DOCUMENT RESUME

ED 134 720 CE 009 420

AUTHOR Fishkind, Henry H.; And Others
TITLE Methodology for Determining Needs for Vocational and Technical Education in Urban Areas in Florida.
INSTITUTION Florida Univ., Gainsville. Coll. of Business Administration.
SPONS AGENCY Florida State Advisory Council on Vocational and Technical Education, Tallahassee.; Florida State Dept. of Education, Tallahassee.
BUREAU NO 6-6002
PUB DATE Sep 76
NOTE 253p.

EDRS PRICE MF-$0.83 HC-$14.05 Plus Postage.
DESCRIPTORS *Employment Projections; *Labor Supply; Manpower Development; *Manpower Needs; *Models; *Needs Assessment; Post Secondary Education; Program Development; Regional Planning; Research; Statewide Planning; Technical Education; Urban Education; *Vocational Education
IDENTIFIERS Florida

ABSTRACT

The general objectives of this study were to (1) develop a methodology whereby needs assessments of vocational and technical education might be conducted efficiently and effectively in all urban areas of Florida, and (2) conduct, using the methodology developed, a needs assessment of the needs of business and industry, students, funding, facilities, and personnel as they relate to vocational education in a selected urban area of Florida. The area chosen for review in the project was Planning Region Four, which consists of seven northeast Florida counties. The methodology developed for the study consisted of a five part procedure: (1) An overall economic analysis of the planning region and its potential for economic and population growth was set forth, (2) alternative methodologies for projecting the demand for labor in a given urban area were developed and tested, (3) a methodology for projecting the supply of labor by occupation for an urban area was developed and tested, (4) procedures were developed for meshing forecasts of occupational demand and supply for urban areas, so that prospective shortages and surpluses of manpower could be readily identified, and (5) extensive field surveys were conducted of the Vocational-Technical Education (VTE) programs, facilities, teachers, students, and administrators. The most important conclusion drawn from the study's field work was the existence of vocational program unevenness within Region Four. Unique results were claimed by the study in three areas. First, the report showed how existing manpower projection techniques for an urban labor market area can be improved, expanded, and made more meaningful for VTE planning. Second, a systematic and comprehensive procedure was developed to project the ure supply of labor by occupation. Third, a format was developed relate occupational supply and demand forecasts to VTE programs des in a more easily understandable and usable form. (HD)

September, 1976

METHODOLOGY FOR DETERMINING NEEDS FOR VOCATIONAL AND TECHNICAL EDUCATION IN URBAN AREAS IN FLORIDA

by

Henry H. Fishkind
Jerome W. Milliman
Richard W. Ellson

The project (No. 6-6002) herein was conducted for the Florida State Advisory Council on Vocational and Technical Education pursuant to a grant administered by the Florida Department of Education. Contractors undertaking such projects are encouraged to express freely their professional judgements in the conduct of the project. Point of view or opinions stated do not, therefore, necessarily represent the official position or policy of the Florida Department of Education or the Florida State Advisory Council.

ACKNOWLEDGEMENTS

In conducting this research effort we received help and guidance from many individuals and agencies, and we wish to express our sincere appreciation.

First, Mr. Bruce Howell and Dr. James Wilkerson of the Florida State Advisory Council on Vocational and Technical Education provided help and guidance throughout. Further thanks are due to Mr. James Tarr and Mr. Timothy Campbell of the Department of Community Affairs who provided us with much of the necessary data and provided intellectual stimulation, valuable insights, and companionship.

Second, we wish to acknowledge the contributions to this report from the vocational education administrators in the Jacksonville labor market area: Mr. David Rigsley, Mr. Thomas Godbee, Mr. Alan Harvey, Mr. Ralph Upton, and Mr. Ned Hansen. These individuals spoke with us a length about the vocational education programs and permitted us to tour their facilities. Particular thanks are due to Mr. Marion Bishop and Mr. Frank Peterson who gave generously of their time and energy to insure the success of this research. Finally, Dr. Eric Mills not only spoke with us at length but provided valuable comments on a draft of portions of this report.

Finally, we want to acknowledge the support of the Bureau of Economic and Business Research at the University of Florida. Dr. Carter C. Osterbind, Bureau Director, provided guidance and support in our research, Mrs. Fran Terhune handled administrative matters, Mr. Rafael Betancourt and Mr. Juan Gonzalez provided editorial and computer program assistance, and Mrs. Dot Evans was most cooperative in typing this report.

While all these individuals provided input to this report, we alone are responsible for any errors of omission or commission.

Henry H. Fishkind
Jerome W. Milliman
Richard W. Ellson

September, 1976
Gainesville, Florida

CONTENTS

OUTLINE

Chapter I

INTRODUCTION

1.1 Purpose of the Study

1.2 Objectives of the Study

1.3 Rationale for the Study

1.4 Methodology of the Study

1.5 Philosophy and Concepts for Needs Assessment

- 1.5.1 Public and Private Benefits
- 1.5.2 Types of Needs
- 1.5.3 Manpower Projections and VTE Planning and Operation

1.6 Organization of the Study

Chapter I

INTRODUCTION

1.1 Purpose of the Study

This study was commissioned by the Florida State Advisory Council on Vocational and Technical Education. Its purpose is to develop methodology for determining the needs for vocational and technical education (VTE) in urban areas in Florida. Heretofore most studies of VTE needs have utilized state and national data and they have not adequately related needs of business and industry, VTE personnel and facilities, and students to each other in a local labor market context.

1.2 Objectives of the Study

The general objectives of the study are:

1. To develop a methodology (i.e., systematic procedure) whereby needs assessments of vocational and technical education might be conducted efficiently and effectively in all urban areas of Florida.
2. To conduct, using the methodology developed above a needs assessment of:

    *Business and industry needs,
    *Student needs,
    *Funding needs,
    *Facility needs, and
    *Personnel needs

    as they relate to urban vocational and technical education programs in one selected urban area of Florida, in light of all available vocational and technical resources, including public, nonproprietary, and proprietary institutions.

The specific objectives of the study are:

1. Develop and apply alternative procedures for assessing present and future demands (requirements) for manpower by occupation for urban areas.
2. Develop and apply alternative techniques for assessing present and future supplies of manpower by occupation for urban areas.
3. To field test the methodologies developed in the Jacksonville labor market area (Planning Region Four).
4. Evaluate these alternative projection procedures in terms of accuracy, data availability, cost, and ease of application.
5. Conduct surveys of vocational education personnel, students, business, facilities, and programs in the Jacksonville area.

1.3 Rationale for the Study

The Standard Metropolitan Statistical Areas (SMSAs) in Florida contain over 80 percent of the state's total population and over 70 percent of the full-time equivalent vocational students. The vast majority of funds provided for VTE in Florida are spent in these urban areas. Although some studies of the effectiveness of VTE programs have been conducted, none of these past efforts have systematically assessed whether or not the total vocational effort in Florida's urban areas adequately meets the needs of all sectors of the public for vocational and technical education.

In 1972 an extensive statewide evaluation of Florida VTE programs was carried out (Harris et al., 1972). As part of this evaluation a cost-effectiveness study of four VTE programs in Florida was conducted. The results for these four programs were encouraging. Positive and significant net payoffs resulted from student and state investment in these programs. However, it is difficult to generalize about all VTE programs from the small sample. Moreover, other sections of the statewide

evaluation of Florida's plan for VTE revealed important weaknesses. The worst flaw of the plan was that it did not provide estimates of the current and future demands for manpower by occupation and by location within the state.

Four recent efforts to increase the effectiveness of Florida's VTE programs have focused on improving labor market information in general and information on the demands for occupations in particular. In one study a management information system for VTE administrators was designed and used in pilot studies (Latta and Schmidt, 1972). The system provided data on students, instructors, program courses, facility utilization, student placement and follow-ups, and fiscal data. This information is a prerequisite for program monitoring, evaluation and control. Second, an extensive survey of technical employment in Northeast Florida was recently completed (Baker, 1972). Employment statistics by occupation were generated and projections of future manpower needs were made by simple trend extrapolations. Third, a model for assessing a local area's occupation needs based upon Job Bank information of the Florida Employment Service was developed (Tucker and Rowell, 1974). Finally, an Occupational Information and Delivery System (OIDS) for manpower planning at the state and substate levels in Florida was designed (Farr and Campbell, 1975).

Although a start has been made on measuring the demand for labor by occupations at the local level, there are some important deficiences in these efforts. The Baker study has three defects. First, the study does not consider the students, funding, facilities, or personnel of the existing VTE programs in the region. Second, the methodology used for estimating current manpower needs is based upon area skill surveys of employers by mail which has been found to be unreliable (see discussion Section 2.3.2). Finally, simple trend projections in the future have been found to be inaccurate.

The work by Tucker and Rowell concentrates on the development of management information systems. Two problems are present in their pioneering work. First,

the data on local labor markets developed by the Employment Service has major gaps in its coverage. Second, Tucker and Rowell provide no procedure for projecting future manpower needs. That is to say their emphasis is primarily on developing an information system on current job conditions in local labor markets.

The OIDS system will provide manpower and educational planners with projected occupational demands and measures of net occupational supply. Thus far the OIDS system has been largely implemented only at the state level. We believe that the system has a great deal of promise. One of the objectives of this study is to apply, test and evaluate the OIDS system for use in urban areas in Florida.

1.4 Methodology of the Study

Our approach to needs assessment for urban labor market areas will have five parts:

1. *Set forth an overall economic analysis of the region and its potential for economic and population growth.* This should be done before a detailed labor market analysis is undertaken and presented. The establishment of an overall regional context is desirable in order to facilitate the occupational projections themselves and in order to make the projections more understandable and useful to VTE planners, business and industry, guidance and placement counselors, and to students. Too often labor market projections are not plated in a overall regional context. Furthermore, the region selected for analysis should be a coherent economic labor market area. For this project we have selected Florida Planning Region Four which is a seven county area in Northeastern Florida. The region is composed of Duval, Nassau, Baker, Clay, Putnam, St. Johns, and Flagler counties. It constitutes a unified labor market area centered around Jacksonville.
2. *Develop and test alternative methdologies for projecting the demand for labor by occupation for a given urban area.* Although many of the

regional economic models appear to be a reasonably good job of forecasting employment by industrial (SIC) grouping, they do not provide manpower forecasts by occupation. Moreover, this is one of the first urban manpower studies which tests alternative forecasting techniques in the same labor market area.

3. *Develop and test methodology for projecting the supply of labor by occupation for an urban labor market:* All existing manpower forecasting models are stronger on the analysis of the demand for labor than upon the supply of labor.
4. *Develop procedures for meshing forecasts of occupational demand and supply for urban areas, so that prospective shortages and surpluses of manpower can be readily identified.* Furthermore, formulate a methodology to convert all occupational projections into VTE clusters, so that the occupational categories are compatible with VTE training programs.
5. *Conduct extensive field surveys of the VTE programs, facilities, teachers, students, and administrators.* Relate survey results to occupational forecasts and needs assessments.

We plan to use a 1980 time horizon for the development of our labor market projections. It appears that a projection span of five years is sufficient for most of the VTE planning needs. Second, a five-year time span represents about the maximum length of time it is possible to predict future conditions for substate areas with reasonable accuracy. However, we recommend that these forecasts be updated and revised on an annual basis in order to pick up the growth of new industries and the special impact of exogenous forces upon the regional economy.

1.5 Philosophy and Concepts for Needs Assessment

Needs assessment for VTE can mean many things to many people. It is the purpose of this section to discuss some of the philosophical and conceptual issues related to the assessment of needs. We shall discuss public and private benefits, types of needs, and the relation of manpower projections to VTE program planning and evaluation.

1.5.1 Public and Private Benefits

We are concerned with the responsiveness of VTE systems to meet the diverse needs of different populations and its role in providing equal opportunity and upward mobility for students from low income families. Ideally, a needs assessment should be concerned with the benefits and costs of VTE programs, how demands for VTE are articulated, how VTE programs are produced and how they are financed. In many ways our present study does not fully grapple with all of these issues. Yet, we do believe that we have made an important beginning.

It is clear that a large part of the benefits of VTE programs accrue directly to the students and their families in terms of greater earning potentials and greater social mobility. These benefits are often called private benefits. If all of the benefits were "private" in nature it could be argued that the consumers or beneficiaries of VTE should be required to pay for the services received as in the case of proprietary VTE schools. However, VTE programs are generally provided publicly without charge to students throughout the United States.

The rationale for public support of VTE lies in the belief that the public benefits which accrue to the society at large justify public provision. Two aspects of public benefits can be identified. First, benefits from VTE (and from education in general) accrue to society in addition to the students trained, i.e., benefits "spill over" to society at large. Second, is the

notion of equal opportunity in a democratic society which requires that education be made available to everyone without regard to the ability to pay.

Some of these public benefits can be measured in monetary terms. However, it is clear that many aspects are intangible and can not be measured directly in dollars and cents.

Perhaps just as important as the problems of measurement of public and private benefits are the problems which result from the possibility that different groups within the community may have different demands for VTE. There are often no easy ways to reconcile differing needs and differing perceptions of public and private benefits for VTE within and across school districts. Citizens' preferences may differ across income groups. Moreover, citizen preferences may not always coincide with the preferences of educational administrators and teachers.

1.5.2 Types of Needs

The nature of a need for VTE implies a desire by VTE personnel, business and industry, students, or a community for VTE services. No need exists for services which have no utility or the capacity to render satisfaction. Yet, "needs" seen in this light are practically unlimited, i.e., we all want and need many kinds of goods and services. Since resources for VTE are scarce, it is necessary to satisfy those needs which have the greatest benefits thus using our educational and community resources most productively. Clearly, there may be needs for which the benefits derived are less than the costs. Moreover, with limited resources for VTE programs some programs will be more meritorious than others. The point we wish to make here is that all VTE "needs" are relative and the needs which <u>really</u> count are ones whose benefits exceed costs. Without a final balancing of benefits and costs all required or projected needs are best thought of as being "potential" or "provisional".

It is often possible to classify needs by time period, geographical location, client groups, and producer groups. Shortrun needs of less than one year in duration may differ sharply from long run needs over a five or ten year period. Clearly, needs as seen from a local or community point of view may not be the same as needs perceived at the state or national level. Local VTE planners are usually more supportive of programs that serve more immediate program needs. Many rural communities still stress VTE programs in agriculture and home economics even though these fields are declining as sources of job opportunities. Extreme orientation to local needs can result in program duplication in communities serving the same general labor market.

Large urban areas generally have a different need pattern than the balance of the state. These areas are often characterized by heavy population densities, large concentrations of poverty, large concentrations of minority populations, and large concentrations of unemployment. It is possible that the emphasis on needs of large urban areas can polarize a state VTE system along urban-rural lines.

Conflicts in the perception of needs can be very real, and there are no easy answers. It is quite possible that the needs for VTE may be seen differently by instructors, administrators, taxpayers, students, and by business and industry. Communication between various interest groups can always be improved. Moreover, better manpower data and better analysis of potential benefits and costs can make the choices among alternatives more explicit and provide a more informed basis for decision makign. Yet, it is clear that some conflicts will always remain, and that compromise will be required in determining which needs and whose needs will be met.

