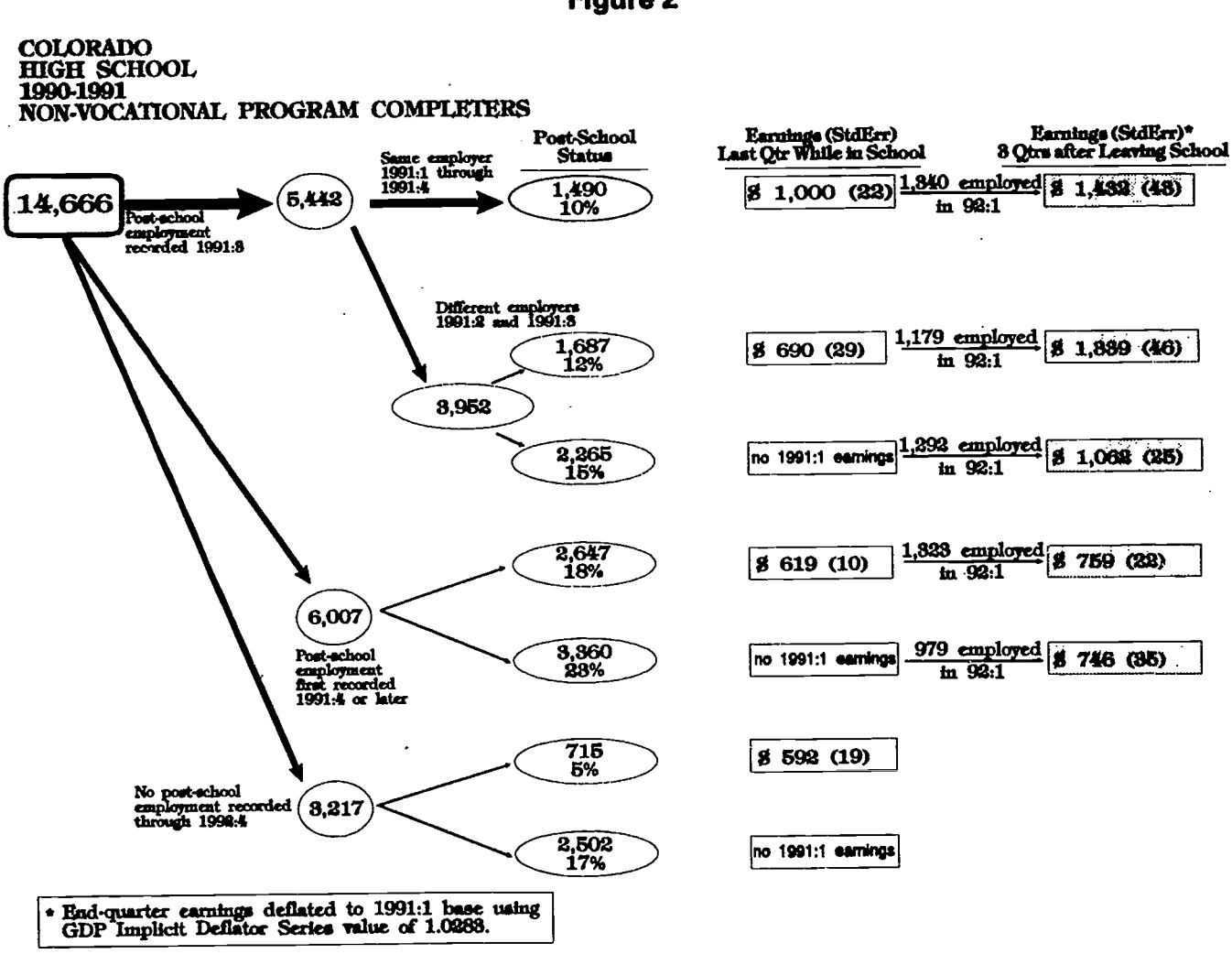


class, 53 percent of the total, exhibit varied mixes of pre- and post-completion employment in Colorado.

The pre-earnings amounts that appear in Figure 1 reveal that those who were working for the same employer both before and after their vocational program completion had a substantially higher average earnings level than their classmates in 1991:2, which was the quarter in which they each completed a vocational program. This earnings advantage was sustained at least through the first quarter of 1992; i.e., three quarters after they left school. Chapter Four follows these earnings paths through December 1992. In this chapter, the emphasis is on *transition*.

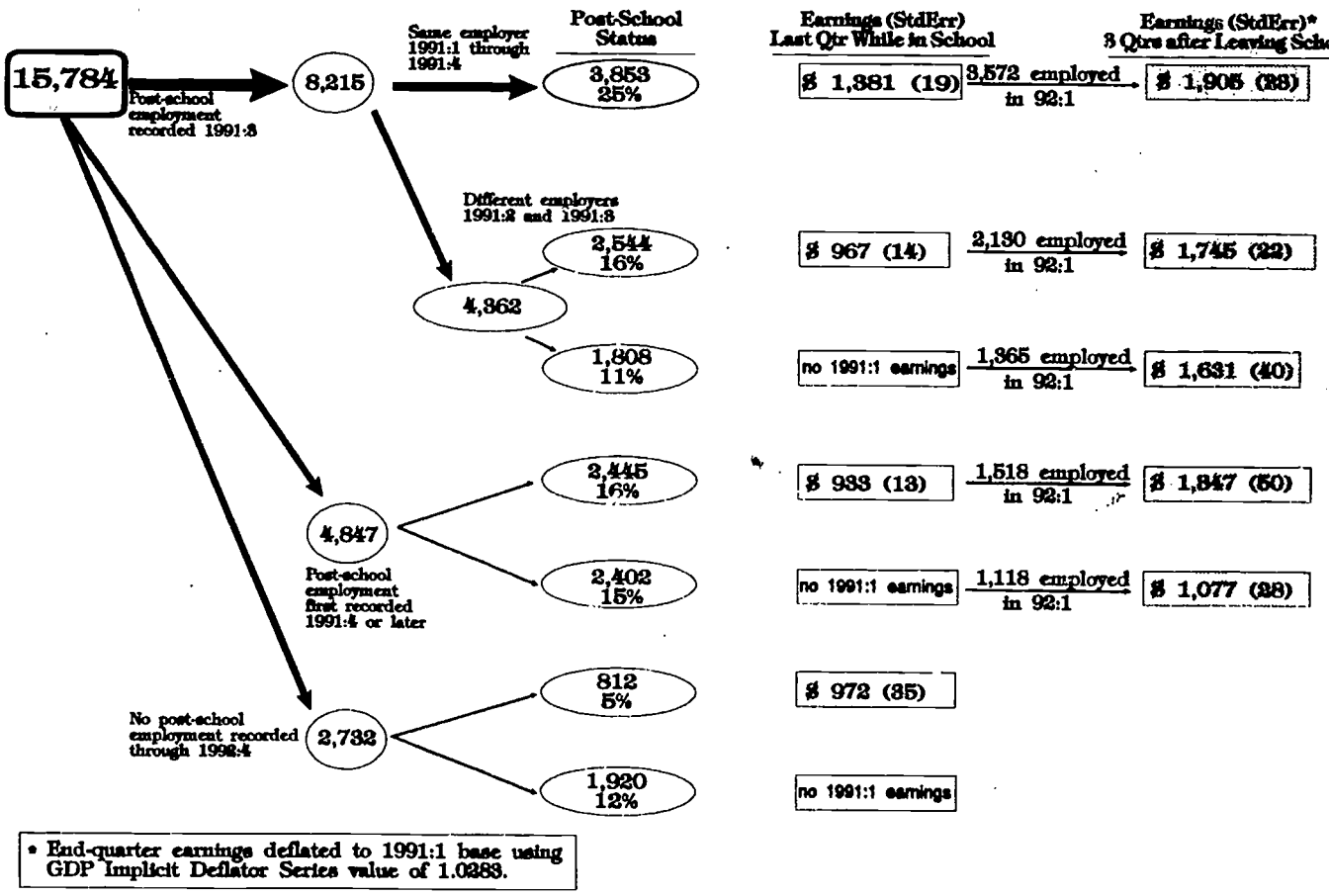
Non-Vocational Program Completers. Figure 2 reveals the transition of Colorado's 1990-91 public high

Figure 2



school seniors who did not complete a vocational program but who did take the ACT assessment during their senior year. Two aspects of Figure 2 are of particular interest. The percentage of this group that is found to have maintained a pre-graduation employer affiliation through at least the beginning of 1992 is lower than the retention rate of their classmates who completed a vocational program—10 percent versus 14 percent, respectively—and these non-vocational students had significantly lower average reported Colorado earnings than their non-vocational classmates, both while the members of each group were still in school (1991:1) and three quarters after they left school (1992:1). A portion of this earnings difference may be attributed to full-time versus part-time employment differences between the two groups. This possibility will be investi-

Figure 3



gated in refinements of this initial release of findings. For now, any comparisons between Figure 1 and Figure 2 should take into consideration how ACT assessment may be correlated with the employment and earnings patterns that are revealed in Figure 2 (e.g., motivation, intent to continue one's education, and adult influence on the student's decisions).

Florida's High School Class of 1990-91 Vocational Program Completers. Figure 3 traces the initial transition from high school to work for the universe of 1990-91 vocational program completers. The transition pattern that is revealed in the seven stacked circles that classify the 15,784 vocational program completers among pre- and post-completion employment combinations indicates why the unit of

analysis issue is so crucial for a reliable interpretation of the data. A cursory comparison of this seven-circle stack in Figures 1, 2, and 3 demonstrates the state-specific nature of the transition phenomenon, at least as it is revealed through each state's administrative data sources. Interstate differences can be traced to education system governance differences, program requirement/definition differences, and state economic structure/prosperity differences.[24]

One out of every four Florida 1990-91 public high school vocational program completers was affiliated with the same Florida employer during the last months while still enrolled in school and the months immediately after leaving school. These former students exhibit significantly higher average reported earnings, both before and after leaving school, than their classmates who were not able, or willing, to sustain this employer affiliation. Seventeen percent of the universe of these 1990-91 high school vocational program completers had not been reported as being employed in Florida at any time between July 1, 1991, and December 31, 1992.[25]

Non-Vocational Program Completers. Figure 4 displays the school-to-work transition flow pattern for a stratified random sample of 14,169 Florida 1990-91 public high school graduates who did not complete a vocational program. A significantly smaller percentage of non-vocational students than vocational program completers were found to have sustained a pre-graduation employer affiliation after leaving school: 16 percent versus 25 percent. Those who do exhibit this continuity of affiliation have a reported *pre*-graduation average earnings level that is $133 less than the average reported earnings for their vocational program completer classmates. This earnings gap widened slightly to $151 three quarters later.

The Continuing Education Issue. Administrative data received from Florida's Employment and Training Placement Information Program include a continuing education data element that indicates whether the former 1990-91 high school students subsequently enrolled in one of Florida's public postsecondary institutions. This data element was used to compare the transition flows and the initial earnings levels of those who were, or were not, reported as having continued their education in one of these Florida public schools.

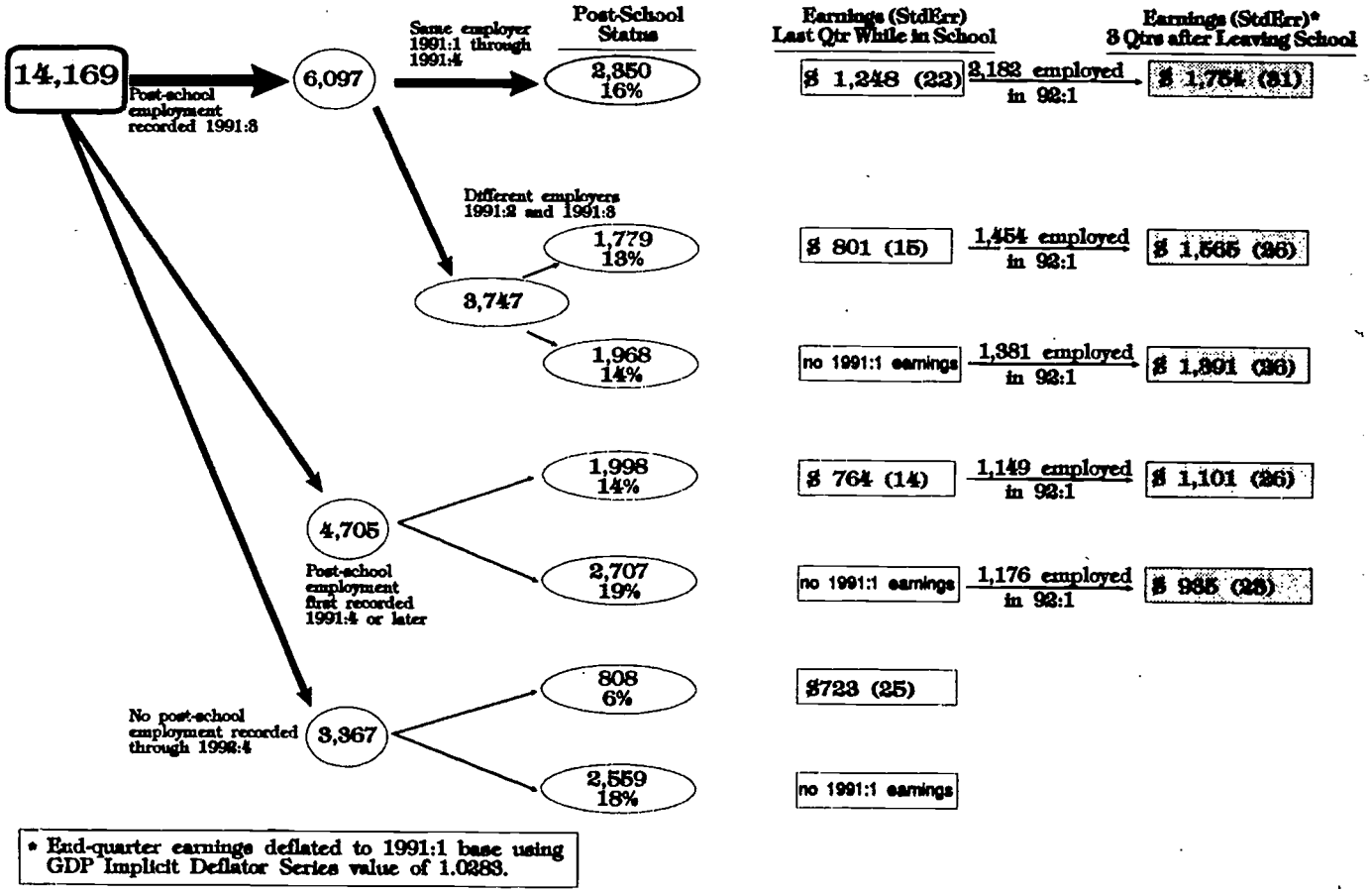
Calculation of average pre- and post-completion earnings levels for those who did not enroll in a Florida public postsecondary school increases the average pre-completion earnings amount by 10 percent for vocational completers and by 13 percent for non-vocational high school graduates. Three quarters later, this difference had increased to 15 percent for the vocational completers and to 17 percent for the non-vocational graduates. These changes document what anyone would expect—the average earnings level of those who do not continue their education is at least temporarily higher than the average earnings of their classmates who have enrolled in postsecondary schools.

A Summary of the High School Class of 1990-91 Findings. The transition flows in Figures 1-4 reveal the following consistent pattern.

1. A substantial percentage of the Colorado and Florida 1990-91 public high school graduates continued an employer affiliation that had been established before they left school, and completers of a high school vocational program were more likely than non-vocational graduates to

Figure 4

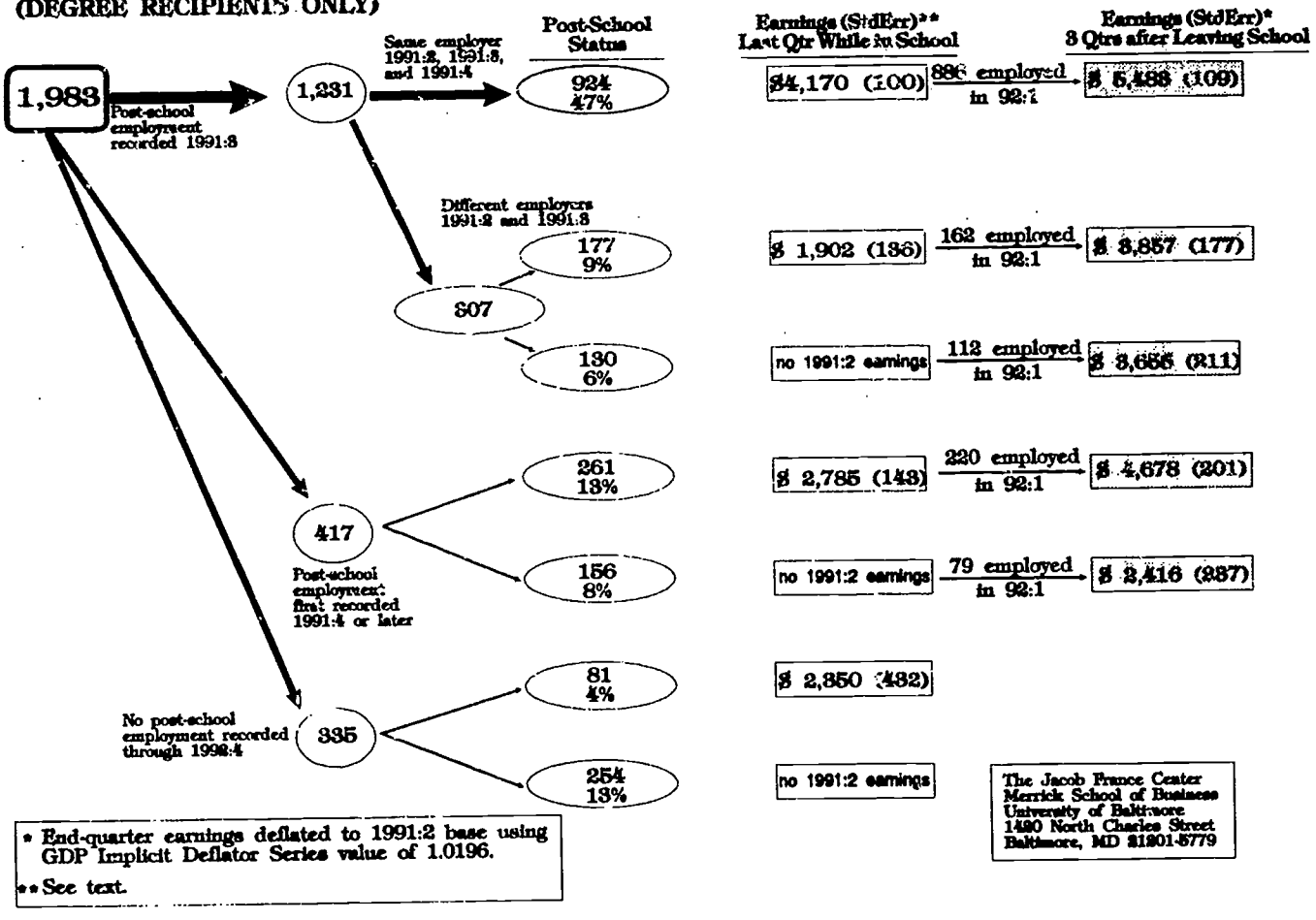
FLORIDA
HIGH SCHOOL
1990-1991
NON-VOCATIONAL PROGRAM COMPLETERS



continue with the same employer for whom they had worked while still in high school.

2. Those former students who stayed with the same employer had a higher average earnings level just before leaving school and nine months later than those who started a new job after leaving school.
3. The percentage of 1990-91 Colorado and Florida public high school graduates who were not employed in the same state through the end of 1992 varies from 17 percent to 33 percent, and this percentage is not uniformly higher or lower based on the former students' completion of a vocational or non-vocational program.[26]
4. The percentage of 1990-91 Colorado and Florida public high school graduates who were employed in the same state but in an employment affiliation that was established *after* high school graduation ranges between 53 percent and 68

Figure 5



percent for the four vocational and non-vocational groups.

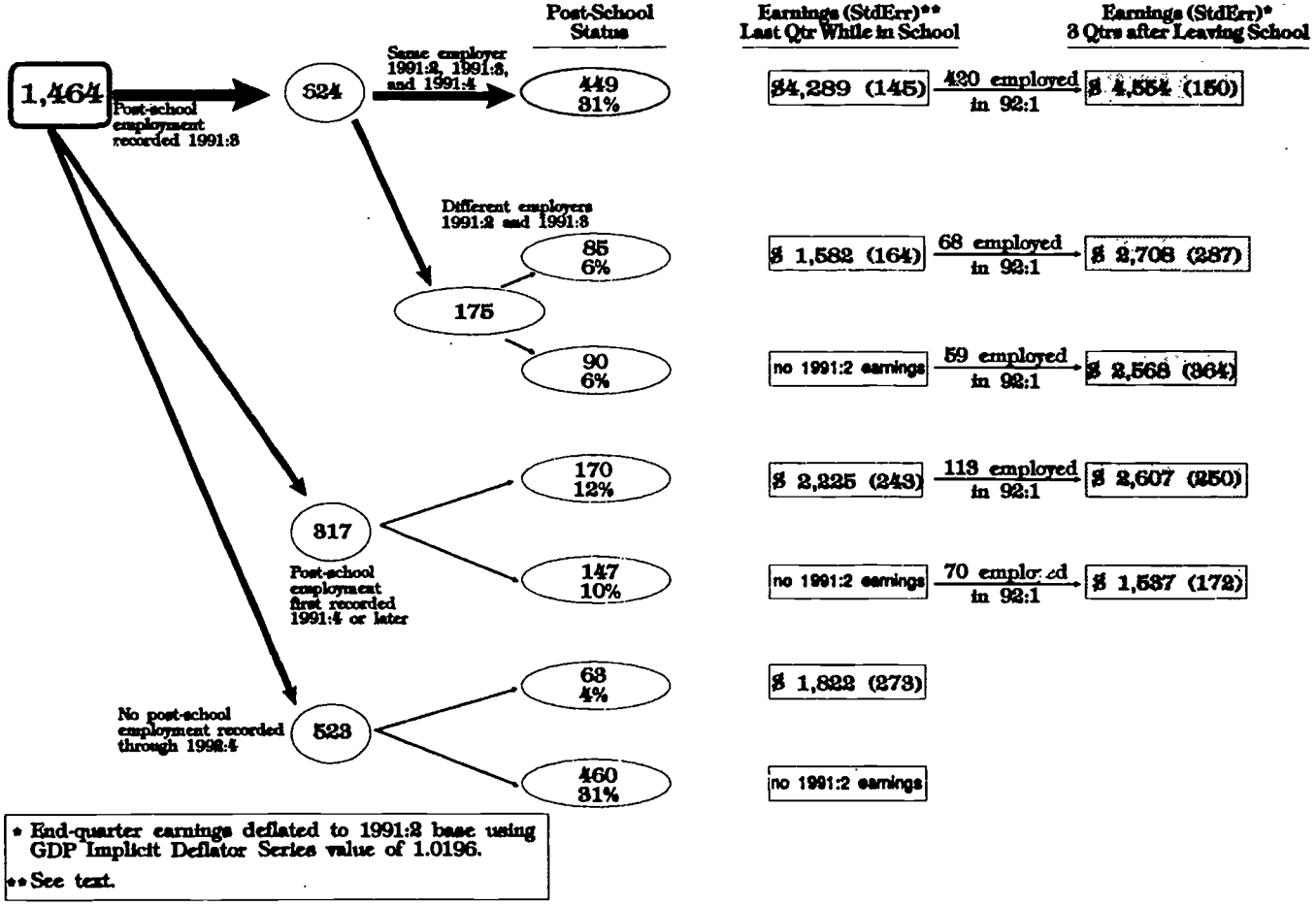
This section of the paper has focused on the immediate transition months; the focus is widened in Chapter Four to trace the former students' earnings paths through December 1992.

The Community College Students' Transition: The Class of 1989-90[27]

Introduction. The seven figures in this section trace the transition from community college to work for six groups of former students: (1) the universe of 1990-91 public community college vocational program completers in Colorado; (2) the universe of 1990-91 public community college non-vocational program completers in

Figure 6

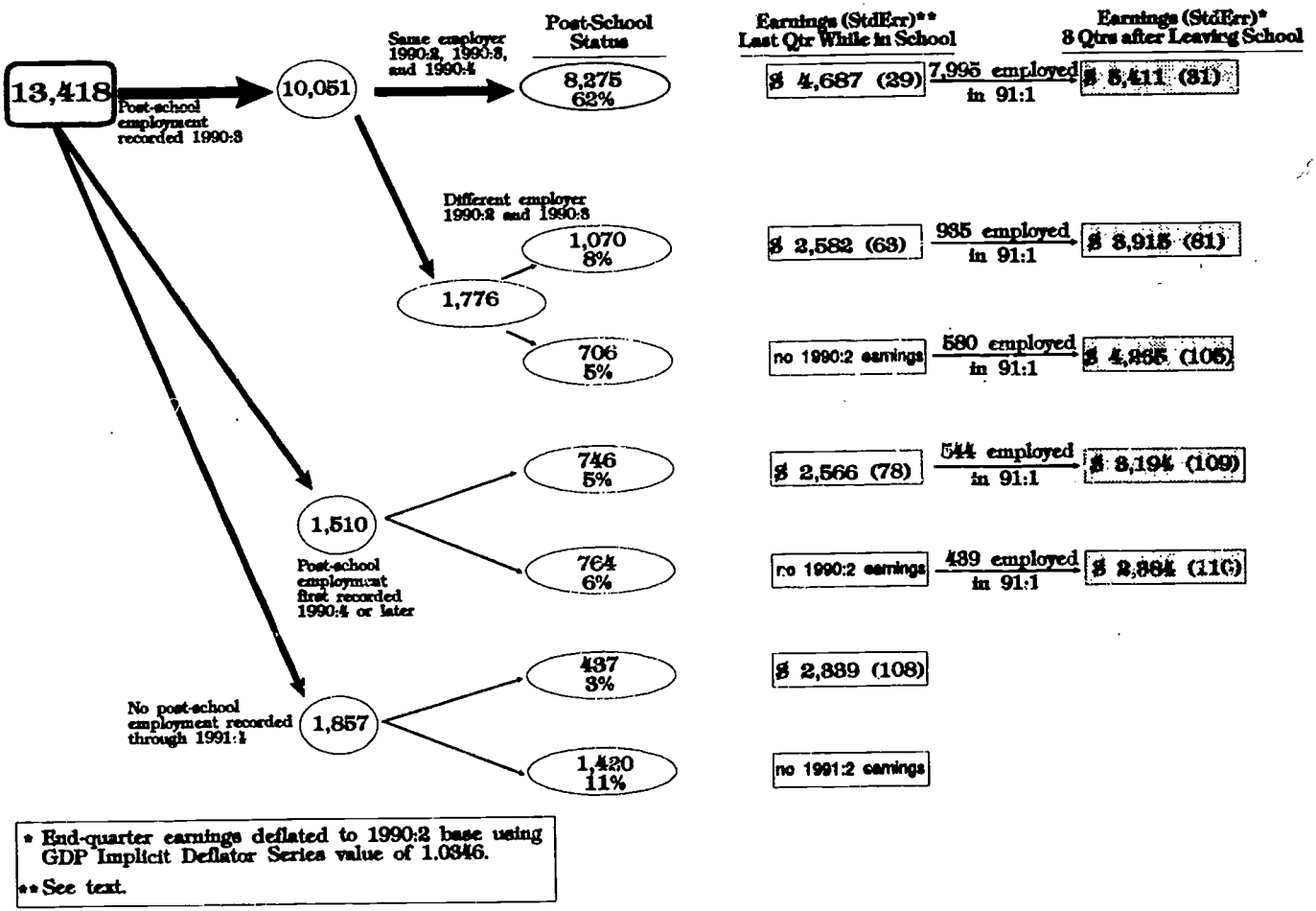
COLORADO
COMMUNITY COLLEGES
1990-1991
NON-VOCATIONAL DEGREE RECIPIENTS



Colorado; (3) the universe of 1989-90 public community college vocational program completers in Florida; (4) the universe of 1989-90 vocational program completers[28] in Missouri; (5) the universe of 1989-90 public community college non-vocational completers in Missouri; and (6) the universe of 1989-90 public community college vocational program completers in Washington state.