1.5.3 Manpower projections and VTE Planning and Evaluation

Manpower projections for local areas are clearly just a part of needs assessment, but it is also clear that projections of manpower by occupation

and by location are an essential part. We have been surprised both at seeing needs assessments without manpower projections and also equally surprised at projections being interpreted as showing "need" in themselves. If manpower shortages are projected a "potential" need may exist. But, until we have examined both the costs of meeting that need in terms of programs, facilities and personnel and the benefits in terms of student placement, earnings, conditions of work, and regional growth we have not made a full evaluation or "assessment of need."

The present study points to a full assessment of needs. However, it falls short of one. We show how projections can be improved and made more meaningful in relation to program planning. We have gone part of the way, and we point to what needs to be done. We believe that needs assessment for VTE is in its infancy. We are confident that many of the remaining conceptual and data problems are tractable and capable of solution. Yet, we believe that it will always be difficult to measure some of the public benefits. In addition, some conflicts in needs and preferences of diverse groups may only be resolved by compromise.

Here are some of the problems of needs assessment at the national and state levels as we see them (our views are strongly influenced by Drewes and Katz, 1975):

1. At present we see need for a systematic relation between manpower projections which are used for different purposes, e.g. the planning of new programs, evaluation of operations, evaluation of older programs, evaluation of the needs of business and industry, and the needs of student guidance.
2. We believe that manpower projections at the state and national level are often used to justify new programs. Furthermore, once programs are established the projections may not be used

in evaluating program operation or possible program termination. In fact, program termination seems to be based upon declines in student interest rather than more general indicators of benefits and costs. In addition, we suspect that manpower projections are sometimes used as "window-dressing" by local or state officials to meet some formal requirements for program authorization. Apparently, manpower data are used to justify programs preselected upon other grounds.

3. Finally, we see a great need for improvement of local manpower data in terms of accuracy, format, and interpretation. Local officials complain that the manpower projections for local areas (when available) are inaccurate, and they lack credibility since special local conditions are ignored. Too often the data is presented without a narrative explaining the overall economic conditions in the local labor market. Too often the local VTE officials are not provided assistance in how to use projections developed by outside "experts". Too often the occupational classifications are not presented in terms of VTE program clusters which can be used for student guidance and program planning, and, too often the needs of business and industry are not directly assessed.

The goal is systematic program monitoring and evaluation. Needs assessment is a complex, important and continuing task.

1.6 Organization of the Study

This study comprises seven chapters. Following the introduction, Chapter II presents a review and critique of manpower projections for VTE. Chapter III develops the conceptual and empirical models we will apply. Chapter IV analyses

the case study area in terms of its demographic and economic trends. Chapter V presents the results of the alternative projection methodologies we have tested. Chapter VI describes national problems in VTE delivery systems and presents our surveys and evaluation of the VTE programs in the test area, and Chapter VII gives our conclusions and recommendations.

Stevens (1976) has raised the question that the development and use of employment projections for planning for VTE curricula may be a "mission impossible". He writes (1976, p. 38):

> It should be apparent by now what answer will be forthcoming to this question about the possibility of the assigned mission. We know from observation that the transmitter is operating because we have reams of computer printouts with employment information of many types. We also know the receiver is functioning because we see the numbers from computer printouts showing up in planning documents of education agencies. This surface manifestation of a successful transmittal from information producer to information consumer is confounded by evidence that generally only intermediate consumption occurs. Just as ruminating animals bring up a cud from the first stomach to be chewed again, what is really sought in vocational-technical education planning is a cud, a "second chewing" of information which is currently stored in planning documents, to nourish the administration of educational processes.

OUTLINE

Chapter II

MANPOWER PROJECTIONS FOR VOCATIONAL EDUCATION: A REVIEW AND CRITIQUE

2.1 Introduction

2.2 The Utility of Forecasting in Relation to Needs Assessment

- 2.2.1 Accuracy of Forecasts
- 2.2.2 Forecasts Versus Projections
- 2.2.3 Manpower Information Gaps
- 2.2.4 Incentives to Use Projections
- 2.2.5 Forecasts and Planning

2.3 Techniques for Manpower Forecasting

- 2.3.1 Classification of Techniques
- 2.3.2 Unspecified Techniques
- 2.3.3 Specified Technological Models
- 2.3.4 Specified Economic Models
- 2.3.5 Specified Predictive Models

2.4 Critique of Manpower Projection Models

2.5 Forecasts of Supply of Manpower

Chapter II

MANPOWER PROJECTIONS FOR VOCATIONAL EDUCATION: A REVIEW AND CRITIQUE

2.1 Introduction

The purpose of this section is to review the literature and examine the state of the art for forecasting manpower for vocational-technical education (VTE) at the state and local levels. First, we shall discuss the utility of forecasting in relation to needs assessments. Next, we shall classify and examine various types of techniques for manpower forecasting. Finally, we will assess attempts to provide information about the supply for manpower.

The literature on projections of manpower for vocational education is rather extensive. Here we shall present the major highlights. Our bibliography does include most of the important references. However, the following discussion will rely heavily on four sources:

a. David E. Kidder, *Review and Synthesis of Research on Manpower Forecasting for Vocational-Technical Education* (1972).

b. Leonard A. Lecht, *Evaluating Vocational Education--Policies and Plans for the 1970's With an Annotated Bibliography* (1974).

c. David W. Stevens, *Employment Projections for Planning for Vocational-Technical Education Curricula: Mission Impossible?* (1976).

d. Robert C. Young, et al., *Vocational Education Planning: Manpower, Priorities, and Dollars.* Final Report (1972).

2.2 The Utility of Forecasting in Relation to Needs Assessment

2.2.1 Accuracy of Forecasts

It should be acknowledged at the beginning that manpower forecasting has received considerable criticism with respect to its utility in vocational education planning. Critics have pointed out that: (1) forecasts are often inaccurate, (2) inaccurate forecasts may result in misallocated resources, and (3) that manpower data is often not presented in a form (or in sufficient detail) necessary to guide students, teachers or administrators.

Several responses to these criticisms have been made. Young (1972, p. 22) grants that forecasts of demand and supply of manpower may not have the desired accuracy levels. However, he argues that the use of explicit forecasts by trained manpower economists may be better than implicit forecasts by amateurs. Second, evidence suggests that the accuracy of forecasts may increase over time as forecasting experience grows and the generation of relevant data improves. A paradox arises in that the value of a forecast increases as it is disaggregated in terms of occupational breakdown and as it becomes more local area specific (in contrast to aggregated national data). Yet, the difficulties of making small area forecasts with specific occupational detail are well known.

The need for accuracy in manpower forecasts for VTE planning is dependent in large part on two factors: (1) the nature of the VTE training in terms of whether it is generalized or specific and (2) the proportion of the labor force that VTE supplies in a given labor market. The larger the proportion of the forecasted demand for trained labor that VTE programs can potentially supply the more necessary it becomes to forecast accurately. Similarly, accuracy has greater value when expansion of the VTE system is in the form of specific (rather than general) training programs.

2.2.2 Forecasts Versus Projections

Stevens (1976) stresses the difference between conditional employment projections and forecasts. A forecast is said to represent the "best guess" of what is expected to occur. By contrast, employment projections are conditional and are based upon explicit assumptions about the workings of the economy. Too often the VTE administrator tends to overlook the conditional nature of the projections and the underlying assumptions upon which they are based. To reduce the lack of understanding about the nature of the projections the forecaster should probably present several projections with a clear statement of the assumptions involved regarding assumed institutional constraints and assumed economic conditions. In this study we will use the terms projection and forecast interchangeably. Yet, we shall stress the importance of a careful documentation of the assumptions made in developing the estimates.

2.2.3 Manpower Information

To many VTE planners there appears to be an abundance of future manpower information which has limited value for program planning while at the same time there is a shortage of needed information for direct application. Lecht (1974, p. 44) has identified three important gaps in existing manpower data. First, most of the data is national in character. Projected national requirements for various occupations abound. Yet, there is often very little information about local or regional job openings in these same occupations.

Second, most of the information stemming from such standard sources as the U.S. Department of Labor's *Tomorrow's Manpower Needs* neglects supply considerations and deals largely with manpower demands and "requirements" in various occupations. For example, the industry-occupation matrix can give highly detailed requirements for 1980. Yet, there is a dearth of comparable data on occupational supply. Without this kind of information it is very difficult to appraise the future role of VTE in various occupational fields.

For example, low ratios of vocational enrollments to projected job openings may mean that VTE should be expanded or it may signify that manpower needs in these occupations are being met in a satisfactory fashion from non-VTE sources. Of course, for many occupations entrance requirements are not very specific so there is a great deal of interoccupational mobility and thus it is difficult to define occupational supply.

Third, most estimates of future manpower requirements usually are based upon employment growth or expansion demand over a five or ten year period. Often too little attention is paid to job openings attributable to replacement needs--to replace losses caused by death, retirement, occupational mobility, and withdrawal from the labor force. Job openings from replacement demands may be two or three times as large as those stemming from expansion demand, and to ignore these will produce serious underestimates of labor demand. Clearly, there appears to be a need to make manpower projections which more directly related to the operational needs of the VTE system, including students, teachers, and administrators.

2.2.4 Incentives to Use Projections

All of the foregoing implies that better information and better manpower forecasts will be usefully employed by VTE planners. Stevens (1976, p. 38) adds a note of caution or skepticism to this common prescription by suggesting that administrators in VTE may not have strong incentives to make more than superficial use of employment projections. The answer to this problem goes beyond the "standard" communication failures between the producers and consumer of occupational employment information. To Stevens, the more fundamental problems lie in the politics of educational planning. In a partial explanation of the failure to make more use of employment projections by VTE administrators, Stevens writes (1976, p. 37):

> Returning to the asymmetry between potential rewards to action and anticipated losses from a failure to act, we can see that virtually no one in an administrative role has a strong incentive to contribute consummate performace in using Department of Labor, or anyone elses, employment projections. Professional educators and associated staffs and physical plants are already arrayed across the country. Any inconsistency between employment projections and the range of preferred capabilities of these resources will revoke adoption of a defensive self-serving posture, just as it would in any other part of the public or private sectors: Evidence of this asymmetry phenonmenon is seen in the administrative enthusiasm expressed about projected newly emerging or rapidly expanding employment oppportunities, versus the hostility generated toward evidence of projected decline of opportunity or current abundance of qualified persons.

If Stevens is correct, dramatic changes in administrative behavior in the use of manpower forecasts will not be forthcoming until new rules of the game are developed to change the nature of the incentive-reward structure in VTE planning and administration.

2.2.5 Forecasts and Planning

It is well recognized that VTE planning should not be based upon employment criteria alone. Just because there is expected to be a shortage in a particular occupation does not mean that a training program should attempt to meet that need. As we pointed out above there may be other supply responses which can meet the need more effectivelythan VTE. Even more basic is the possibility that the wages and working conditions in that occupation may be too low or unattractive to attract sufficient numbers of workers. Clearly, forecasts of manpower demand and supply are just initial steps in the assessment process. We must examine at least two additional types of information: benefits and costs of VTE programs. On the benefit site, we must examine such things as wages (earnings), student interest, job satisfaction and long run promise. Potential social benefits such as reduced crime rates should also be oriented. On the cost side, careful consideration should be given to required facilities, personnel and funds. Educational resources are limited. We must use them efficiently. Several criteria for

efficient planning have been suggested: (1) minimize costs of attaining specific or given program goals; (2) maximize benefits for a given amount of resource; (3) teach as many students as possible in programs of given quality; or (4) expand programs up to the point where marginal (incremental) benefits equal marginal costs. Each of these criteria has merit in some circumstances.

It appears that VTE program planning should give more consideration to benefits and costs in the assessment of needs. Cost-benefit information should be well organized and included in the planning process. This means that forecasts of demand and supply by occupation should be supplemented, on the one hand by cost data. On the other hand, information on manpower requirements should have corresponding information with respect to prospective earnings, conditions of work, and job satisfaction. Variations in the success of graduates from particular VTE programs are likely. This implies that a continuous monitoring policy should be instituted. Ideally, we want to follow up graduates and compare program benefits with training costs with the hope of modifying, expanding and deleting programs in light of their success (net benefits). Lecht has noted that the literature shows an abundance of reports at the state level that focus on manpower projections for VTE. Yet, there are relatively few which related the future projections to the training facilities, personnel and to budgets and expenditures. Even fewer studies exist which relate future projections to expected benefits as well as VTE program costs.

In summarizing the literature on indicators of success in VTE programs Lecht (1974, p. 9) writes:

> The studies dealing with the economic and educational performance of the vocational students are far from conslusive. They make a reasonable case for a positive economic return to investments in vocational education. The studies also challenge the notion that vocational education should receive support because it encourages students with limited verbal ability to remain in school. The problem in assessing the economic return to vocational education is that a great deal may be expected

from a program with a limited purpose without recognition of the condition necessary for its success--a dynamic economy.

2.3 Techniques for Manpower Forecasting

2.3.1 Classification of Techniques

There are a number of ways to classify techniques for VTE manpower forecasting. Young (1972, p. 37) lists four techniques:

1. Employer surveys,
2. Extrapolation of trends,
3. Economic techniques, and
4. Job vacancy-occupational outlook approach.

Stevens (1976, 11) classifies employment projection models in eight ways:

Model One:	"Same As Before"
Model Two:	"Fixed Coefficient Production Function"
Model Three:	"Increased Labor"
Model Four:	"Incremental Labor-Output Ratio"
Model Five:	"Skill and Industry Employment Forecasting"
Model Six:	"Skill and Industry Effects"
Model Seven:	"One State Skill and Industry Effects"
Model Eight:	"Regression Analysis"

Kidder (1972, p. 6) uses four classifications:

1. Unspecified: data generated techniques with assumptions and structure not specified,
2. Specified technological models,
3. Specified economic models, and
4. Specified predictive models.

As the reader can see, there is a good deal of overlap in these three sets of classifications. For purposes of this review we follow the Kidder classification although all of the techniques discussed by Stevens and Young will be included.

2.3.2 Unspecified Techniques

The use of unstructured models for manpower forecasting is quite common in the public and private sectors. Experienced "old hands" often have the knowledge to make informed guesses about the future which are surprisingly accurate. However, when employed by amateurs, the results may be very poor. Moreover, the failure to specify causal relationships and to make assumptions explicit makes these unspecified techniques difficult to employ in policy analysis and evaluation.

In the VTE manpower area, the best-known unstructured techniques are employer skill surveys and job vacancy-occupational outlook approaches. Employer skill surveys at the local level are of two types: the Area Skills Survey and the Training Needs Survey. In the area skill survey state employment agencies request information from local employers on their current and future expected manpower requirements in 50 to 150 occupations. Both mail surveys and on site questionnaires are used, and a two to five year forecast horizon is typical. In addition, estimates of replacements and on-the-job training are obtained. With other data on supply and demand, estimates of training needs for local areas can be made. The training needs survey tends to cover fewer occupations, fewer employers and has a shorter forecast period.

The area skills surveys have been strongly criticized for being costly and inaccurate. Employers are not reliable sources of occupational forecasts. In addition, there are problems of a lack of understanding of job classification schemes and low response rates. Finally, forecasts of supply responses are not given systematic study. Although this method no longer has the support of the U.S. Employment Service, it is still employed by many state and local agencies.

By itself, the area skill survey appears to be a poor forecasting technique. Yet, it can be used periodically to fill gaps in inter-censual occupational data, and it can provide very quick estimates of immediate plans for firm expansion or contraction. Moreover, it can serve as a communication channel between the VTE system and local employers and help make schools more responsive to the needs of employers. Finally, even though it is inaccurate, the skills survey does provide an order of magnitude estimate of employment demands which is useful when the limitations of the technique are taken into account.

The job vacancy-occupational outlook technique (also know as the unfilled openings-industry occupational outlook matrix approach) was developed by Medvin (1967, 1969). It is most useful when the facilities for training are very small in relation to expected occupational needs. Under such circumstances high degrees of accuracy in forecasting employment for VTE planning are not necessary. The strength of this technique lies in the simple approach to get at persistent and intense shortages of manpower. But its simplicity is also its weakness because it can not tell us why the situation exists and what kinds of policies are best needed to respond to unfilled openings.

Essentially, the job vacancy approach analyzes shortages by comparing job openings that have been unfilled for 30 days or more as a percentage of total listings. An index is constructed in descending order indicating, first, jobs with apparent intense shortages. Tables can be constructed to also reflect wage rages and working conditions so that the openings-matrix approach can be related to supply factors. The system is relatively inexpensive compared to area-skill surveys, and the information can be easily related to job and instructional codes at the local level.

When supplemented with specified models of labor market demand and supply, it seems likely that the job vacancy data system can be helpful in VTE planning. However, standing alone a change in the intensity ratio could be caused by either (or both) demand or supply changes. As Kidder suggests, such a non-causal technique does not provide the policy maker with a way to check the descriptive accuracy of a forecast or a way to design VTE policy to alter the forecast.

2.3.3 Specified Technological Models

In this category Kidder discusses trend extrapolation (in its various forms), technological change models, input-output models and various systems models of labor markets. The common feature of these various techniques is their assumption that the relationships among the various inputs (labor, capital, and land) for producing outputs remains fixed during the forecast period or perhaps changes in some fixed or predetermined way.

Trend extrapolation estimates future employment on the basis that future patterns will be similar to past trends. This technique has the advantage of economy and speed. Naive trend extrapolation models may be of three types: no change, constant absolute change or constant relative change. A more sophisticated approach would be to develop trend projectections through least squares regressions. These regressions should be accompanied by an explicit statement of the assumptions used. If this is done, faulty assumptions can be changed to improve the model. By contrast, unstated assumptions offer little guidance on how to improve faulty projections. Trend projections have been found to be more accurate than more expensive techniques when the forecast is for a short range period. Obviously, the farther one projects into the future the less likely it will be like the past. Also accuracy falls off as the area or region becomes smaller, and as more occupational detail is required.

Various attempts have been made to forecast technological change and its effects upon manpower. Technological forecasting has become more sophisticated in recent years. Studies include detailed technological projections, "best plant" forecasts, international comparisons, and leading indicators. However, many of the forecasts have involved technological categories which are too aggregated to be of use to occupational forecasters except for highly specialized technicians.

Input-output models which spell out the interindustry relations of an economy in matrix form have gained acceptance in regional analysis. A number of attempts have been made to apply this technique to occupational forecasting by translating industry demands into specific occupational manpower needs. The most well known work of this kind is the Bureau of Labor Statistics' 4-volume publication *Tomorrow's Manpower Needs* (1969). Estimates of occupational employment by industry are derived from an industry-occupation matrix, and these are summed to provide the total estimate of employment by occupation. Ten-year forecasts are provided. To translate the occupational categories into VTE categories requires the use of the manual *Vocational Education and Occupations* (U.S. Department of Health, Education, and Welfare, 1969). Translating national BLS projections into projections for state and local areas has been attempted with varying degress of success. It is clear that national input-output coefficients and national occupational aggregations can have serious limitations in small specialized regions. Yet, input-output models which are based upon primary state and local data are very time consuming and costly to develop. On this point Kidder concludes (p. 31):

> The community base study, or some variant, may offer a less costly way of spelling out local industry structural characteristics. On the other hand, vocational educators who must produce forecasts may find adaption of the Bureau of Labor Statistics' national projection to local needs a tempting possibility. To be useful, however, such a technique requires considerable supporting evidence, such as Medvin's unfilled-openings data or technology studies, as well as

liberal amounts of informed judgement from individuals knowledgeable about local conditions.

System models attempt to picture the labor market by looking at broad demand and supply factors responsible for yielding some specified targets at a future date. The basic approach is to chart or picture the labor market as a system with the use of technological assumptions. Most system models do not try to explain behavior through an economic framework. Kidder reviews three such models: the Battelle Institute's Michigan Study (1966), Arnold's Pennsylvania Study (1969), and Bradon et al., *Occupational Training Information System* (OTIS) (1970). In general, the system models are best viewed as excellent methods of assembling and organizing labor market information. The use of fixed supply and demand parameters and the failure to employ sophisticated economic assumptions (particularly about behavior on wage rates and input substitution) will limit their application to rather static situations.

2.3.4 Specified Economic Models

In this category Kidder discusses models which attempt to relate forecasting with optimizing behavior on the part of educational planners. Optimizing behavior requires the specification of a social objective function in precise terms (e.g. maximize net earnings of trainees relative to costs or minimize VTE costs to eliminate specified manpower shortages). When multiple objectives exist and when there is lack of agreement on the objective function, maximization procedures have proved to be difficult to implement. Two types of models have been used: linear (and non-linear) programming and cost-benefit analysis.

Our review of these models indicates that they are of limited usefulness in forecasting. The programming models in particular do not explain labor market behavior. Therefore, the "efficient" programming solutions

may be based upon very crude assumptions about supply-demand changes in the labor markets.

Cost-benefit studies (and cost-effectiveness studies) have proved very useful in program evaluation on ex post data. When cost-benefit studies are performed on ex ante data they must rely on forecasts developed by other manpower-forecasting techniques. As of now, the cost-benefit studies are complementary to successful forecasting models, and they serve to remind forecasters and administrators that reactions to forecasts require careful consideration of benefits and costs. Perhaps at a future date there will be more integration of forecasting, planning and evaluation models.

2.3.5 Specified Predictive Models

These models are econometric models which involve solving a series of simultaneous equations (determined through regression techniques) to depict the supply and demand forces in labor markets. These models are new in the labor/manpower field, particularly at the state and local levels.

A conjunction of events has recently made it possible to build regional econometric models for projections of manpower requirements on a state and local basis. The usefulness of such models has been apparent for some time. However, the ability to construct such models on a sound conceptual and empirical basis has only developed in the past few years.

Two factors are responsible for this capability. First, substantial progress has recently been made in obtaining inter-censal data on the occupational distribution of employment for detailed SIC industries on a state basis. Without the new program by the Bureau of Labor Statistics (BLS) called Occupational Employment Statistics (OES), the data requirements for a regional manpower econometric study could not be met.

The second factor has been the development of regional modeling itself in the last decade. Milliman's (1971) review of large scale regional

forecasting models concluded that the state-of-the-art had advanced significantly from the pioneering New York Regional Study to the Susquehanna River Basin simulation model, which intergrated demographic, employment and water sectors for eight major subregions. Glickman's (1971) review of small area econometric models showed that the field had come of age. No longer are regional economists confined to the simple economic base framework as popularized by Tiebout (1962). Also, it is clear that the use of econometric models provides a flexible alternative to the expensive data requirements of regional input-output models as exemplified by the Philadelphia input-output model (Isard et al., 1967).

Regional econometric model building is not possible at a reasonable cost in terms of data, computer programs, and in terms of regional economic theory. The time is right to construct regional econometric models to analyze regional manpower needs.

Some cautions, however, should be made clear. Models of this type require considerable professional expertise and computer time. A model once constructed needs to be carefully calibrated, updated, and evaluated. Moreover, tests of such multi-equation models against forecasts by less sophisticated techniques need to be performed. This is particularly important since all techniques suffer to a great extent from the lack of good data at the local level to estimate supply and demand equations. The data is particularly weak on the supply side in terms of how job mobility, on-the-job training, and area migration factors actually operate. On the demand side, there are major weaknesses in local area data for replacement demands.

Finally, econometric models will still perform best in projecting industry employment totals. To get specific occupational breakdowns it is necessary to use coefficients from an industry-occupation matrix. And, in turn we still have to make more or less subjective assumptions about the

occupation-education structure. Perhaps someday we can specify VTE categories directly in production equations.

2.4 Critique of Manpower Projection Models

As we have seen a number of techniques exist for projecting regional employment. Each has unique features in terms of cost, reliability, and data needs. All have utility for some situation; all models have limitations. Our basic findings are:

a. Manpower projections at the national and state levels are now well-established and widely employed. (Scoville, 1972; Ahmad and Blaug, 1973; and Wabe, 1974.)

b. Manpower projections at the substate, regional, and local levels are not well-established. The quality of the data for local labor markets is less reliable and techniques presently employed are simplistic. Moreover, the fact that local economies are more "open" in terms of the movement of goods, services and people across boundaries makes it much more difficult to project local labor demand and supply (Stevens, 1976).

c. All existing manpower forecasting models are stronger on the analysis of the demand for labor than upon the supply of labor (Bezdek, 1974).

d. The supply of labor has often been developed from population projections and labor force participation rates disaggregated by age, sex and other relevant variables. This procedure has most validity at national levels and for aggregate manpower supply estimates. It has many serious shortcomings when applied in local labor market areas, and also when one is concerned with detailed occupational supply, that is, those persons working or seeking work in a given occupation at a given place and time (*Tomorrow's Manpower Needs*, Vol. 1, 1969).

e. The data limitations for econometric models of regional labor markets appear more serious for the supply side than for the demand equations.

For example, estimates of new labor market entrants from formal training programs are available. Yet, reliable data for on-the-job training and upward mobility in internal labor markets is very rare (Doeringer and Piore, 1971).

f. The demand for labor is often thought of as the expansion demand plus the replacement demand. Our judgment is that projections of expansion demand appear to be given more attention than replacement demand. In reality, and particularly in slow growing areas, the demand for labor is often dominated by replacement demand. For instance, the U.S. Department of Labor estimates that for the nation two out of three job openings result from replacement demand. However, manpower projection models concentrate on forecasting expansion demand.

g. Replacement demands are created by the need to replace workers who drop out of the labor force or change occupations for a variety of reasons. Separation rates calculated by the Bureau of Labor Statistics are based upon two factors, death and retirement. These data assume that death and retirement rates are the same for each age group in all occupations across all states. Separation rates at the substate level are not readily available.

h. Other factors affecting replacement demand such as occupational and job mobility are given less attention although they may be major factors in local labor markets. Many of the factors affecting job turnover at the state and substate levels are difficult to model. Transfers from one occupation to another may be as large as separations because of death and retirement (BLS Bulletin #1816, 1974).

i. With few exceptions, most manpower projection models are based upon a "requirements" approach. Manpower projection models usually adopt a fixed coefficient production function approach using national and state

occupational matrix data developed by the Bureau of Labor Statistics. The limitations of fixed coefficients at local and regional levels may introduce serious bias (Young, 1972; Bezdek, 1974).

j. Manpower projection models which are used to assess needs for various kinds of training programs usually assume that unmet needs (projected manpower requirements in excess of projected labor supplies in given occupations) can or should be met by training program responses. Other important sources of market adjustment tend to be neglected (Stevens, 1976).

k. Few models for making manpower projections appear to be adequately tested. Replication over time has not been extensively practiced. Most models fail to include estimated forecast errors. Tests against naive models and simple trend extrapolation are rarely performed (Kidder, 1972).

l. None of the models examined adequately estimate internal staff needs for keeping the model on line and updating it over time (Milliman, 1971; Kidder, 1972; and Stevens, 1976).

m. Most models do not attempt to reflect the institutional environment within which they are to be employed. Production of better information and better projections will be of little use unless the results can be easily communicated to the various decision-makers in a decentralized institutional framework. The projection models for vocational-technical education fail to deal with estimates of staff needs for the vocational educational system (Lecht, 1974, Stevens, 1976). Stronger links between forecasts of supply and demand and the costs and benefits of program implementation are necessary (Young, 1972).

2.5 Forecasts of Supply of Manpower

Planning for increasing the supply of skilled manpower through VTE programs should be dependent upon knowledge of the quantity and quality of labor by

occupations. As we have indicated above, most of the forecasting techniques concentrate very heavily on demand considerations and skimp on the supply aspects. Relatively little study has been given to the role that VTE should play in fulfilling differential occupational requirements in relation to sources of entry and in relation to other labor market adjustments.

Figure 2.5 below depicts the sources of entry and exit by occupation (Tarr and Campbell, 1975). For regional or local labor markets, the data should be area specific. The smaller the area the more important will be the effect of in and out migration. For the larger and more developed regions there will be more possibilities for mobility within and between occupations.

Figure 2.5

Occupational Sources of Entry and Exit

Entry	Current	Exits
- Formal training a. schools: public and private b. colleges c. federal manpower programs	- Employed - Unemployed - Those not in labor force	- Deaths - Retirement - Occupational mobility - Outmigration - Other separations
- On-the-job training and upward mobility		
- Inmigration		
- Occupational migration		
- Exmilitary		
- Other		

Most writers in the field of VTE manpower forecasting indicate in general terms that information would be necessary to produce forecasts of the supply of manpower. However, the empirical data for the implementation of detailed supply forecasts is largely missing even at the national level. At the state and local area levels, information is even more scarce. Unfortunately, occupations for which meaningful occupational supply estimates can be made are often ones which have a

fairly high level specific training requirements, e.g. scientific, engineering, and health occupations. For many occupations reliable information on how workers become qualified for jobs is difficult to obtain.

These difficulties have been widely recognized. A number of research efforts are underway to improve estimates of the supply of manpower, and shortcut methods are being developed for forecasting purposes. There is reason to hope that the numerous difficulties and deficiences in terms of our knowledge of the supply of manpower by occupations and regions will be reduced in size and scope in the near future. An excellent review of the research efforts underway is found in Young (1972, p. 34-68). Already data collection systems are being developed for estimating training output by institutional type, occupation and geographic area.

OUTLINE

Chapter III

CONCEPTUAL FRAMEWORK AND EMPIRICAL MODELS TO BE TESTED

3.1 Introduction

3.2 Labor Market Concepts

- 3.2.1 The Concept of a Derived Demand
- 3.2.2 The Requirements Approach
- 3.2.3 Employment, Demand, Job Openings and Job Vacancies
- 3.2.4 Limitations of Requirements Approach
- 3.2.5 Shortages, Internal Labor Markets and Occupational Classifications

3.3 The Demand for Labor

3.4 Techniques for Projection of Expansion Demand

- 3.4.1 Introduction
- 3.4.2 Trend Projection
- 3.4.3 Shift-Share Projection
- 3.4.4 Econometric Projection

3.5 Replacement Demand

3.6 Application of the Demand Model

3.7 Data Availability

3.8 The Supply of Manpower

3.9 Empirical Supply Models

3.10 Three Techniques to Project Occupational Entries

3.11 Meshing of Supply and Demand Forecasts

Chapter III

CONCEPTUAL FRAMEWORK AND EMPIRICAL MODELS TO BE TESTED

3.1 Introduction

The determination of vocational and technical education needs is a multi-faceted endeavor. Since vocational and technical education is defined by statute as education which provides salable labor market skills, the logical starting point is an analysis of labor market conditions at the national, state, and especially local levels. The basic procedure is to estimate the demand for labor by occupations now and for future time periods (a five year horizon is common) based upon assumptions concerning general economic conditions, forces affecting the particular industry, and local economic trends. These estimates of the demands for labor by occupations are compared with the current and projected supplies of labor by occupations derived from an analysis of demographic trends and the output of all educational and training programs. The comparisons of the demands for and supplies of labor by occupations reveal which occupations may experience an excess of demand or supply. Thus, they provide valuable information for program planning and guidance. Given the assessment of labor market conditions, administrators can evaluate the adequacy of existing facilities, equipment, funding, and personnel for meeting any required modifications in program offerings.