Colorado's Community College Class of 1990-91 Vocational Program Completers (Degree Recipients Only). Figure 5 shows the transition from school to work for the universe of 1,983 vocational program completers in Colorado's public community colleges in 1990-91. Nearly half of these former students remained with the same employer after leaving school. Those who did exhibit substantially

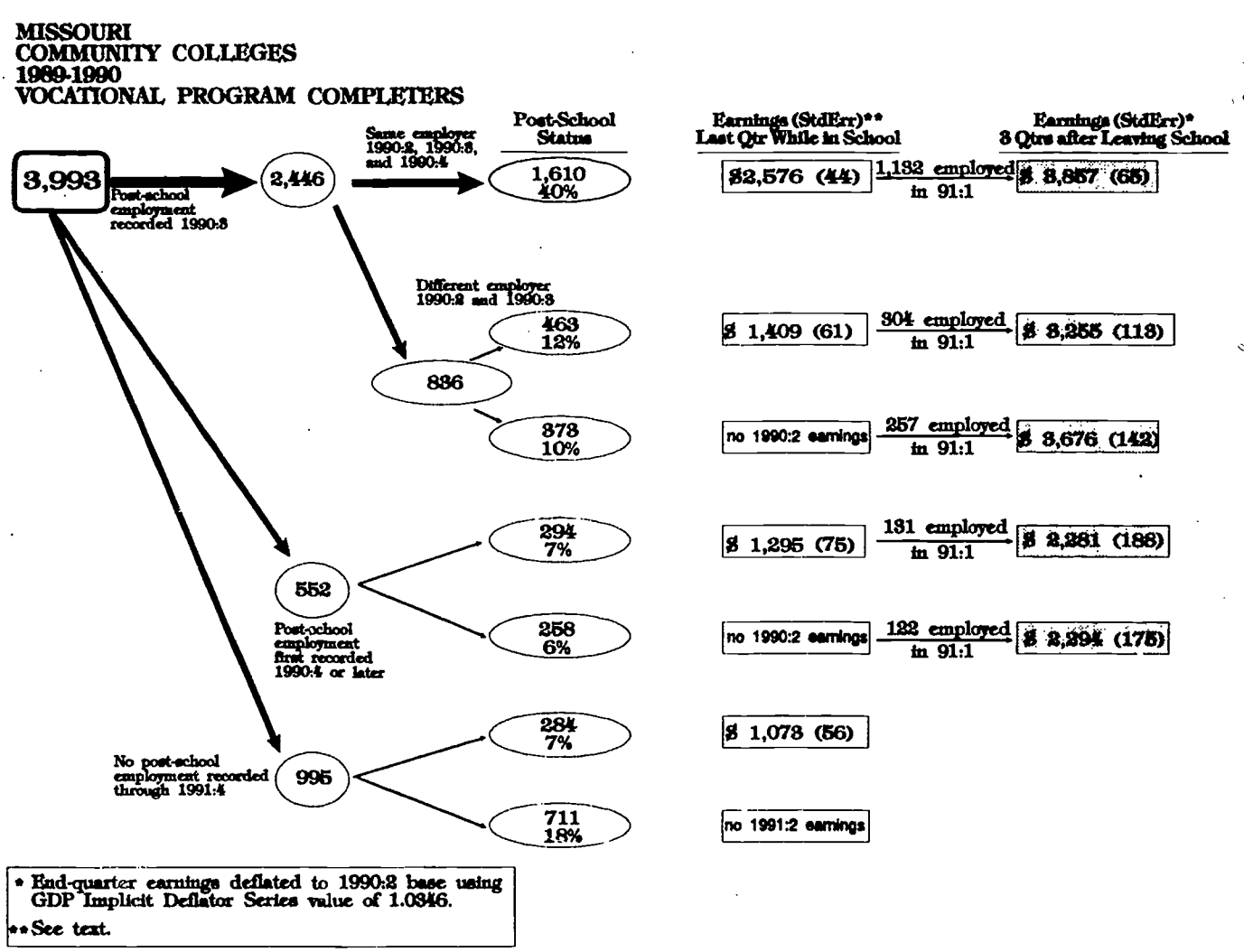
Figure 7



higher average earnings nine months after leaving school than others who began work with a new employer after leaving school. This documents the importance of controlling for previous/concurrent employment and earnings before attempting to estimate the impact of a community college education on subsequent employment and earnings.[29]

Non-Vocational Program Completers (Degree Recipients Only). Figure 6 traces the transition of Colorado's 1990-91 public community college graduates who were not vocational program completers. Important differences appear in a comparison of this figure with Figure 5. First, a substantially smaller percentage of non-vocational graduates sustained a previously established employer affiliation. This fact

Figure 8

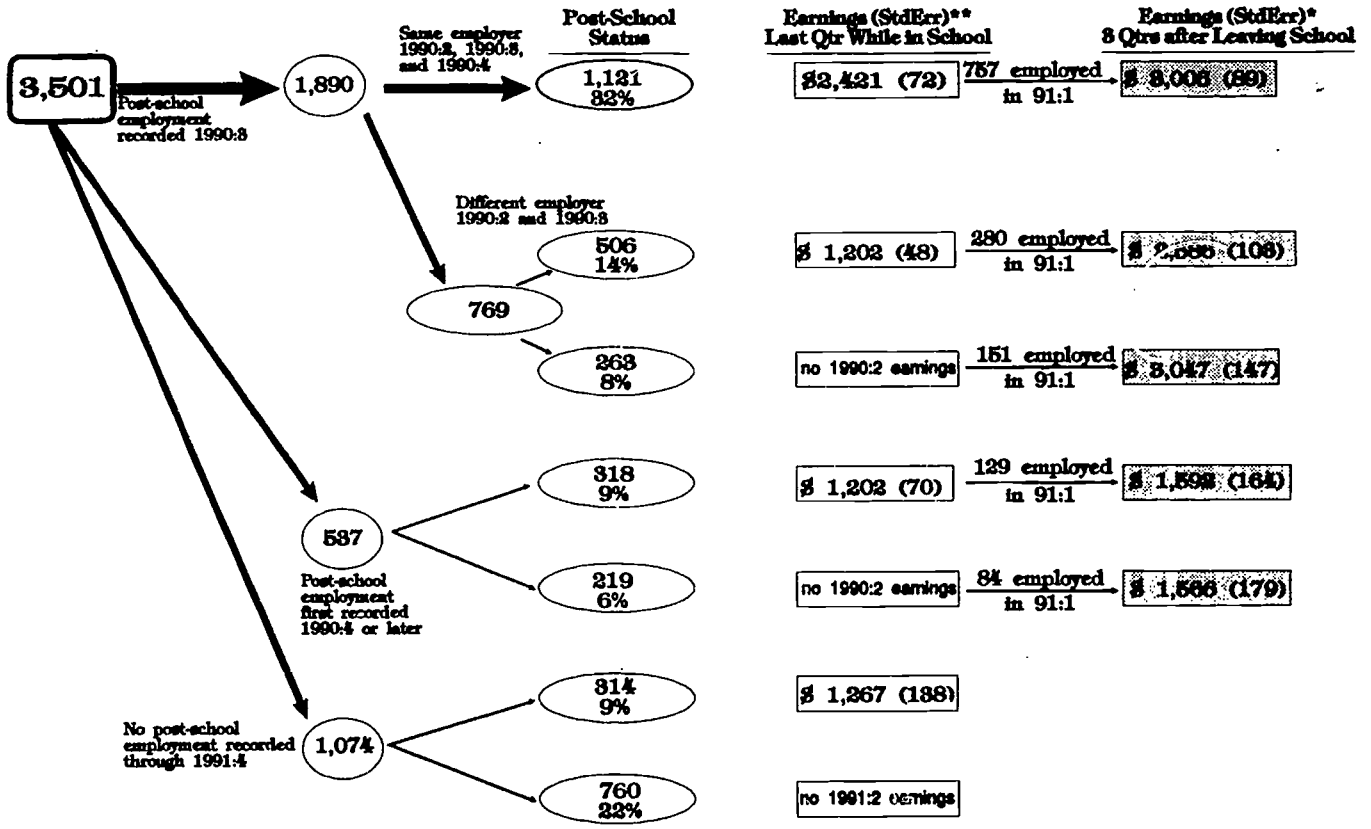


reinforces the caution that has already been expressed about the importance of accounting for pre-existing employer affiliation when comparisons of alleged educational outcomes are made. Second, a comparison of the reported average earnings levels three quarters after the former students left school reveals a significant advantage for the vocational program completers over their non-vocational classmates.

Florida's Community College Class of 1989-90 Vocational Program Completers.[30] Figure 7 reveals that 62 percent of Florida's 13,418 community college vocational program completers in 1989-90 worked for the same Florida employer before leaving school and three quarters later. Only 14 percent of these community college vocational program completers were not working for a Florida employer at any time since leav-

Figure 9

MISSOURI
COMMUNITY COLLEGES
1989-1990
NON-VOCATIONAL PROGRAM COMPLETERS



* End-quarter earnings deflated to 1990:2 base using GDP Implicit Deflator Series value of 1.0846.

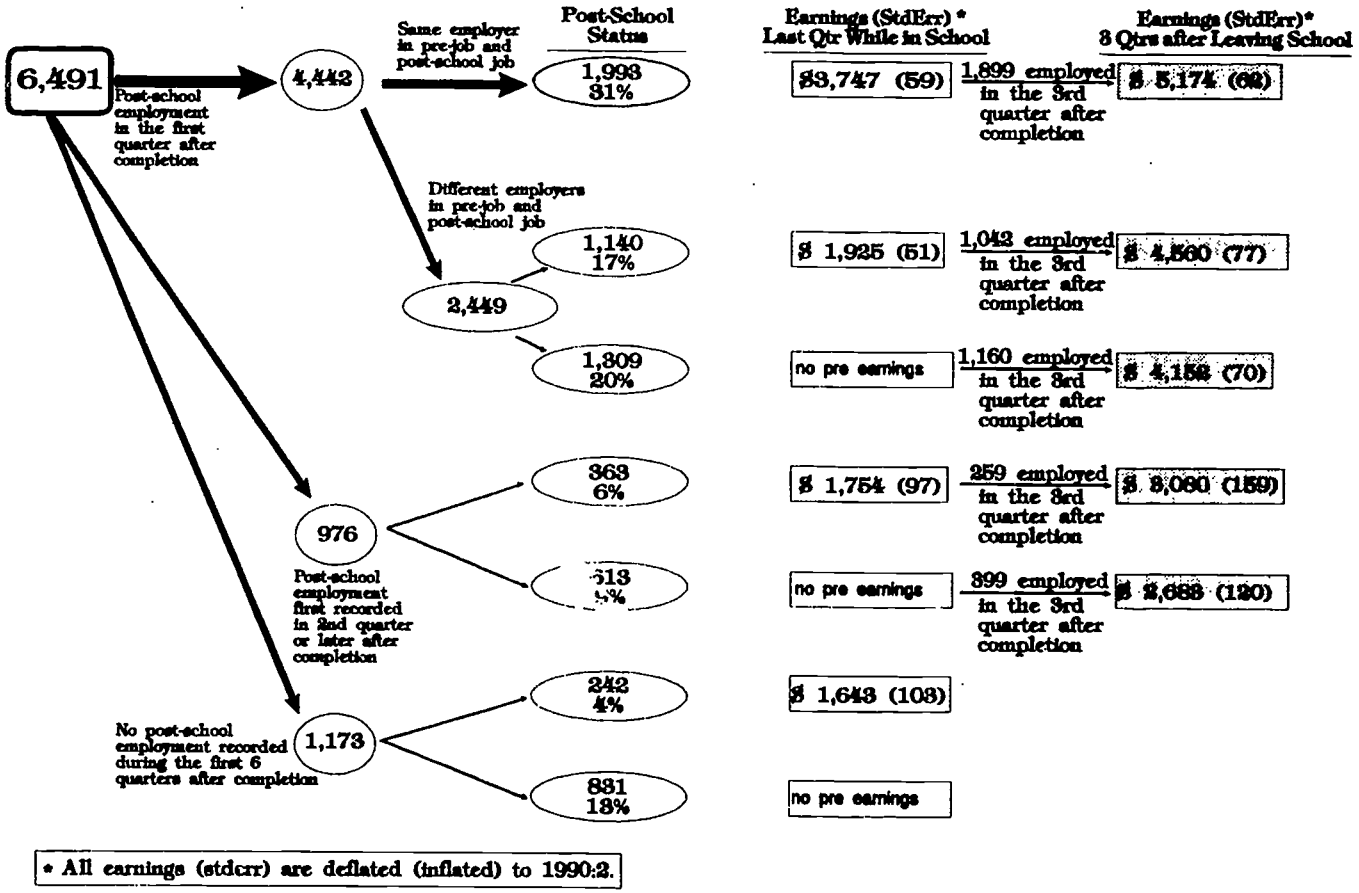
** See text.

ing school through the end of 1991. Overall, 78 percent of the former students were employed in Florida during the January-March 1991 quarter.

Missouri's Community College Class of 1989-90 Vocational Program Completers.[31] Students who left Missouri's community colleges in the spring of 1990 appear to have encountered daunting challenges in finding and keeping jobs as the national recession began in the summer of 1990. Figure 8 indicates that 40 percent of those who left a Missouri community college vocational program with at least 30 credit hours maintained a pre- and post-completion employer affiliation at least into October of that year; however, 30 percent of these former students were not working for this employer in the January-March 1991

Figure 10

WASHINGTON
COMMUNITY AND TECHNICAL COLLEGES
1989-1990
VOCATIONAL PROGRAM COMPLETERS



quarter. These attrition rates indicate the critical importance of exercising caution when findings included in this monograph are extracted for use elsewhere. Recorded employment rates are a complex function of measurement accuracy (e.g., use of a proxy for program completion) and state-specific economic conditions.

Non-Vocational Program Completers.[32] Former Missouri public community college students who left with 30 or more credits, but who did not enroll in a vocational program, are less likely than their vocational program[33] classmates to have been employed in Missouri at the beginning of the year following departure from school: 40 percent versus 49 percent, respectively. Non-vocational education students also exhibit consis-

tently lower reported earnings for this January-March 1991 quarter across all five categories of pre- and post-school departure employment status.

In this case as well, it will be important to determine which of these former community college students subsequently enrolled in one of Missouri's public four-year colleges or universities. Missouri's Coordinating Board for Higher Education maintains a single database for each of these postsecondary partners.

Washington's Community College Class of 1989-90 Vocational Program Completers.[34] Like Figure 8, Figure 10 also reveals the state-specificity of former students' transition from school to work. In this case, 31 percent of the vocational program completers continued to work with the same employer while still in school and at least during the next two quarters; only five percent of these employees had severed this affiliation by the third quarter after leaving school. Overall, 73 percent of Washington's 1989-90 community college vocational program completers were employed in Washington three quarters after leaving school.

Until this section of the manuscript, a uniform mapping of the school-to-work transition has been provided for each state, level, year, and program population for both the high school and community colleges. This approach reflects a conscious effort to simplify the reader's burden in attempting to generalize from the reported findings. One consequence of giving this priority to interstate uniformity and simplicity is that many attributes of the state-specific administrative databases, and many of their common longitudinal features, have been ignored. One hint about this untapped potential is provided here, as a bridge from Chapter Two's focus on the school-to-work transition to Chapter Three's treatment of the labor market churning issue, which remains a high-priority policy topic.

Each of our state-specific databases provides an opportunity to test the accuracy of this conclusion in the earliest phase of a newly emerging high school or community college graduate's exposure to the nation's employment opportunities circa 1990-92. In this section, only one aspect—the delay in getting started—is examined using Washington's administrative records.

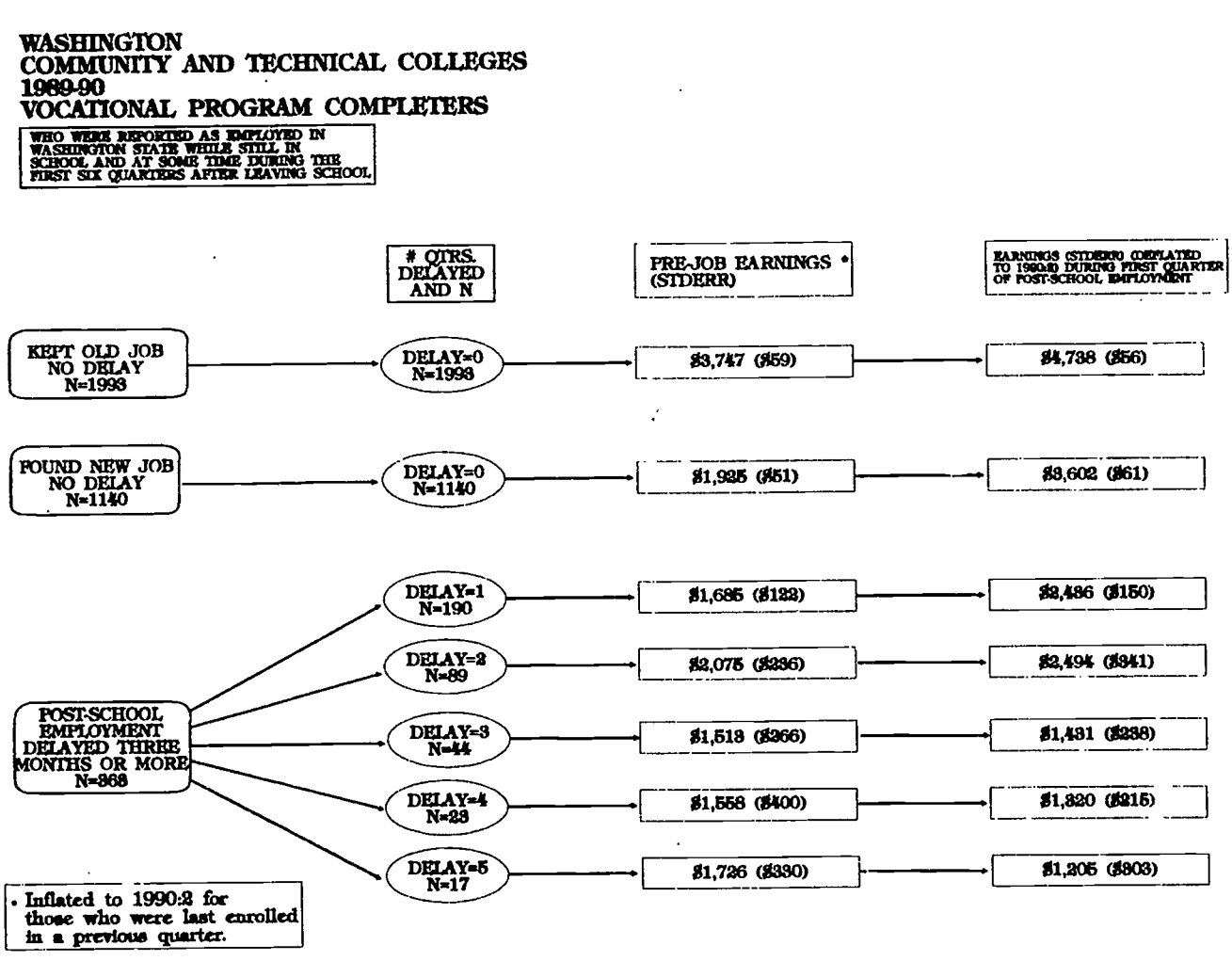
Figure 11 addresses two questions.

1. What *delay* pattern in starting post-school employment is observed among 1989-90 Washington community college vocational program completers, all of whom worked for a Washington employer during the quarter in which they left school?
2. Is there a relationship between this delay pattern and average reported earnings while the former students were still in school and between the delay pattern and the average reported earnings level during the first quarter of post-school employment?

The answer to the first question is that only 10 percent of Washington's 1989-90 community college vocational program completers who were working just before leaving school were delayed three or more months in starting a new job in Washington. Seventy-three percent of those who were working while still in school remained with the same employer for more than three months after leaving school. The other 17 percent of the former students started a new job immediately (i.e., during the first three months following graduation).

The answers to both parts of the second question are that there is a clear relationship between reported earnings before leaving school and whether a student then continued with the same employer; there is no obvious

Figure 11



pre-earnings/delay pattern, and there is a clear pattern of initial post-school earnings/delay: former students who continued a previous employer affiliation or who started to work soon after leaving school received higher earnings in their first quarter of employment.[35]

Although these findings taken alone are interesting, appropriate use of multivariate statistical techniques is required to investigate the causal aspects of these questions. Figure 11 has been presented as an example of how the longitudinal nature of the database can be exploited.

A Summary of the Community College Findings. The transition flows in Figure 5 through Figure 11 reveal the following patterns.

1. The percentage of former community college students who stayed with the same employer while in school and for more than three subsequent months ranges from 31 percent to 62 percent among the four states. This percentage is higher for community college vocational program completers than for their non-vocational classmates in the two state-specific instances where this comparison can be made. The percentage is substantially higher for the former community college students than it is for their counterparts at the high school level (see previous section) in the two state-specific cases where this comparison is possible.
2. Those who continued a pre- and post-completion affiliation with an employer had higher average earnings both before and after leaving school, relative to their classmates who started new jobs after leaving school. A significant difference in the average earnings level is found *between* the vocational and non-vocational groups, with the vocational completers exhibiting higher average earnings.
3. A much higher percentage of former community college vocational program completers than non-vocational graduates were employed in the same state at some time during the first year and one-half after leaving school.
4. A former student's average reported earnings level during the first quarter of employment is related to the length of delay in starting work after leaving school (based on one state's data). Those who started work sooner earned more from the beginning.

Chapter Three: Labor Market Churning—1985-1992 Perspective

Introduction

As Osterman and Iannozzi conclude, "the early years in the labor market for many graduating students are characterized not by an absence of jobs but rather by a 'churning' process. High turnover and frequent job change are evident during this period when youth sample different jobs or simply move from one low-skill job to another. The phenomenon of churning represents a characteristic of the youth labor market that has important implications for program design" (1993, 4). The principal theme in Chapter Two was that many former students, particularly community college students, traverse the bridge from school to work with the same employer for whom they had worked while in school and that higher average earnings relative to the earnings of those who established new employer ties after leaving school reflects this continuity. This information provides a firm foundation from which to discuss the churning phenomenon. Chapter Three changes the paper's focus by lengthening the post-schooling reference period and targeting measures of labor market churning.[36]

The chapter begins with a single table that reveals the extent of labor market churning (i.e., change of employer) that occurred within each of the 10 state, level, year, and type groups over the first year and one-half of former students' exposure to labor market opportunities between mid-1990 and the end of 1992.

Following this table is a two-and-one-half year analysis of labor market churning for 1989-90 Colorado[37] and Florida community college program completers, which introduces Classification of Instructional Programs (CIP) categories for the first time. This analysis illustrates a finer level of detail than what appeared in Chapter Two. The particular vocational programs were chosen because they contain large numbers of former students.

The discussion continues by introducing a new population of vocational completers: 1985-86 Florida high school, district postsecondary, and community college completers in selected districts.[38] First, the account traces six-year profiles of former students' labor market churning from 1986 through 1992 and then presents figures depicting separate high school vocational program completers, district postsecondary program completers, and community college vocational program completers. The fourth figure contains six-year churning trends for the high school and community college completers, while the final figure in this group of five compares the average annual earnings of former students who did or did not move between employers in each of three two-year intervals after leaving school.

With the introduction of Figure 17, attention then turns to an example of how a state's merged administrative databases can be used to classify post-school employment status in a new way—one that can meet the needs of state and local vocational educators. Washington's 1989-90 population of community college vocational program completers is used for this illustrative purpose.

The chapter ends with the first presentation of multivariate statistical estimates in this monograph, which are based on Washington's 1989-90 community college vocational program completer population. Four outcome measures are used:

1. length of first employer affiliation after leaving school, measured in quarters;
2. a yes-no indicator of whether a former student changed employers (i.e., churned) during the first year and one-half following completion;
3. time spent in the first employer affiliation after leaving school, as a percentage of all quarters during which a former student was employed (over this one-and-one-half-year period after leaving school); and
4. a yes-no indicator of whether a former student continued an employer affiliation that existed prior to program completion.

Employment Churning: A Four-State Overview

Table 1 summarizes former students' movement between employers during the first year and one-half after leaving school. Unlike Chapter Two's app oach, which separated the high school and community college findings, Table 1 covers all 10 state, year, level, and program populations.

The *kept pre-job* column in Table 1 offers compelling evidence of the high percentage of former students, vocational/non-vocational and high school/community college completers alike, who maintain a pre-existing employer affiliation after leaving school. Readers are encouraged to wait until this evidence has been combined with the earnings findings presented in Chapter Four, and with the relevance findings reported in Chapter Five, before concluding that this pattern is an indication of strength or weakness in the transition phenomenon in the United States.

The *first post-school job length* column, which presents average length of the employer-specific affiliation in quarters, shows that former non-vocational students

Table 1

Employment Churning Overview : Four States

	Pre-Grad. Job (?)	N	Kept-Pre-Job %	First Post-School Job Length N	Mean (Qtrs)	Stderr	% of Total Emp Length Mean (Qtrs)	Stderr
High School								
Colorado (90-91 Cohort)								
Vocational	Yes	4,897	0.30	4,475	3.23	0.03	0.72	0.00
	No	5,968		2,804	2.37	0.03	0.73	0.01
Non-vocational	Yes	6,539	0.23	5,824	2.84	0.02	0.73	0.00
	No	8,127		5,625	2.18	0.02	0.74	0.01
Florida (90-91 Cohort)								
Vocational	Yes	9,643	0.40	8,831	3.66	0.02	0.76	0.00
	No	6,141		4,221	2.74	0.03	0.77	0.00
Non-vocational	Yes	6,935	0.34	6,127	3.45	0.02	0.76	0.00
	No	7,234		4,675	2.55	0.02	0.77	0.00
Comm. College								
Colorado (90-91 Cohort)								
Vocational	Yes	1,443	0.64	1,362	4.45	0.05	0.84	0.01
	No	540		286	2.93	0.10	0.78	0.02
Non-vocational	Yes	767	0.59	704	4.21	0.07	0.84	0.01
	No	697		237	2.36	0.10	0.79	0.02
Florida (89-90 Cohort)								
Vocational	Yes	10,528	0.79	10,091	4.87	0.02	0.87	0.00
	No	2,890		1,470	3.23	0.05	0.82	0.01
Missouri (89-90 Cohort)								
Vocational	Yes	2,651	0.61	2,367	4.39	0.04	0.83	0.01
	No	1,342		631	3.40	0.08	0.79	0.01
Non-vocational	Yes	2,259	0.50	1,945	4.01	0.04	0.81	0.01
	No	1,242		482	3.17	0.09	0.83	0.01
Washington (89-90 Cohort)								
Vocational	Yes	3,738	0.53	3,496	4.52	0.03	0.83	0.00
	No	2,753		1,922	3.71	0.04	0.80	0.01

Notes:

(1) Pre-Grad. Job is defined to be the job held in 1991:1 for high school program completers and CO community college completers; in 1990:2 for community college program completers in FL, and MO; and in the quarter prior to the graduation year/quarter for community college program completers in WA (where graduation year/quarter is available).

(2) N is the total population in that category.

(3) Kept-pre job indicates the rate for those who continued in the pre- job at least into the second quarter after completion as a percent of all who held a pre-job.

(4) First Post-Sch Job Length is the length in quarters of the first job after program completion, or the pre-job held at least to the second quarter after completion (only the post-completion period is counted in the length).

(5) % of Total Emp Length is the length, in quarters, of the first post-sch job as a percent of the total observed (i.e., known) employment length after completion.

(6) The reference period for calculating the first post-school job length and % of total Employment length is 1991:3-1992:4, for high school in CO, FL and community college in CO; 1990:3 - 1991:4 for community college in FL, MO; and six quarters after graduation year/quarter for year/quarter for community college in WA. The maximum is six quarters.

(7) Those without a post-school job are not counted in the calculation of "First Post-School Job Length" and "% of Total Emp Length".

who were not employed while they were still in school have the shortest average length of the first job held after leaving school (including only the post-school part of this tenure for those who continued a pre-completion employer affiliation). In addition, those who were not employed while still in school exhibit a uniformly shorter employer-specific tenure than their classmates who had combined education and work activities (comparing within each state, level, and program category).

The observed range of percentage values in the *first job length/total job length* column is narrow—from a low value of 72 percent to a high value of 87 percent. The interpretation of these figures, considered together, is straightforward; over the first 18 months of post-school exposure to labor market opportunities, most of the time spent working is committed to the first job held.[39]

Table 2 lengthens the post-school observation interval to two-and-one-half years, 1990:3 through 1992:4. This presentation is limited to Colorado and Florida 1989-90 community college program completers.[40] The *maximum* value of any post-school status in this table is 10 quarters. The 1989-90 high school completers exhibit an average post-school first job length that is more than six months less than their community college counterparts, who left school at the same time. The analysis does not find vocational/non-vocational differences in average length of first post-school job length for Colorado's 1989-90 community college completers.[41]

The *right-truncation* column in Table 2 shows the percentage of the completers who reported post-school employment and were still employed in this first job in 1992:4. Florida's[42] right-truncation percentages are much lower for those who started a new job after leaving school, relative to their classmates who continued an employer affiliation that had been established before they left school. One exception to this pattern is observed: those who completed a Health & Medical Sciences program at one of Florida's community colleges in 1989-90 were equally likely to continue to be affiliated with their first post-school employer in 1992:4 if they had, or had not, reported working for this employer prior to program completion.

The five columns on the right side of Table 2 provide a descriptive summary of the churning phenomenon for these groups of 1989-90 community college program completers. The *churn-91* column shows the percentage of post-school job holders who moved between, or among, employers within the same state at some time during 1991 (i.e., the year after they left school). The state-specific or vocational-program-specific average percentage who changed employers at least once during 1991 ranges from a low of 16 percent for completers of Florida's protective services programs who remained with the same employer after leaving school to a high of 39 percent for completers of Florida's engineering technology programs who had not remained with a pre-completion employer after leaving school. This finding reinforces the importance of distinguishing between community college enrollees who may be upgrading their skills with the intention of remaining with a current employer and those who are attempting to acquire entry-level skills to qualify for employment after leaving school.

The *average number of employers* column appears to confirm what others have reported in earlier years: a substantial amount of churning occurred during the first 30 months after the students left school in 1990:2. The final *no churning* column strengthens this conclusion, showing that the state- or program-specific percentage who had not changed employers at all during the 1991:1 through 1992:4 interval ranges from a low of 36 percent to a high of 74 percent.