We examine these issues in more depth in the following ten sections. First, we discuss some general labor market concepts. Next, we examine the general demand for labor. Third, we outline three techniques for making projections fo the expansion demand. Fourth, we describe the projection of replacement demands. In section six, we set forth the application of the demand model, and then we examine the availability of data. Sections eight and nine analyze concepts of the supply

of manpower. In section ten we present three empirical procedures for estimating the supply of labor in local labor markets. Finally, in section eleven we outline the meshing of the supply and demand for labor.

3.2 Labor Market Concepts

3.2.1 Concept of a Derived Demand

Economists consider the demand for labor to be a derived demand--i.e. derived from the demands for goods and services. For example, in any time period t, managers formulate projections of their output or sales for period t + 1 which serves as the basis for hiring capital and labor to produce the projected level of output. Conditions in the markets for commodities and services strongly influence the labor market. Thus, accurate measures of current and future levels of economic activity in the commodities and services markets are essential.

The next step in determining the demand for labor by occupations is an examination of the production functions, technological trends, institutional constraints, and relative factor input costs which managers operate under. The influence of these four factors is most easily explained by example. Suppose that a manager expects to produce 100 units of output in period t + 1. Essentially, the manager hires capital and labor services, and raw materials combining these in the most economical manner to produce the required output. In most cases the factors of production (land, labor, and capital) can be combined in various proportions to produce the outputs--alternative production functions are possible, i.e. x units of capital, y units of labor, and z units of raw materials together can yield 100 units of output where x, y, and z can take on various values.

What limits the values x, y, and z can take? First, technological considerations limit the range of factor proportions especially the quantities and qualities of labor and capital inputs. Second, the firm may already have

a substantial investment in useful plant and equipment available for production in t + 1. Very few firms start from scratch each year, and this greatly reduces the flexibility of production processes. Third, institutional constraints such as government regulations, contract stipulations, or union rules may prohibit certain factor combinations. Finally, firms undertake production because they believe it will be profitable. Thus, managers try to combine the inputs to the productive process in the most economical way while satisfying the three constraints listed above. This is an optimizing process subject to various constraints with the goal of minimizing the cost of production. The end result of this process, relevant to the question at hand, is the demand for labor by occupations or with appropriate skills.

3.2.2 The Requirements Approach

The general procedure used in this study is the requirements approach which is the most popular of manpower projection models. Essentially, the requirements approach assumes that there are "requirements" for labor determined by the structure of production (as outlined above) and by the needs for replacement. These requirements are compared with estimated supplies of manpower to determine needs, which in turn can be translated into educational requirements. As we shall point out below, this requirements approach has a number of limitations and must be used with caution.

3.2.3 Employment, Demand, Job Openings, and Job Vacancies

In the discussion of labor market concepts it is important to distinguish between: a) employment and demand, and b) job vacancies and projected job openings. We discuss each of these in turn below.

In discussions of the labor market there often is confusion between demand and employment. Stevens (1976, p. 3) explains the difference between demand and employment as follows:

> . . . demand will be considered only in the context of effective demand; i.e., the number of persons with particular qualifications which employers are willing and able to hire. . . Employment is the outcome of interacting supply and demand forces. In other words, there is a set of unspecified determinants of the number of persons who offer their services (supply), and a second --not entirely different--set of factors which determines the level of effective demand. It is the outcome of these interacting forces which determines the mix and level of employment at a point in time, and the changes which occur through time.

This distinction is important because demand and employment are not synonymous. The total number of workers by skills which employers are willing and able to hire at the given wage rates, the effective demand, may be greater or less than the available number of people with the requisite skills available for employment. This interaction of supply and effective demand often results in some lesser number actually finding employment.

We also need to distinquish between a projected job opening and a job vacancy because these terms are also not synonymous. We define a job vacancy as a position which a manager is actively seeking to fill. By contrast, a projected job opening is a rather amorphous concept to which various analysts have attached alternative definitions. Hansen (1965, p. 10-20) has arranged these alternative definitions of job openings into five categories:

1. Requirements: This concept uses the procedures outlined above. Projections of the levels of economic activity in the commodities and services markets are used to derive demands for labor by occupations.
2. Availables: This represents the forecasted numbers of qualified workers who can fill the requirements projected in number one. This is the supply of labor by occupations, and it will be further discussed below.
3. Outcomes: The difference between requirements and availables represents the excess demand or supply of labor possessing

particular skills. This concept does not provide for feedback or other labor market adjustments in the requirements or availables due to knowledge of labor market imbalances.

4. Outcomes with responses: Here the responses of employers and workers to the projected labor market conditions are allowed for, and the initial supply and demand assumptions revised.
5. Actuals: This final concept moves beyond the outcomes with responses and encompasses the effects of altered manpower training programs including vocational and technical education.

This concept of projected job openings is important in assessing vocational and technical education needs. Note that the categories of: outcomes, outcomes with responses, and actuals involve comparing the supplies of labor against the demands. Thus, we need to discuss the factors which affect the supply side of the labor market and finish our investigation of demand factors before we reach section 3.9.

3.2.4 Limitations of Requirements Approach

The model we have described above is a requirements approach. It does not deal with the potential market responses to shortages or surpluses of labor in various occupations. In other words, our model describes the outcome of meshing supply and demand forecasts, and it does not attempt to evaluate the responses of labor market factors or educational administrators to projected imbalances.

There are a variety of sources of response to labor market conditions which can occur besides the alternative of formal education and training programs. For example, if we assume that the 1980 forecasts reveals an excess demand for welders in Jacksonville, there are many labor market responses which could correct this apparent disequilibrium including the following:

1. formal training of welders could be provided at public or private expense in an area vocational-technical school, Federal Manpower Training Program, private institution, junior college, or other institution,
2. on-the-job training at public or private expense could be provided,
3. relocation of production or migration of welders to Jacksonville could occur,
4. the production process can be altered so fewer welders are required, i.e., factor substitution is often possible--capital can be substituted for labor, prefinished materials used, or new fasteners employed,
5. wages, hours, and conditions of work can be altered which may induce more welders to offer their services in the labor market --occupational mobility is possible.

Although this list is only partial, it illustrates the point that a projected labor market imbalance may prove illusory because of unforeseen adjustments by other sectors.

In addition, even if adjustments are occurring in the labor market, it is important to evaluate the speed of adjustment. For instance, very slow adjustments which are costly to society may be fruitful areas for publicly funded training in vocational and technical education programs. The speed of response by vocational and technical education (VTE) programs is also relevant here. For some requirements where facilities and teachers exist, VTE can respond quickly. Otherwise, the response time may be quite slow.

3.2.5 Shortages, Internal Labor Markets and Occupational Classifications

The model we have developed is a requirements approach, and we wish to extend and refine some of the concepts introduced earlier. Specifically

we will discuss four additional concepts: 1) shortage, 2) internal labor markets, 3) educational "requirements", and 4) occupational classifications.

In our requirements approach the "bottom line" is a comparison of occupational supply and demand. To many analysts an excess demand for a particular occupation indicates a shortage. This notion of shortage is quite vague and subject to many interpretations. A shortage can imply that the number of qualified persons in the occupation is less than the demand, and we would expect the relative earnings of those employed in this occupation to rise. Second, a shortage may be defined to exist whenever the rate or return offered in the occupation is rising relative to other occupations.

A dynamic shortage may exist when relative earnings are temporarily too low to immediately clear the market for a particular profession. This type of shortage is particularly relevant to VTE planning since it implies that labor market adjustments are occuring albeit with some lag in response. Another shortage concept important to VTE planning revolves around the notion of social demand. Social demand as distinguished from effective demand (where there is a willingness by employers to pay) depends upon certain stated normative preferences about how things ought to be. Stevens (1976, p. 21) illustrates this point with the "shortage" of physicians in rural areas. "By applying a single high physician/population ratio observed in one area, one can create an impression that there are shortages in all other areas which exhibit lower ratios. But, there may be a few or no existing or forecasted job-vacancies (effective demand minus the currently employed) in these areas."

A fifth type of shortage may result due to imperfect labor market information--qualified persons may not know about existing openings. Shortages may result when relative wages are inflexible preventing the appropriate labor market adjustments to occur quickly. Finally, shortages may result due

to changes in technology, inflexible skill training of existing workers, and barriers to entry or long training periods. In conclusion then, it is important to have some notion as to what type of excess demand or "shortage" is projected to occur when using the requirements approach.

A second important concept is that of the internal labor market. The internal labor market refers to the "labor market" within a particular firm as opposed to the external labor market where all firms and workers compete to fill or find job openings. This is an important distinction for VTE planning, because VTE is oriented towards training which will produce immediate job placements for its students.

We must recognize that labor markets are not perfectly competitive processes. In addition to the problem of imperfect information, there are many institutional impediments to the rapid adjustment of demands and supplies in the labor market. A major institutional impediment is the existence of limited ports of entry into employment for firms (Stevens, 1976, p. 26-27). Many jobs in the economy are not open to every qualified applicant; internal promotions or transfers within a firm, i.e. internal recruitment procedures, are used to fill many job openings above the entry level. Doeringer and Piore (1971) explain why this internal labor market forms to close off competition from the external labor market. However, what is relevant for our purposes here is the existence of internal labor markets, and that these ports are concentrated in lower level jobs from which workers can advance through the internal occupational hierarchy.

Many analysts believe that most skill training takes place on-the-job within the internal labor market of the firm. Since many jobs are task and establishment specific, formal training is not possible. Thus, advancement up the occupational ladder often depends upon successful on-the-job training results.

The existence of internal labor markets should affect the type of VTE programs offered. With limited ports of entry, VTE programs need to provide graduates with the appropriate readily marketable skills to pass through those ports. In addition, since promotion up the occupational job ladders are most often internal to the firm, VTE graduates need a broad enough background to provide sufficient flexibility for promotion to new occupations.

This brings us to a third important concept, the educational requirements necessary for employment. There is a running controversy over whether education in general and VTE in particular directly increases productivity of graduates, or whether such education is only a screening device used by employers. Denison (1974), Mincer (1974), and other argue that education contributes directly to productivity while Edwards et al. (1975), Arrow (1973), Stiglitz (1974), and others contend that education has little affect on productivity, but is important for screening potential employees. Stevens (1976, p. 28) remarks, "It matters very much whether education's major contribution is direct enhancement of productivity, or a screening of potential productivity. One would not necessarily expect an optimal education technique which imparts direct productivity development to also be optimal in performing screening functions."

A final important concept is the occupational classification system. Our model provides forecasts of occupational demand and supplies. However, it is often difficult to determine which VTE programs will provide training for specific occupations forecasted in the model. That is to say, the occupational classification system used by the Bureau of Labor Statistics in developing the Occupational Employment Statistics (OES) Program (from which the all-important industry-occupation matrix is derived) is often not consistent with VTE program codes. Although the OES program has published

a manual for converting OES output codes to VTE program codes, many problems still exist. Most important among these is that no occupational classification system exists which is tailored to needs of planning a skill-training curriculum. Rather, VTE program codes are forced into other occupational classification schemes for other purposes.

3.3 The Demand for Labor

In the current time period the demand component consists of two parts: a) those currently employed by occupations and by industries, and b) current job vacancies by occupations and by industries. For any future time period the demands for labor with particular skills can be fruitfully separated into an expansion component and a replacement component. The expansion component refers to the growth (or decline) of total employment in the industry under study due to product market conditions which will be reflected in the needs for labor. Replacement demand is the result of death, retirement, or other labor market separations. We examine each of these next.

Expansion demand is the easier of the two components to forecast, and there exists a large and sophisticated body of literature on this subject. A wide range of techniques exist for projecting future levels of employment, ranging from such simple techniques as trend extrapolations and shift-share analysis, to autoregressive schemes of various degress of complexity, input-output tables, and econometric models. Of these the econometric models are becoming the more widely used because they are relatively inexpensive to build and maintain, and are quite flexible in their operation. Furthermore, these models have produced reasonably accurate employment forecasts.

In the past the lack of occupational data at the local level precluded effective forecasts of the demand for labor by occupations. However, in 1970 the Bureau of Labor Statistics initiated the Occupational Employment Statistics

program (OES) (Stevens, 1976; U.S. Department of Labor, 1969; Tarr and Campbell, 1975 to gather and analyze the necessary local occupational data.

The OES program is a cooperative federal-state effort composed of three parts: a) the OES survey, b) industry-occupation matrices, and c) state and area occupational manpower projections. State employment agencies conduct surveys of occupational employment, and this information on the total employment of each industry and the occupational composition of that employment is used to construct the industry-occupation matrices. Then given a vector of forecasting employment levels by industries from an econometric model the analyst can apply the industry-occupation matrix (which reflects the industry staffing patters) to obtain an occupational demand forecast. These forecasts represent the expansion component of the demand for labor by occupations. It is important to note here that a high degree of industrial disaggregation is necessary. Otherwise, large internal movements of employees from one industry to another will be masked in the aggregation process since simultaneous growth and decline in various sectors of the economy may not effect the total level of employment at all.

In almost all areas of the U.S., the occupational demands for labor are due more to replacement needs than to expansion. Even in a rapidly growing state like Florida replacement needs are estimated to provide more than one-half of all projected job openings (Tarr and Campbell, 1975, p. 166). Replacement demand results from the need to replace workers who drop out of the labor force, or who transfer from one occupation to another.

Death and retirement account for most labor force separations. A major exception is women who leave the labor force to form families. This component of replacement demand, separations, is not too difficult to understand conceptually. The Bureau of Labor Statistics (*OES Survey Operations Manual*, 2nd edition, 1974; *BLS Handbook on Methods*, Bulletin 1711, 1971) has developed and tested a procedure for calculating separations at the national level. This procedure involves the

calculations of "tables of working life," one for males and one for females (to account for separations to form families). The tables are based on two main components: a) standard life tables--actuarial calculations which provide death rates for the population by age, and b) retirement rates--based on labor force participation rates for the population by age.

Ideally, these tables of working life should be further modified to allow for the effects of occupations on separations. Some occupations are more hazardous or more strenuous than others, so separation rates must be age, sex, and occupation specific. Given such tables of working life, accurate projections of separations by occupations would be obtained by applying the tables to the existing employed labor force.

The second element of replacement demand results from workers who transfer to other occupations, occupational mobility, or who migrate to other labor markets in other areas, geographic mobility. There is little theoretical literature and even fewer empirical studies of this important component of replacement demand. However, both these forms of migration represent important forces which help to maintain equilibrium in the labor market. For example, if there is an excess supply of carpenters in region 1, we would expect the relative earnings of carpenters would fall in region 1 compared with other occupations. Migration is one response available to those supplying carpentry services in region 1--they may move to other regions, undertake training, or work in another occupation.

There are many forces which affect mobility. Foremost among these are labor market conditions.. As the example above illustrated, excess occupational demands or supplies of labor give rise to modifications of relative earnings and induce geographic and occupational mobility. In addition, employment conditions within the firms of a particular region are important.. Doeringer and Piore (1971) point out that except for entry level positions, most firms fill positions by promoting or upgrading existing employees, and they argue that this represents the dominant

form of occupational mobility. These labor market conditions which influence mobility are the results of interactions between the supplies of and demands for labor by occupations. As such they represent the categories of outcomes with responses or actuals as described above, and they are difficult to model. We will return to this issue of mobility below, when we discuss the meshing of supply and demand estimates for planning purposes. Here it is sufficient to note that potential labor market disequilibrium will give rise to adjustments in earnings and mobility which tend to move the market back into equilibrium.

There are other factors besides labor market conditions which affect mobility. For instance, it is well known that younger workers are more mobile both occupationally and especially geographically than other workers. Furthermore, married workers are less mobile than singles, and inmigration varies widely over areas in the U.S. While these factors modify the effects of labor market conditions, the forces of demand and supply remain paramount.

3.4 Techniques for Projection of Expansion Demand

3.4.1 Introduction

We have defined the expansion demand for labor as the increase above current levels in the number of workers which employers will be willing and able to hire at some future date. That is, as the demand for goods and services rises over time employers need more labor. A wide variety of techniques exists for projecting this expansion demand. These range from the relatively simple trend extrapolations to autoregressive schemes of various degress of sophistication, linear programming models, input-output analysis, and econometric models. Research has shown that each of these techniques has its strengths and weaknessess, and the best technique to use in any particular situation depends upon the problem to be solved. It is the purpose of this section to evaluate three techniques for projecting the expansion demand for labor; trend projection, shift-share, and econometric models.

Some background remarks are in order here before we embark on a detailed analysis of projection procedures. All forecasting and projection techniques are based upon the assumption that past events and phenomena are a guide to the future. Techniques differ with respect to their sophistication in handling historical information, and in their flexibility to allow for possible structural changes. However, if drastic structural changes have recently occurred or if such changes are expected to occur within the forecast horizon, the accuracy of any forecasting technique will be severely restricted. For the national economy this is not a particularly vexing problem because national forecasts have proven to be quite accurate in the past. Furthermore, the dramatic changes which have occurred in various areas of the country tend to counterbalance one another in the national totals.

This may not be the case for a local economy. At the local level the fortunes of a large employer or the location of a new plant can have dramatic and unforseen consequences for the local labor market. This is not to say that projection techniques are useless, but we note that local area forecasting is more difficult than national forecasts. For these reasons local area forecasts must be used judiciously, and consultation with local businesses, employment security offices, government officials, and others knowledgeable about the local economy can provide invaluable information on local area economic trends and prospects--information which is unavailable from other sources.

3.4.2 Trend Projection

In terms of time, money, and human effort, trend extrapolation is the least expensive procedure to measure expansion demand. Trend extrapolation is a noncausal approach (in that it does not attempt to explain behavior) based on the assumption that the future will be like the past. There are a number of decision rules which can be used to project trends into the future.

Four come immediately to mind:

1. no change--projected employment is equal to current levels,
2. constant change--changes in the level of employment occurring in the recent past will continue in the future,
3. constant percentage change--percentage changes in past employment will continue in the future, and
4. regression rule--a regression of employment on time.

The regression approach, employment as a function of time, is both the most sophisticated and flexible of these trend extrapolation rules, and we have chosen to use it in our trend extrapolations.

Our procedure for projecting the expansion demand for labor by the regression rule was quite simple. Using employment data from 1960-1974 we ran regressions of the following form:

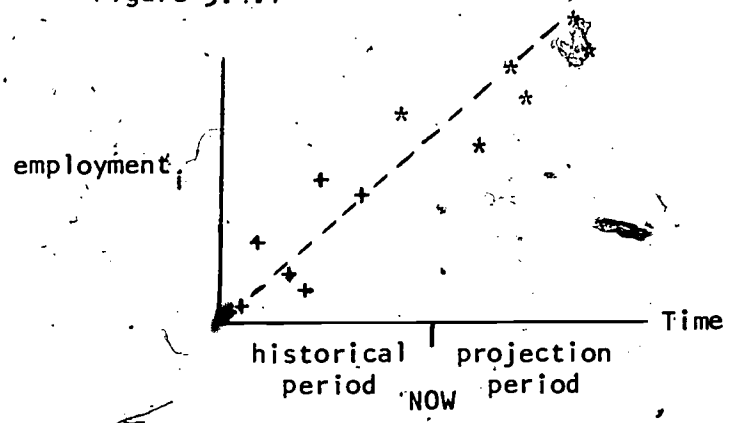
(1) $E_{it} = f(Time_t)$ Where: E_{it} = employment in industry at time t.

$Time_t$ = the time period

One regression was run for each industry, and the regression coefficients indicate the increments to employment as time goes on.

As we noted earlier the strength of this procedure is its low cost. Furthermore, for industries which have grown steadily in the past and are expected to continue to grow steadily in the future, this procedure may be optimal. However, this technique is not sophisticated enough to allow for the influence of the business cycle and the periodicity it produces in the employment patterns of many industries over time. A simple illustration will make this more concrete.

Figure 3.4.1



actual past employment +

regression line --------

actual future employment *

In Figure 3.4.1 we have depicted the employment pattern for industry i and assumed that future employment levels for i are known. The regression line based on historical data is represented by a dashed line. Such a regression produces a straight line through the data. Thus, if future employment in industry i continues to be influenced by business conditions, our regression extrapolation would produce forecasting errors.

Some improvement in forecasting accuracy may be possible by using a polynomial functional form. In this case time and higher powers of time would be included in the regression equations as illustrated in equation (2) below where the symbols are defined in equation 1:

$$(2) \quad E_{it} = f(Time_t, Time_t^2, Time_t^3)$$

Although this procedure does in fact produce better fits to the historical data, it resulted in unreasonable forecasts. The higher powers of time in many cases exert a large influence over the projected results. As the length of time is increased for a forecast, these coefficients dominate the results. The resulting forecasts are often unreasonable, e.g., negative employment levels in some cases or fantastic increases in employment in other cases. Thus, we find that the more simple regression extrapolation model is preferred.

Table 3.4.2 provides a 1980 time trend forecast of employment by broad industrial categories for 1980 and the resulting percentage distribution of employment for the Jacksonville labor market (Planning Region Four).

3.4.3 Shift-Share Projection

A second and more sophisticated non-causal technique is shift-share. Shift-share analysis was originally developed and traditionally used as a descriptive device (Perloff et al., 1960; Fuchs, 1962; Ashby, 1965). However, some recent studies have developed shift-share as a forecasting tool (Hellman and Marcus, 1970; Water Resources Council, 1972; James and Hughes, 1973; Emerson et al., 1975; Zimmerman, 1975), although the debate over the validity of the approach continues (Houston, 1967; Brown, 1969, 1973; Floyd and Sirmans, 1973). Shift-share projections revolve around the use of equation (3) where: i = industry, j = region, k = benchmark economy, usually the U.S., t = time, x = indicator of economic activity, in our case employment.

$$(3)\quad x_{ij}(t+1) = \left(\frac{x_{ijt}}{x_{ikt}}\right)x_{ik}(t+1) + \left(\frac{x_{ij}(t+1)}{x_{ik}(t+1)} - \frac{x_{ijt}}{x_{ikt}}\right)x_{ik}(t+1)$$

Equation three has two components, a share component representing the percentage of the benchmark's activity which occurs in the region, and a shift component describing movements or shifts in the share over time. As Zimmerman (1975) notes $x_{ij}(t+1)$, the unknow share compoent, is on both sides of the equation, so in practice the shift component is modified:

$$(4)\quad \frac{x_{ij}(t+1)}{x_{ik}(t+1)} - \frac{x_{ijt}}{x_{ikt}} = \frac{x_{ijt}}{x_{ikt}} - \frac{x_{ij}(t-1)}{x_{ik}(t-1)}$$

The implicit assumption underlying equation (4) is that past trends will be repeated in the future. Our projections for the Jacksonville labor market area using this technique are presented in Table 3.4.3.

While the shift-share approach is a bit more complicated that the trend extrapolations using a regression with time as the independent variable,

Table: 3.4.2

Jacksonville Labor Market Area Projections:
1980 Time-Trend Employment Projections by Broad Industrial Categories

Industry	Employment	Percentage
Total	328,996	100.00%
Agriculture and other n.e.c.	18,062	5.49
Mining	465	0.14
Construction	24,981	7.59
Manufacturing	38,403	11.67
Durables	17,040	5.18
Fabricated metals	3,512	1.07
Transportation equipment	4,521	1.37
Nondurables	21,363	6.49
Food and kindred products	6,352	1.93
Paper and allied products	7,792	2.37
Chemicals	1,280	0.39
Transportation, communication, utilities	26,258	7.98
Communication	7,800	2.37
Transportation	17,631	5.36
Utilities	827	0.25
Wholesale trade	24,951	7.58
Retail trade	52,089	15.83
Finance, insurance, real estate	31,457	9.56
Finance	10,684	3.25
Insurance	16,024	4.87
Real estate	4,749	1.44
Services	55,007	16.72
Government	57,323	17.42
Federal	14,486	4.40
State	8,778	2.67
Local	34,059	10.35

Table: 3.4.3

Jacksonville Labor Market Area Projections:
1980 Shift-Share Employment Projections by Broad Industrial Categories

Industry	Employment	Percentage
Total	349,200	100.00%
Agriculture and other n.e.c.	17,050	4.88
Mining	965	0.28
Construction	28,479	8.16
Manufacturing	47.173	13.51
Durables	24,719	7.08
Fabricated metals	4,319	1.24
Transportation equipment	7,052	2.02
Nondurables	22,454	6.43
Food and kindred products	6,430	1.84
Paper and allied products	7,346	2.11
Chemicals	1,889	0.54
Transportation, communication, utilities	25,789	7.39
Communication	8,205	2.35
Transportation	16,831	4.82
Utilities	753	0.22
Wholesale trade	23,341	6.68
Retail trade	51,965	14.88
Finance, insurance, real estate	38,292	10.97
Finance	12,713	3.64
Insurance	18,917	5.42
Real estate	6,662	1.91
Services	59,593	17.07
Government	56,553	16.20
Federal	12,108	3.47
State	11,126	3.19
Local	33,319	9.54

it is still relatively inexpensive and straightforward. Furthermore, recent empirical tests by Zimmerman (1975) have shown that shift-share approaches can produce quite accurate forecasts of employment.

There are two weaknesses to the shift-share approach. First, like the trend extrapolation technique the shift-share procedure provides a relatively straight line projection and cannot replicate the cyclical behavior of many employment categories. Second, the shift-share approach is not useful for policy simulation because it does not have any price theoretic or behavioral parameters. Thus, if we expect some modifications in economic behavior over the forecast horizon, the shift-share technique will be inaccurate. Table 3.4.3 provides a 1980 employment forecast for the region's major industries and the resulting percentage distribution of employment.

3.4.4 Econometric Projection

The most sophisticated approach we implement is an econometric model. There are two features which distinquish the econometric model from the other approaches we have described above. First and most important, the econometric approach attempts to model the behavior of economic units, thus it is a causal approach as contrasted with trend extrapolation or shift-share analysis which are noncausal techniques. Second, while the three procedures we have outlined are all statistical techniques, only the econometric model is a system of simultaneous equations. Of the three techniques we tested, only the econometric model provides a consistent and comprehensive framework on which to base forecasts. However, the econometric approach is also the most expensive approach to use both in terms of real costs (computer time, data gathering, testing, etc.) and in technical expertise. The econometric approach then is justifiable if a) its forecasts seem substantially better

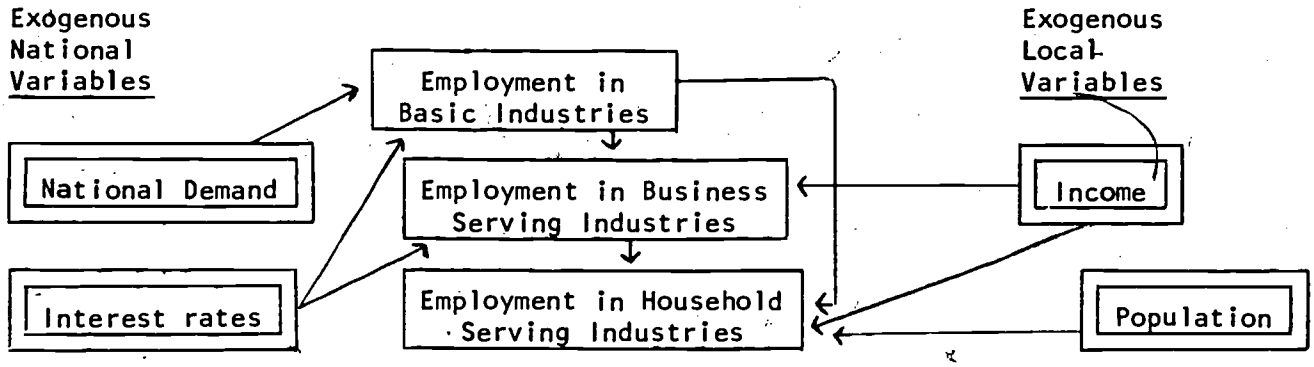
than the other two less expensive techniques, trend extrapolation and shift-share analysis, described above, or b) policy analysis is comtemplated.

The economic theory which is the foundation for our econometric model can be explained quite simply. We can view any region's economy as being composed of two basic categories of economic activity: a) those oriented towards serving local markets termed nonbasic industries, and b) those oriented towards serving nonlocal or external markets called basic industries. The forces which determine the level of economic activity in the basic industries are largely exogenous to the region and depend upon such things as national demand, national income, interest rates, and relative prices. Sales of basic goods and services result in an inflow of income from outside the region and the continuation of expansion of employment in these basic industries. The inflow of income from outside the region results in demands for locally provided goods and services, demands for the outputs of nonbasic industries in our terminology. These nonbasic industries can be further subdivided into business-serving and household-serving groups. The business-serving group provides ancillary services and raw materials to the export industries, such as office supplies, transportation services, legal advice, and the like. The household-serving industries fulfill the needs of households including food, shelter, clothing, and entertainment.

For the purpose at hand, a complete econometric model is not necessary. A truncated model which focuses on employment is more relevant and less costly to construct for forecasting the expansion demand for labor. A schematic diagram of the model is provide in Figure 3.4.4. The model provides yearly forecasts of employment over the planning horizon.

Figure 3.4.4

Schematic Diagram of the Econometric Model for Employment



Expansion demand can be readily calculated as the difference between the employment levels of the initial and final periods.