Table 2

Colorado and Florida Community College Program Completers, 1989-90 Cohort
Two and One-Half Year Employment Churning: 1990:3 - 1992:4

	Pre-Comp Job (?)	N	First Post-School Job Length: Size	Mean	Stderr	R-trunc: Mean	% of Total Emp Length: Mean	Stderr	Churn-91: Mean	Churn-92: Mean	# Employers: Mean	Stderr	No-Churn: Mean
Colorado													
Vocational													
ALL	*	4,007	3,415	4.65	0.06	0.30	0.64	0.01	0.34	0.38	2.78	0.03	0.39
Office Occupation		642	547	4.64	0.14	0.33	0.64	0.02	0.34	0.37	2.55	0.07	0.37
Engineering Tech.		486	418	5.53	0.17	0.39	0.70	0.02	0.29	0.29	2.24	0.08	0.47
Allied Health		626	565	4.53	0.13	0.26	0.61	0.01	0.36	0.40	3.31	0.09	0.36
Health & medical		464	441	4.78	0.15	0.32	0.62	0.02	0.31	0.39	2.85	0.09	0.37
Child Care/Food		94	82	4.39	0.38	0.26	0.68	0.04	0.33	0.35	2.66	0.18	0.40
Protective Services		311	276	4.94	0.22	0.34	0.62	0.02	0.32	0.32	2.87	0.12	0.42
Non-vocational													
ALL		1,715	1,240	4.61	0.10	0.32	0.68	0.01	0.28	0.36	2.48	0.05	0.45
Floride													
Vocational													
ALL	Yes	10,528	10,168	7.07	0.03	0.51	0.78	0.00	0.23	0.23	2.45	0.02	0.62
	No	2,890	1,641	4.36	0.08	0.33	0.72	0.01	0.30	0.32	2.34	0.04	0.48
Office Occupation	Yes	679	650	6.88	0.13	0.47	0.78	0.01	0.24	0.26	2.19	0.06	0.59
	No	314	185	3.71	0.22	0.28	0.69	0.02	0.32	0.31	2.11	0.10	0.44
Engineering Tech.	Yes	569	557	7.22	0.14	0.53	0.80	0.01	0.22	0.21	2.00	0.06	0.64
	No	182	77	4.05	0.37	0.29	0.67	0.04	0.39	0.25	2.00	0.13	0.45
Allied Health	Yes	2,526	2,426	6.33	0.07	0.41	0.72	0.01	0.28	0.27	2.96	0.04	0.54
	No	720	468	4.78	0.16	0.33	0.71	0.02	0.31	0.30	2.67	0.10	0.48
Health & medical	Yes	1,860	1,804	7.46	0.07	0.52	0.80	0.01	0.20	0.23	2.55	0.04	0.64
	No	193	111	6.02	0.32	0.50	0.76	0.03	0.31	0.28	2.13	0.15	0.56
Child Care/Food	Yes	100	91	6.32	0.37	0.43	0.73	0.03	0.31	0.41	2.74	0.19	0.48
	No	53	29	3.72	0.55	0.28	0.71	0.06	0.28	0.34	2.10	0.28	0.45
Protective Services	Yes	2,855	2,813	7.97	0.06	0.66	0.85	0.01	0.16	0.16	2.18	0.03	0.74
	No	375	258	5.40	0.23	0.47	0.77	0.02	0.25	0.26	2.20	0.11	0.58

Notes:

(1) Pre-Comp Job means a job held in the second quarter of the completion year.
(2) N is the total population in that category. Size is the number of observations used in the calculation of all columns.
(3) R-trunc indicates the percentage of cases that are right-truncated in the calculation of the first post-school job length; i.e. they were still employed in the first job in 1992:4
(4) First Post-School Job Length is the length in quarters of the first job after completion, or the pre job carried at least to the fourth quarter of the completion year (only the post-completion period is counted in the length).
(5) % of Total Emp Length is the percentage of the first post-school job as a part of the total employment length after the graduation.
(6) Churn-91 is the percentage who changed jobs in 1991; churn-92 is the percentage who changed jobs in 1992.
(7) # Employers is the number of employers the individual had during the reference period.
(8) Former students who have no recorded post-school employment are omitted.

* Distinction omitted because it is affected by the wage-record anomaly.

A Multivariate Analysis of Churning, 1990:3-1991:4

Table 3 presents the first regression estimates of this monograph, depicting the Washington 1989-90 population of community college vocational program completers. The four dependent variables used in each of the four regressions are:

1. first job length;
2. ever churned (i.e., worked for two or more employers);
3. first job/total time employed ratio; and
4. continued pre-completion employer affiliation.

Regressions (1) and (3) in Table 3 were estimated using linear techniques, while regressions (2) and (4) used logistic methods. The brief six-quarter post-school observation period results in relatively low variance in the *first job length* and *continued pre-completion employer affiliation* dependent variables.

Table 3 reveals that males have a significantly shorter average *first job length* than their female classmates—at least over the first right-truncated, six-quarter, post-completion interval. Those who completed a *health & medical sciences* program exhibit a higher average *first job length* than their classmates who completed other community college vocational programs. Those who retained their pre-completion jobs, and those who had higher pre-earnings, also exhibit longer average first job durations.[43]

Table 3 also shows that males are more likely than their female classmates to have changed employer affiliation at least once during this one-and-one-half year period. Completers of a *health & medical sciences* program are significantly less likely than completers of other vocational programs to have changed employers. Those who continued in their previous employer affiliation after leaving school are less likely than others to have changed employers at a later time during this six-quarter interval. Those who had a job while still in school are more likely than their non-working classmates to change jobs during the first 18 months after leaving school. In addition, the earnings level of pre-completion employment during 1990:2 exhibits a positive association with post-completion churning.

Together, these relationships suggest that pre-completion employment affects the opportunity of former students to move among employers after leaving school. Chapter Four investigates whether the former students' mobility patterns are associated with earnings differences.

The *continued pre-completion employer affiliation* logistic regression estimates presented in Table 3 reveal that African-American vocational program completers are much more likely than their classmates to have remained in a pre-completion employer affiliation. The *agriculture education* and *health & medical sciences* program completers exhibit opposite patterns of continued employer affiliation, with the agriculture education completers being less likely to retain a pre-completion employer affiliation, and the completers of a health & medical sciences program being more likely than all others to continue with the same employer.[44]

Additional Management Diagnostics

Figures 12 through 17 provide further insights about the churning findings that have been presented thus far. Figures 12, 13, and 14 refer to 1985-86 populations of high school, district postsecondary, and community college vocational program completers. Unlike the 1989-90 and 1990-91 populations, which represent statewide universes, these former students are from the first group of 28 high school districts and 2 community

Table 3

WASHINGTON STATE
COMMUNITY COLLEGES
1989-90
VOCATIONAL PROGRAM COMPLETERS

Churning Analysis

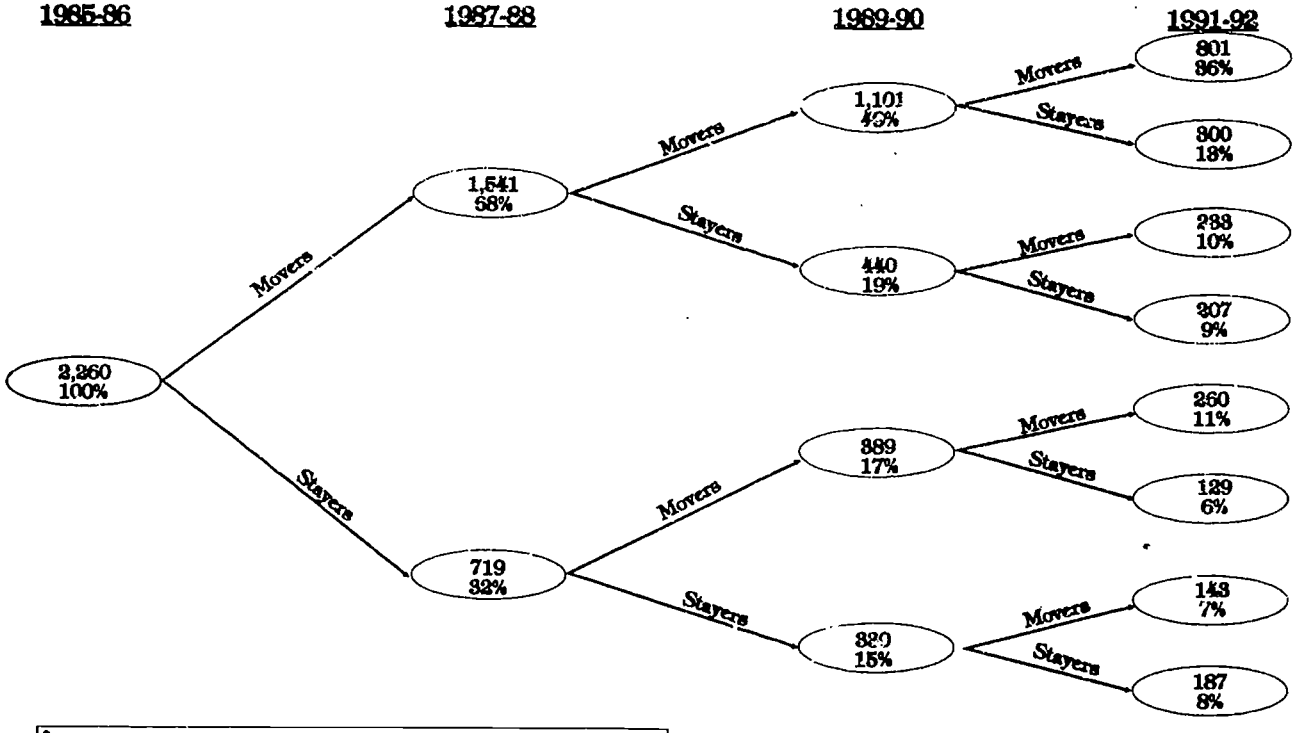
Dependent Variable Regression Type Number of Observations R-sq or C Population	First Job Length Linear Regression 1818 R-sq = 0.0548 Churning Group		Ever Churned Logistic Regression 5060 C = 0.67 Have Post-Sch Job		% of First Job Length in Emp Linear Regression 5060 R-sq = 0.0677 Have Post-Sch Job		Kept Pre-Job Logistic Regression 3471 C = 0.743 Had Pre-Grad Job	
	Estimate	P-Value	Estimate	P-Value	Estimate	P-Value	Estimate	P-Value
Intercept	2.122	0.000	-0.305	0.639	0.788	0.000	-0.157	0.847
Demographic Character								
Male	-0.100	0.117	0.185	0.013	-0.022	0.016	-0.206	0.022
Black	0.130	0.510	0.208	0.356	-0.002	0.939	0.592	0.046
Hispanic	0.085	0.671	0.163	0.479	0.005	0.864	0.150	0.583
Age	-0.006	0.741	-0.017	0.427	0.002	0.515	-0.055	0.053
Age Squared	0.000	0.643	0.000	0.556	-0.000	0.714	0.001	0.014
Vocational Program:								
Agriculture Education	-0.335	0.101	0.052	0.832	-0.033	0.280	-0.181	0.592
Office Occupation	-0.017	0.848	-0.124	0.219	0.005	0.678	0.163	0.205
Engineering Technology	0.230	0.049	-0.238	0.072	0.042	0.007	-0.042	0.797
Allied Health	0.221	0.004	-0.061	0.489	0.014	0.185	-0.048	0.662
Health & Medical Sciences	0.240	0.020	-0.846	0.000	0.077	0.000	-0.011	0.927
Child Care /Food Service	0.010	0.936	0.105	0.469	-0.004	0.835	0.200	0.254
Local Economic Conditions								
Local-Avg-Earn ($ 1,000)	-0.064	0.552	-0.030	0.786	0.005	0.727	0.193	0.217
Local-Avg-Emp	0.835	0.344	0.801	0.428	-0.117	0.332	-1.288	0.314
Pre-Graduation Job Info.								
Kept-Pre-Job	0.296	0.000	-0.635	0.000	0.065	0.000		
Pre-Job	0.045	0.531	0.301	0.000	-0.025	0.016		
Pre-Job-Earn ($ 1,000)	0.046	0.017	-0.170	0.000	0.017	0.000	0.440	0.000
Post-School Job Delay								
First Job Delay 1 Qtr.	-0.059	0.490	0.142	0.178	0.025	0.063		
First Job Delay 2 Qtr.	-0.199	0.111	0.003	0.983	0.073	0.000		
First Job Delay 3 Qtr.	-0.478	0.013	-0.635	0.002	0.158	0.000		
First Job Delay 4 Qtr.	-0.833	0.005	-1.080	0.000	0.216	0.000		
First Job Delay 5 Qtr.	-1.535	0.008	-2.392	0.000	0.232	0.000		

Note:

1. Italic indicates a 0-1 dummy variable.
2. Local-Avg-Earn is the average 1991:1 earnings of all 1989-90 Washington Community College students by groups of counties. Local-Avg-Emp is the average 90:3-91:1 employment rate by the same groupings.
3. Pre-Job refers to the job held by individuals in school, kept-pre-job means they carried the pre-job at least to the second quarter after leaving school.

Figure 12

FLORIDA
HIGH SCHOOLS
1985-86
VOCATIONAL PROGRAM COMPLETERS



* This figure includes only those former students who were still reported as employed in Florida in 1992. Former students who left a Florida employer in one year, but were not reported by another Florida employer until a subsequent year, are shown as having moved in the later year. Former students who moved among multiple Florida employers during a given year are counted only once.

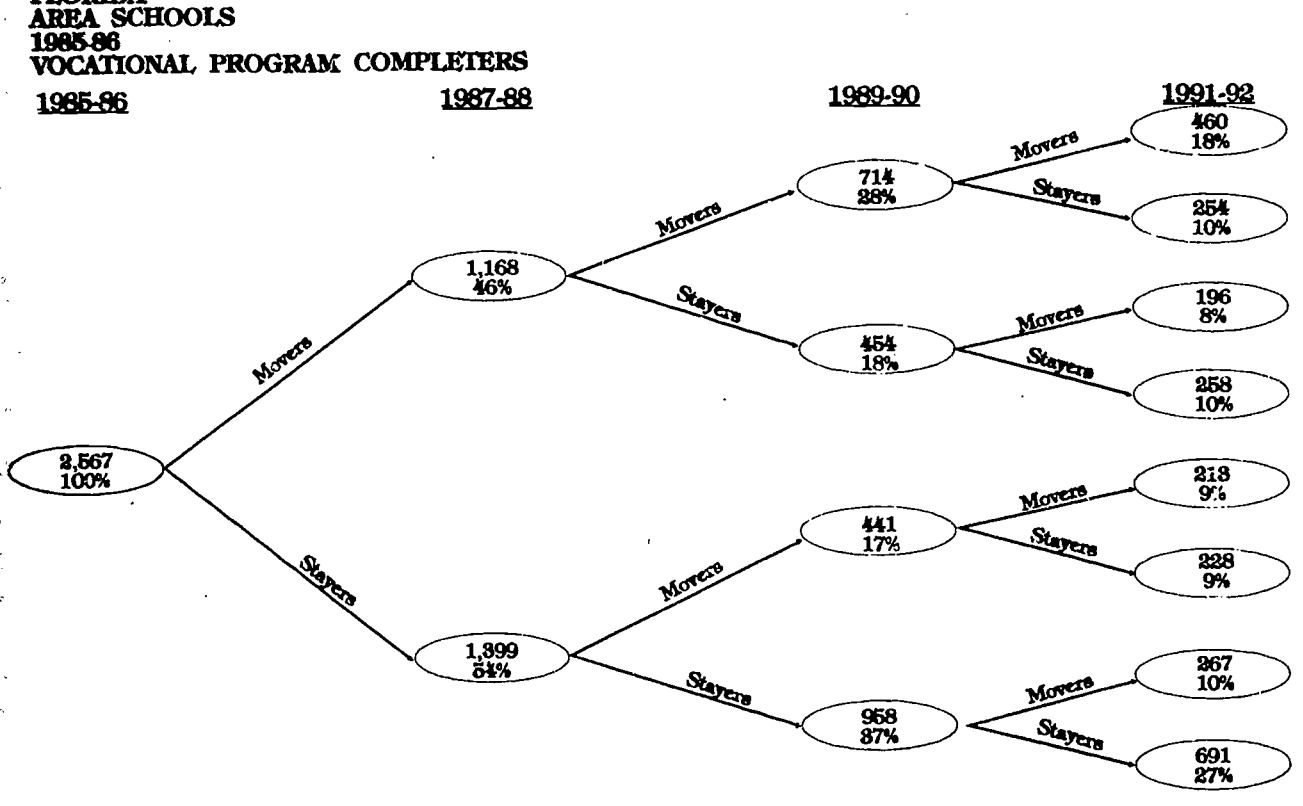
college districts that participated in the inaugural test of Florida's statewide management information system.

Figure 15 plots six annual rates of former students' reported movement among Florida employers. Separate trend lines are shown for former high school students from the 28 pilot districts and for vocational program completers in the two community college districts that are charter members of Florida's Education and Training Placement Information Program.

Figure 16 is paired with Figure 14. Here, average annual earnings levels are shown for each of the *stayer* and *mover* groups that appear in Figure 14.

Figure 17 illustrates the design of a screen that could be used in administrative meetings or by research support staff members to explore differences in

Figure 13



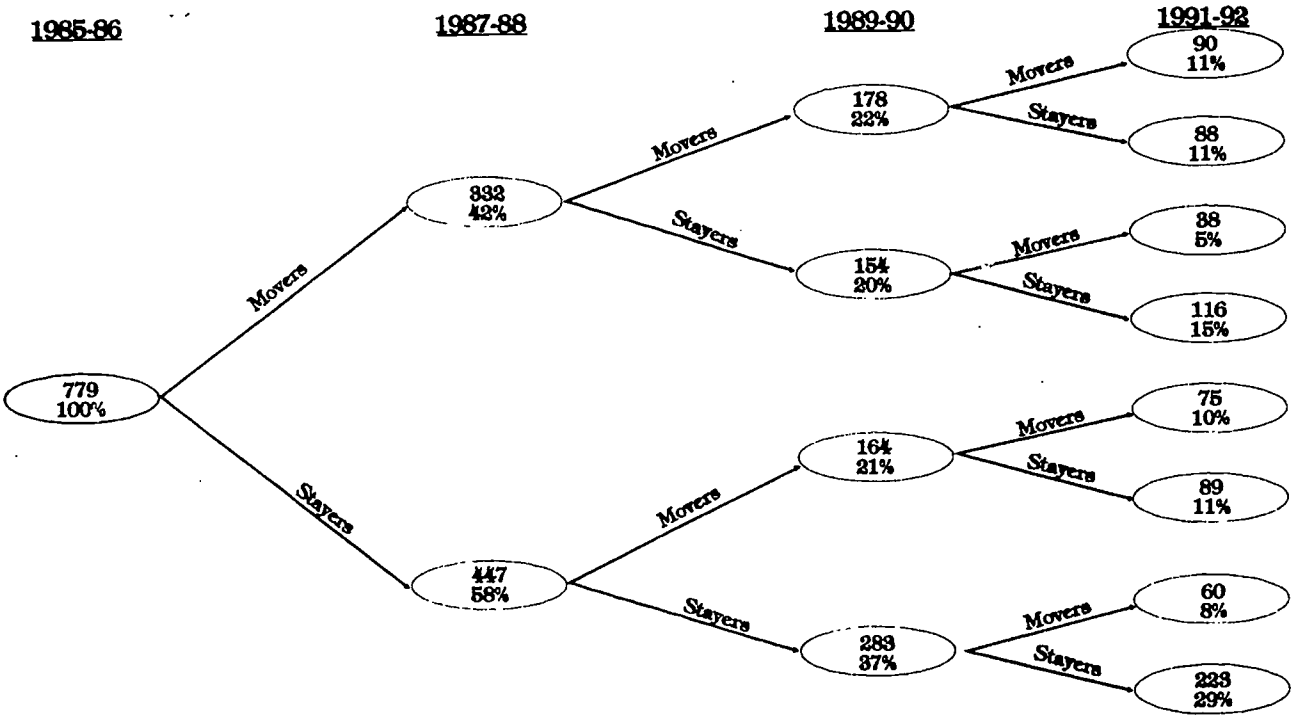
* This figure includes only those former students who were still reported as employed in Florida in 1992. Former students who left a Florida employer in one year, but were not reported by another Florida employer until a subsequent year, are shown as having moved in the later year. Former students who moved among multiple Florida employers during a given year are counted only once.

employment outcomes between student populations, among programs and schools, and in different economic climates.

Figures 12, 13, and 14 show the sequential mobility paths recorded for former high school, district postsecondary, and community college vocational program completers. The *top* path in each figure traces the percentage of those who repeatedly changed employers at least once during each of the three two-year periods after the former students left school in 1986. The *bottom* path in each figure traces the percentage of those who sustained an affiliation with their employer during the preceding two-year interval. Those found on other branches of these "trees" exhibit a mixed pattern of staying and moving.

Figure 14

FLORIDA
SELECTED* COMMUNITY COLLEGES
1985-86
VOCATIONAL PROGRAM COMPLETERS



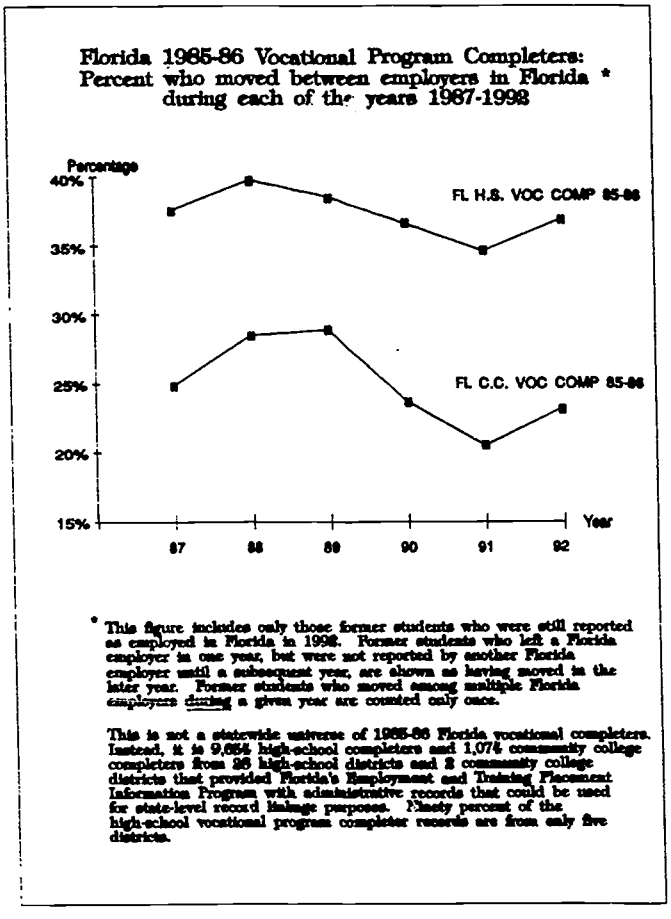
* This figure includes only those former students who were still reported as employed in Florida in 1992. Former students who left a Florida employer in one year, but were not reported by another Florida employer until a subsequent year, are shown as having moved in the later year. Former students who moved among multiple Florida employers during a given year are counted only once.

These three figures show that 1985-86 completers of these high school vocational programs are more likely than completers of district postsecondary or community college vocational programs to have changed employers during each of the three post-school leaving intervals. By the end of 1992, only 8 percent of former high school students were still working for their first employer after leaving school. This contrasts with rates of 27 percent and 29 percent, respectively, for the district postsecondary and community college completers who left school in Florida during the same year.

Figure 15 traces the year-to-year incidence of mobility between, or among, employers for the 1985-86 Florida high school and community college vocational program completers. The decline in churning that appears for each of these groups from 1989, through

Figure 15

FLORIDA
SELECTED HIGH SCHOOLS
AND COMMUNITY COLLEGES
1985-86
VOCATIONAL PROGRAM COMPLETERS

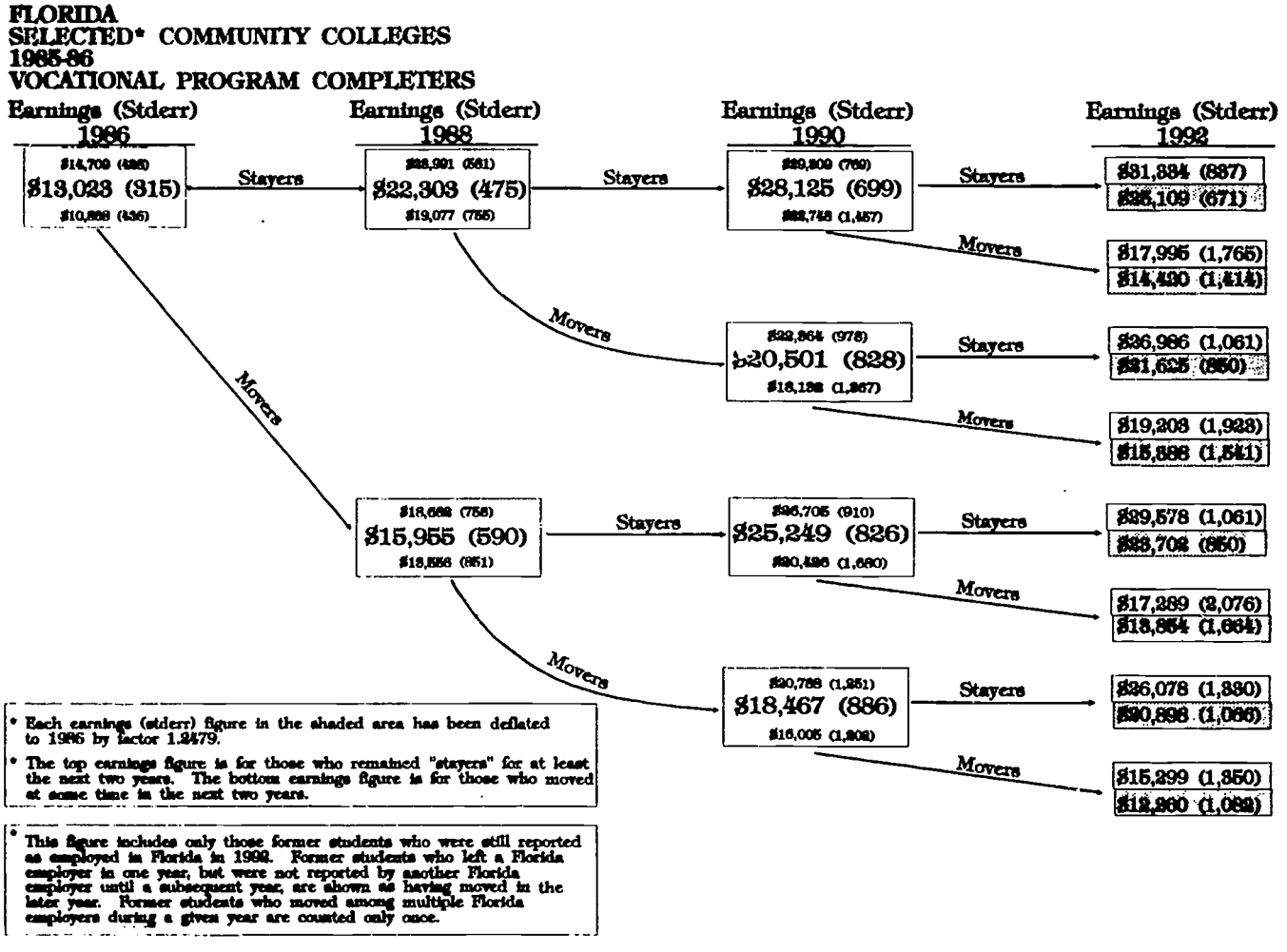


* This figure includes only those former students who were still reported as employed in Florida in 1992. Former students who left a Florida employer in one year, but were not reported by another Florida employer until a subsequent year, are shown as having moved in the later year. Former students who moved among multiple Florida employers during a given year are counted only once.

This is not a statewide universe of 1985-86 Florida vocational completers. Instead, it is 9,654 high-school completers and 1,074 community college completers from 26 high-school districts and 2 community college districts that provided Florida's Employment and Training Placement Information Program with administrative records that could be used for state-level record linkage purposes. Ninety percent of the high-school vocational program completer records are from only five districts.

1990, and then in 1991 is consistent with a "settling-in" phenomenon—former students enter into sustaining employer affiliations at increasing rates over time. However, this trend also reflects the impact of the 1990-91 recession, which decreased the possibility that former students were able to move from one employer to another. Each record of churning reflects the actions of two parties: an employer who extended a job offer and a candidate who accepted this offer. Churning is a result of this interplay. Any force that affects either the opportunity to change employers or the incentive to do so changes the observed rate of churning. A low rate of churning might be traced to high levels of employee satisfaction with their current jobs; or, it might be an artifact of limited opportunity to move. This limited opportunity, in turn, might be attributed to a genuine

Figure 16



absence of job openings elsewhere; or, it might reflect deficient qualifications of the incumbent employees who appear to be locked into their current jobs. Similarly, a high rate of documented churning might be traced to highly qualified employees being repeatedly enticed to move from business to business; however, it might reflect poorly qualified employees who are unable to hold a job. Churning evidence alone is just a first step toward understanding the competitiveness of former students in vocational education programs.

Figure 16 reveals another facet of the churning phenomenon. Starting with the 1985-86 completers of vocational programs in the two community college districts that were also covered in Figures 14 and 15, this presentation provides three average earnings figures for each of seven groups. The population repre-

sented in each of Figure 16's boxes is identical to the one depicted in Figure 14. The dollar amount that is shown in the larger font size is the average annual earnings for a particular population-year combination. The two dollar amounts that appear in each box in a smaller font size document the reported average earnings levels for members of this subgroup who stayed with (upper figure) or left (lower figure) their employer during the next two years. For example, the 1986 average annual earnings figure of $13,023, shown in the upper left corner of Figure 16, represents all the 1985-86 vocational program completers in these two community college districts in Florida who were working in 1992 for a covered employer in Florida. The top figure of $14,709 in the same box represents the 1986 average annual earnings of those members of this population of former students who remained affiliated with the same employer at least through 1988. The bottom figure of $10,868 in this box represents the 1986 average annual earnings of those who changed employers at least once between 1986 and 1988. No attempt has been made here to distinguish between one-time movers and those who worked for more than two employers during these two years.

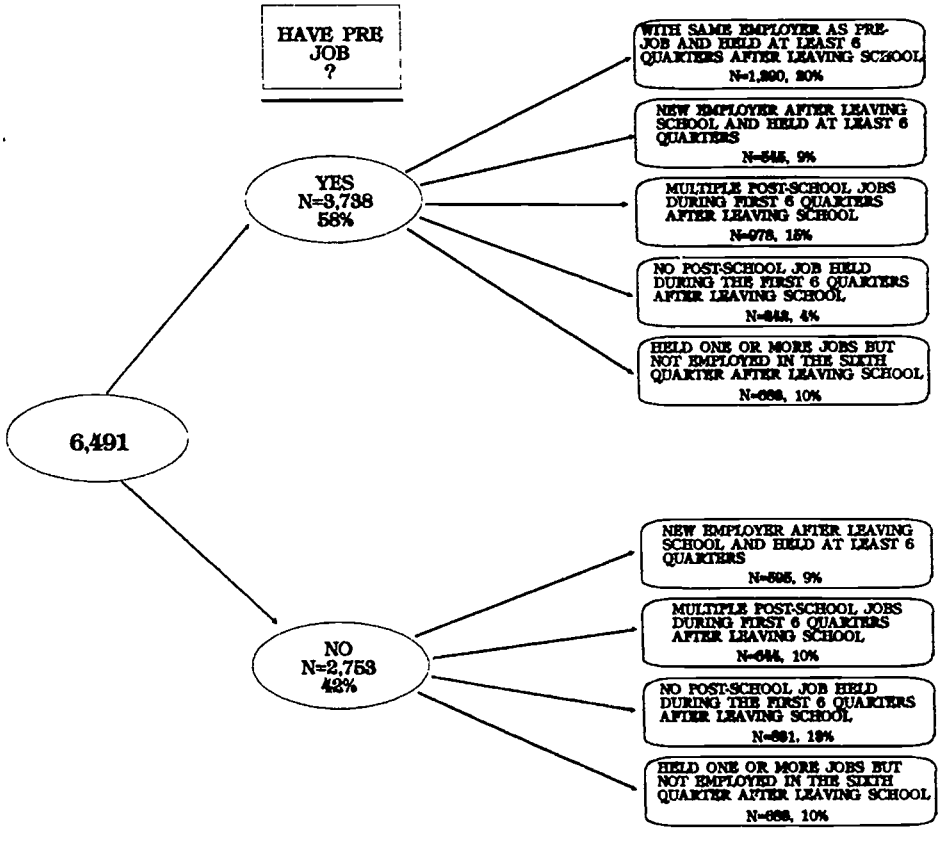
As was the case with Figure 14, the top and bottom sequence of boxes that read from left to right are expected to be of greatest interest to most readers. The small font sequence across the top of Figure 16, which rises from $14,709 in 1986 to $31,334 in 1992, represents the actual increase in average annual earnings for those who sustained a single employer affiliation during the first six years after completion.[45] The shaded figure of $25,109, which appears just below the uppermost 1992 average earnings amount of $31,334, is the deflated value of the latter amount based on a 1986 base using the Gross Domestic Product Implicit Deflator Series. This allows each reader to easily calculate the increase in real purchasing power that has occurred for any subgroup over the six-year reference period. This increase can be used as a rough index of an average former student's worth to an employer. A direct comparison of the top and bottom boxes in the 1992 column shows that those who remained with one employer throughout the six years had a two-to-one average annual earnings advantage over their classmates who changed employers at least once in each of the three two-year intervals covered in the reference period.[46]

Figure 17 represents one additional way in which pre- and post-employment patterns can be displayed for administrative use. Here, the right-side vertical stacking of former students' employment status after leaving school accounts for all of Washington's 1989-90 community college vocational program completers. These completers have been divided in the middle of the figure into those who were employed in Washington state while the completers were still enrolled in school and those who were not employed while still in school. Each reader is encouraged to visualize this information as it would appear on a computer screen, with a capability to perform further diagnostics in the form of queries to provide comparisons of the nine employment statuses that appear in Figure 17. For instance, the upper right-corner box, which represents those who have remained with the same employer since before they left school, can be explored further to identify differences associated with demographics, vocational program classification, school, or reference-time interval.

The figures and tables included in this chapter complement those presented in Chapter Two. Together, they provide important insights about the bridge months and next few years of former students' work histories. These highlights represent the visible tip of a hidden iceberg

Figure 17

WASHINGTON
COMMUNITY AND TECHNICAL COLLEGES
1989-90
VOCATIONAL PROGRAM COMPLETERS



of administrative records that document how former vocational students have fared in the competitive labor market of the 1990s.

A Summary of Employment Churning Findings

The following patterns of employment churning emerged in Tables 1, 2, and 3 and in Figures 12 through 17.

1. Substantial movement between and among employers occurs, on average, during the first years of a former student's post-school work history.
2. Completers of high school vocational programs exhibit more churning than do their community college counterparts.
3. Limited comparative evidence does not indicate a difference in employment churning between vocational and non-vocational completers.

4. Those who held jobs while in school are more likely to exhibit post-school leaving mobility than are those who were not employed while in school.
5. Those who continued in a previous job after leaving school are less likely to move to another job than those who started new jobs after leaving school—at least during the first year and one-half following completion.
6. The patterns of employment churning that emerge are associated with vocational program categories, economic and demographic factors, and the timing of beginning work after completion. These relationships indicate that care must be exercised in generalizing from these state, level, and year findings.

These findings should be interpreted in the context of post-school earnings levels and growth paths and of the relevance of vocational program content to post-school employment. These are the topics of Chapter Four and Chapter Five.

Chapter Four: 1991-92 Earnings of Recent Vocational Program Completers

Introduction

This chapter answers the third of the four questions posed in Chapter One: How are the combinations of concurrent and initial post-school employment related to the level and growth of a former student's earnings?[47]

Hollenbeck (1992), Grubb (1993), Kane and Rouse (1993), and Rouse (1993) provide a foundation for investigating earnings outcomes that can be associated with the nation's investment in vocational education. These authors have published results that account for many of the sources of bias that affect all comparisons of earnings figures. Rouse identifies *selection* biases associated with differences between those who attain an educational plateau and others who do not, including those who enrolled but did not finish and those who never enrolled; *diversion* biases associated with the presence of one type of institution—for example, a community college—as this expands the choice set from which prospective students must select a preferred school; *democratization* biases that arise from the altered mix of credentials found in the workforce; *contamination* biases that stem from a failure to record the enrollment of some members of a research population in unknown education or training activities—for example, out-of-state enrollment in public postsecondary

programs or enrollment in private schools; and *measurement error* biases that emerge when recorded information is not an accurate measure of the intended concept—for instance, intentional or careless misreporting of earnings. The findings that emerge in this chapter do not reflect any attempt to take these influences into account. What this chapter does contain is the first public release of reliable and current information about the earnings of former students in high school and postsecondary vocational education programs. Refined analyses reflecting the state-of-the-art in research methods and standards will be released in 1994.

Multiple comparisons of average annual earnings levels appear in the following pages. Unlike Chapter Two—in which a uniform format was used for all state, year, level, and program presentations—this chapter highlights different aspects of a particular state's database. Florida's administrative records are used to distinguish between those who are, or are not, known to have continued their education in a Florida public school.[48] Colorado's earnings outcomes are presented by sex and by vocational-nonvocational program classification. Missouri's earnings outcomes are organized by credit-hour groupings. Finally, Washington's earnings outcomes are shown for three different levels of credentials: associate's degree, greater than or equal to a one-year certificate, and less than a one-year certificate. This approach offers each reader a sampling of different ways in which earnings data can be reported.[49]

Earnings Measures Used

Two measures of earnings are utilized.

- **Earnings.** This represents the average earnings in all four quarters of 1991 or 1992 for former students who had any reported earnings in the reference year. The calculation of this average earnings number does not include those who had no reported earnings in any of the four quarters.[50] No full-time, part-time, year-round, or seasonal employment is considered in deriving this average earnings amount.
- **Full Earnings.** This concept represents what many interested parties want to know: What is the annual earnings level for a recent high school or community college completer who works full-time year-round? Step one in this calculation determined which of the former students reported earnings records in each of the four quarters of the reference year (1991 or 1992). This is interpreted as a reliable indicator of year-round employment. We then turned to 1990 Census five-percent Public Use Micro Sample (PUMS) data for each of the four states to derive a state-specific, full-time, year-round (40 hours a week and at least 48 weeks a year of self-reported employment) earnings distribution for Census respondents whose highest level of educational attainment was either high school only or community college associate degree completion. The high school respondents were age-censored to achieve comparability with our 1990-91 reference year. We then selected the fifth quintile of this distribution as a cut-off point, which eliminates the lowest five percent of self-reported earnings by those who were employed full-time and year-round. This threshold dollar value refers to 1989 annual earnings, so we used the Gross Domestic Product Implicit Deflator series to inflate each of these state- and education-level specific earnings to reflect 1991 and 1992 values. These figures then became the dollar-amount floors that were established to identify former students considered to have worked full-time and year-round. This procedure includes part-time and/or partial-year workers who earn enough to exceed this threshold earnings level and excludes those who have unusually low earnings—even though they have an earnings record in each of the four quarters. An appendix to this chapter elaborates on these points.

This chapter includes vocational and non-vocational comparisons for Colorado and Florida high school completers and for Colorado and Missouri community college completers; female and male comparisons for each state, level, and program group; continuing education and not-continuing-education comparisons for Florida's high school completers; credit-hour threshold comparisons for Missouri's former community college students; and type of certificate and degree comparisons for Washington's community college vocational program completers.

The Former High School Students' Earnings: The Class of 1990-91

This section presents two tables:

1. 1990-91 Colorado High School Vocational Program Completers and Selected Non-Vocational Students (i.e., those who took the ACT assessment during their senior year in 1990-91) and
2. 1990-91 Florida High School Vocational Program Completers and Selected Non-Vocational Students (i.e., a stratified random sample of 1990-91 high school graduates who did not complete a vocational program).

Colorado's High School Class of 1990-91. Table 4 presents the two earnings measures for Colorado's 1990-91 high school completers. These findings represent *vocational* and *non-vocational* groups by *sex*.

When the "any earnings" criterion is used to calculate 1992 average earnings levels for these groups of 1990-91 high school completers, the following patterns emerge.

- Completers of a high school vocational program earn more than the members of the high school non-vocational comparison group who have been identified using ACT assessment records.[51]
- The 1992 male average earnings level is higher than their average female classmate's earnings within each of the vocational/non-vocational groupings.

The *full earnings* part of Table 4, which uses the adjusted 1990 Census PUMS estimate of a Colorado-specific full-time and year-round earnings level for high school graduates (only), reveals compelling evidence of the importance of accounting for differences in the former students' consistency of paid employment. The same vocational/non-vocational and sex-based average earnings relationships that appear when the "any earnings" criterion is used are repeated when the *full earnings* criterion is substituted; however, as one would expect, the average earnings level in each category is substantially higher.

The average earnings patterns that appear in Table 4 are not affected by the administrative data anomaly that was described in Chapter One. However, the unknown effect of using the ACT assessment as a way to identify a non-vocational comparison group suggests that caution should be exercised when generalizing from these findings.

Florida's High School Class of 1990-91. Table 5 replicates for Florida Table 4's results for Colorado—with two important refinements.

1. The non-vocational comparison group is a stratified random sample of Florida's 1990-91 high school graduates.
2. A *continuing education* variable is introduced to show whether conclusions about post-high school earnings need to be adjusted for differences in the incidence of continuing education between the vocational and non-vocational groups and between the male and female groups of former students.

Table 4

COLORADO
HIGH SCHOOL
1990-91
VOCATIONAL AND SELECTED* NON-VOCATIONAL PROGRAM COMPLETERS

EARNINGS OUTCOMES

Program	Sex	Size	Earnings in 1992			Full Earnings in 1992		
			N	Mean	Stderr	N	Mean	Stderr
Vocational	F	6,414	4,175	$5,122	$74	1,322	$9,892	$127
	M	4,451	2,797	5,843	97	1,002	10,918	149
	All	10,865	6,972	5,411	59	2,324	10,334	97
Academic	F	7,296	5,536	3,665	52	970	9,114	189
	M	7,370	5,417	4,253	54	1,105	9,794	132
	All	14,666	10,953	3,956	38	2,075	9,476	113
Adjusted Difference Of Voc. - Acad.			1,523 (71) Significant			962 (150) Significant		

Notes:

1. "Full Earnings in 1992" is defined as "Earnings in 1992" if earnings were reported for each of the four quarters, and if this earnings amount is equal to or greater than $5777; which is the inflated 5% quantile of 1989 full time workers' earnings in the corresponding 1990 census group. Full time is defined as 40 hours or more per week, 48 weeks or more per year.
2. The significance tests are for the difference between mean earnings levels for the vocational and academic groups, adjusted for the different distributions of 'sex' in these groups. The tests are based on 5% significance level.

* ACT assessment takers.

Table 5

FLORIDA
HIGH SCHOOL
1990-91
VOCATIONAL AND SELECTED* NON-VOCATIONAL PROGRAM COMPLETERS

EARNINGS OUTCOMES

Program	Sex	Cont-Educ	Size	Earnings in 1992 N	Earnings in 1992 Mean	Earnings in 1992 Stderr	Full Earnings in 1992 N	Full Earnings in 1992 Mean	Full Earnings in 1992 Stderr
Vocational	F	Yes	4,828	4,129	$5,246	$59	1,202	$9,688	$95
		No	5,409	4,181	6,347	75	1,673	10,677	106
	M	Yes	2,096	1,761	5,747	100	591	10,337	124
		No	3,457	2,436	7,651	124	1,135	12,249	168
	ALL		15,790	12,507	6,153	43	4,601	10,763	65
Academic	F	Yes	4,230	3,439	4,381	58	749	9,320	100
		No	4,929	3,330	5,148	88	978	10,620	184
	M	Yes	1,826	1,499	4,944	102	401	9,960	176
		No	3,190	2,013	6,084	120	700	11,458	195
	ALL		14,175	10,281	5,048	45	2,828	10,390	88
Adjusted Difference Of Voc-Acad				1,102 (61) Significant			366 (108) Significant		

Notes:

1. "Full Earnings in 1992" is defined as "Earnings in 1992" if earnings were reported for each of the four quarters, and if this earnings amount is equal to or greater than $6665; which is the inflated 5% quantile of 1989 full time workers' earnings in the corresponding 1990 census group. Full time is defined as 40 hours or more per week, 48 weeks or more per year.
2. The significance tests are for the difference between mean earnings levels for the vocational and academic groups, adjusted for the different joint distributions of 'sex' and 'continuing education' in these groups. The tests are based on 5% significance level.

* Random stratified sample.

Table 5 reveals that taking *continuing education* into account is important; those who are not known to have continued their education during the 1991:3-1992:4 observation period have significantly higher average earnings levels than those who were reported to have continued their education in one of Florida's public postsecondary schools. Table 5 also reveals the same average earnings advantage for males within each program group and for vocational program completers relative to non-vocational program completers at the high school level. The substantial *full earnings* difference for vocational completers also stands, which continues to build a case for accounting for full-time/part-time and year-round/partial-year employment differences.

Former Community College Students' Earnings: The Class of 1989-90

Introduction. This section includes four earnings outcome tables:

1. Colorado 1989-90 community college associate degree recipients, by vocational or non-vocational status (Table 6).
2. Florida 1989-90 community college vocational program completers, classified by whether they are known to have continued their education in a Florida public four-year college or university (Table 7).
3. Missouri 1989-90 community college vocational program "completers," based on thresholds of 30 to 59 credit hours and equal to or greater than 60 credit hours (Table 8).
4. Washington state 1989-90 community college vocational program completers, by whether a student completed an associate degree, a certificate requiring at least one year of course work, or a certificate that required less than one year of coursework (Table 9).

Each of these four tables also provides a male/female breakout of reported average earnings levels within the specified program categories; and each table also provides the same two measures of earnings that were introduced in the previous high school section of this chapter.

Tables 6 and 7, which represent Colorado and Florida respectively, provide both 1991 and 1992 *annual earnings* and *full earnings* information. Tables 8 and 9, which represent Missouri and Washington state respectively, provide only 1991 *annual earnings* and *full earnings* information. The latter two tables will be updated when we receive the necessary administrative records.

Colorado's Community College Class of 1989-90. Table 6, when compared with Tables 4 and 5, indicates that completers of a community college vocational program had significantly higher 1991 and 1992 average annual earnings levels than their counterparts who completed a high school vocational program. Care should be exercised in basing conclusions on these direct comparisons among tables. Tables 4 and 5 cover former students in the class of 1990-91, while Table 6 covers the community college class of 1989-90. None of these three tables takes into account former students' continuing education.[52]

Table 6 exhibits the first reversal of a consistent pattern of average earnings advantage for former students in vocational programs over their classmates in non-vocational programs. Both the 1991 and 1992 measures of *full earnings* reveal an average earnings advantage for males who are completers of a non-vocational program over their male classmates who completed a vocational program. This table includes only associate degree recipients in each group. This adds to the cumulative evidence that indicates important differences in

Table 6

COLORADO
COMMUNITY COLLEGE
1989-90
ASSOCIATE DEGREE RECIPIENTS, VOCATIONAL/NON-VOCATIONAL

EARNINGS OUTCOMES

Program	Sex	Size	Earnings in 1991 N	Earnings in 1991 Mean	Earnings in 1991 Stderr	Earnings* in 1992 N	Earnings* in 1992 Mean	Earnings* in 1992 Stderr	Full Earnings in 1991 N	Full Earnings in 1991 Mean	Full Earnings in 1991 Stderr	Full Earnings* in 1992 N	Full Earnings* in 1992 Mean	Full Earnings* in 1992 Stderr
Vocational	F	1,122	911	$16,384	$328	865	$18,463	$369	573	$20,933	$355	624	$22,620	$357
	M	912	679	18,776	542	647	20,675	518	430	25,308	603	469	25,904	514
	All	2,034	1,590	17,406	300	1,512	19,410	307	1,003	22,808	335	1,093	24,029	304
Academic	F	704	451	10,834	497	450	12,466	493	185	19,937	753	241	19,238	593
	M	613	331	16,681	891	331	18,143	879	162	28,291	1,225	193	27,735	1,028
	All	1,317	782	13,309	485	781	14,872	479	347	23,837	733	434	23,017	598
Adjusted Difference Of Voc. - Acad.			4,088 (559)			4529 (559)			-862 (777)			1,064 (640)		
			Significant			Significant			Not Significant			Not Significant		

1. "Full Earnings in 1991" is defined as "Earnings in 1991" if earnings were reported for each of the four quarters, and if this earnings amount is equal to or greater than $8667; which is the inflated 5% quantile of 1989 full time workers' earnings in the corresponding 1990 census group. The cut-off point for 1992 earnings is $8887. Full time is defined as 40 hours or more per week, 48 weeks or more per year.
2. The significance tests are for the difference between mean earnings levels for the vocational and academic groups, adjusted for the different distributions of 'sex' in these groups. The tests are based on 5% significance level.

* 1992 earnings are deflated to 1991 by factor 1.025.

Table 7

FLORIDA
COMMUNITY COLLEGE
1989-90
VOCATIONAL PROGRAM COMPLETERS

EARNINGS OUTCOMES

Program	Cont. Educ.	Sex	Size	Earnings in 1991 N	Earnings in 1991 Mean	Earnings in 1991 Stderr	Earnings* in 1992 N	Earnings* in 1992 Mean	Earnings* in 1992 Stderr	Full Earnings in 1991 N	Full Earnings in 1991 Mean	Full Earnings in 1991 Stderr	Full Earnings* in 1992 N	Full Earnings* in 1992 Mean	Full Earnings* in 1992 Stderr
Degree	Yes	F	836	711	$21,095	$494	693	$22,599	$525	533	$25,917	$492	509	$27,737	$524
		M	509	435	21,478	689	407	23,838	741	311	27,348	700	311	28,660	753
		All	1,345	1,146	21,240	403	1,100	23,058	429	844	26,444	404	820	28,087	432
	No	F	3,204	2,708	23,790	225	2,598	25,199	236	2,256	26,776	211	2,127	28,362	220
		M	1,354	1,032	22,684	401	981	23,920	439	786	27,143	378	739	28,558	431
		All	4,558	3,740	23,485	197	3,579	24,849	210	3,042	26,871	185	2,866	28,413	198
Non-Credit	Yes	F	735	667	$16,747	$426	646	$17,957	$500	458	$22,074	$410	465	$22,878	$525
		M	849	781	20,017	351	762	21,333	384	641	22,974	316	645	24,044	353
		All	1,584	1,448	18,520	276	1,408	19,793	312	1,009	22,607	251	1,110	23,564	301
	No	F	2,363	1,884	13,731	238	1,744	14,505	256	1,089	19,927	270	1,072	20,257	281
		M	2,273	1,886	18,390	243	1,812	19,197	275	1,475	21,513	239	1,444	22,491	277
		All	4,636	3,770	16,062	174	3,556	16,896	192	2,564	20,840	180	2,516	21,539	201
Certificate	Yes	F	132	115	$15,648	$1,020	112	$17,175	$1,016	74	$20,985	$1,156	77	$21,754	$1,057
		M	283	263	19,600	679	255	22,517	708	194	24,352	604	204	26,218	633
		All	415	378	18,398	572	367	20,887	595	268	23,422	548	281	24,994	555
	No	F	213	173	18,269	881	174	18,427	882	131	21,986	941	127	22,543	925
		M	385	345	21,873	606	337	23,481	662	287	24,983	555	277	26,577	621
		All	598	518	20,670	505	511	21,760	540	418	24,044	486	404	25,309	524

1. "Full Earnings in 1991" is defined as "Earnings in 1991" if earnings were reported for each of the four quarters, and if this earnings amount is equal to or greater than $9101; which is the inflated 5% quantile of 1989 full time workers' earnings in the corresponding 1990 census group. The cut-off point for 1992 earnings is $9332. Full time is defined as 40 hours or more per week, 48 weeks or more per year.

* 1992 earnings are deflated to 1991 by factor 1.025.

the way employers reward signals of candidate qualification (e.g., degrees/certificates, program completion, credit hours, and competencies attained).[53]

When 1991 and 1992 average annual earnings comparisons between vocational and non-vocational completers are made, including all of the former students who had any earnings in the reference year, a significant advantage for the former vocational students is found. No significant difference is observed when the population of former students in each group is narrowed on the basis of the *full earnings* threshold value. Again, group-specific differences in the rate of members' continuing education is a likely reason for this disappearance of an immediate average earnings advantage for completers of community college vocational programs.

Florida's Community College Class of 1989-90. The evidence in Table 7 confirms that continuing education differences should be accounted for when comparisons of average annual earnings levels between groups are made, but that the nature of the interplay between continuing education and earnings is complex. Among the *associate degree* recipients depicted in Table 7, those who are not known to have continued their education in one of Florida's public colleges or universities have higher *annual earnings*, but not higher *full earnings*, than those who are known to have continued at the postsecondary level. However, among the *non-credit* program completers, those who are known to have continued their education have significantly higher *annual earnings* and *full earnings* than their classmates who are not known to have continued. This is another fragment of evidence that builds a case for using extreme care in understanding how unit-of-analysis decisions affect reported earnings levels and relationships. Completers of non-credit vocational programs who then continue their education should be expected to have different work histories—and perhaps different demographics—than their former classmates who did not immediately continue their education at a Florida public institution. The *certificate* recipients who appear in Table 7 exhibit a pattern of mean earnings that is similar to the pattern for their degree-receiving classmates.

Table 7 also documents important differences in *1992 full-earnings* levels for the 12 credential, continuing-education, and sex subgroups. No significant difference in the mean *1992 full earnings* levels is found among male/female and continuing education/not continuing education subgroups within the associate degree recipient population. However, males who received either non-credit or certificate program completion credentials exhibit a significant *1992 full earnings* advantage over their female classmates who received the same credential.

Chapter Five takes these Florida community college earnings findings one more step and includes *training relatedness* measures provided by Florida's Education and Training Placement Information Program. An occupational classification data element is based on a snapshot of employment status that is taken during the October-December quarter of the same year that a former student completed their vocational program, with the pertinent information collected in the January-March quarter of the following year (but referring to the employee's occupational assignment in the fourth quarter of the previous year). A survey instrument is mailed to employers who have been identified from the administrative records of Florida's Department of Labor and Employment Security.

Missouri's Community College Class of 1989-90. Table 8 provides compelling evidence about the importance of minimizing measurement error in the use of terms such as *completion* of a vocational program.

Table 8

MISSOURI
COMMUNITY COLLEGE
1989-90
VOCATIONAL COMPLETERS

EARNINGS OUTCOMES

Program	Sex	Credits	Size	Earnings in 1991 N	Earnings in 1991 Mean	Earnings in 1991 Stderr	Full Earnings in 1991 N	Full Earnings in 1991 Mean	Full Earnings in 1991 Stderr
Vocational	F	30 - 59	476	338	$7,591	$304	111	$13,525	$460
		> =60	1,361	1,018	13,653	272	563	19,302	291
	M	30 - 59	412	269	9,107	411	106	15,163	534
		> =60	874	592	14,210	404	323	20,569	450
	ALL		3,123	2,217	12,326	187	1,103	18,694	221
Academic	F	30 - 59	638	422	6,943	277	127	13,634	413
		> =60	1,028	749	9,944	263	281	16,965	320
	M	30 - 59	487	305	8,538	421	112	15,694	695
		> =60	535	299	9,811	534	99	19,691	876
	ALL		2,688	1,775	8,967	176	619	16,488	263
Adjusted Difference Of Voc-Acad				2,558 (241) Significant			1,083 (323) Significant		

1. "Full Earnings in 1991" is defined as "Earnings in 1991" if earnings were reported for each of the four quarters, and if this earnings amount is equal to or greater than $8225; which is the inflated 5% quantile of 1989 full time workers' earnings in the corresponding 1990 census group. Full time is defined as 40 hours or more per week, 48 weeks or more per year.
2. The significance tests are for the difference between mean earnings levels for the vocational and academic groups, adjusted for the different joint distributions of 'sex' and 'credit hours attained' in these groups. The tests are based on 5% significance level.

Here, two credit-hour proxies are introduced, because no direct measure of program completion is available. The average earnings relationships that are presented in Table 8 contain no surprises. The *1991 full-earnings* column indicates very similar average earnings levels for males and females who had earned at least 60 credit hours, but with one important exception: women who had completed at least 60 credit hours, but who were not enrolled in a vocational program, had a mean *1991 full-earnings* level that is significantly below that of their male classmates. Once again, this finding highlights the importance of knowing more about the course mix and vocational program affiliation as correlates of earnings levels and growth paths.

Washington's Community College Class of 1989-90. The cumulative evidence that has been presented up to this point is corroborated in Table 9—which shows that significant mean earnings differences occur between the *degree* and *≥1 year certificate* recipient groups but not between the *degree* and *<1 year certificate* groups, when each is adjusted for the sex composition of the group. The significant differences of mean *1991 full-earnings* levels between male and female certificate recipients will trigger further investigation to isolate the respective influences of segregation among vocational program offerings and labor market differences in initial employer/industry affiliations and subsequent work histories.

Table 10 adds new dimension to the format used in Table 9. Here, the *1991 full-earnings* figures from Table 9 are repeated, but they are now accompanied by a new earnings concept: *1991 full-time earnings*. This new measure takes advantage of Washington's recording of *reported hours of work* in its administrative records of employment and earnings. A threshold level of 1,920 hours (the equivalent of 40 hours a week for 48 weeks during a year) was used to identify those who would could be classified as full-time workers. This calculation boosts the mean earnings level for some groups more than for others, with males who had received a <1 year certificate exhibiting the smallest difference between the *1991 full-earnings* and *1991 full-time earnings* concepts. The appendix to this chapter elaborates upon this point.

A Summary of Earnings Findings

The earnings data in Tables 4 through 10 reveal the following patterns.

- The 1990-91 completers of a high school vocational program in Colorado or Florida had significantly higher 1992 *earnings* and 1992 *full earnings* than their classmates who completed a non-vocational program.
- Awareness of continuing education status is an important source of information for discussing the effect of a particular level and type of education on subsequent employment and earnings outcomes; and the available evidence indicates that the interplay among continuing education, employment, and earnings also depends upon the type of credential that was received at an earlier stage of a former student's maturation.
- The interdependence of community college credit hours, credential attainment, and subsequent earnings levels and growth paths is complex.