A typical equation for employment in a basic industry has the form:

$$E_{ijt} = f(E_{iust}, RS_{ijt})$$

where: E = employment, i = industry identified, j = Jacksonville region, us = U.S. economy, t = time period, and RS = regional share. The rationale for the equation is that local employment in an exporting industry depends upon export demand and the competitive position of the industry in its market. U.S. employment in the industry serves as a proxy for export demand since data on regional export demand is not available. The regional share variable is calculated from a shift-share analysis and represents regional competitiveness. Location quotients were used to identify regional exporting industries. The location quotient equals $\%E_{ijt}/\%E_{iust}$, or the ratio of the percentage employment in industry i in the region to the percentage employment in industry i in the U.S. It represents the degree of relative concentration of the industry in the area. If the location quotient exceeds one, this implies that the industry is an export-oriented one.

A typical equation for employment in a business serving industry takes the form:

$$E_{ijt} = f(E_{kjt}, TE_{jt}, RS_{ijt})$$

where: the symbols are the same as above and K = a linked local industry and TE = total regional employment. If for example the industry being studied is fabricated metals, employment (and output) in the shipbuilding industry will have a large influence on employment in fabricated metals. The industry linkages were determined by studying the Florida and U.S. input-output tables.

Finally, the equation for a typical household-serving industry has the form:

$$E_{ijt} = f(TE_{jt}, Y_{jt}, RS_{ijt})$$

where: the symbols are the same as above and Y = regional income.

Table 3.4.5 provides a 1980 employment forecast for the region's major industries and the resulting percentage distribution of employment derived from our econometric model.

At this point a comparative analysis of the three employment projection techniques is in order. In Table 3.4.6 we present a comparison of the employment forecasted using each approach. While the actual employment data for 1980 is of course unknown, we can evaluate the reasonableness of the forecasts by comparing them to projections of the region's labor supply. From the table we can see that the area's 1975 population was 757,804, and its labor force was 319,115 which implies a labor force participation rate of 42 percent. The Bureau of Economic and Business Research at the University of Florida projects a population of 847,100 for the area in 1980. If we assume a constant labor force participation rate of 42 percent, the area's 1980 labor force would be 355,782.

Trend projections produced a 1980 employment estimate of 328,996. This would imply an unemployment rate of 7.53 percent. The shift-share approach forecasts 1980 employment at 349,200 imploying a 1.85 percent unemployment rate. The econometric technique provides the most conservative employment forecast, 324,352,

Table: 3.4.5

Jacksonville Labor Market Area Projections:
1980 econometric Employment Projections by Broad Industrial Categories

Industry	Employment	Percentage
Total	324,352	100.00%
Agriculture and other n.e.c.	12,450	3.84
Mining	507	0.16
Construction	24,831	7.66
Manufacturing	43,157	13.31
Durables	19,593	6.04
Fabricated metals	3,864	1.19
Transportation equipment	5,599	1.73
Nondurables	23,564	7.26
Food and kindred products	6,817	2.10
Paper and allied products	8,610	2.65
Chemicals	1,569	0.48
Transportation, communication, utilities	25,534	7.87
Communication	8,667	2.67
Transportation	15,927	4.91
Utilities	940	0.29
Wholesale trade	21,945	6.77
Retail trade	53,865	16.61
Finance, insurance, real estate	35,270	10.87
Finance	11,713	3.61
Insurance	18,349	5.66
Real estate	5,208	1.61
Services	53,551	16.51
Government	53,242	16.41
Federal	14,072	4.34
State	8,347	2.57
Local	30,823	9.50

and the highest unemployment rate, 8.83 percent. All of these projections appear to be reasonable if we compare their implicit unemployment rates against historical data.

Another basis for comparing the three employment projections is their distribution of total employment by broad industrial categories. These percentage distributions indicate the projected industrial composition of employment for 1980. In Table 3.4.7 we have listed the 1980 percentage distributions of employment forecasted by each of the three techniques and actual employment distribution for 1970 and 1974. As the table shows none of the 1980 projections deviate very far from the 1970 or 1974 composition of industrial employment. Our projections do show a larger percentage of workers in agriculture and other industries not elsewhere classified than the 1970 or 1974 figures. This difference is due largely to changes in definitions and is not significant.

Table 3.4.7 does reveal some interesting differences among the projections. First, there are significant differences in the manufacturing forecasts. The trend procedure provides for 2 percent less employment in manufacturing than does the share or econometric projections. The major portion of the difference is in the durable goods category. Second, there is a 1 percent difference in the relative projected importance of wholesale trade with the shift-share being the lowest, trend the highest, and the econometric projection in between. Third, the shift-share also projects relatively less retail trade activity for 1980 than the other techniques. Fourth, there is a 1 1/2 percent difference in the projections for finance, insurance, and real estate. Trend is again the lowest with the other techniques producing almost identical forecasts. Finally, for government, trend forecasts are 1 percent higher than the other procedures.

Such differences as these are to be expected given that we used three quite different forecasting techniques. However, the rather close correspondence among the forecasted compositions of employment and their relations to the actual data

Table: 3.4.6

Comparison of 1980 Employment
Projections for the Jacksonville Area Labor Market

1975	Population	757,804
	Labor force	319,115
	Labor force participation rate	42%
1980	Projected population	847,100
	Projected labor force	355,782
1980	Total employment forecasts	
	a. Trend projections	328,996
	b. Shift-share projections	349,200
	c. Econometric projections	324,352
1980	Implicit unemployment rates	
	a. Trend projections	7.53%
	b. Shift-share projections	1.85%
	c. Econometric projections	8.83%

Table: 3.4.7

Percentage Distribution of Employment for the Jacksonville Labor Market Area by Selected Techniques

Industry	Actual 1970	Actual 1974	1980 Projections Trend	Shift-Share	Econometric
Total	100.00%	100.00%	100.00%	100.00%	100.00%
Agriculture and other n.e.c.	2.39	1.94	5.49	4.88	3.84
Mining	0.06	0.22	0.14	0.28	0.16
Construction	6.21	7.95	7.59	8.16	7.66
Manufacturing	14.38	12.77	11.67	13.51	13.31
Durables	5.30	5.54	5.18	7.08	6.04
Fabricated metals	0.83	1.03	1.07	1.24	1.19
Transportation equipment	1.50	1.52	1.37	2.02	1.73
Nondurables	9.08	7.23	6.49	6.43	7.26
Food and kindred products	2.61	2.09	1.93	1.84	2.10
Paper and allied products	3.54	2.64	2.37	2.11	2.65
Chemicals	0.57	0.62	0.39	0.54	0.48
Transportation, communication, utilities	9.65	8.51	7.98	7.39	7.87
Communication	2.71	2.70	2.37	2.35	2.67
Transportation	6.94	5.81	5.36	4.82	4.91
Utilities	0.37	0.38	0.25	0.22	0.29
Wholesale trade	8.12	7.67	7.58	6.68	6.77
Retail trade	17.16	16.92	15.83	14.88	16.61
Finance, insurance, real estate	8.41	9.73	9.56	10.97	10.87
Finance	2.87	3.23	3.25	3.64	3.61
Insurance	4.72	5.07	4.87	5.42	5.66
Real estate	0.81	1.44	1.44	1.91	1.61
Services	14.77	16.37	16.72	17.07	16.51
Government	18.22	17.54	17.42	16.20	16.41
Federal	5.75	4.64	4.40	3.47	4.34
State	2.17	2.75	2.67	3.19	2.57
Local	10.83	10.15	10.35	9.54	9.50

is heartening. None of our employment forecasts by industrial categories appears to be "out in left field."

In Chapter V we shall convert these industrial employment forecast to occupational employment forecasts by using the industry-occupation matrix described in Section 2.3.3 above. Then we shall again analyze the derived occupational forecasts for reasonableness. Now, however, we turn to a discussion of replacement demand for labor which constitutes the larger share of the total demand for labor.

3.5 Replacement Demand

As we stressed above the total occupational demand for labor is composed of two parts, expansion and replacement. For almost all areas more job openings result from replacement needs than from expansion requirements so this factor is very important. BLS has devised a procedure to calculate replacement demand which we described briefly above in Section 3.3.

The BLS publication (*Tomorrow's Manpower Needs*, Supplement No. 4, 1974) sets forth in detail a procedure to calculate replacement demands. Tables of working life are the heart of the procedure. The BLS method provides separation rates for each occupation and every state. The separation rates are small members (i.e. .0081 for engineers in 1980) which are applied to the number currently employed in the occupation to produce estimates of separations.

This procedure has a number of limitations. First, separation rates for men only account for death and retirements, and the rates for women include only death, retirement, and child bearing. No adjustments are made for occupational mobility. Second, the separation rates are based on the assumption of a constant age and sex distribution of the occupation over the forecast period. Finally, the separation rates are not occupation specific. Thus, the rates are predicated on an assumption that mortality and retirement do not differ by occupations.

3.6 Application of the Demand Model

The first step in estimating the occupational demand for labor is to project replacement demand. The BLS replacement factors are applied to the current levels of employment by occupations repetitively over the forecast period, and the resulting total equals replacement demand.

Expansion demand is projected in two steps. First, employment projections by detailed industries are made by each of the three procedures described above. Then the industry-occupation matrix is applied to the employment figures to yield occupational projections.

The final step is to sum the expansion and replacement demands which equal the total occupational demand for labor. Although the application of the demand model can be described in a few paragraphs, extensive work is involved. The expansion and replacement demands must be carefull checked for reasonableness in the context of past trends and relationships. Compounding an already difficult task is that staffing patters, i.e. the cells of the industry occupation matrix, will also change over the forecast period. These staffing patterns must also be projected. There are two sources of forecast error now, and either could distort the demand forecast.

In Chapter V we present our detailed 1980 forecasts of the demand for labor by occupations. Thus, we will not further discuss the estimates or procedures here.

3.7 Data Availability

Quality data to nourish all portions of our model is not now available. There are four main problem areas, and we briefly describe each of these below.

First, agricultural employment data is quite poor. There are a number of reasons why this is so. Since most agricultural workers are often not covered under social security, unemployment compensation, or minimum wage laws, careful records of activity in this sector are not available. A further complication is due to the migratory nature of much farm work as various crops ripen in diverse

locations. Thus, accurate data on the number of agricultural workers or their occupations is not readily available. Finally, the definition of agricultural workers has been in flux over the past few years, so consistent time series data (which form the basis for all projection techniques) is not available.

Second, as we mentioned above in Section 3.3 and 3.5 the BLS method for calculating replacement demand as outlined in *Tomorrow's Manpower Needs* (1969) is imperfect. The replacement coefficients are not occupational specific, and they relate only to death and retirements. Occupational or geographic mobility are ignored.

An important problem which effects all employment data is the classification of multiproduct firms and firms which change product lines. For example, many firms produce a whole range of products which can be classified in various ways. Conglomerate firms such as ITT or Gulf-Western are extreme examples. Where should the employment in such firms be classified? The current practice is to allocate all the employment of a multiproduct firm to the industrial category which has the largest percentage of the firm's employment. This can introduce a bias in the data if a pharmaceutical maker has a hand tool subsidiary for example, or if a communication equipment manufacturer owns an insurance subsidiary. The employment in these subsidiary categories are counted with the firm's main line of business and are not included in their correct industrial categories.

Finally, data on the supply of labor is not complete. While data on employment is collected regularly, this constitutes a measure of the interaction of effective demand and supply. The total supply of labor is measured quite accurately, but the industrial composition of this supply is not assessed on a regular basis. Furthermore, the supply of [illegible] by detailed occupations is only measured every ten years in the decennial census. The lack of detailed time series data on the supply of labor by industries and by occupation is a serious weakness in the existing data base. As we shall see in the following sections this lack of supply data has some

important influences on our selection of techniques for needs assessment and on the types of manpower analyses which can be conducted.

3.8 The Supply of Manpower

For the purposes of this discussion we define the occupational supply of workers as those persons working or seeking work in an occupation at a point in time. This concept is related but somewhat distinct from the notion of the supply of labor used in economics. In economics the supply of labor is described as a relationship between a schedule of wages offered and manhours supplied to the labor market depicted as an upward sloping supply of labor curve. Our concept of the occupational supply of labor is similar in that it includes the relation of the wage and desire to supply labor services. Indeed, we recognize relative real earnings as the primary determinant of occupational labor supply. However, our concept of occupational supply is couched in terms of jobs and workers not manhours, and our concept views wages and earnings as fixed during the period at hand.

Why do workers offer themselves for employment in a particular occupation? The point of working is to have command over real goods and services available in the market place. If it is assumed that workers are well informed and rational, then clearly workers will offer themselves to the employers who provide the highest level of real earnings. That is to say, workers behave in a manner similar to that of employers or managers as described in Section 3.2. Like employers, workers too are profit maximizers and attempt to sell their skills to the highest bidder, other things being equal.

When a worker cannot find employment in his preferred occupation, he may turn to a different occupation, enroll in a training or education program to upgrade his skills, or learn a new trade. Similarly, if a worker is disssatisfied with his current job, he may seek further training or education. Again assuming that workers are rational, enrollment in a training program can be viewed as an invest-

ment. Additional training will improve a worker's human capital which, when combined with manhours, can be sold in the labor market. Such investment will provide positive returns if the costs of training (including foregone earnings during the training period) are less than the discounted future increments to earnings made possible by the new training.

The current supply of labor in a particular occupation is a dynamic phenomenon analogous to a large lake with tributaries and outlets which represent potential entry and exit paths from the occupation. In Section 2.5, Figure 2.5, we displayed the sources of entry and exit for an occupation. We reproduce that figure below.

Figure 3.8

Occupational Sources of Entry and Exit

Entry	Current	Exits
- Formal training a. schools: public and private b. colleges c. federal manpower programs	- Employed - Unemployed - Those not in labor force	- Deaths - Retirement - Occupational mobility - Outmigration - Other separations
- On-the-job training and upward mobility		
- Inmigration		
- Occupational migration		
- Exmilitary		
- Other		

As Figure 3.8 indicates the sources of entry and exit from an occupation are many and varied. In a complete model we would want to attach accurate numbers to each of the items indicated in the figure for the current and future time periods. For some items this will be relatively easy while for others, it will prove difficult or impossible. We examine these items below.

The effect of these data limitations can be illustrated by examining each column in Figure 3.8. Beginning with the column labelled "current," we note that data are available on those currently employed in a particular industry. Further-

more, data are also available on the number of workers employed in broad occupational groups, i.e. white collar workers, technical and kindred workers, operatives, and the like. However, consistent data series disaggregated by detailed occupations are typically available only from census years. Yet, it is precisely this type of detailed occupational employment data that is relevant for VTE planning. Fortunately, detailed occupational data can be constructed from employment data by industry. The procedure involves the application of the industry-occupation matrix to the industry employment data producing estimates of occupational employment.

Even though we are able to construct current period occupational employment data, the two other categories of potential current supply are far more difficult to measure. Data on the number of people unemployed by occupations is not presently available. There has been some promising work on generating this data from state employment security records (Tucker, 1974). However, there are many problems inherent in this approach. For example, employers of highly skilled occupations rarely use state employment offices, and highly skilled workers seldom register at the state employment office. Furthermore, the unemployed who register may do so at more than one employment office, resulting in double counting.

The registration records for unemployment insurance are a potential source for unemployment information by occupations. However, at the present time the records are not organized for this purpose. Current procedures do not allow for a tracking of each insuree over time, so the use of monthly data to construct a quarterly or annual data series on the number of unemployed by occupations will result in substantial double or triple counting.

The most difficult dimension of measuring the current occupational supply of labor is those who are not now in the labor force because of family responsibilities or the desire for leisure time. However, if relative wage rates or other economic conditions should change, they may enter the labor force. Thus, this is a potentially large source of occupational supply, and it should be measured to insure

accurate long-term forecasts. Unfortunately, there is no data on this source of potential supply.

There are six major sources of entry into an occupation as Figure 3.8 shows. Formal training is skill acquisition or the augmentation of the human capital of the enrollees. It is distinguished from on-the-job training because no production takes place. Formal training may be quite general in nature preparing students for many occupations, or it may be quite specific in nature. Vocational and technical education is one portion of public school formal training. The data on this aspect of occupational entry, formal training, is quite good. Both schools and the federal government keep records on program graduates. However, complete data from private schools is not now available.

A second source of entry is on-the-job training. On-the-job training (OJT) is difficult to define and harder to measure. OJT is training which occurs while the individual is engaged in production. Such programs range from highly structured regimens to very informal "watch your neighbor" approaches. OJT is typically industry, firm, and task specific in contrast to formal training which even when highly concentrated in one area, is more general than OJT and rarely is task and firm specific. Data here is almost nonexistent. For our ideal conceptual model this is no real problem since we can assume that such data could be obtained. However, in practice this poses a serious handicap because "most job skills currently in use have been learned on-the-job!" (Stevens, 1975, p. 7; U.S. Department of Labor, 1964; Wirtz and Goldstein, 1975.)

Migration both among occupations and between regions represents another important entry source. As we noted above, workers may respond to differences in relative earnings across regions or among occupations by migrating or changing occupations. This mobility is an important source of labor market adjustment. As Tarr and Campbell (1975, p. 213) noted, Florida's population has grown 4.77

times fastern than that of the U.S. from 1940 to 1970, and inmigration has largely accounted for this differential. The skills possessed by these inmigrants are an important source of entry into any occupation and cannot be ignored. Data on these inmigrants and their occupations are only available every ten years in the Public Use Sample derived from the decennial census.

Entrants from outside the labor force, especially exmilitary personnnel, represent the sixth source of entry. We define this category as persons who are trained for a specific occupation but for various reasons have not been part of the labor force. Many in this category are women who are reentering the labor force after their families have grown up. Women and exmilitary personnel who are outside the labor market represent an important source of potential supply, particularly in some occupations such as nursing, public school teaching, and commercial airplane pilots and crews. Here too data is almost nonexistant.

The final category which affects occupational supply is exits. BLS has developed procedures for estimating deaths and retirements by occupations. As described in Sections 3.3 and 3.5, the procedure uses tables of working life and the age distributions of those employed in various occupations to develop a table of separation rates. While this procedure has limitations (i.e. separation rates are not occupation specific), it does produce reasonably accurate results for separations. However, no data is available on occupational mobility or separations for other reasons.

3.9 Empirical Supply Models

The goal of an occupational supply model is to produce accurate forecasts of the future labor supply by detailed occupations. These supply forecasts are then compared with occupational demand forecasts to determine the extent of unmet demands, or "needs". This is called a requirements approach as we have noted before, and forecasts of supply are an important part of any needs assessment.

Since the data on the occupational supply of labor is severely restricted, there are two alternatives we can pursue for our supply model. On the one hand, we could formulate a truncated supply model based on the limited data which exists. On the other hand, we can attempt a complete supply model by making some heroic assumptions to generate the missing data. We shall pursue both routes. However, we note that many of the included supply elements are highly speculative, and we shall clearly present the assumptions used. In this way the reader can retrace our steps, modify our assumptions if desired, or calculate a truncated supply model based on harder data.

A comprehensive occupational supply forecast requires a detailed analysis of the entry and exit trends for each individual occupation. However, the discussion which follows will be in terms of a single occupation for ease of exposition.

We will implement a four-step procedure to project the supply of labor in a particular occupation:

1. establish the time horizon of the forecast,
2. collect base year information on those currently in the occupation,
3. project the number currently in the occupation who will leave the occupation during the forecast period, and
4. estimate the number of entries into the occupation during the forecast period.

Below we examine each of these steps in some detail.

The first step is to establish the time horizon for the forecast, 1980 for this project. Next, base year data on the number currently employed in the occupation and those currently unemployed in the occupation must be gathered. Two alternative strategies are available. On the one hand, we can use the 1970 census data on occupational labor supply since this includes both employed and unemployed workers. This would be the easiest approach, and the census data is generally guite accurate. A drawback here is that this data is now six years old.

On the other hand, we could attempt to estimate the current 1976 occupational employment totals as follows. Employment information by detailed occupations is not available, but employment information for wage and salary workers covered by unemployment insurance is collected and published regularly by the Florida Department of Commerce under the auspices of a joint BLS-state cooperative program. This data base, know as the ES 202 data, is of high reliability, and its provides detailed industry employment information.

Projections of the current employment by occupations can be generated by applying the industry-occupation matrix to the current industry employment totals from the ES 202 reports. That is, the industry-occupation matrix indicates the staffing patterns (or occupational distributions) by industries, so that multiplying this matrix by industry employment totals produces an estimate of current employment.

Estimates of unemployment by occupations are much more difficult because there is no data comparable to the ES 202 reports for unemployment by industries. The aggregate unemployment rate is reported monthly. If the number of unemployed workers was distributed across industries in proportion to the numbers employed by the industries, then we could simply apply a factor equal to the inverse of aggregate unemployment rate to each industry's employment totals to estimate the number unemployed by industries. Again, the industry-occupation matrix could be used to produce unemployment counts by occupation.

However, there is no reason to think that the distribution of unemployment is proportional to an industry's level of employment. In fact, there is good reason to believe this not to be the case. The plight of Florida construction workers is general and carpenters and laborers in particular is a case in point. The aggregate unemployment rate does provide a count of the number unemployed which we can use as a control total. What is needed is a procedure to weight the aggregate unemployment rate so it will reflect current industry employment trends. We could use the following procedure:

a. multiply the aggregate unemployment rate by the labor force to produce the total number unemployed--the control total,

b. calculate the percentage change in employment over the past year in detailed industries,

c. change the signs of the percentage changes calculated in "b" and use these as weights for aggregate unemployment rate,

d. apply the weighted unemployment rates to each industry's employment level,

e. check the projected unemployment total produced in step "d" against the control total and repeat step "d" iteratively changing all the weights proportionately until the projected unemployment total equals the control value.

The product of this procedure is unemployment totals by detailed industries. We could then use the industry-occupation matrix to produce unemployment counts by occupation. Some distortion will be introduced because layoffs in a particular industry do not occur proportionately across all occupations. Typically, the least productive workers are terminated first, and blue collar workers are laid off before white collar workers.

Given the complexity and uncertainty of this approach for generating current period occupational supply data, we have decided to use the 1970 census data as our base year occupational supply data.

The final element of the current supply of labor in the base period is composed of those who have requisite skills but are not now in the labor force. Since we have no data at all on this element, we can not estimate its magnitude. We simply note here that our count of the base year occupational supply is an underestimate since this factor is not included. This completes step two of our four step procedure, and we now have base year information on the occupational supply of labor.

The third step is to evaluate the number of workers who will leave the occupation during the forecast period. Thus, if the base year is 1970 and the time horizon is 1980, we must determine the number of workers who will leave this occupation during the ten year interval. We can categorize those who leave an occupation by their motivations, a) death and retirement and b) other separations. As described above BLS has devised a procedure for estimating death and retirements by occupations from tables of working life. This procedure will be used here. Other separations are largely due to occupational mobility and job upgrading. We have no data for this source either, and we will be forced to ignore it.

3.10 Three Techniques to Project Occupational Entries

The final step in our occupational supply procedure is to estimate the magnitude of entries into the occupation over the forecast horizon. There are three alternative procedures which could be used to project the number of entries. First, Tarr and Campbell (1975) have developed a methodology for tracing most of the entry sources outlined in Figure 3.8. Second, an econometric approach to the problem is conceptually possible, and finally, a shift-share procedure can be implemented. We describe these below.

The approach developed by Tarr and Campbell is the most direct. It calls for an analysis of each source of entry into an occupation: formal public training, formal private training, on-the-job training, inmigration, occupational migration, exmilitary, and other. Reasonably good time series data exists on formal training conducted in public schools and by the federal government. Since the output of these programs is not particularly volatile, trend extrapolation by linear regression is an appropriate projection tool. Furthermore, placement follow up data is now available for most publicly funded vocational education programs, and we can apply these placement rates to projected program outputs to forecast the number of new entrants into an occupation from this source.

Inmigration has accounted for over 90 percent of Florida's population growth over the past 15 years, and those migrating to the state are an important source of entry into various occupations.

Tarr and Campbell (1975) have devised a methodology for estimating the supply of labor by occupations from this source. The decennial census provides occupational information on new inmigrants in the public use samples. If one assumes that the occupational distribution of inmigrants in noncensus years is similar to census years, then the percentage distribution of occupations revealed in the public use sample can be applied to the number of net migrants over the forecasting horizon. In this way the occupational skills of inmigrants can be estimated and included in the forecasted occupational supply totals.

Unfortunately little data is available on the outputs of private training schools. These private institutions feel that such data is proprietary information, and they are most reluctant to reveal how many graduates they produce, the placement records of their graduates, or what occupations they specialize in. The data situation is even worse for on-the-job training or for other entry sources such as occupational mobility and entrants from outside the labor force. No data is presently available for these sources of entry. Thus, these sources must be ignored even though their impacts on particular occupations may be large.

Therefore, we need to adjust our supply forecasts to reflect these supply elements. Since no data on these elements is available, a direct approach is impossible. We could use an indirect residual approach to develop adjustment factors for each occupation as follows. Occupational information is available for each census year. One approach would be to apply our procedure to 1960 data and develop an occupational supply forecast for 1970. Then calculate the percentage error of each occupational forecast and use these percentages to adjust the 1980 forecast.

In light of the many data constraints and the complexity of the supply forecasting methodology we have devised above, a second alternative appears to be easier to implement and requires somewhat less data. This alternative approach to the projection of future entries into an occupation employs econometric procedures. The most satisfying methodology in terms of economic theory is to relate the potential supply of labor in occupation "i" in location "j" to the wage rate in "i", wage rates in closely related occupations, and the population's age and skill distribution in "j" and in neighboring areas. We can express this mathematically as:

$$\text{Supply potential } ij = f(W_j, V_j, Pop_{ij}, \frac{\Sigma_k Pop_{ki}}{dkj})$$

where: W_j is a vector of wage rates, V_j is a vector of unemployment rates, Pop_{ij} is population in j with skills i, and dkj is the distance from region k to region j.

Although this approach has much to recommend it, it is not feasible at the present time. The main stumbling block is that wage data by detailed occupations has been collected and reported for only the past few years, and a consistent wage series cannot be properly constructed. As more data becomes available in the future this econometric approach could be implemented.

A third and most tractable approach is the use of shift-share procedures. As we described above in Section 3.4, shift-share was developed as an analytic tool by Perloff et al. (1960). Later work by Zimmerman (1975) and James and Hughes (1973) developed shift-share into a forecasting tool. Shift-share has been used successfully for forecasting employment levels in a regional context (Zimmerman, 1975). However, we feel it has promise for projecting entry into occupations. The procedure is inexpensive and uses only existing data.

Occupation supply data is available for census years both for the U.S. economy and for the Jacksonville area. This data can be used for shift-share projections

as follows:

$$O_{ijt+10} = O_{iust+10} \frac{O_{ijt}}{O_{iust}} + O_{iust+10} \frac{O_{ijt}}{O_{iust}} - \frac{O_{ijt-10}}{O_{iust-10}}$$

where: oi = labor supplied in occupation i, j = subscript for the region, Jacksonville labor market area, us = United States economy, and t = 1970. The first component of the formula represents the share component, i.e. the second component accounts for the shift in the share of U.S. occupational employment in industry i. These elements can be computed from historical census data. The "driving" element in the procedure is the future U.S. occupational employment for the target year, 1980. This data is available from *Tomorrow's Manpower Needs*, 1969, Volume III.

Given the data limitations and complexities of the previous two procedures, we decided to use this shift-share methodology to forecast entries by occupations. While no one has ever used shift-share for occupational forecasting, it has proven effective in forecasting employment for small areas. This leads us to believe it will be appropriate for the problem at hand. We discuss the implementation of this procedure and present our forecasted occupational supply totals in Chapter V.

3.11 Meshing Supply and Demand Forecasts

In the sections above we described methods for projecting the demands for and the supplies of labor by occupations. Now we must compare these demands and supplies occupation by occupation to assess the future needs for vocational and technical education. The process is composed of two parts: a) the matching of projected demands and supplies by occupations, and b) converting from occupational needs to vocational education programs. Table 3.11 illustrates how we shall format the output of projections.

A few words of caution are needed here. We wish to remind the reader that our procedures are imperfect and the underlying data is not always reliable, so these

Table: 3.11

EMPLOYMENT OPPORTUNITIES RELATED TO VOCATIONAL EDUCATION PROGRAMS
LABOR DEMAND AND SUPPLY, SUMMARY[1]

Jacksonville Labor Market

OE Code[2]	Instructional Program	Projected Labor Demand		Projected Labor Supply		
		Expansion and Replacement Needs[3]	Total Demand	Vocational Education Output[4]		Total supply[5]
		1980	1980	1975	1980	1980
	Total					

[1]Data from Employment Service and from other sources.

[2]Listed in numerical order by broad occupational category (2-digit code) and by instructional programs within.

[3]Include only total expansion and replacement needs; not total employment figures.

[4]Number trained through vocational education programs available for work to meet labor expansion and replacement needs.

[5]Number trained from all sources available for work to meet labor expansion and replacement needs.

projections must be used with some care and knowledge of their shortcoming particularly on the supply side. Furthermore, a potential excess demand for a particular occupation, a "need", can be filled in many ways by the labor market. Increasing vocational education training is but one of these ways. Changing relative wage rates may result in occupational mobility, entrants from outside the labor market may fill the need, or firms may substitute capital for labor eliminating the projected need. Thus, many ways exist for the labor market to adjust to unmet "needs".

OUTLINE

Chapter IV

GENERAL ECONOMIC ANALYSIS OF THE JACKSONVILLE REGION

4.1 Introduction

4.2 Population Characteristics

4.3 Economic Characteristics

4.4 Location Quotients

4.5 Prospects for Future Growth

4.6 The 1974-75 Recession

Chapter IV

GENERAL ECONOMIC ANALYSIS OF THE JACKSONVILLE REGION

4.1 Introduction

The purpose of this chapter is to provide a general overall economic analysis of the Jacksonville labor market area in terms of its present and expected population and economic growth. We believe that this general overview should precede a detailed labor market analysis by occupations which is developed in Chapter V below. The material in this chapter is designed to be illustrative of the kind of analysis which should be done on an annual basis, and which should be provided along with the occupational forecasts of manpower supply and demand for a given local labor market. When placed in an overall regional economic context, we believe that the detailed projections will be more understandable and useful to VTE planners, business and industry, guidance and placement counselors, and to students.