The appendix to this chapter elaborates upon the ways in which full-time employment proxies can be derived. Chapter Five then introduces the last of the new topics that are covered in this monograph—the relationship between vocational program classification and subsequent occupational assignment and how useful this information is as a predictor of a former student's future earnings.

Table 9

WASHINGTON
COMMUNITY AND TECHNICAL COLLEGES
1989-90
VOCATIONAL PROGRAM COMPLETERS

EARNINGS OUTCOMES

Degree Level	Sex	Size	Earnings in 1991 N	Earnings in 1991 Mean	Earnings in 1991 Stderr	Full Earnings in 1991 N	Full Earnings in 1991 Mean	Full Earnings in 1991 Stderr
Degree	F	2,797	2,300	$19,083	$232	1,671	$23,781	$218
	M	1,581	1,212	18,677	346	815	24,322	349
	All	4,378	3,512	18,943	193	2,486	23,959	186
Certificate (>=1 year)	F	838	659	14,222	333	438	18,567	327
	M	485	396	18,191	545	276	23,046	536
	All	1,323	1,055	15,712	298	714	20,298	299
Certificate (<1 year)	F	262	206	2,714	763	96	21,393	1,002
	M	95	76	22,893	1,602	60	27,409	1,544
	All	357	282	15,457	753	156	23,707	885
Adjusted Difference Of Degree - Cert. (>=1 yr)				3,351	347		3,923	337
				Significant			Significant	
Adjusted Difference Of Degree - Cert. (< yr)				2,716	770		593	863
				Significant			Not Significant	

1. "Full Earnings in 1991" requires that earnings were reported for each of the four quarters, and that the combined earnings amount is equal to or greater than $9751; which is the inflated 5% quantile of 1989 full time workers' earnings in the corresponding 1990 census group. Full time is defined as 40 hours or more per week, 48 weeks or more per year.
2. The significance tests are for the difference between mean earnings levels for the degree and certificate groups, adjusted for the different distributions of 'sex' in these groups. The tests are based on 5% significance level.

Table 10

WASHINGTON
COMMUNITY AND TECHNICAL COLLEGES
1989-90
VOCATIONAL PROGRAM COMPLETERS

EARNINGS OUTCOMES

Degree Level	Sex	Size	Full Earnings in 1991 N	Full Earnings in 1991 Mean	Full Earnings in 1991 Stderr	FT Earnings in 1991 N	FT Earnings in 1991 Mean	FT Earnings in 1991 Stderr
Degree	F	2,797	1,671	$23,781	$218	599	$25,700	$371
	M	1,581	815	24,322	349	402	26,300	502
	All	4,378	2,486	23,959	186	1,001	25,941	300
Certificate (> = 1 year)	F	838	438	18,567	327	126	21,189	605
	M	485	276	23,046	536	112	25,480	778
	All	1,323	714	20,298	299	238	23,208	505
Certificate (< 1 year)	F	262	96	21,393	1,002	38	24,096	1,551
	M	95	60	27,409	1,544	33	28,381	2,170
	All	357	156	23,707	885	71	26,087	1,321

1. "Full Earnings in 1991" requires that earnings were reported for each of the four quarters, and that the combined earnings amount is equal to or greater than $9751; which is the inflated 5% quantile of 1989 full time workers' earnings in the corresponding 1990 census group. Full time is defined as 40 hours or more per week, 48 weeks or more per year.
2. "FT Earnings in 1991" is the average earnings of those who worked at least 1920 hours (40 hours per week, 48 weeks per year) in 1991.

Chapter Five: Training-Related Employment[54]

Introduction

This chapter provides up-to-date findings about training-related employment of former public postsecondary vocational program completers in the United States. This information will be of interest to vocational educators, elected and appointed officials, and policy analysts alike.

Most of the findings that are presented here use data provided by Florida's Education and Training Placement Information Program. This unit has designed and pilot tested an analytical approach that is intended to routinize, yet accurately represent, *relatedness* decisions. Florida's approach, which has focused on community college vocational program applications up to this point, is used here for both descriptive and analytical purposes.

The descriptive parts of the chapter explore how the determination of *relatedness* varies in difficulty among the U.S. Department of Education's Classification of Instructional Programs (CIP) categories and between types of public postsecondary school. The analytical sections explore how useful a *relatedness* measure is as a predictor of a former student's earnings soon after leaving school, of the length of first job held after leaving school, and of churning as this term was defined and used in Chapter Three. The Chapter ends with an illustration of how a state's administrative records can be used to compare the earnings of recent completers of vocational programs with the average earnings of all employees in the same industries—after a *relatedness* decision has assigned each industry to a related or not-related category for selected vocational programs.

Debate of the relevance and importance of training-related employment as a performance measure for vocational education has persisted for decades.[55] Those who favor its use tout the logic of judging the Nation's investment in expensive classroom facilities and instructional expertise on the basis of whether the competencies that are developed are actually required in the jobs that former students are able to find. Others, who

express skepticism about placing too much emphasis on skill acquisition and subsequent use, counter that vocational education should be held to no higher a standard in this regard than is applied to non-vocational curricula. Many of these doubters assert that all educational activities share uniform core objectives: to expand the range of student competencies, to develop personal confidence and raise the quality of interpersonal relations, to foster successful participation as a member of a team, and to provide a solid foundation for continued learning. Others express a more practical concern that occupational change is so pervasive that it is futile to expect public schools to always be on the frontier of employer needs. A related view that questions the attention that is given to training relatedness as an outcome measure arises from an awareness that the traditional precision of defining occupations is crumbling as employers seek and achieve unprecedented levels of flexibility in assigning employees to multiple tasks and responsibilities.[56] This spreading disintegration of the concept of well-defined occupational targets coincides with an ironic sense of urgency in acquiring competency certification systems that assure at least short-term continuity in the use of *relatedness* scales for performance measurement purposes.

The Measurement of Relatedness

Florida's Education and Training Placement Information Program has invested a substantial amount of time and professional expertise in the design and pilot testing of an analytical approach that permits a uniform cross-matching of community college vocational programs and occupations or industries that are considered to be *related* to instructional content.

Florida's approach uses the Occupational Employment Statistics Program taxonomy[57] that was developed by the U.S. Department of Labor's Bureau of Labor Statistics, employers' own occupational titles as these appear on the survey instruments that are returned to the Program unit each winter,[58] and the U.S. Department of Education's Classification of Instructional Programs taxonomy.

Florida's Education and Training Placement Information Program has designed a software package that assigns one of three *relatedness* codes to as many of the reported job titles as possible, based on each former student's vocational program classification. The three levels of *relatedness* that are assigned are *directly related*, *somewhat related,* and *unrelated.* A substantial number of job titles cannot yet be processed in such a routine automated manner. In these cases, the Program's staff members conduct an on-screen assignment activity.

Florida's approach involves a second level of *relatedness* screening. When a job title match cannot be identified, an industry match is attempted.[59] At this level a simple determination of related/not related is made. Finally, if the job title and industry-based assignment attempts are unsuccessful, then an *unable to determine* code is assigned.

Patterns of Relatedness: Florida's Postsecondary Class of 1990-91

Tables 11 through 20 in this chapter utilize Florida's pilot *relatedness* approach. This analytical method is applied to two types of postsecondary schools: district postsecondary schools[60] and public community colleges. Two sets of three tables each are presented here. The first table in each set displays the distribution of the former students' employment in Florida during the October-December 1991 quarter, using the *relatedness* assignment approach described previously. The second

Table 11

FLORIDA
DISTRICT POSTSECONDARY
1990-91
VOCATIONAL PROGRAM COMPLETERS

1991:4 Quarter Employment Relatedness Distribution

Determination Method	Related Outcome	N	Perc. of Total	Perc. of Employed	Perc. of Subtotal
Based on Job Title	Directly Related	5388	30%	43%	58%
	Somewhat Related	971	5%	8%	10%
	Not Related	3000	17%	23%	32%
	Subtotal	9359	52%	74%	100%
Based on Industry Only	Related	1241	7%	10%	84%
	Not related	237	1%	2%	16%
	Subtotal	1478	8%	12%	100%
Unable to Determine		1757	10%	14%	
Not Employed in the Reference Qtr.		5305	30%		
Total		17899	100%		

Notes:

Column "Percent of Total" is the percentage of the total population.
Column "Percent of Employed" is the percentage of the former students who were reported as employed in 1991:4.
Column "Percent of Subtotal" is the percentage within each category defined by the relatedness determination methods.
The "Based on Industry Only" rows include only those whose job titles are not available.

The "relatedness" approach that was used to prepare this table was provided by Florida's Employment and Training Placement Information Program. This approach was designed to classify post secondary education/employment relations. The approach is considered to be in a pilot use phase, and is subject to future refinement.

table in each set then shows the same type of distribution for selected vocational programs, which were chosen on the basis of cell-size[61] and representativeness. The third table in each set reveals the relationship of these *relatedness* determinations to movement between, or among, employers at any time during 1992; to first-job length after leaving school; to each group's average earnings level in the October-December 1991 quarter; and to each group's average earnings level in the October-December 1992 quarter.

These descriptive tables are then followed by two sets of two tables each, which present the results of multivariate statistical tests of different specifications of earnings functions; of a job-length—or persistence—equation; and of a labor-market-churning equation. The focus in each case is whether *relatedness* measures advance our understanding of variance in former students' earnings, persistence of affiliation with an employer, or repeated movement among employers.

Florida's District Postsecondary School Vocational Program Completers: 1990-91. Table 11 accounts for the universe of 17,899 completers of a vocational program in 1990-91 at one of Florida's district postsecondary schools. Each of these former students appears in only one of the following four categories:

1. a *relatedness* determination based on the former student's job title as reported in the winter 1992 survey of Florida employers of record during the October-December 1991 quarter;
2. a *relatedness* determination based on the former student's industry affiliation that appeared during the reference quarter of October-December 1991;[62]
3. a decision based on an inability to determine whether the reported employment status was related or not; and
4. a former student who was not employed in Florida during the reference quarter.

The column titled *percent of total* represents the share of the total number of former students (17,899) in each of the four categories. The column titled *percent of employed* omits those who were not reported as employed in Florida during the reference quarter. The column titled *percent of subtotal* omits those who were not reported as employed and those for whom no determination of *relatedness* could be made. Each of these columns has a different, but relevant, role in understanding the *relatedness* issue. Figures that appear in the *percent of total* column relate to the question, "Out of all the students who completed a vocational program in a district postsecondary school in 1990-91, how many were employed in related jobs in the October-December 1991 quarter?" Some of these former students were employed during this reference quarter, so the *percent of employed* column relates to the question, "Out of the subpopulation of former students who were employed during the reference quarter, how many were employed in related jobs?" In addition, since no determination of *relatedness* could be made for some of those who were reported as employed, the column titled *percent of subtotal* pertains to the question, "Out of those former students for whom a determination of *relatedness* could be made, how many were employed in related jobs?"

Table 11 reveals that out of a total of 10,837 cases in which a *relatedness* determination was made,[63] 59 percent resulted in the assignment of a directly related or somewhat-related code based on job-title information;

Table 12

FLORIDA
DISTRICT POSTSECONDARY
1990-91
VOCATIONAL PROGRAM COMPLETERS

Relatedness Distribution by Classification of Instructional Programs

Determination Method	Related Outcome	OFFICE OCCS		ENGINEERING TECHNOLOGY		ALLIED HEALTH		CHILDCARE/ FOOD SERVICE		PROTECTIVE SERVICES	
		N	%	N	%	N	%	N	%	N	%
Based on Job Title	Directly Related	119	6%	26	20%	2,557	38%	151	21%	1,347	54%
	Somewhat Related	179	10%	15	11%	252	4%	52	7%	159	6%
	Not Related	475	25%	39	30%	736	11%	85	12%	456	18%
Based on Industry Only	Related	7	0%	6	5%	934	14%	39	6%	21	1%
	Not related	6	0%	4	3%	69	1%	17	2%	44	2%
Unable to Determine		316	17%	13	9%	449	6%	33	5%	129	5%
Not Employed in the Reference Qtr.		794	42%	29	22%	1,719	26%	336	47%	341	14%
Total		1,896	100%	132	100%	6,716	100%	713	100%	2,497	100%

The "relatedness" approach that was used to prepare this table was provided by Florida's Employment and Training Placement Information Program. This approach was designed to classify post secondary education/employment relations. The approach is considered to be in a pilot use phase, and is subject to future refinement.

Table 13

FLORIDA
DISTRICT POSTSECONDARY SCHOOL
1990-91
VOCATIONAL PROGRAM COMPLETERS

Earnings and Churning Comparison by Relatedness

		Churning in 1992		First Job Length (Qtrs)		Earnings in 91:4 ($)		Earnings in 92:4 ($)		
Relatedness	N	Rate	Sig. Test	Mean	Stderr	Mean	Stderr	N	Mean	Stderr
Directly Related	5,388	0.34		4.6	0.02	$4,026	$29	4,707	$4,897	$37
Somewhat Related	971	0.32	Chi-sq=41.9	4.67	0.06	3,820	90	840	4,704	125
Not Related	3,003	0.4	p=0.000	4.22	0.03	3,146	50	2,491	4,088	62
Industry-Related	1,241	0.41	Chi-sq=5.139	4.32	0.05	3,356	62	1,009	4,130	75
Industry-Not-Related	237	0.49	p=0.023	3.79	0.12	2,657	214	186	3,846	302
Unable to Determine	1,758	0.44		4.11	0.04	2,883	54	1,399	3,910	75

The "relatedness" approach that was used to prepare this table was provided by Florida's Employment and Training Placement Information Program. This approach was designed to classify post secondary education/employment relations. The approach is considered to be in a pilot use phase, and is subject to future refinement.

Table 14

FLORIDA
COMMUNITY COLLEGE
1990-91
VOCATIONAL PROGRAM COMPLETERS

1991:4 Quarter Employment Relatedness Distribution

Determination Method	Related Outcome	N	Perc. of Total	Perc. of Employed	Perc. of Subtotal
Based on Job Title	Directly Related	5,479	38%	50%	65%
	Somewhat Related	977	7%	9%	11%
	Not Related	2,060	14%	18%	24%
	Subtatol	8,516	59%	77%	100%
Based on Industry Only	Related	971	7%	9%	81%
	Not related	224	9%	2%	19%
	Subtatol	1,195	16%	11%	100%
Unable to Determine		1,337	27%	12%	
Not Employed in the Reference Qtr.		3,361	35%		
Total		14,409	100%		

Notes:

Column "Percent of Total" is the percentage of the total population.
Column "Percent of Employed" is the percentage of the former students who were reported as employed in 1991:4.
Column "Percent of Subtotal" is the percentage within each category defined by the relatedness determination methods.
The "Based on Industry Only" rows include only those whose job titles are not available.

The "relatedness" approach that was used to prepare this table was provided by Florida's Employment and Training Placement Information Program. This approach was designed to classify post secondary education/employment relations. The approach is considered to be in a pilot use phase, and is subject to future refinement.

another 11 percent were given a related code based on industry affiliation alone. Overall, 70 percent of those for whom a *relatedness* decision could be made were given a directly related, somewhat-related, or related code. Note, in the far right column of Table 11, that the second-stage use of a former student's industry affiliation during the reference quarter results in a more frequent assignment of a related code (84 percent of such decisions) than when the more precise job-title approach is used.

The results that appear in Table 11 include all of the 1990-91 vocational program completers in Florida's district postsecondary schools, without respect to the mix of programs that are represented in this total. Table 12 indicates why, for most program management and oversight purposes, more interest might be shown in program-specific tabulations of *relatedness* outcomes. Here, the first line within the *based on job title* and the *based on industry only* categories are most revealing. Former students who completed a protective services program are far more likely to be classified as working in a directly related job using the job-title approach than are their classmates who completed an office-occupations program. Similarly, those who completed an allied health program are more frequently classified as being employed in a related job using the industry affiliation approach than are other vocational classmates.

Table 13 shows that the assignment of *relatedness* codes to the former students' employment during the reference quarter is correlated with labor market churning; with the average length of the first job held after leaving school; and with average earnings during the reference quarter and one year later. Those who are given a *directly related* code based on the reported job title associated with their employer affiliation during the reference quarter are less likely to have changed employers during the next year (1992); they therefore exhibit a longer average length of time in their first job since leaving school and a higher average earnings both during the reference quarter and one year later (October-December 1992). The imprecision of the *industry-affiliation* approach to assigning *relatedness* codes is revealed in the fact that no significant difference in October-December 1992 earnings is found between those who were given a related or not-related designation in this way.

Florida's Community College Vocational Program Completers: 1990-91. Tables 14, 15, and 16 present the same information for former students in Florida's 1990-91 vocational programs in public community colleges as appeared in Tables 11, 12, and 13 above for district postsecondary school students. The formats are identical and the results are strikingly similar. Attention is drawn to Table 15, which adds a *health & medical sciences* program classification that did not appear in Table 12. This difference is noted because it highlights how greater occupational specificity in vocational program content can—but may not necessarily—be reflected in a higher incidence of *directly related* employment.[64]

Relatedness as a Predictor of Former Students' Earnings and Related Outcomes

Tables 17 through 20 present the results from estimating earnings equations and related outcomes. Tables 17 and 18 cover Florida's district postsecondary vocational program completers in 1990-91. Tables 19 and 20 cover Florida's public community college vocational program completers in 1990-91. Attention is focused on *relatedness* as a correlate of these outcomes.

Table 15

FLORIDA
COMMUNITY COLLEGE
1990-91
VOCATIONAL PROGRAM COMPLETERS

Relatedness Distribution by Classification of Instructional Programs

Determination Method	Related Outcome	OFFICE OCCS		ENGINEERING TECHNOLOGY		ALLIED HEALTH		HEALTH & MEDICAL SCIENCES		CHILDCARE/ FOOD SERVICE		PROTECTIVE SERVICES	
		N	%	N	%	N	%	N	%	N	%	N	%
Based on Job Title	Directly Related	102	8%	121	18%	1,638	40%	1,541	65%	38	19%	1,512	55%
	Somewhat Related	159	13%	72	11%	191	5%	53	2%	23	11%	271	10%
	Not Related	343	27%	134	20%	503	12%	19	1%	28	15%	390	14%
Based on Industry Only	Related	19	2%	27	4%	444	11%	325	13%	21	11%	6	1%
	Not related	2	0%	4	1%	92	2%	1	0%	3	1%	62	2%
Unable to Determine		229	18%	102	15%	244	7%	142	6%	15	7%	165	6%
Not Employed in the Reference Qtr.		403	32%	219	31%	940	23%	302	13%	73	36%	339	12%
Total		1,257	100%	679	100%	4,052	100%	2,383	100%	201	100%	2,745	100%

The "relatedness" approach that was used to prepare this table was provided by Florida's Employment and Training Placement Information Program. This approach was designed to classify post secondary education/employment relations. The approach is considered to be in a pilot use phase, and is subject to future refinement.

Table 16

FLORIDA
COMMUNITY COLLEGE
1990-91
VOCATIONAL PROGRAM COMPLETERS

Earnings and Churnings Comparison by Relatedness

		Churning in 19992		First Job Length (Qtrs)		Earnings in 91:4 ($)		Earnings in 92:4 ($)		
Relatedness	N	Rate	Sig. Test	Mean	Stderr	Mean	Stderr	N	Mean	Stderr
Directly Related	5,479	0.26		5.06	0.02	$5,826	$39	4,967	$6,625	$45
Somewhat Related	977	0.26	Chi-sq = 138.3	5.07	0.05	5,241	87	900	6,016	103
Not Related	2,060	0.39	P = 0.000	4.29	0.04	3,523	61	1,702	4,479	77
Industry-Related	971	0.3	Chi-sq = 21.1	4.84	0.05	5,376	101	852	6,651	118
Industry-Not-Related	224	0.46	P = 0.000	3.99	0.12	3,192	197	187	4,741	259
Unable to Determine	1,337	0.35		4.47	0.05	4,328	86	1,062	5,728	112

The "relatedness" approach that was used to prepare this table was provided by Florida's Employment and Training Placement Information Program. This approach was designed to classify post secondary education/employment relations. The approach is considered to be in a pilot use phase, and is subject to future refinement.

FLORIDA
DISTRICT POST SECONDARY
1990-91
VOCATIONAL PROGRAM COMPLETERS

Modeling Comparison of Relatedness with/without Industry Specific Earnings

Dependent Variable:	Earnings in 1991:4		Earnings in 1991:4		Earnings in 1991:4	
Regression Type:	Linear Regression		Linear Regression		Linear Regression	
Number of Observations:	12,508		12,508		12,508	
R-squared:	0.5453		0.5388		0.5401	
Population:	Employed in 1991:4		Employed in 1991:4		Employed in 1991:4	
	Estimates	**P-Value**	**Estimates**	**P-Value**	**Estimates**	**P-Value**
Intercept	-661.234	0.034	-263.494	0.398	-438.377	0.159
Demographic Variables						
Age	65.068	0.000	68.973	0.000	66.423	0.000
Age Squared	-0.870	0.000	-0.917	0.000	-0.893	0.000
Male	336.613	0.000	352.675	0.000	347.076	0.000
Black	-144.560	0.000	-142.404	0.000	-165.914	0.000
Hispanic	-70.274	0.178	-42.497	0.417	-114.436	0.028
Vocational Program						
Agriculture	-51.589	0.832	-188.593	0.441	-76.556	0.754
Office Occupations	1.138	0.985	50.211	0.400	-94.587	0.107
Engineering Technologies	-54.663	0.741	15.210	0.927	-143.982	0.386
Allied Health	86.962	0.030	85.722	0.033	146.357	0.000
Child Care/Food Service	-396.188	0.000	-508.688	0.000	-315.164	0.001
Local Economic Conditions						
Local-Avg.-Earn ($)	0.342	0.000	0.289	0.001	0.275	0.001
Pre-Graduation Job Info.						
Pre-Job	-1,011.476	0.000	-1,049.148	0.000	-1,012.733	0.000
Earnings in 91:2	0.748	0.000	0.763	0.000	0.752	0.000
91:4 Job Relatedness						
Directly Related	433.087	0.000	694.192	0.000		
Somewhat Related	225.224	0.001	444.866	0.000		
Not Related	-4.965	0.923	136.952	0.007		
Industry Related	171.469	0.014	485.020	0.000		
Industry Not Related	-44.395	0.701	44.393	0.703		
Industry Information						
Avg. Earnings ($)	0.099	0.000			0.134	0.000
Standard Error of Avg. Earn.	0.476	0.050			0.257	0.289

Notes:

1. Italic indicates a 0-1 dummy variable.
2. Local-Avg-Earn is the average 1992:1 earnings of all 1990-91 Florida High School and Community College students by groups of counties.
3. Pre-Job refers to the job held by individuals in 91:2.
4. Industry-Specific Avg. Earnings are based on two-digit Standard Industry Classification Code. The 1991:4 earnings of all workers in Colorado are used to calculate the average earnings and standard error of the average earnings.

Six sources of possible influence on earnings, job length, and churning outcomes were included in the estimation of these equations:

1. *demographics*—age, sex, and ethnicity;
2. *vocational program*—five program classifications, which cover a representative range of program types;
3. *local economic conditions*—represented by the mean earnings level during the January-March 1992 quarter for all 1990-91 high school and community college students who completed a vocational program in Florida, aggregated into groupings of counties within the state;
4. *employment and earnings while still in school*—represented by a yes/no variable indicating whether a former student had a job during the April-June 1991 reference quarter (assumed to be their last few months in school) and by their actual reported earnings during this reference quarter.;
5. *relatedness*—as described above, including both job-title and industry-affiliation rules for assigning a *relatedness* code and based on reported employment status during the October-December 1991 reference quarter; and
6. *industry-specific information*—included as a test of how industry-specific information affects the relationship between *relatedness* and earnings and of what the information's value as a predictor of earnings is, independent of the *relatedness* code. Here, two-digit Standard Industrial Classification codes were used to derive industry-specific average earnings levels and standard errors. This requires the availability of the universe of administrative records for workers in these industries, which is not the case for Florida's consolidated database. Florida only cross-matches student records with earnings records. No other administrative records of employment and earnings are acquired by Florida's Education and Training Placement Information Program. Therefore, *Colorado's* all-worker industry-specific mean-earnings and standard-errors information was substituted for use in Tables 17 and 19.

Florida District Postsecondary Vocational Program Completers: 1990-91. Table 17 presents the results of estimating three earnings equations that include different combinations of the *relatedness* and industry-specific variables described above. The first specification, in the left column, includes both *relatedness* and industry-specific variables. The second specification, in the middle column, includes only the *relatedness* measures. And the third specification, in the right column, includes only the industry-specific variables.

Each reader is encouraged to browse through the coefficients—demographic, vocational program, local economic conditions, and employment while still in school—although they are not interpreted here. Instead, the discussion limits its attention to the *relatedness* and industry-specific variable coefficients.

When both the *relatedness* and industry-specific variables are included in an equation that is intended to account for differences in the former students' earnings during the October-December 1991 reference quarter, each of the three *relatedness* measures is significant and positive, as are both of the Colorado-based, industry-specific measures of earnings and earnings variance. The interpretation of these results is straightforward: employment in a *related* job is associated with higher earnings during the reference quarter, and employment in an industry that exhibits high average all-worker earnings is also associated with higher former student earnings during the reference quarter.

When only the *relatedness* measures are included in the specification of an earnings function, each of the

Table 18

FLORIDA
DISTRICT POST SECONDARY
1990-91
VOCATIONAL PROGRAM COMPLETERS

Impact of Relatedness

Dependent Variable	Earnings in 1991:4		Earnings in 1992:4		First Job Length		Churned in 1992	
Regression Type	Linear Regression		Linear Regression		Linear Regression		Logistic Regression	
Number of Observations	12,508		12,164		14,874		14874	
R-squared or C	0.5389		0.4247		0.2456		0.618	
Population	Employed in 1991:4		Employed in 1992:4		Have Post-School Job		Have Post-School Job	
	Estimates	**P-Value**	**Estimates**	**P-Value**	**Estimates**	**P-Value**	**Estimates**	**P-Value**
Intercept	-263.494	0.398	-567.029	0.166	2.555	0.000	-0.028	0.937
Demographic Variables								
Age	68.973	0.000	90.354	0.000	0.029	0.001	-0.027	0.014
Age Squared	-0.917	0.000	-1.263	0.000	0.000	0.020	0.000	0.399
Male	352.675	0.000	672.147	0.000	-0.079	0.022	0.190	0.000
Black	-142.404	0.000	-342.147	0.000	0.031	0.377	-0.012	0.786
Hispanic	-42.497	0.417	-140.138	0.044	-0.018	0.709	-0.131	0.032
Vocational Program								
Agriculture	-188.593	0.441	-1,014.283	0.002	0.111	0.624	-0.057	0.849
Office Occupations	50.211	0.400	-181.943	0.018	0.087	0.096	-0.025	0.705
Engineering Technologie	15.210	0.927	-96.094	0.671	0.174	0.275	-0.205	0.324
Allied Health	85.722	0.033	88.840	0.095	-0.145	0.000	0.299	0.000
Child Care/Food Service	-508.688	0.000	-729.610	0.000	-0.046	0.567	-0.166	0.114
Local Economic Conditions								
Local-Avg.-Earn ($)	0.289	0.001	0.666	0.000	0.000	0.002	0.000	0.196
Pre-Graduation Job Info.								
Pre-Job	-1,049.148	0.000	-1,309.925	0.000	0.474	0.000	0.201	0.000
Earnings in 91:2	0.763	0.000	0.725	0.000	0.000	0.000	0.000	0.000
91:4 Job Relatedness								
Directly Related	694.192	0.000	713.578	0.000	1.199	0.000	-0.249	0.000
Somewhat Related	444.866	0.000	470.214	0.000	1.198	0.000	-0.239	0.002
Not Related	136.952	0.007	244.774	0.000	0.902	0.000	0.034	0.514
Industry Related	485.020	0.000	555.697	0.000	1.061	0.000	-0.010	0.890
Industry Not Related	44.393	0.703	392.207	0.018	0.627	0.000	0.333	0.016
Churned in 1992			-440.976	0.000				

Notes:

1. Italic indicates a 0-1 dummy variable.
2. Local-Avg-Earn is the average 1992:1 earnings of all 1990-91 Florida High School and Community College students by groups of counties.
3. Pre-Job refers to the job held by individuals in 91:2.
4. Industry-Specific Avg. Earnings are based on two-digit Standard Industry Classification Code. The 1991:4 earnings of all workers in Colorado are used to calculate the average earnings and standard error of the average earnings.

three measures remains significant and positive; however, the magnitude of the coefficient increases substantially, and even the not-related designation becomes significant and positive. A comparison of the *relatedness* coefficients between specifications one and two reveals how the industry-specific information affects the relationship between *relatedness* and earnings shortly after the former students have left school.

The third specification, in the right column, omits the *relatedness* measures. Here, the industry-specific index of all-worker earnings remains significant and positive.

A comparison of the R-squared values reported in the shaded portion of each of the earnings function specifications indicates that the *relatedness* information does not improve our ability to account for earnings variability at this early stage of the former students' employment.

Table 18 explores additional facets of the possible relationship between *relatedness* and other outcomes that might be of interest. Such outcomes include the former students' earnings at a later date; the length of the first job held after leaving school; and whether movement between, or among, employers has been recorded.

The left column in Table 18 repeats the middle column from Table 17, which includes the *relatedness* measures, but does not include the industry-specific information. The second column in Table 18 reproduces the same specification, replacing the October-December 1991 reference quarter with the one-year later (and most recently available) October-December 1992 quarter, and adding one new variable: whether a former student moved between or among employers during 1992. A comparison of coefficients between the 1991:4 and 1992:4 earnings equations that have been estimated shows that the *relatedness* measures remain significant and positive, relative to the intercept group that includes those for whom a determination of *relatedness* could not be made. The magnitude of the earnings advantage is associated with the precision of the *relatedness* designation; those who were employed in jobs that are *directly related* to their vocational program exhibit the highest earnings advantage, followed by those who were employed in *somewhat related* jobs, and then, in turn, those who were assigned to the *not related* category.

At least one change of employer during 1992 is associated with significantly lower earnings than those who did not change employer affiliation during 1992. Males are seen to have widened their earnings advantage over their female classmates; the African-Americans in the former student population have fallen further behind; and age—i.e, older students—continues to be an advantageous attribute at this early point in the former students' employment.

The decline in overall explanatory power between 1991:4 and 1992:4, which is indicated by the respective R-squared values shown in the shaded portion of each column in Table 18, suggests the growing importance of unobserved differences in complementary human capital acquisition on the job and perhaps of other unobserved life-cycle differences such as marriage, having children, buying a house, or other financial considerations.

The *first job length* specification that appears in the third column of Table 18 complements the estimates that appeared in Table 3 on page 31 in Chapter Three. That table, estimated using administrative records for Washington's community college vocational completers, included no *relatedness* measures. In both cases, right-truncation affects a large number of completers,

Table 19

FLORIDA
COMMUNITY COLLEGE
1990-91
VOCATIONAL PROGRAM COMPLETERS

Modeling Comparison of Relatedness with/without Industry Specific Earnings

Dependent Variable	Earnings in 1991:4		Earnings in 1991:4		Earnings in 1991:4	
Regression Type	Linear Regression		Linear Regression		Linear Regression	
Number of Observations	11,048		11,040		11,048	
R-squared	0.5505		0.5452		0.5432	
Population	Employed in 1991:4		Employed in 1991:4		Employed in 1991:4	
	Estimates	**P-Value**	**Estimates**	**P-Value**	**Estimates**	**P-Value**
Intercept	-1,349.046	0.001	-624.243	0.112	-1,593.289	0.000
Demographic Variables						
Male	348.224	0.000	358.952	0.000	336.845	0.000
Black	-379.172	0.000	-359.124	0.000	-396.685	0.000
Hispanic	78.941	0.374	124.937	0.162	65.466	0.464
Vocational Program						
Agriculture	126.173	0.802	-184.914	0.714	245.031	0.628
Office Occupations	-81.097	0.322	-67.847	0.410	-182.215	0.025
Engineering Technologies	-98.290	0.335	-104.061	0.310	-144.063	0.160
Allied Health	75.909	0.143	-4.262	0.934	121.823	0.016
Medical Science	2,308.255	0.000	2,226.776	0.000	2,465.415	0.000
Child Care/Food Service	-675.754	0.000	-817.925	0.000	-656.258	0.001
Local Economic Conditions						
Local-Avg.-Earn ($)	1.120	0.000	1.017	0.000	1.115	0.000
Pre-Graduation Job Info.						
Pre-Job	-801.805	0.000	-806.899	0.000	-789.015	0.000
Earnings in 91:2	0.602	0.000	0.614	0.000	0.611	0.000
91:4 Job Relatedness						
Directly Related	226.717	0.003	662.065	0.000		
Somewhat Related	100.867	0.280	478.926	0.000		
Not Related	-496.435	0.000	-274.206	0.000		
Industry Related	-112.215	0.256	347.044	0.000		
Industry Not Related	-686.582	0.000	-538.108	0.000		
Industry Information						
Avg. Earnings ($)	0.137	0.000			0.175	0.000
Standard Error of Avg. Earn.	-0.701	0.098			-1.220	0.004

Notes:

1. Italic indicates a 0-1 dummy variable.
2. Local-Avg-Earn is the average 1992:1 earnings of all 1990-91 Florida High School and Community College students by groups of counties.
3. Pre-Job refers to the job held by individuals in 91:2.
4. Industry-Specific Avg. Earnings are based on two-digit Standard Industry Classification Code. The 1991:4 earnings of all workers in Colorado are used to calculate the average earnings and standard error of the average earnings.

Table 20

FLORIDA
COMMUNITY COLLEGE
1990-91
VOCATIONAL PROGRAM COMPLETERS

Impact of Relatedness

Dependent Variable	Earnings in 1991:4		Earnings in 1992:4		First Job Length		Churned in 1992	
Regression Type	Linear Regression		Linear Regression		Linear Regression		Logistic Regression	
Number of Observations	11,048		11,048		14,674		14,674	
R-squared or C	0.5452		0.4418		0.2849		0.837	
Population	Employed in 1991:4		Employed in 1992:4		Have Post-School Job		Have Post-School Job	
	Estimates	**P-Value**	**Estimates**	**P-Value**	**Estimates**	**P-Value**	**Estimates**	**P-Value**
Intercept	-624.243	0.112	-1,089.821	0.024	3.015	0.000	-1.599	0.000
Demographic Variables								
Male	358.952	0.000	650.800	0.000	-0.001	0.965	0.053	0.246
Black	-359.124	0.000	-402.615	0.000	-0.059	0.167	0.123	0.039
Hispanic	124.937	0.162	113.325	0.300	0.018	0.774	0.041	0.648
Vocational Program								
Agriculture	-184.914	0.714	77.211	0.897	-0.515	0.159	0.769	0.111
Office Occupations	-67.847	0.410	-92.355	0.361	0.023	0.687	0.024	0.763
Engineering Technologie	-104.061	0.310	161.113	0.198	-0.024	0.738	-0.044	0.675
Allied Health	-4.262	0.934	333.042	0.000	-0.303	0.000	0.362	0.000
Medical Science	2,226.776	0.000	2,741.662	0.000	-0.005	0.912	0.244	0.000
Child Care/Food Service	-817.925	0.000	-1,016.304	0.000	-0.342	0.007	0.094	0.590
Local Economic Conditions								
Local-Avg.-Earn ($)	1.017	0.000	1.555	0.000	0.000	0.188	0.000	0.003
Pre-Graduation Job Info.								
Pre-Job	-806.899	0.000	-1,098.645	0.000	0.725	0.000	0.045	0.475
Earnings in 91:2	0.614	0.000	0.559	0.000	0.000	0.000	0.000	0.000
91:4 Job Relatedness								
Directly Related	662.065	0.000	505.058	0.000	1.243	0.000	-0.393	0.000
Somewhat Related	478.926	0.000	404.306	0.000	1.214	0.000	-0.263	0.002
Not Related	-274.206	0.000	-155.603	0.067	0.690	0.000	0.167	0.008
Industry Related	347.044	0.000	546.003	0.000	1.135	0.000	-0.270	0.001
Industry Not Related	-538.108	0.000	156.325	0.422	0.519	0.000	0.358	0.013
Churned in 1992			-660.157	0.000				

Notes:

1. Italic indicates a 0-1 dummy variable.
2. Local-Avg-Earn is the average 1992:1 earnings of all 1990-91 Florida High School and Community College students by groups of counties.
3. Pre-Job refers to the job held by individuals in 91:2.
4. Industry-Specific Avg. Earnings are based on two-digit Standard Industry Classification Code. The 1991:4 earnings of all workers in Colorado are used to calculate the average earnings and standard error of the average earnings.

particularly those who remain in their first job held since leaving school as of the last available quarter, which is October-December 1992. This reduces the variance of observed duration in the first job held since leaving school and limits the immediate relevance of the reported relationships. However, future updates of these administrative records will permit a re-estimation of this equation, which will improve our understanding of the correlates of persistence in an employer affiliation.

The final estimates that appear in Table 18, in the right column, are for a specification of the churning phenomenon—who stayed and who moved during 1992. Here, the *relatedness* measures are found to have a significant and negative relationship with the occurrence of movement between, or among, employers in 1992. Further exploration of the other coefficients in this equation suggest that this pattern is associated with former students who completed an allied health program, some of whom were already working in this field while they were still in school.

Florida Community College Program Completers: 1990-91. Tables 19 and 20 replicate the content of Tables 17 and 18 examine the population of Florida's community college vocational program completers in 1990-91. A paired comparison of Tables 17 and 19 reveals a similar role for *relatedness* as a correlate of earnings for both of these postsecondary vocational program completer populations. Again, however, industry-specific all-worker earnings information can be substituted for this *relatedness* information without a loss of overall ability to account for differences in the former students' earnings. This may be important from a performance measurement standpoint, because it is costly to collect job-title *relatedness* information. If the former students' earnings achievement is of primary interest, then sole reliance on the available administrative records of industry affiliation and earnings can meet administrative needs. However, if other uses are made of the job-title information, then the administrative records alone will be insufficient.

A paired comparison of Tables 18 and 20 leads to a similar conclusion. Adding one more year to the post-schooling reference period results in a diminished overall ability to account for differences in former students' earnings. Again, unobserved variables associated with what has happened in the job environment itself and with life-cycle changes become more important as the reference period lengthens. How competencies that are acquired in school and skills that are learned on the job complement each other must be accounted for, as must unobserved substitution of on-the-job learning for required skills that were never learned in school.[65]

Attention is directed to the *medical sciences* line in Table 20, which reveals how one program-specific population can differ from each of the others, including the *allied health* field. This adds still another documentation of the importance of knowing what unit of observation lies behind any reported statistic about vocational education outcomes.

The Use of Industry-Specific All-Worker Earnings Information

The discussion thus far[66] focused on the use of a multi-state consolidated database of administrative records that combines school-based information about former students with employment and earnings information about the same former students. Attention has been split between discussion of topics that required information about vocational program completers only and issues that depended upon a comparison of vocational and non-vocational student outcomes. However, in each case

Table 21

COLORADO
COMMUNITY COLLEGE
1989-90
VOCATIONAL PROGRAM COMPLETERS

EARNINGS RELEVANCE ANALYSIS (THREE QUARTERS AFTER COMPLETION)

			Weighted All Workers Earnings	1991:1 Earnings			Full Earnings		
			MEAN	N	MEAN	STDERR	N	MEAN	STDERR
CIP Groupings	SEX	Related							
Agriculture	M	No	$4,878	21	$3,624	$430	16	$4,500	$318
	F	No	4,878	19	2,289	344	8	3,603	456
		Yes	2,752	13	2,791	241	11	3,044	186
Health & Med. Sci.	M	No	2,463	132	5,189	342	111	6,008	356
		Yes	5,332	59	5,822	448	50	6,662	429
	F	No	2,463	296	4,073	157	205	5,433	144
		Yes	5,332	355	4,830	124	296	5,517	111
Protective Service	M	No	4,356	164	5,617	277	137	6,522	271
		Yes	4,787	24	5,312	492	23	5,466	489
	F	No	4,356	39	4,952	443	30	6,151	340
		Yes	4,787	7	4,087	1,027	6	4,552	1,084
Construction Trades	M	No	4,232	21	2,868	580	11	4,736	728
		Yes	4,259	5	2,960	871			
Business Manag./- Adm.	M	No	3,759	105	5,285	362	87	6,133	377
		Yes	5,021	36	4,687	742	27	5,866	877
	F	No	3,759	256	3,727	156	192	4,566	167
		Yes	5,021	224	3,351	153	166	4,133	166
Marketing Oper./Dist.	M	No	3,977	5	4,163	948	5	4,163	948
	F	No	3,977	25	2,860	307	17	3,618	304
		Yes	2,154	12	1,682	340			
Engineering Tech./Related	M	No	3,483	208	5,034	230	164	6,097	227
		Yes	6,915	92	5,944	294	87	6,210	285
	F	No	3,483	39	3,170	316	26	4,222	290
		Yes	6,915	18	5,529	561	17	5,738	552
Vocational Home Econ.	F	No	3,523	31	2,197	244	14	3,359	266
		Yes	2,648	28	2,075	271	14	3,262	244
Mechanics & Repairers	M	No	4,504	114	4,294	327	77	5,855	367
		Yes	3,928	71	3,032	219	47	4,014	211
Transportation	M	No	3,479	32	2,877	339	19	4,088	345
		Yes	7,488	10	3,451	571	10	3,451	571

Note:

(1) Training related employment: based on the researchers' Classification of Instruction Program Code -- Standard Industrial Classification Code "relatedness" match. Available upon request.

(2) The category sample sizes are limited to be 5 or more for confidentiality reasons.

(3) The full earnings figure is calculated for the full-time workers defined by the inflated 5% quantile of the corresponding 1990 Census Colorado Public Use Micro Sample full time group.

attention has been limited to the populations of former students, without placing this discussion in the broader context of a state's economy. Here, the former students only boundary is removed, and one more example is provided of how a state's administrative records can be used to inform the decisions of vocational educators, parents, students, and elected officials.

Table 21 identifies 10 vocational program groupings, which are based on the U.S. Department of Education's Classification of Instructional Programs. Information is shown for male and female former students separately, when this can be done without jeopardizing the anonymity of these former students or their employers. When anonymity cannot be assured an entire line, or population-specific segment of a line, has been deleted. The column that is titled *related* splits the former students' recorded employment into *related* and *not related* categories, based on the author's matching of Classification of Instructional Programs and Standard Industrial Classification (SIC) codes.[67]

The column titled, *weighted all workers earnings*, is the important new facet in Table 21. The universe of Colorado's earnings records for the January-March 1991 quarter was used to calculate the mean value of what all of the workers in each industry grouping earned during this three-month reference period. The weights that were used in this calculation are the percentages of two-digit Standard Industrial Classification affiliations that were reported for each vocational program grouping's completers in the same quarter (i.e., in the first quarter of 1991). For example, if 20 percent of the completers of a repairers and mechanics program were employed in SIC 75 (automotive repair, services, and parking) in this quarter, then a 20 percent weight was given to the earnings of all workers who were reported as employed in SIC 75 in the first quarter of 1991 in Colorado.

Each reader should scan the column titled, *weighted all workers earnings*, in Table 21 for two reasons. First, notice that the same dollar amount is shown for both male and female completers within each *relatedness* category for a particular vocational program. This happens because the administrative records of industry affiliation and earnings do not include any demographic information. This means that the *all worker earnings* figures that appear in Table 21 are just that—all workers, without respect to the sex composition of the workforce within each two-digit Standard Industrial Classification category. The second reason to scan this column is to become familiar with the range of average earnings levels that occurs within a particular state and time interval, based solely on differences in the mix of industries that is represented in each figure.

The columns titled *1991:1 earnings* and *full earnings* use the same definitions that have been used throughout the monograph. The two new features in Table 21 are the author's assignment of a *relatedness* designation to vocational program-industry pairings and the use of the universe of a state's administrative records to calculate an all workers average earnings amount.

Table 21 can be used to explore how a particular population of vocational program completers has fared after just a few months of work experience after leaving school, relative to the average worker in the same grouping of industries in the same state at the same time. The *1991:1 earnings* column includes all of the former students who had any reported earnings in the reference quarter. The *full earnings* column includes only those former students whose earnings exceed the 1990 Census-based threshold that was defined earlier. If a reader thinks that most workers in an industry grouping are employed full-time, year-round, then the

full earnings figure might be chosen for comparative purposes. However, if a reader is unsure about the extent of full-time, year-round employment that is represented in the *weighted all workers earnings*, then the *1991:1 earnings* figure might be used for comparative purposes.

Any comparisons that are made using the data in Table 21 will be dependent upon the author's decisions about vocational program-industry *relatedness*, which is undocumented here. This table is presented for illustrative purposes only. The intent here is to alert readers to practical uses that can be made of administrative information to place vocational education outcomes within the context of a state's overall economic activity.

A Summary of Relatedness Findings

The following patterns of *relatedness* emerged in Tables 11 through 21.

1. Successful assignment of a *relatedness* code based on a reported job title is a more precise method of recording *relatedness* than the use of an industry-affiliation basis for assigning such a code, but the rate of success in doing so varies across vocational programs and among educational levels (e.g., high school, area school, and community college). *Relatedness* is a continuum that has been segmented in many ways for specific purposes. There is no consensus on how many categories should be established or what the definitions of each ought to be.
2. Florida's *relatedness* codes are associated with former vocational students' earnings during the first year after they left school. However, knowledge of a former student's industry affiliation during the same reference period serves as an equally powerful predictor of earnings.
3. Indices of *relatedness* can be placed within the broader context of a state's economic structure and performance to gain valuable insights about how vocational program completers are faring relative to the average employee in the same industries.

This section completes the presentation of new information. Chapter Six synthesizes the findings that have been presented at the end of Chapters Two through Five; draws conclusions based on these findings; and describes the next phase of the author's research program and plan to update and add new data elements to the multi-state consolidated database.

Chapter Six: Findings, Conclusions, and a Research Plan

A Synthesis of Findings

Four questions were posed in Chapter One. Each question is restated here with a summary of the pertinent findings that emerged in Chapters Two through Five.

> *What relationships exist among concurrent work and schooling, the ease of transition from school to work, and the stability of a former student's affiliation with their first employer after leaving school?*

The first important pattern revealed in Chapter Two is the consistently high percentage of vocational program completers, at both the high school and postsecondary levels, who sustained an uninterrupted affiliation with the same employer at least during their last months while still in school and through the first few months after leaving school. When only those who are known to have held a job during their last months in school are considered, the state/level-specific minimum percentage of vocational program completers who persisted with the same employer across this bridge is 30 percent.

Those who continued with the same employer during this transition period were also found to have a longer average length of stay with their first employer after leaving school (considering only the post-schooling part of this affiliation), and they were less likely to have moved from one employer to another during the post-schooling reference months.

Completers of a vocational program exhibit a consistent advantage[68] over their former non-vocational classmates with respect to each of these measures: rate of persistence, length of first job held after leaving school, and churning rate. This pattern holds in vocational/non-vocational comparisons at both the high school and postsecondary levels.

The consistency of these findings among the four states and between the high school and postsecondary levels has important implications for the interpretation of traditional measures of the employment and earnings outcomes of vocational education. The high rate of continued employer affiliation through what is usually

called the period of *transition from school to work* means that the post-schooling employment and earnings outcomes are often a joint outcome of combined school-based and on-the-job development of competencies. In such cases, there will be a false attribution of enhanced productivity to vocational education when the on-the-job contribution of a former student while still enrolled in school is unobserved.

What patterns of repeated employer-to-employer mobility are revealed?

Substantial movement is observed between and among employers during the first years after the former students left school. Completers of high school vocational programs exhibit higher rates of churning (i.e., movement between employers) than do completers of postsecondary vocational programs. No consistent difference in churning pattern is found between completers of vocational programs and their non-vocational classmates. Those who are known to have held jobs while still in school, but did not stay in these jobs through the bridge year, are more likely to have moved between or among employers after leaving school. Observed differences in churning rates are associated with vocational program categories, economic and demographic factors, and the timing of beginning work after leaving school.

Males are more likely than their female classmates to have changed employers during the reference years after leaving school. This pattern is explained, in part, by the fact that the former students who completed a Health and Medical Sciences program are less likely to have changed employers than are their classmates who completed other vocational programs. Those who exhibit a delay in starting their first job after leaving school are less likely to have moved on to another employer than their classmates who are known to have begun work more quickly.

How are these combinations of concurrent and initial post-school employment related to the level and growth-path of a former student's earnings?

Former students who continued with the same employer through the bridge period were consistently found to have higher earnings than their classmates while they were still in school, shortly after leaving school, and at the end of the post-school reference period (October-December 1992). The interplay of continuing education, full-time versus part-time employment status, and a former student's sex clouds any attempt to offer a simple interpretation of the former students' earnings profiles. Similarly, the contributions of credit hours, program affiliation, and credential received to an explanation of observed earnings differences are complex, as Grubb (1993) and Kane and Rouse (1993) have already concluded.

How important is knowledge of the relationship between a former student's vocational education program and subsequent occupational classification as a predictor of post-school earnings?

Knowledge about a former student's occupational assignment within a place of employment is not needed to predict that employee's earnings; awareness of the person's industry affiliation is an acceptable substitute for this purpose, and this information is available in each state's administrative records without resorting to survey data collection procedures. However, surveys can be used for other reasons—for example, maintaining contact with employers who hire former students.

The new U.S. occupational classification taxonomy, which is scheduled to be announced by the U.S. Department of Labor's Bureau of Labor Statistics in January 1994, can be expected to reverberate through the vocational education community, which has adopted a number of proprietary software packages to conduct studies of *relatedness*.

Conclusions

Vocational education in public high schools and postsecondary schools across the United States was already performing its traditional role of preparing students to enter the workforce as the new era associated with the Carl D. Perkins Vocational and Applied Technology Act of 1990 began in October 1991. The consistency of supporting findings that emerged in the previous chapters, all of which were based on a new multi-state consolidated database of administrative records, reflect a pervasive strength within the Nation's public vocational education systems. Former students who have completed vocational programs in public high schools, area vocational-technical schools, technical colleges, and community colleges, find and keep jobs. The annual earnings levels associated with these jobs are often higher than the earnings of their classmates who completed a non-vocational curriculum.

Acknowledgment of pervasive strength is accompanied by concurrence with Grubb (1993) and with Kane and Rouse (1993) that public education in the United States is a heterogeneous enterprise. Each submission of supporting evidence to the court of public opinion can be countered with examples of difference—or an absence of difference—that challenge the endorsement of systemic vigor. Substantial separation of the sexes within vocational programs persists, which results in early and sustained differences in earnings. Completers of vocational programs in public high schools earn more than their non-vocational classmates, but members of either group who do not continue their education at the postsecondary level are in clear jeopardy of failing to clear the hurdle of economic self-sufficiency through employment.

Mobility is often touted as a fundamental strength of the U.S. economy. Mobility is seen as the key to advancement. Unsettling evidence about the accuracy of this cornerstone of national pride has been revealed here—at least insofar as this privilege is assumed to be available to those who are leaving school in the 1990s. Figure 16 in Chapter Three offers a striking picture of a wedge that widens the chasm between a steeply rising earnings path for those who retain an employer affiliation and a level trajectory of earnings for those who exhibit a pattern of repeated movement between employers.

Too much attention is devoted by vocational educators to the concept of *relatedness* as a performance measure. Schools should develop relevant competencies, but this is not the issue here. Distinctions are fading between vocational and non-vocational curricula, among occupations, and between what an employee does routinely and what they are expected to be able to do when asked. This raises the question: "What is supposed to be related to what?" Our capacity to measure *relatedness* is faltering, and there is no compelling reason to expect a reversal of this trend. The modular approaches to competency certification that are emerging promise to replace the traditional notion of a vocational program. This, in turn, introduces a new challenge in attempting to align school offerings with employer requirements in a practical (i.e., routine) way. A sensitivity of employer requirements to changing market conditions multiplies the difficulty that is encountered in trying to carry out this alignment. Evidence of job

retention, industry affiliation, and earnings trajectory is available in the administrative records that were described in the appendix to Chapter One. Greater reliance should be placed on these data elements as a substitute for costly, and frequently flawed, measures of *relatedness* for vocational education performance measurement purposes.

Hollenbeck (1992), Grubb (1992), Grubb (1993), Kane and Rouse (1993), and Card (1993) have advanced the quality of discourse about how the measurement of education's effect on earnings should be conducted. The final section charts the path that will be followed to act upon those insights.

A Research Plan

This monograph provides the first public release of findings based on the multi-state consolidated database of administrative records that has been assembled since July 1991. During these two years new features were added to the database that had not been contemplated at the outset. Acquisition of ACT assessment records for students who participated in this activity at a Colorado site is one example of such an addition. Florida's provision of a random sample of non-vocational student records is another example of a database supplement that was not anticipated at the beginning of the database assembly activity. Missouri has promised to provide information about former student's receipt of community college credentials which will complement the credit hours only data that was relied upon here. Each of the four cooperating states has provided annual updates of continuing education activity by former students in earlier cohorts, as well as administrative records for more recent student cohorts and the most recent four quarters of employment and earnings records.

This database will be used to carry out the descriptive and analytical refinements that have been identified throughout this monograph (e.g., updating Missouri and Washington's post-schooling reference period, when 1992 earnings records are received). It will also be used to investigate the *returns to education* topic, following in the footsteps of Card, Grubb, Hollenbeck, Kane and Rouse.

Two new research initiatives are planned. One will collect information at selected worksites in two of the four states, which will document on-the-job education, training, and performance that can then be linked to the already existing records of vocational education and employment and earnings. The intention is to collect this new information in local areas that have experienced substantial economic turmoil in the past few years, as a way to test how complementarities between human capital acquisition in school and in the workplace actually emerge.

The second new research initiative, which is expected to follow the first, will build upon Anita Summers' (1993) documentation of how little can be said about the relationship of school inputs to labor market outcomes. Interest has been expressed in each of the four states in providing more comprehensive information about the school environments that existed when the students in the consolidated database were enrolled.

School and labor market conditions in the United States are different now than they were in the 1970s and 1980s. Public policy decisions should be made with an accurate understanding of how schools in the 1990s contribute to the nation's competitiveness, and to the promotion of individual opportunity. The initial findings from a research program that began two years ago, which appear here for the first time, contribute to this education process. The next stages of the research program will continue this advance.

Chapter One Appendix: Wage-Record Components

Introduction

Many readers are expected to have heard about the type of administrative record that is used here to document each former student's employment and earnings.[69] These records are often referred to as wage-records, or unemployment insurance (UI) records.

This appendix explores some of the nuances of the records, affording the opportunity to learn more about the features of, and definitions used in, these state-specific administrative data systems. The rest of this appendix elaborates on the brief description in Chapter One of the consolidated database.

The Basic Features of a Wage Record

At the outset, basic attributes of the administrative data source should be understood.

1. The employment and earnings records are collected by each state's employment security agency to administer the state's unemployment compensation program. Important consequences result from relying upon this source of employment and earnings information.
   a. Only former students' employment in the state in which they attended school is included in this analysis.[70]
   b. Federal civilian and military employment, U.S. Postal Service employment, railroad employment, employment by a religious or philanthropic organization, and self-employment with no other paid employees is not covered here.
   c. No occupational information is contained in the administrative files provided by the state employment security agencies.
   d. No wage-rate information is contained in these administrative records. Each employer reports an employee's total pay received for all pay periods that occur during each quarter.[71]
   e. The first and last days of an employee's affiliation with an employer are not reported.

This means that a quarterly earnings figure represents an unknown portion of the thirteen-weeks (i.e., full-quarter and partial-quarter employment status cannot be distinguished).[72]

2. Public release of the identity of any person or reporting entity is strictly prohibited by state and federal laws.

It is important to distinguish between past practice and future opportunity. State employment security agencies are repeatedly buffeted by changes in the public's expectations for accountability. Simultaneously, advances in data processing technologies, coupled with plummeting costs, offer increasingly attractive opportunities to respond to these demands for timely and reliable information. This monograph documents how far four pioneering states have progressed in meeting the needs of their constituents for high-quality management information.

Geographic Coverage

Four states—Colorado, Florida, Missouri and Washington—have cooperated in the assembly of the database that led to this initial report of findings. Colorado's Community College and Occupational Education System governs 11 state-system community colleges, four local-district colleges, and six area vocational-technical education schools and maintains a statewide management information system for Colorado's high school vocational education programs. Florida's Department of Education serves the State's 67 public-school districts that offer secondary, and in many cases postsecondary, vocational education programs as well as Florida's 28 public community colleges. Missouri's Coordinating Board for Higher Education maintains a statewide database representing the State's 10 public community colleges. Washington's State Board for Community and Technical Colleges governs and maintains a state-level management information system for the State's 27 community colleges and five technical colleges.

Colorado's Department of Labor and Employment; Florida's Department of Labor and Employment Security; Missouri's Division of Employment Security; and Washington's State Employment Security Department, provided the administrative records that allow us to identify both concurrent and post-school employment affiliations and associated earnings of the students.[73]

School-Year Coverage

The populations of former students whose education and work histories are investigated in this monograph comprise a subset of the multiple state/school-year cohorts that were acquired. Colorado and Florida each provided substantial numbers of student records beginning with the school year of 1985-86; Missouri's coverage begins in 1986-87, and Washington's coverage begins in 1987-88. Similar state-specific differences occur in the availability of employment and earnings information for this research. Colorado provided information on the universe[74] of covered[75] employment beginning with 1988:2; however, an anomaly in this data series has forced us to use only 1990:4 through 1992:4.[76] Florida's Education and Training Placement Information Program arranges for an annual match of pertinent student records against the state's employment and earnings records. This coverage begins with 1986:1 and currently extends through 1992:4. The Florida Education and Training Placement Information Program then encrypts the individual and business identifiers, so the files that are transmitted to the research team cannot be used to reveal the identity of a former student or a business. Missouri provides the

universe of employment and earnings information, which now covers the period 1988:1 through 1992:4. Washington transmits a former students-only linked record, which currently covers 1985:1 through 1992:4.

This monograph documents concurrent and post-school employment and earnings profiles for multiple school-year populations of former students:

1. 1985-86 completers of vocational education programs in 28 high school districts and 2 community college districts in Florida. These are the earliest cohorts that are available to investigate more than the two-and-one-half years of post-school employment and earnings dynamics that are available for the other states.
2. 1989-90 completers of vocational education programs in Florida, Missouri, and Washington state community colleges;[77] 1989-90 completers of non-vocational education programs in Missouri community colleges; and 1990-91 completers of vocational education and non-vocational education programs in Colorado's high schools,[78] area vocational-technical education schools, local district colleges, and public community colleges and in Florida's high schools.

Each of these state-specific populations and their collective coverage provides a valuable source of baseline intelligence about pre-1990 vocational education outcomes, which will serve as an important reservoir of information for continuing research as each of the state-specific files is updated in the future.

Unit of Analysis Decisions

The phrase, "completers of high school and community college vocational education programs," appears repeatedly in the previous pages. Definitions of *completer* and *vocational education program* are state-specific. No uniform metric, which would allow direct interstate comparisons of program outcomes, is available.[79]

Completion of a vocational program is not necessarily synonymous with graduation. Independent measures of *completion* and *graduation* are important to distinguish the net effects of skills and credentials on subsequent employment opportunities and earnings growth paths.

The term *vocational education* has both legal and colloquial meanings. The U.S. Department of Education's Classification of Instructional Programs is designed to accommodate both management and conversational needs. Readers will find few references to program-specific employment or earnings outcomes in the *descriptive* sections of this monograph. However, the *analytical* sections do use the U.S. Department of Education's Classification of Instructional Programs taxonomy to report program-specific employment and earnings outcomes. The descriptive sections focus on *school level* and *type of curriculum*, which translates into a four-cell approach: high school vocational; high school non-vocational; community college vocational; and community college non-vocational. The analytical sections add demographic, school-related, and local economic factors. The descriptive sections of the report are intended to answer the question, "What employment and earnings patterns are revealed?" while the analytical sections attempt to answer the question, "*Why* are these patterns revealed?"

It is expected that readers who are interested in *net impact estimates* of vocational education's effects on student outcomes will be disappointed. The state-level management information systems that provided the data used here are designed to monitor activities within vocational education, with only secondary attention given to issues that bridge vocational and non-vocation-

al constituencies. Two years ago, when assembly of the four-state database began, there was no expectation that any non-vocational comparison group information would be available at the high school level. Fortunately, through the dedicated efforts of the consortium members in Colorado and Florida, we identified a high school comparison group in each of these states. At the community college level only Colorado and Missouri have provided non-vocational student information.[80]

A second reason why readers who are interested in *net impact estimates* might be disappointed is that the post-school period covered here is only two-and-one-half years in most sections of the monograph.[81] This is a contentious issue. Historically, many within the vocational education community have advocated reliance on initial job-placement as the only equitable measure of vocational education's performance. A rationale offered for this belief has been that a vocational education program's impact on employment opportunity is contingent upon many forces (e.g., student demographics, abilities, and motivation; local economic conditions; and employer attitudes), which are subject to only limited influence by vocational educators. At the same time, others have documented complementarities among skills acquired in school settings, subsequent on-the-job training, and long-term earnings growth. The findings that are reported here fall in between the time intervals that these respective advocacy groups want to observe.

Continuing Education

This monograph documents the importance of combinations of school enrollment and concurrent employment. This is an important finding, but it also presents an analytical challenge. The limited scope of state-level management information systems translates into a need to perform multiple stages of record linkage to accurately identify sequential, and sometimes concurrent, enrollment patterns. Fortunately, each of the co-operating education entities carries out such record-linkage activities for its own management purposes; although only limited use of this information appears here.

Continuing education data are important for at least two reasons. First, they refine our ability to interpret quarterly and annual earnings figures, because we have no direct measure of full-time versus part-time employment. Reported point-in-time earnings levels and observed quarter-to-quarter or year-to-year earnings paths over time are affected by whether a former student is currently enrolled in a higher level education activity. A second important use of continuing education information is to distinguish the separate, and perhaps complementary, effects of multiple levels of educational attainment on recorded employment and earnings measures.

Terminology for Interpreting Reported Earnings Figures

Almost all of the earnings figures that are found in this monograph have been acquired from the four state employment security agencies that were identified earlier.[82]

1. *Pre-earnings*: This refers to the earnings that were reported by a former student's employers during the first quarter (high school) or second quarter (postsecondary) of the year she or he completed the reference vocational or non-vocational program.[83] This provides multiple insights. It indicates that the former student was employed while still in school,[84] a condition that is used as one index of the school-*and*-work phenomenon. It also provides a measure of the former student's combined effort and reward from paid employment while still in school.

These measures are useful in attempting to answer the question, "W*hy* do we observe the post-school employment and earnings patterns that occurred?"

2. *Initial post-school earnings*: This refers to a former student's total reported quarterly earnings three quarters after completion of the reference vocational or non-vocational program. This decision means that a former student may have one, two, or three quarters of post-school employment (i.e., she or he may have started post-school employment in the third or fourth quarter of the same year as program completion or in the first quarter of the next year). Measurement error associated with the actual month of school leaving could lengthen this interval to as much as six quarters; diagnostics are continuing.
3. *Most recent earnings*: This earnings figure represents 1992:4 total reported quarterly earnings for Colorado and Florida's former students and 1991:4 total reported quarterly earnings for Missouri and Washington's former students. Updated Missouri and Washington tables and figures will be available from the author in early 1994.
4. *Annual earnings*: Much of this monograph focuses on quarterly observations, because they highlight the incidence of movement between employers and associated earnings differences that are detected by this approach. However, most people think in terms of *annual* earnings, which they can relate to readily available comparative information from various media sources. It is also important to provide annual earnings information because substantial quarter-to-quarter unevenness in earnings occurs.[85]
5. *"Full" earnings*: The 1990 Census five-percent micro-records file for each of the four states was used to calculate a state-specific 40 hours per week/full-year 1989 threshold earnings figure for high school graduates (only) and community college associate degree recipients (only). These earnings figures were then adjusted using the Gross Domestic Product Implicit Deflator series (see below) to derive a 1991 "full" earnings figure for Missouri and Washington and both 1991 and 1992 "full" earnings figures for Colorado and Florida. These figures were then used on a state-by-state basis to establish an earnings floor proxy that is intended to represent what a full-time, year-round worker with comparable educational attainment earned in each state in the reference year. Then, reference-year annual earnings figures are reported for these state-specific subpopulations of high school and community college vocational and non-vocational completers. This is the best approximation that we can provide of what many readers really want to know—how much a high school or community college vocational program completer earned in 1991 or 1992 if they worked full-time and year-round and how this compares with the earnings of others who attained the same level of education.[86]
6. *Deflated earnings*: All post-school earnings figures have been adjusted to reflect changes in the Nation's overall cost-of-living since the reference pre-earnings quarters. This allows the tracing of earnings growth paths that offer a better approximation of how productivity/human capital levels and changes are transformed into higher earnings than would be the case if allowance had not been made for cost-of-living changes. Reader care is urged in using these adjusted earnings figures for other purposes. Particular caution is urged if an adjusted figure is compared with an unadjusted earnings figure from another source.

Chapter Four Appendix: Calculation of a Full-Time Earnings Threshold Amount

Introduction

The term *full-earnings* is defined in the appendix to Chapter One, and the concept of *full-time earnings* is defined in Chapter Four. This appendix elaborates on diagnostics that have been carried out using the 1990 Census Public Use Micro Sample (PUMS) files and administrative records provided by Washington's Employment Security Department. Three topics are investigated:

1. *full-time employment* defined in two ways—using annual hours of reported employment and earnings threshold approaches;
2. what can be said about the earnings of those who are included and excluded by using these two definitions; and
3. the average earnings of those who are included based on these definitions.

The reference population here is 1989-90 completers of vocational programs in Washington's community and technical colleges.

The Definition of Full-Time Employment

Washington's five percent Public Use Micro Sample (PUMS) files were used to identify respondents who were between the ages of 17 and 23 at the time the Census of Population was conducted in the winter of 1990; whose highest level of educational attainment was high school graduation, or its equivalent (e.g., receipt of a GED); who were not enrolled in postsecondary education at the time the Census was conducted; and who reported working at least 48 weeks, and an average of 40 hours per week, during the Census' reference year of 1989.

The fifth percentile of the resulting sample's self-reported 1989 annual earnings from wages and salaries was adopted as a full-time cut-off point. This decision was based on an assumption that some of the observations in the lower tail of this earnings distribution represent reporting or recording errors of what is intended to be an accurate reporting of earnings from full-time, year-round employment. The resulting threshold

earnings level was then inflated to a 1991 equivalent using the Gross Domestic Product Implicit Deflator series to provide a more accurate basis for defining a 1991 cut-off level for full-time employment purposes.

The Census PUMS file was then used to identify those who were between 19- and 29-years-old in the winter of 1990; whose highest level of educational attainment was an academic or vocational associate's degree; who were not enrolled in another postsecondary program at the time the Census was conducted; and who reported working at least 48 weeks and an average of 40 hours a week during the Census' reference year of 1989. Again, the resulting PUMS fifth percentile earnings level was chosen as the cut-off point, and this value was then inflated to represent 1991 full-time/year round threshold earnings.

The Resulting Full-Time, Year-Round Earnings Threshold Level

The 1991 equivalent threshold earnings level that arises from the approach described above is $9,751. This figure compares to a threshold value of $9,951 that was derived by applying the 1,920 annual hours (48 weeks and 40 hours per week) criterion to the actual administrative records for Washington's 1989-90 vocational program completers. This figure ($9,951) is the actual minimum value in the distribution of reported 1991 earnings for this population of vocational program completers.

The fact that the Census-based fifth percentile inflated earnings figure is only two percent below the actual minimum value derived from the Employment Security Department's administrative records supports a conclusion that, at least in this application, the Census-based approach is a reasonable approximation of the actual threshold earnings level that arises from full-time, year-round employment.

The Inclusion Versus Exclusion Issue

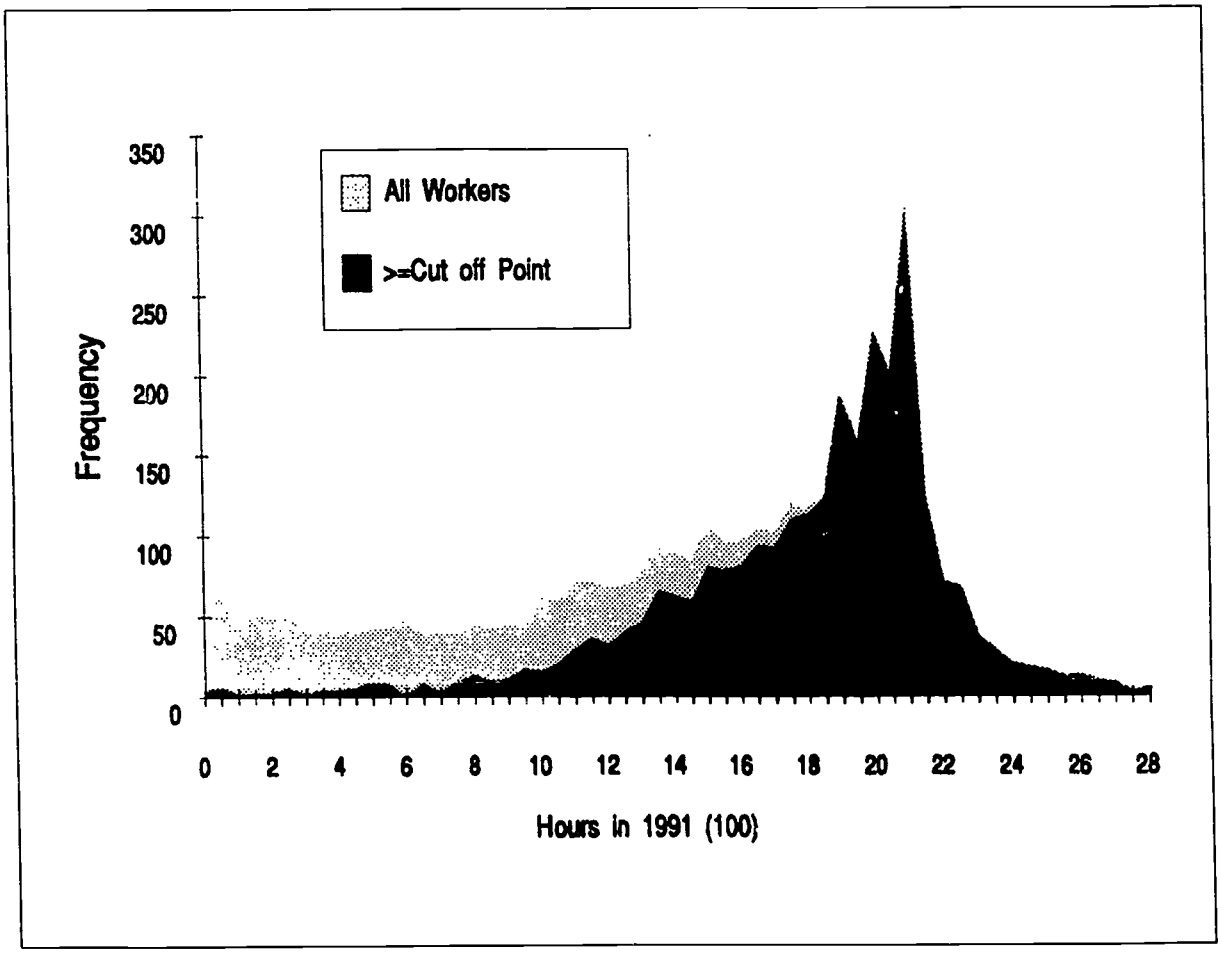
Figure 18 on the next page displays two earnings distributions. The darker shaded distribution includes only those 1989-90 vocational completers in Washington whose reported annual earnings in 1991 (based on the Employment Security Department's administrative records) exceeded the Census-based threshold level for full-time, year-round earnings ($9,751). The lighter shaded area includes the rest of the 1989-90 completer population (i.e., those whose earnings did not exceed this threshold amount). The metric used on the horizontal axis of this figure is 100 hour units of reported employment in 1991. The purpose of this display is to provide each reader with a visual understanding of how the use of an *earnings* threshold aligns with the use of an actual *hours* threshold of annual full-time employment.

Figure 18 shows that few of the former students who were reported to have worked less than 1,000 hours in 1991 had reported annual earnings of more than $9,751. In fact, for four intervals of reported hours of employment in 1991 the following probabilities of exceeding the Census-based earnings threshold of $9,751 apply.

Hours	Percent Exceeding Threshhold
zero- 499	7.9
500- 999	20.5
1,000- 1,499	56.7
1,500- 1,920	91.5

Figure 18

WASHINGTON
COMMUNITY AND TECHNICAL COLLEGES
1989-90
VOCATIONAL PROGRAM COMPLETERS
REPORTED HOURS OF WORK



The Effect of the Threshold Definition on Derived Average Earnings Levels

The population defined using the Census-based data approach results in the inclusion of some part-time, partial-year employees who have unusually high earnings levels that exceed the calculated, and excludes some full-time, year-round employees who have unusually low earnings levels that fall below the calculated threshold level. Figure 19 shows this result. Those who appear to the right of the vertical line that is drawn at the 1991 annual earnings level of $9,751 are defined as full-time workers using the Census-based approach. The darker shaded area represents those who are known to have been full-time workers based on their reported number of hours worked exceeding 1,920. The lighter shaded area includes all of Washington's 1989-90 vocational program completers who appear in the Employment Security Department's administrative records of 1991 employment and earnings, but who did not meet or exceed the threshold level of reported annual hours of employment that would have placed them in the full-time group.

Figure 19 clearly shows that use of the Census-based, full-time earnings threshold of $9,751 includes a substantial number of workers who did not meet or exceed the 1,920 hours of reported employment criterion. Furthermore, this distribution reflects a concentration of observations in the lower portion of the earnings scale above $9,751. This would be expected since these workers were reported as having been employed less than 1,920 hours in 1991. This concentration, in turn, lowers the calculated mean *full-time earnings* level that arises from adoption of the Census-based approach. The percentage of cases that fall in each of three annual earnings intervals when the respective definitions of *full-time earnings* are used is shown below.

Annual Earnings Interval	Census-Based Definition	Annual Hours Definition
$ 9,751-$17,999	37 percent	23 percent
18,000- 29,999	43 percent	48 percent
30,000 or more	20 percent	29 percent

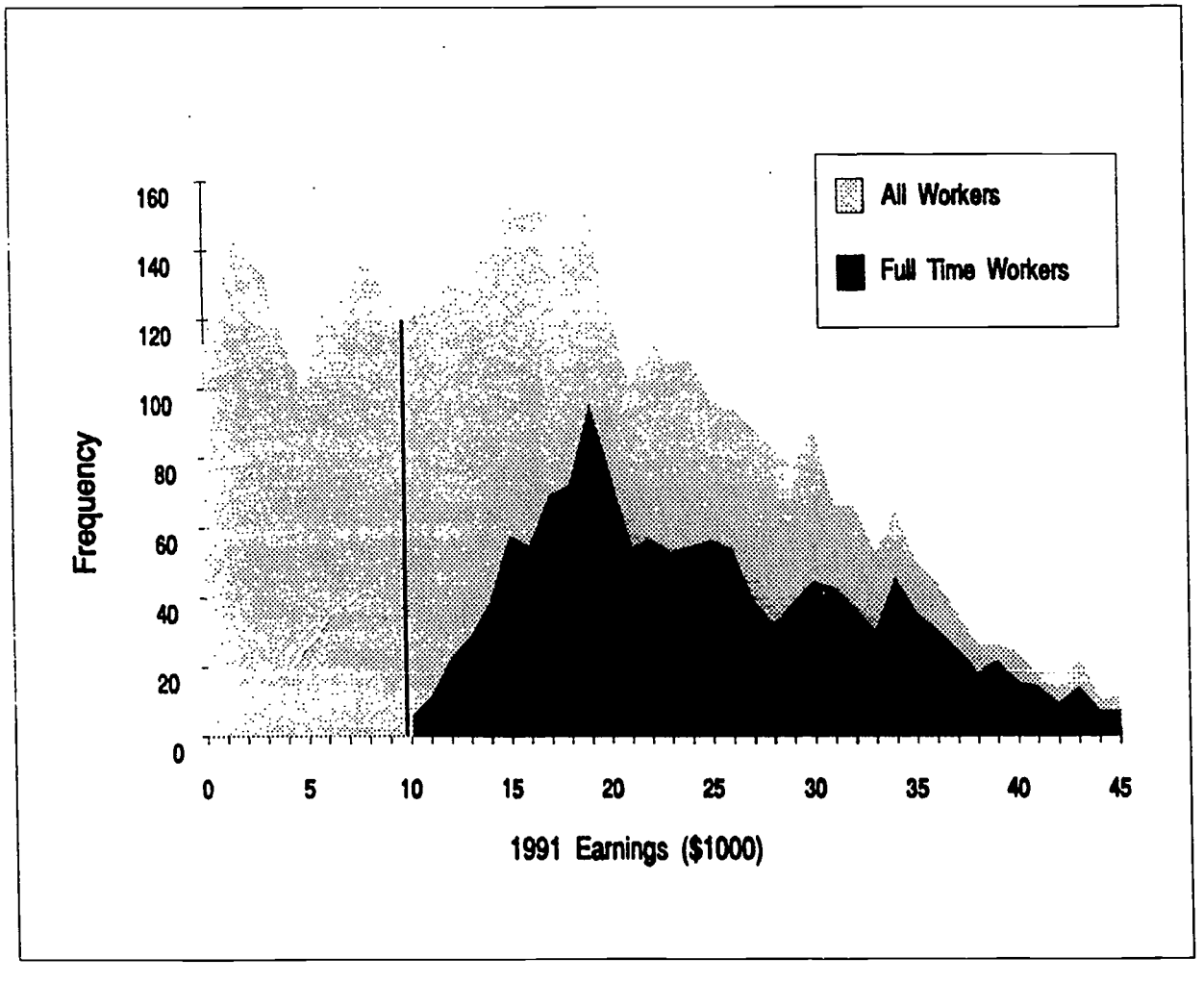
The actual effect of this failure to exclude some less than full-time workers by using a Census-based definition of *full-time earnings* is demonstrated on the next page. Here, 1991 earnings for Washington's 1989-90 community college vocational program completers are presented using each of the two definitions of earnings. The *full-earnings* amounts are repeated from Figure 9 in Chapter Four. The *full-time earnings* amounts are derived by using the 1,920 hours of reported employment criterion.

Credential	Sex	Full Earnings	Full-Time Earnings	Difference
Assoc Degree	F	$23,781	$25,700	$1,919
	M	24,322	26,300	1,978
Certificate ≥ One Year	F	18,567	21,189	2,622
	M	23,046	25,480	2,434
Certificate < One Year	F	21,393	24,096	2,703
	M	27,409	28,381	972

This comparison of mean annual earnings using the two definitions shows that use of the Census-based approach understates actual average full-time/year round earnings for the groups that are more likely to exhibit a concentration of reported earnings closer to

Figure 19

WASHINGTON
COMMUNITY AND TECHNICAL COLLEGES
1989-90
VOCATIONAL PROGRAM COMPLETERS
REPORTED EARNINGS



the threshold level of $9,751 and for those groups that are more likely to include members with less than full-time, year-round employment.

Conclusion

These diagnostics indicate that caution should be exercised in the use of the *full-earnings* amounts that appear in this monograph. The dollar amounts shown are accurate, based on the Census-based definition of a threshold level of annual earnings. Caution is required because the *distribution* of earnings above this threshold level differs among subgroups, and the percentage of those who exceed this threshold level—but did not actually work full-time, year-round—also differs among these subgroups.

Endnotes

[1] See: Evans, Rupert N., and Violas, Paul. 1983. "History of Changes in Outcomes Expected of Vocational Education," in Floyd L. McKinney and Patricia Fornash (eds.). *Selected Evidence Supporting or Rejecting Eighteen Outcomes for Vocational Education*. Columbus, OH: The Ohio State University, The National Center for Research in Vocational Education, pp. 33-55; and, Rahn, Mikala L., Hoachlander, E. Gareth, and Levesque, Karen. 1992. *State Systems for Accountability in Vocational Education*. Berkeley, CA: MPR Associates, Inc.

[2] The Carl D. Perkins Vocational and Applied Technology Act of 1990, Public Law 101-392, September 25, 1990, Sec. 403 (a), requires the U.S. Department of Education's Office of Education Research and Improvement to conduct a national assessment of vocational education programs assisted under the Act. Sec. 403.(b)(5) refers to *the success of the school-to-work transition*, and to *the degree to which vocational training is relevant to subsequent employment*. This is the third comprehensive national assessment of vocational education since 1981. See: The National Institute of Education. 1981. *The Vocational Education Study: The Final Report*. Vocational Education Study Publication No. 8. Washington, DC; and U.S. Department of Education, the National Assessment of Vocational Education. 1989. *Summary of Findings and Recommendations, Volume I*. Washington, DC. The 1990 Act stipulates that the assessment shall include a description and evaluation of employment outcomes of vocational education. The direct effect of the 1990 Act first emerged at the local school level on October 1, 1991, which means that the employment outcomes part of the national assessment cannot address the impact of the Act *per se* on the subsequent employment opportunities of affected students. The first population of former high school and community college students who could have been affected by two years of the 1990 Act's provisions graduated in May/June 1993; and Fall 1991 high school juniors who are pursuing a full-time 2+2 tech-prep program will not graduate until May/June 1995.

[3] For an introduction to the pertinent literature see: Stevens, David W. 1983. "Outcomes for Vocational Education: Economic Perspectives," in McKinney, Floyd L., Fornash, Patricia. *Selected Evidence Supporting or Rejecting Eighteen Outcomes for Vocational Education*. Columbus, OH: The Ohio State University, The National Center for Research in Vocational Education; Strong, Merle E. and Jarosik, Daniel. 1989. *A Longitudinal Study of Earnings of VTAE Graduates*. Madison, WI: University of Wisconsin-Madison, Vocational Studies Center; Ghazalah, I.A. 1991. *1979 Vocational Education Graduates in 1986*. Athens, OH: Ohio University; Hollenbeck, Kevin. 1992. *Postsecondary Education as Triage: Returns to Academic and Technical Programs*. Staff Working Paper 912-100, Kalamazoo, MI: W.E. Upjohn Institute for

Employment Research; Stern, David. 1992. *Economic Returns to Non-Baccalaureate Education and Training for Postsecondary Students and Adults.* Berkeley, CA: University of California at Berkeley; Grubb, W. Norton. 1993. "The Varied Economic Returns to Postsecondary Education." *The Journal of Human Resources.* 28:2, pp. 365-382; Kane, Thomas, Rouse, Cecilia Elena. 1993 "Labor Market Returns to Two- and Four-year Colleges: Is a Credit a Credit and Do Degrees Mater?" NBER Working Paper No. 4268, Cambridge, MA: National Bureau Of Economic Research, Inc.; Osterman, Paul and Maria Iannozzi. 1993. "Youth Apprenticeships and School-to-Work Transition: Current Knowledge and Legislative Strategy." EQW Working Paper No. 14, Philadelphia, PA: University of Pennsylvania, National Center on the Educational Quality of the Workforce; and Card, David. October 1993. "Using Geographic Variation in College Proximity to Estimate the Return to Schooling." Working Paper No. 4483, Cambridge, MA: National Bureau of Economic Research, Inc.

[4] Chapters Three and Four include six and one-half year (1986-1992) coverage for more than five thousand vocational program completers at the high school and community college levels.

[5] The appendix to Chapter One provides a more detailed description of the individual data sources and consolidated database.

[6] The appendix to Chapter One describes many of the complexities of the state-specific databases. Every reader should understand that this monograph is the first public reporting of findings using a multi-state/multiple-agencies consolidated database that has been assembled since July 1991. Each of the four states uses these and other data for their own research purposes. Readers who are familiar with documents that have been released by the state entities should be particularly alert to differences in definition of post-school employment in this monograph and some of those documents. Florida's Education and Training Placement Information Program documents routinely include federal civilian and military employment and U.S. Postal Service employment. Washington's State Board for Community and Technical Colleges documents *out-of-state* employment in four nearby states and conducted a 1991 survey of a random sample of non-matched student records; see Washington State Board for Community and Technical Colleges. October 1993. *Using Administrative Data Matches for Follow-Up.* Olympia, WA: Division of Enrollment Planning and Information Services, No. 93-5.

[7] By year-end the author will complete a companion monograph that was commissioned by MPR Associates, Inc. for the National Center for Research in Vocational Education at the University of California, Berkeley. This companion volume is intended to serve as a primer, or manual, for conducting management diagnostics using linked administrative databases.

[8] For a comprehensive treatment of the confidentiality topic, see National Research Council. November 1993. *Private Lives and Public Policies: Confidentiality and Accessibility of Government Statistics.* Washington, DC: National Academy Press.

[9] This is not an all-or-nothing issue. Some states allow district or institutional discretion in the use of a social security number as a student identifier. At least one state education entity has been denied the opportunity to acquire student records by social security number, even though this information is maintained at the local level. The trend is toward greater use of social security numbers as a student record identifier, but the site-specific composition of this trend is uneven, and the trend itself can easily be reversed by legislative or judicial action at the federal, state, or local level.

[10] Major *excluded* groups include federal government civilian and military personnel, U.S. Postal Service employees, railroad employees, employees affiliated with religious and philanthropic organizations, self-employed individuals, individuals who receive *only* commissions (i.e., they receive no salary), and some agricultural workers.

[11] Reference to "an administrative record" here is imprecise. Each State Employment Security Agency maintains a state-specific database, which usually requires linkage of multiple data sources to include all of the data elements that are described here. The appendix to this chapter elaborates on this point.

[12] Most states require reporting of earnings when paid, not when earned. This requirement results in uneven quarter-to-quarter patterns, which reflect payment of lump-sum amounts such as seasonal and year-end bonuses. States differ in coverage and enforcement of employer reporting of non-wage forms of compensation (e.g., meals and lodging) and tips. States differ in the ceiling level of an employee's annual earnings that is taxed for unemployment compensation purposes, but *all* earnings are reported; there is no truncation, as there is with employer reporting of earnings to the Social Security Administration. The federal government has contracted with the MITRE Corporation to conduct a feasibility study of a wage simplification process, which might result in a more uniform definition and reporting of earnings in the future. Consideration is also being given to requiring federal government agencies to file quarterly employment and earnings reports with State Employment Security Agencies. These two examples typify the dynamic nature of working with administrative records.

[13] Washington requires employers to report each employee's hours of work. This information was used to conduct diagnostics that are reported in an appendix to Chapter Four. Florida requires employers to report each employee's weeks of work. The appendices in this monograph, and the companion monograph that will soon be submitted to MPR Associates, Inc., provide instructions on how quarter-to-quarter matching of administrative records can be used to achieve reliable proxies for *full-quarter* employment and earnings. The appendix to Chapter Four indicates that it is more difficult to isolate cases of full-time versus part-time employment.

[14] Alaska requires employers to provide occupational information. Other states have conducted pilot studies of such reporting practices. Interest in adding an occupational item to the quarterly employer reports ebbs and flows in most of the states. Jay Pfeiffer, who directs Florida's Education and Training Placement Information Program, is an authority on this issue; he conducted one of the early pilot programs of this type and is in frequent contact with those in other states who advocate this change. Pfeiffer also manages a comprehensive statewide survey activity that complements Florida's use of administrative records for management and research purposes.

[15] "The final months of a student's enrollment in a vocational program" are *assumed* to be April, May and June, except when the actual date of school-leaving is known. This is expected to introduce very little measurement error for high school students, who normally complete a program in May or June. The administrative records acquired from Washington's State Board for Community and Technical Colleges include the quarter/year of vocational program completion, which has been used to align "the final months of a student's enrollment" with the administrative records obtained from Washington's Employment Security Department. Loretta Seppanen, Manager of Research & Analysis for the State Board, estimates that typically one-half of Washington's community and technical college students graduate in the Spring quarter, with 15-17 percent graduating in the Summer, Fall, and Winter terms. Diagnostics are underway to document how measurement of "the final months of a student's enrollment" is affected by using different, or multiple, quarters of pre-school leaving employment and earnings data. For now, readers can be confident that measurement error does not affect findings that are based on "the final months of a student's enrollment in a vocational program" for high school students and for Washington's community and technical college students. Caution should be exercised in the interpretation of similar findings that are based on Colorado, Florida, or Missouri postsecondary vocational student records.

[16] See: Stern, David and Stevens, David W. December 1992. *Analysis of Unemployment Insurance Data on the Relationship Between High School Cooperative Education and Subsequent Employment*. Washington, DC: U.S. Department of Education, National Assessment of Vocational Education. Other pertinent references include: Osterman, Paul. 1980. Getting Started. Cambridge, MA: The MIT Press; Meyer, Robert H. and Wise, David A. 1982. "High School Preparation and Early Labor Force Experience" in Freeman, Richard B. and Wise, David A. *The Youth Labor Market Problem: Its Nature, Causes, and Consequences*. Chicago, IL: The University of Chicago Press, pp. 277-347; Haggstrom, Gus W., Blaschke, Thomas J. and Shavelson, Richard J. 1991. *After High School, Then What? A Look at the Postsecondary Sorting-Out Process for American Youth*. R-4008-FMP. Santa Monica, CA: RAND; U.S. Department of Education. March 1991. *Combining School and Work: Options in High Schools and Two Year Colleges*. Washington, DC: Office of Vocational and Adult Education; Yasuda, Kenneth E., Sr. June 1991. *Working & Schooling Decisions: A Study of New Hampshire Teenage Labor Market Behavior and the Level of Educational Attainment*. Concord, NH: New Hampshire Department of Employment Security, Economic and Labor Market Information Bureau; and Lynch, Lisa M. May 7, 1993. *Payoffs to Alternative Training Strategies at Work*. Cambridge, MA: National Bureau of Economic Research, Inc.

[17] Here, reference to a former student's status as "already employed" or "did not work" is based on earnings reported by covered employers to the state employment security agency in a particular state. Employment that *is* reported is expected to offer a higher probability of on-the-job training opportunity and of complementarities between competencies acquired in a vocational program and work activities than employment that *is not* reported (e.g., off-the-books employment or commission-only employment).

[18] This chapter's coverage of transition flows for former *postsecondary* students in Colorado and Florida includes only *community college* program completers. District postsecondary and area vocational-technical schools are introduced in Chapter Five. The basic format that is presented here can be replicated for *any* subpopulation, subject to satisfaction of the strict confidentiality stipulations that apply to all of the administrative data sources.

[19] Each of the four high school figures in this chapter refers to a 1990-91 population of completers. Four of the six community college figures in the chapter refer to 1989-90 completers, and two figures refer to 1990-91 completers. A one-time anomaly in Colorado's administrative records distorts reported employment rates and earnings figures prior to October 1990. Use of the 1989-90 records in this case would introduce serious measurement error for two of the four quarters in the *bridge* year that applies for the Florida, Missouri, and Washington postsecondary figures in this chapter.

[20] This is the *actual* quarter following graduation for all high school students and for Washington's community and technical college students, but it is the *assumed* next quarter for postsecondary students in Colorado, Florida, and Missouri's administrative records (see footnote 33).

[21] An important feature of the consolidated database is that an employment and earnings record for any former student can reappear in a future annual update of the state employment security agency's administrative records. Among the reasons why a former student's status is unknown here are: (1) continuing education out-of-state (or in a private school in-state); (2) employment elsewhere; (3) non-covered employment within the reference state; and (4) actual noninvolvement in either paid employment or continued education. Readers are urged to limit their interpretation of this data to what can be said with confidence.

[22] The following rule-of-thumb can be adopted: double the standard error number that is shown; add this new number to the accompanying average earnings amount to get an upper-bound estimate; subtract the same new number from the average earnings amount to get a lower-bound estimate. A practical interpretation of the resulting range between the lower and upper bounds is that repeated calculation of an average earnings level for comparable populations will lie outside this range less than five times out of every one-hundred calculations. When a reader wants to determine whether any two calculated mean earnings values differ, derive these upper and lower boundaries for one of the calculated means, and then see if the calculated mean of the other group lies within this range. If it does, then caution should be exercised in saying that the reported average earnings levels differ. If it does not, then a reader can be confident that the reported averages really are different (at least 95 times out of every 100 trials). A more stringent test of difference can be performed by using a factor of 2.57 instead of 1.96 in the first step. This will increase the confidence level to 99 times out of every 100 replications. A more precise way to determine whether group mean earnings levels differ is to derive the difference between the two mean values, and then calculate the standard error of this difference, which is the square root of the sum of the squares of the two corresponding standard errors. Then use this figure to establish upper and lower bounds for the difference between the two means. If the resulting range includes zero, then the difference cannot be said to be statistically significant, as this term is normally defined and used.

[23] We also know which of the *vocational* program completers took the ACT assessment in 1990-91. This data element has been used in preliminary diagnostics that are not reported here. Future research will combine the ACT data elements, which include demographic/aspiration/test score vectors, in conjunction with continuing education data elements, to provide a more complete analysis of the relationship between ACT test taking, an initial transition from high school to work, and concurrent/subsequent continuing education.

[24] An important goal when the four-state consortium was established in 1991 was to determine the extent of such differences and to investigate whether and how these factors can be reconciled to advance the usefulness of administrative data sources for policy and management uses. Events since 1991—including the provisions of Part H of the Higher Education Act Amendments of 1992, which require all public and private postsecondary institutions that participate in federal student loan programs for occupational offerings to document the reasonableness of student costs in terms of graduates' earnings prospects—have heightened the importance of pursuing this goal. Initiatives to broaden state participation in this activity are being explored by both consortium-member and non-member states.

[25] Readers are reminded, again, that the employment counts that appear in this report do not include federal government civilian and military employment; U.S. Postal Service employment; employment by a religious or philanthropic organization; self-employment without other paid employees; or employment in another state. This means that the employment count that is included in Figure 3 should be described in the following way: "Eighty-three percent of Florida's 1990-91 high school vocational program completers were employed at some time during the one-and-one-half years following school leaving by Florida employers who are required to file quarterly reports of employee earnings with Florida's Department of Labor and Employment Security."

[26] This range reflects multiple differences among the states, including proximity to employment opportunities in adjacent states, employment mix (e.g., the importance of federal government civilian employment), and the popularity of private postsecondary continuing education opportunities. For the same reasons, the percentage of former students who do not appear in a state's employment and earnings records will vary among school districts. This is one reason why care must be exercised when relying upon these administrative records for performance standards purposes.

[27] The Florida, Missouri and Washington subsections refer to the class of 1989-90. The Colorado subsection refers to the class of 1990-91. This realignment was necessary to avoid the unfortunate one-time anomaly in Colorado's administrative records covering the former students' employment and earnings.

[28] Missouri's Coordinating Board for Higher Education has not provided a *program completion* data element for our use, but they have promised to do so. Reference to Missouri community college *program completers* in this report is based on the use of 30-credit-hour and 60-credit-hour thresholds that are

intended to represent one-year certificate and two-year degree programs. The appropriateness of this substitution cannot be tested until both credit hours and program completion data elements are available.

[29] This is particularly important in the case of Higher Education Act Part H, which appears to provide an incentive for postsecondary institutions to recruit candidates who already have good jobs, so school officials can be confident that they will have high earnings after graduation *independent of the school's actual effect on earnings*. This is only a problem if such candidates can actually be enrolled in large numbers, which will be unlikely if candidates understand the school's average impact on observed earnings profiles. Each governor's State Higher Education Review Entity should be aware of this issue.

[30] No Florida community college *non-vocational* comparison group has been identified to date, so this is a stand-alone subsection. The findings reported here refer to Florida's public community college system vocational programs only. District postsecondary programs are not included. The Florida employment rates that are described here do not include the federal government civilian and military personnel and U.S. Postal Service employees, which are routinely reported by Florida's own Education and Training Placement Information Program.

[31] Missouri's Coordinating Board for Higher Education did not provide an actual *program completion* data element, because the statewide management information system was initially established to trace enrollees as they *entered* the community college system, not as they *left* it. The Board is preparing a student record database that will include the desired program completion code. This will be used to refine the findings that are reported here.

[32] The same 30-credit hour criterion was used to establish a proxy for *program completion* by former Missouri community college non-vocational program enrollees as was used in the previous subsection and in Figure 8 for former Missouri community college vocational program enrollees.

[33] The precision of measurement issue arises here. We know that a former community college student was enrolled in a vocational program and that they accumulated at least 30 credit hours, but we do not have a more accurate measure of exposure to *vocational* credit hours. An important next step will be to introduce additional descriptors of a former student's education when a state's database permits further refinement. For example, Colorado's community college records indicate whether a former student received a *less than one-year certificate, a one-year/less-than-two-year certificate, a two-year/less-than-four-year certificate, an associate's of applied science degree, an associate's of general studies degree, or an AA/AS associate's degree*. Washington's State Board for Community & Technical Colleges records distinguish among *leaver/less than 45 credits, leaver 45 credits or more, completer with degree, completer with certificate/at least one year, and certificate/less than one year* categories.

[34] This subsection takes advantage of the Washington State Board for Community & Technical Colleges' administrative records, which include a *quarter of last enrollment* data element that provides a more accurate measure of the timing of actual school leaving than is possible with the Colorado, Florida, and Missouri postsecondary records.

[35] The earnings data are reported on a quarterly basis: January-March; April-June; July-September; and October-December. A former student can begin work at any time, although there are well-documented "spikes" at the beginning of each month. This means that a first-quarter earnings figure often reflects less than a full quarter of employment in Figure 11. This analysis can be refined by restricting the observations to those who were employed at both the beginning and end of a quarter. This is accomplished by performing quarter-to-quarter matches of employer-specific affiliation. When this is done for a three-quarter sequence, employment at the beginning and end of the middle quarter can be detected. Of course, the result would be *second*-quarter earnings in the new job, not first-quarter earnings as is shown in Figure 11.

[36] Four references are recommended as complements to those that have already been cited in Chapters One and Two. See: Stern, David and Ritzen, Jozef M.M. (eds). 1991. *Market Failure in Training? New Economic Analysis and Evidence on Training of Adult Employees*. New York, NY: Springer-Verlag; Orfield, Gary. 1992. "Urban Schooling and the Perpetuation of Job Inequality in Metropolitan Chicago" in Peterson, George E. and Vroman, Wayne (eds.). 1992. *Urban Labor Markets and Job Opportunity*. Washington, DC: The Urban Institute Press. pp. 161-199; Field, Alfred J. and Goldsmith, Arthur H. 1993. "The Impact of Formal On-the-Job Training on Unemployment and the Influence of Gender, Race, and Working Lifecycle Position on Accessibility to On-the-Job Training" in Darity, William, Jr. (ed.). *Labor Economics: Problems in Analyzing Labor Markets*. Boston, MA: Kluwer Academic Publishers. pp. 77-116; and Maguire, Steven R. June 1993. "Employer and occupational tenure: 1991 update" *Monthly Labor Review*, 116:6. pp. 45-56. Each of these highlights the interplay of employee qualification and performance as well as demand-side opportunity, as determinants of job stability.

[37] The administrative records anomaly that affects pre-October 1990 employment and earnings data for Colorado is of limited importance here, because the focus of attention is on 1991 and 1992 churning patterns.

[38] These districts were *selected* only in the sense that they were the first in Florida to join in the first-year pilot stage of the Florida Education and Training Placement Information

Program, which now covers all districts in the state and is the source of our annually updated statewide database. No pretense is intended that these districts are representative of all 1985-86 Florida completers' subsequent employment stability profile.

[39] Some readers might conclude that the high level and narrow range of the *first job length/total job length* ratio is simply an artifact of the short six-quarter observation period. Others may discourage use of this finding without complementary information about the *number of quarters employed/six quarters* ratio.

[40] Table 2 and Table 1 can be linked in the following way. Refer to the "Florida/vocational/all/yes (pre-completion job held)" row in Table 2. The N for this group is 10,528, which is found in Table 1's "Florida/community college/vocational/yes" row.

[41] No non-vocational comparison group data are available for Florida's 1989-90 community college vocational completer population.

[42] Colorado's 1990:2 pre-completion employment status numbers are affected by the administrative records anomaly that was identified in Chapter One, so no pre-completion employment status breakout can be shown.

[43] The monotonic relationship of the post-school delay dummy variables to average post-school length of first job is an artifact of the six-quarter observation period and the definition of these dummies.

[44] Again, these patterns are likely to be artifacts of occupation- and industry-specific licensure requirements, traditions, market conditions, and related factors that are not uniform from state-to-state—or perhaps even among a state's regions. These differences must be understood to make proper use of management diagnostics.

[45] A former student is defined as a *mover* in any two-year interval if, and only if she or he started a new job during these two years, after having left a previous job. A former community college student could have held more than one job during the reference years.

[46] It is important to remember that these *stayers* already enjoyed a 35 percent average annual earnings advantage in 1986, relative to their classmates who would become repeated *movers*. This means that members of the respective groups differed at the beginning of their post-schooling work histories. This is why caution is urged in using only post-schooling employment and earnings information as outcome measures. It is also why the use of appropriate multivariate statistical techniques is encouraged to improve the accuracy and transparency of outcome estimates.

[47] In addition to the references cited in footnotes 3, 34, and 54 in previous chapters, see: Boissiere, M., Knight, J.B., and Sabot, R.H. 1985. "Earnings, Schooling, Ability, and Cognitive Skills" in *The American Economic Review*, 75:5. pp. 1016-1030; Taubman, Paul. November 1991. "Report of the Conference on the Rate of Return on Education." Philadelphia, PA: University of Pennsylvania, National Center on the Educational Quality of the Workforce; Hartog, Joop. 1992. *Capabilities, Allocation and Earnings*. Boston, MA: Kluwer Academic Publishers; Lang, Kevin. April 1992. *Does the Human Capital/Educational Sorting Debate Matter for Development Policy?* Working Paper No. 4052. Cambridge, MA: National Bureau of Economic Research, Inc.; and Allen, David L. and Honey, William D. July 1993. *Labor Market Outcomes of Education, Employment & Training Programs*. Salem, OR: The Oregon Employment Division, Research, Workforce Analysis Section.

[48] A similar data element is available in the consolidated database for each of the other states, but this step has not yet been taken using those databases.

[49] The companion monograph that has been commissioned by the University of California at Berkeley's National Center for Research in Vocational Education includes a sequential presentation of different tables, each of which is based on the same database. This reveals how the same data can be assembled in different ways to highlight particular favorable or unfavorable facets of a vocational program's performance. This is intended to serve as a staff training document, which can improve the quality of legislative and management decisions that affect the vocational education community.

[50] A refinement of these calculations will require that each of the former students must have reported earnings in both the first and last quarters of the year, indicating that they were working at both the beginning and the end of the year, but not necessarily throughout the year.

[51] This comparison includes vocational program completers who took the ACT assessment, and others who did not; and it does not take continuing education differences between the two groups into account. Refinements to take these factors into account will be performed.

[52] This will be done in the first phase of refinements of this initial public release of findings.

[53] The consolidated database will support refinements of Tables 4, 5, and 6 that will advance our understanding of this issue.

[54] See: Bishop, John. 1993. "Educational Reform and Technical Education?" Working Paper 93-04. Ithaca, NY: Cornell University, New York State School of Industrial and Labor Relations, Center for Advanced Human Resource Studies; Eck, Alan. October 1993. "Job-related education and training: their impact on earnings" in *Monthly Labor Review*, 116:10.

pp. 21-37; and Meyer, Robert H. February 1991. "The Efficacy of Specific Occupational Training." Madison, WI: University of Wisconsin, Department of Economics.

[55] See: Evans and Violas 1983.

[56] See: Stevens, David W. Forthcoming. "The Case for Revising U.S. Occupational Classification Systems." Washington, DC: U.S. Department of Labor, Bureau of Labor Statistics.

[57] The Bureau of Labor Statistics has scheduled a first public release of a new occupational classification taxonomy for January 1994. This new taxonomy is similar to Canada's National Occupational Classification system, which was completed earlier this year.

[58] The survey instrument designed by Florida's Education and Training Placement Information Program provides industry-specific job-title guides that are intended to increase the amount of uniformity that is achieved at the outset. However, respondents are allowed to provide their own job titles, if this is thought to be less burdensome and more accurate.

[59] Washington's State Board for Community & Technical Colleges uses an industry-based *relatedness* algorithm that relies upon occupational staffing pattern data collected by Washington's Employment Security Department through its cooperative agreement with the U.S. Department of Labor's Bureau of Labor Statistics. The basic approach used is to define an industry-vocational program match whenever what is considered to be a related occupation appears in an industry's reported occupational staffing pattern. This approach does not require information about a former student's own occupational assignment. The industry affiliation is detected in the cross-match of State Board administrative records against Employment Security Department administrative records. This approach supports a statement that "a particular student is/is not employed in an industry that includes among its occupational opportunities one or more occupations that have been defined as related to that student's vocational program."

[60] Florida's Education and Training Placement Information Program has developed this pilot version of a *relatedness* assignment for the State's community college programs only. The application of this approach to Florida's district postsecondary vocational programs here is not sanctioned by Florida's Program.

[61] The confidentiality stipulations that accompany both the student records and the employment and earnings records prohibit any public release of information that would permit the direct or indirect identification of a former student or a student's employer.

[62] A former student might have held more than one job, either sequentially or at the same time, during the reference quarter. When this is detected in the administrative records a decision must be made whether to treat each such record as an independent event or to adopt a rule for selecting one of the multiple records for follow-up contact purposes.

[63] The total of 10,837 is the sum of 9,359 decisions based on job title and 1,478 decisions based on industry affiliation.

[64] Florida's analytical approach to assigning a *relatedness* code to the reference quarter employment of former students has focused on community college programs. Here, this approach has been extended to district postsecondary programs as well. The author applied the same analytical approach to Florida's high school students without success, which demonstrates the importance of customizing the assignment procedure to a particular type of institution and range of programs within this educational level. The integration of academic and vocational components at the high school level that is underway throughout the United States will continue to weaken the precision of cross-matching between a particular program's curriculum content and labor market demands that can be said to require these unique competencies. The simultaneous recasting of occupational descriptions to encompass a longer list of discretionary tasks and a broader range of personal qualities further weakens this cross-matching capability.

[65] The next phase of the author's research program will address both types of unobserved variables, by combining information about on-the-job learning and performance with the measures that are already included in the multi-state consolidated database. This can be accomplished without jeopardizing the confidentiality stipulations in the pertinent state and federal laws, but doing so requires cautious progress through a series of steps that includes discretionary use of informed consent procedures. The pilot stage of this refinement will begin in 1994.

[66] The only exceptions appeared in four of the regression equations in Tables 17 and 19, which included variables that were derived from the same source of information that is described in this section: Colorado's employment and earnings records.

[67] The assignment of these codes is available from the author upon request.

[68] This assumes that persistence, duration, and absence of churning are advantageous outcomes. Earlier, in Chapter Three, this premise was challenged. There it was noted that without additional information these measures are likely to be interpreted as signals of employee competitiveness by some observers and as evidence of an employee's inability to advance by detractors. The earnings and relatedness measures, which were introduced in Chapters Four and Five respectively, help to distinguish between these interpretations of the former students' competitiveness. If those who exhibit what have been called advantages here are also found to have

higher earnings, a steeper trajectory of earnings growth-path, and higher rates of training related employment, then more confidence can be placed in the use of the word, "advantage," to describe these facets of the bridge year.

[69] The first-known use of administrative records for this purpose is in Borus, Michael E. 1964. *The Economic Effectiveness of Retraining the Unemployed*. New Haven, CN: Yale University. Also see: Stevens, David W. et al. 1982. "Vocational Education, CETA Program Participation and Subsequent Earnings of 1975-76 Graduates in the State of Missouri." *The Federal Role in Vocational Education, Special Report No. 39: 183-214*. Washington, DC: National Commission for Employment Policy; Stevens, David W. 1987. "Assessing the Impact of the Carl D. Perkins Vocational Education Act: Economic Development Issues." *Design Papers for the National Assessment of Vocational Education*. Washington, DC: U.S. Department of Education; Phipps, Ron, McDaniel, Cleve. 1988. *The Missouri Student Achievement Study: Results of the First Year*. Jefferson City, MO: Missouri Coordinating Board for Higher Education; Stevens, David W. 1989. *Using State Unemployment Insurance Wage-Records to Trace the Subsequent Labor Market Experiences of Vocational Education Program Leavers*. Washington, DC: U.S. Department of Education, National Assessment of Vocational Education; Stevens, David W. 1989. *Using State Unemployment Insurance Wage-Records to Construct Measures of Secondary Vocational Education Performance*. Washington, DC: U.S. Congress, Office of Technology Assessment; Smith, Gregory P. 1989. *A Longitudinal Tracking Study of Short-Term Education and Employment Outcomes of Colorado Community College Graduates*. Denver, CO: Community College and Occupational Education System; Pfeiffer, Jay J. et al. 1990. *Florida Education and Training Placement Information Program. Annual Report: 1990*. Tallahassee, FL: Department of Education; Seppanen, Loretta. 1990. *Vocational Education Outcomes in Washington Community Colleges*. Olympia, WA: State Board for Community College Education; Ghazalah, I.A. 1991. *1979 Vocational Education Graduates in 1986*. Athens, OH: Ohio University; Stevens, David W. et al. 1992. *Measuring Employment Outcomes Using Unemployment Insurance Wage Records*. Washington, DC: U.S. Department of Education, Office of Policy and Planning; Stevens, David W. 1992. "Occupations and Earnings of Former Vocational Education Students: Design Issues." *Design Papers for the National Assessment of Vocational Education*. Washington, DC: U.S. Department of Education; Stevens, David W. 1992. *National Performance Indicators for Vocational-Technical Education*. Washington, DC: U.S. Department of Education, Office of Vocational and Adult Education; Jarosik, Daniel, and Phelps, L. Allen. 1992. *Empowering Accountability for Vocational-Technical Education: The Analysis and Use of Wage Records*. Madison, WI: National Center for Research in Vocational Education; and, Amico, Lorraine. 1993. *State Capacity to Use UI Wage Records: The Vocational Education Experience*. Washington, DC: National Governors' Association, Center for Policy Research, Training and Employment Program, National Occupational Information Coordinating Committee and U.S. Department of Education, Office of Vocational and Adult Education.

[70] The extent of interstate mobility is affected by many factors. These are of particular importance when a state's performance management system is being designed, because border districts and specific vocational programs may exhibit unusually high out-migration patterns. The Division of Performance Management and Evaluation, Office of Strategic Planning and Policy Development, Employment and Training Administration, U.S. Department of Labor, is currently managing a 16-state project titled "Pilot Projects on Using UI Wage Records to Follow Up JTPA Terminees." Some of the states that are participating in this research are investigating the incidence of interstate mobility of JTPA terminees and how this would affect a state's performance-based allocation of resources among eligible Service Delivery Areas.

[71] Each state has its own unemployment compensation statute, which results in some differences in the definition of quarterly earnings across the states. This does not affect the findings that are reported here, because each state's data are presented and described separately. Pooling of earnings data from more than one state would require the analyst to become familiar with the nuances of each of the state-specific definitions of employer coverage and employee earnings. The author is not aware of any important definitional differences among the four states that are covered here, which would require an expression of caution when interpreting findings.

[72] However, quarter-to-quarter record matching permits detection of an employer-specific affiliation at the beginning and end points of a quarter. This procedure has been used in other aspects of the author's research program to represent a "snapshot" of point-in-time employment status.

[73] A detailed description of the steps that were taken to reach agreement with each of these state agencies, which provided for the transmittal of confidential information in a useful form, is omitted here. However, this is an important component of the overall account of what was required to bring the research to this point, and what lessons have been learned from this experience. Having said this, readers must understand two things about this process. First, each of the states, and specific individuals in each of the cooperating agencies, *volunteered* to participate in the research. State-specific reimbursement of data extraction costs did not cover the personal time that was devoted by dedicated public servants to transmit the data and then, of equal or greater importance, to help us to understand the nuances of these state-specific administrative records. Second, each of the agency-specific

agreements stipulates that the confidential records will be used only for the author's clearly defined research purposes and that these records will be maintained in encrypted form under the author's supervision at all times, and subject to state-specific return/destruction provisions.

[74] Colorado and Missouri's employment security agencies have provided the universe of covered employment records in accordance with agreements that describe the importance of being able to place the employment and earnings profiles of former students in the context of the state's overall employment dynamics. Examples of the use of this capability are found in subsequent chapters of this monograph. One valuable benefit of maintaining a file of all covered employment is that it permits future recovery of historical employment and earnings information for new populations of students who have not been identified yet. This is particularly important for understanding patterns of adult return to school and of adult mixing of employment and education activities. At the same time, this anticipatory archiving of information is a lightning-rod that attracts public concern about possible breaches of confidentiality assurances. The author is completing a comprehensive analysis of this issue for the U.S. Department of Labor's Bureau of Labor Statistics.

[75] This term refers to the state-specific definition of employers who are required to submit quarterly reports of employee earnings in compliance with the state's unemployment compensation law. An often repeated statistic is that "more than 95 percent of non-federal government employment is covered" by each state's unemployment compensation reporting requirement.

[76] Each of the state agreements provides for an annual updating of the most recent four quarters of administrative records.

[77] Florida's data also covers postsecondary district vocational education programs.

[78] Colorado's 1990-91 high school non-vocational completers population includes former students who completed the ACT assessment in a Colorado test-taking setting prior to the Fall of 1992. Test-score information provided by the ACT corporation allowed identification of this comparison group without jeopardizing the confidentiality of the ACT records. Florida's 1990-91 high school non-vocational completers population includes former students who were randomly selected from a stratified database of the state's high school graduates in that year. Again, the details of how these agreements were achieved provide important lessons about how administrative information can be used in a responsible way when interested parties are willing to try to accommodate each others' needs.

[79] This monograph will be used as an advocacy platform to achieve such a uniform metric through voluntary state action, which will enhance both intrastate comparisons across program areas and interstate comparisons within program areas. Past abuses of such comparisons have heightened skepticism within the vocational education community that external parties (e.g., legislators and governors) will use comparative information in a responsible manner.

[80] Washington's State Board for Community and Technical Colleges recently undertook its first crossmatch of wage records for non-vocational postsecondary students in the state's 1991-92 cohort.

[81] One section provides six-and-one-half year post-school coverage. The sections that report comparative findings for Colorado's and Florida's high school vocational and non-vocational completers provide only one-and-one-half year post-school coverage.

[82] The 1990 Census five-percent public use micro sample (PUMS) files were obtained for each of the four states. Data elements pertaining to demographics, education, employment, and earnings were extracted from these files. Preliminary results from analysis of these data were provided to the National Assessment of Vocational Education staff members in May 1993. No Census data-based findings are reported here. The wording of the 1990 Census schooling question is unfortunate in terms of our research need. The essential 1990 Census education question is: "How much schooling has this person *completed*? (Do not include vocational certificates or diplomas from vocational, trade, or business schools or colleges unless they were college level associate degrees or higher)." The answer categories provided were: "12 grade, no diploma; high school graduate (diploma or equivalent; e.g., GED); some college, but no degree; associate degree in college—occupational program; associate's degree in college—academic program." Difficulty is also experienced in using the Census' 1989 total wage income figure for comparative purposes here, since attention is focused on vocational and non-vocational completion during the 1989-90 and 1990-91 school years.

[83] Open-entry/open-exit policies and well-known seasonal patterns in the timing of postsecondary exit mean that some measurement error is introduced here for students who leave school in any month other than June. Washington's data provide the actual month of completion/graduation, which is used for Washington-specific tables and figures in this monograph. High school exits are concentrated in June, so little measurement error arises in these sections. Additional diagnostics continue (e.g., looking at quarter-to-quarter changes in earnings levels during all four quarters ending with June of the school-leaving year.)

[84] Again, diagnostics are underway to determine how the use of particular pre- and post-school leaving quarters affects employment and earnings patterns and the interpretation of these patterns.

[85] This unevenness arises from quarter-to-quarter differences in the amount of work time (i.e., variations in full-time/part-time and full-quarter/partial-quarter employment) and from differences in the compensation that is received (e.g., seasonal commissions or bonuses and promotions or raises).

[86] We selected Census high school graduate (only) records based on a narrow age range, so the comparison of earnings is precise for the high school cohorts. This cannot be done for the community college graduates, so the Census data for this group includes earnings for individuals who received their two-year postsecondary degree in an unknown year. Thus, the Census earnings levels will be higher than for our 1990 completers. Also see the appendix to Chapter Four.

National Center on
the Educational Quality
of the Workforce

University of Pennsylvania
4200 Pine Street, 5A
Philadelphia, PA 19104-4090