Throughout this study we have emphasized the VTE planning on the local level should be specifically oriented toward the local labor market area. It is true that planning for VTE cannot ignore national and regional trends. Yet, it is clear that the most important sources of employment and income are determined in the local labor market which will include a large labor-force commuting area surrounding the central SMSA for the region.

In this case study for testing our methodology to improve the state of the art in forecasting urban manpower requirements, we have referred to the Jacksonville labor market area. We should make it clear that this labor market area is best defined as Planning Region Four in Northeast Florida which forms a well defined labor market area. There are ten planning regions in Florida as defined by the

Florida Department of Administration. In general, they comprise reasonable approximations of labor markets which can be used as a basis for local manpower forecasting regions. Furthermore, the OIDS system (Tarr and Campbell, 1975) which is now providing occupational demand forecasts (*Florida Employment Directions*, 1975) is on a planning region basis.

Our profile of Planning Region Four is composed of six main sections. Following this introduction we describe the population and demographic characteristics of the region. Sections 4.3 and 4.4 analyze the area's economic characteristics, and in Section 4.5 we assess the prospects for future growth. Finally, Section 4.6 examines the behavior of the region's economy during the 1974-75 recession. It is important to analyze the socio-economic forces which influence Region Four in order to more fully understand the area's needs for vocational and technical education.

4.2 Population Characteristics

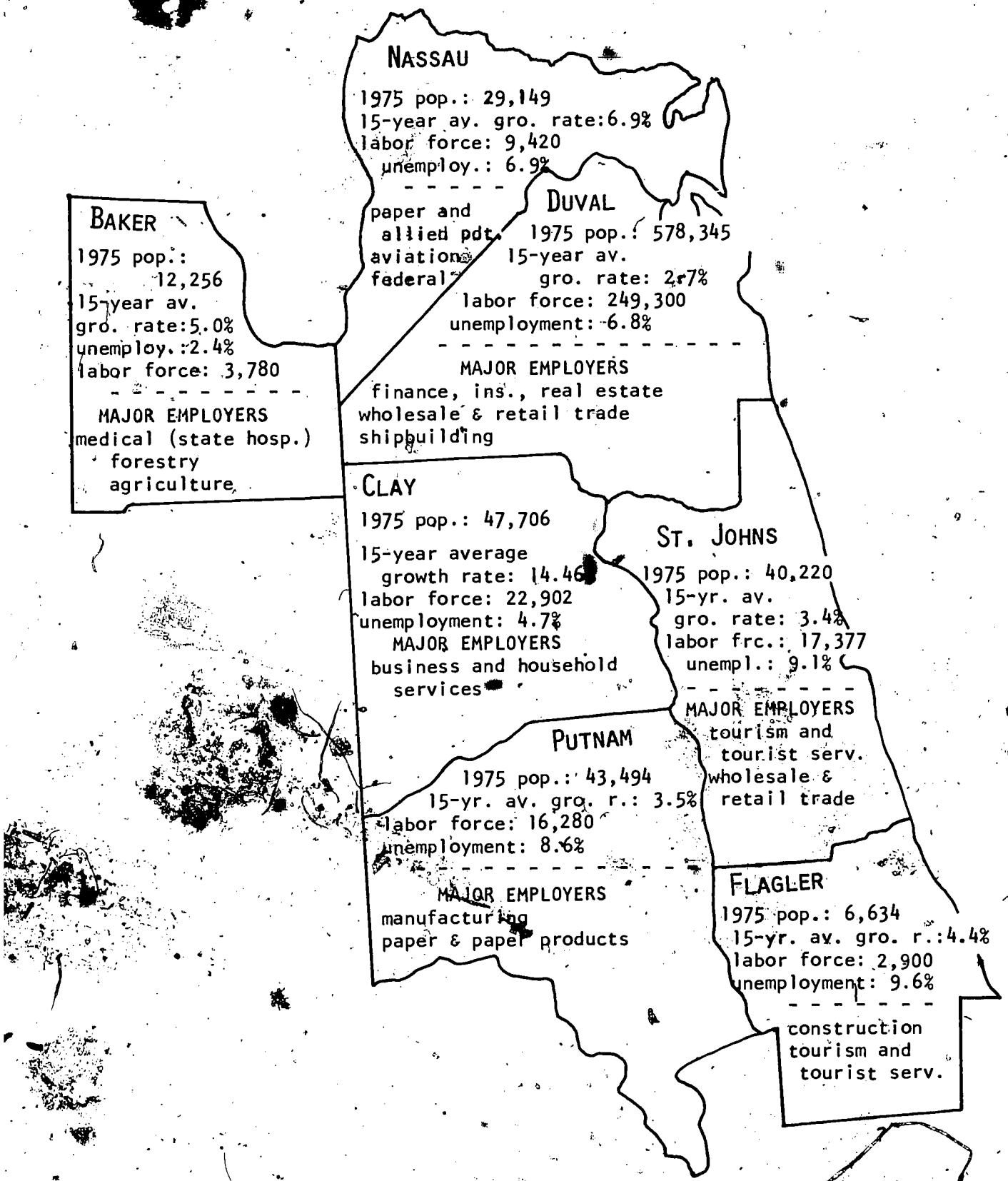
Planning Region Four is composed of seven Northeastern Florida counties: Duval, Nassau, Baker, Clay, St. Johns, Flagler, and Putnam. Figure 4.2.1 is a map of Florida showing each of the ten planning areas, and Figure 4.4.2 provides descriptive data for Region Four. Region Four contains 5,068 square miles or 9.3 percent of Florida's total land area. In 1975, 757,806 people lived in the region accounting for 8.9 percent of Florida's population. The area's labor force in 1975 totaled 321,959 (or 9.2 percent of Florida's labor force) and the labor force participation rate was 42.1 percent, slightly above the Florida rate of 40.3 percent.

Table 4.2.3 contains Region Four population data by broad age groups for 1974 and 1975 and Table 4.2.4 shows the region's population as a percentage of Florida's population. An interesting fact revealed by these tables is that the region's population is more concentrated in the under 25 age group than in the state's

Figure 4.2.2

DESCRIPTIVE DATA PLANNING, REGION FOUR

(all data are for 1975)



Unemployment rates are for March, 1975, and are not adjusted for seasonality.
Source: Bureau of Economic and Business Research, *Florida Statistical Abstract*, 1975 and Florida Department of Commerce, *Florida Employment Statistics*, February, 1976.

Table: 4.2.3

Region 4 Population by Age Group

Area	Year	Under 25	Under 15	15-24	5-64	25-44	45-64	Over 64	Total
Baker	1974	5,416	3,409	2,007	5,174	2,857	2,317	1,255	11,841
	1975	5,534	3,459	2,075	5,426	3,005	2,421	1,296	12,256
Clay	1974	21,904	14,324	7,580	20,123	12,914	7,209	3,736	45,761
	1975	22,743	14,574	8,196	21,095	13,496	7,599	3,868	47,706
Duval	1974	266,012	147,089	118,923	258,295	150,538	107,757	46,105	570,413
	1975	269,372	145,498	123,874	260,475	144,504	115,971	48,500	578,347
Flagler	1974	2,359	1,427	932	2,113	924	1,189	1,788	6,259
	1975	2,422	1,571	851	2,505	1,076	1,429	1,707	6,634
Nassau	1974	13,066	8,543	4,523	11,555	6,690	4,865	2,072	26,693
	1975	13,846	9,113	4,733	12,970	7,352	5,618	2,333	29,149
Putnam	1974	18,109	11,148	6,961	17,432	7,950	9,482	6,805	42,346
	1975	17,961	11,484	6,477	18,570	8,504	10,066	6,963	43,494
St. Johns	1974	16,479	9,585	6,894	15,372	7,349	8,023	6,079	37,931
	1975	16,856	10,369	6,487	16,649	7,519	9,130	6,715	40,220
Region 4	1974	343,345	195,525	147,820	330,064	189,222	140,842	67,840	741,244
	1975	348,734	196,068	152,666	337,690	185,456	152,234	71,382	757,806

Source: Bureau of Economic and Business Research, University of Florida.

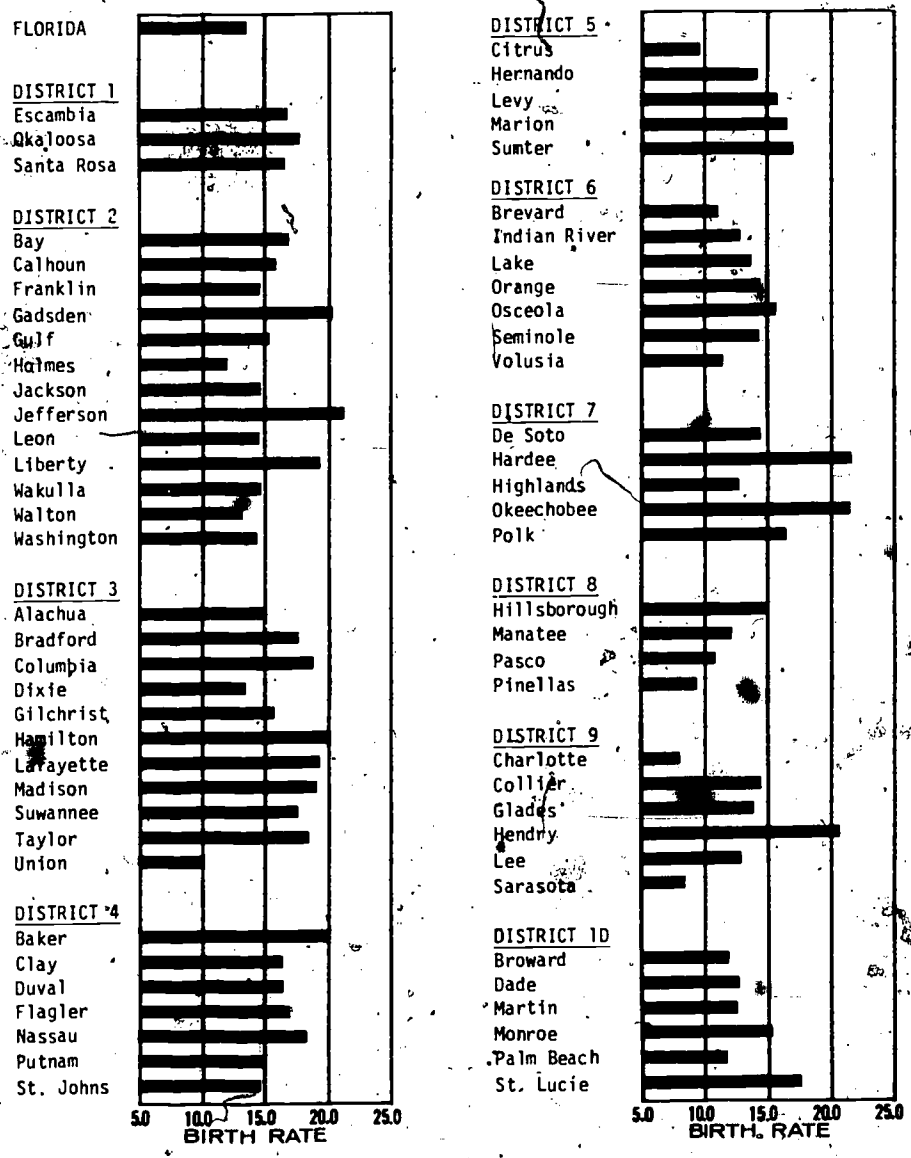
Table: 4.2.4

Region 4 Population as a Percent of Florida

Area	Year	Under 25	Under 15	15-24	5-64	25-44	45-64	Over 64	Total
Baker	1974	0.17	0.18	0.15	0.15	0.16	0.13	0.09	0.14
	1975	0.17	0.19	0.15	0.15	0.16	0.13	0.09	0.14
Clay	1974	0.68	0.77	0.56	0.56	0.70	0.41	0.26	0.55
	1975	0.70	0.79	0.58	0.57	0.71	0.41	0.26	0.56
Duval	1974	8.29	7.94	8.76	7.18	8.17	6.14	3.20	6.92
	1975	8.32	7.92	8.84	6.98	7.61	6.32	3.20	6.82
Flagler	1974	0.07	0.08	0.07	0.06	0.05	0.07	0.12	0.08
	1975	0.07	0.09	0.06	0.07	0.06	0.08	0.11	0.08
Nassau	1974	0.41	0.46	0.33	0.32	0.36	0.28	0.14	0.32
	1975	0.43	0.50	0.34	0.35	0.39	0.31	0.15	0.34
Putnam	1974	0.56	0.60	0.51	0.48	0.43	0.54	0.47	0.51
	1975	0.55	0.63	0.46	0.50	0.45	0.55	0.46	0.51
St. Johns	1974	0.51	0.52	0.51	0.43	0.40	0.46	0.42	0.46
	1975	0.52	0.56	0.46	0.45	0.40	0.50	0.44	0.47
Region 4	1974	10.60	10.55	10.89	9.18	10.27	8.03	4.70	8.98
	1975	10.76	10.68	10.89	9.07	9.78	8.30	4.71	8.92

Source: Bureau of Economic and Business Research, University of Florida.

Table 4.2.5.--Birth Rates per 1,000 Population in Florida Planning Districts and Counties: 1974



Source: Florida Statistical Abstract, 1975

population. 46.0 percent of the area's population is under 25 while only 38.2 percent of the state's population is younger than 25 for a difference of 7.8 percent. Thus, almost 11 percent of the state's school age population lives in the area. We can infer from this fact that the demand and need for educational services and vocational education programs will be stronger in Region Four than in the state as a whole.

Table 4.2.5 shows birth rates for Florida and each of its planning regions. From the table it is clear that birth rates are substantially higher for Region Four than is typical in Florida. Furthermore, migration to the region from other areas is well below Florida averages. For example, from 1970 to 1974 Florida population grew by 1,457,922 people and 91.2 percent of this change was due to migration. By contrast over the same period Region Four's population increased by 78,538 and only 65.3 percent of this was due to migration (Bureau of Economic and Business Research, University of Florida, 1976).

Finally, Florida's population grew by 25 percent between 1970 and 1975 where as Region Four's population expanded by only 14.4 percent. So, the region is clearly growing more slowly in population than the state, and the region's population growth is more heavily dependent on natural increase than is the state's. The upshot of this is that we can continue to expect that Region Four's population will be more highly concentrated in the younger age groups than state population, and we would expect that the needs for vocational education programs will also be relatively stronger in Region Four than in the state in general.

4.3 Economic Characteristics

Knowledge of the economic characteristics of a region is fundamental for determining labor market trends. Since labor market trends determine the demands for labor by occupation and influence occupational labor supplies, it is of utmost importance to study the composition of the region's economy.

Region Four is a well defined labor market area centered around Jacksonville. Jacksonville's location, on the Atlantic Coast at the mouth of the St. John's River, provides important economic benefits and has a large influence on the region's economic activities. In fact, Region Four and Jacksonville in particular can be considered as the gateway into northeastern Florida. Due to its location Jacksonville is the commercial and service hub for Northeast Florida and Southeast Georgia.

Jacksonville possess excellent transportation facilities:

a. a large sea port, the only natural deep water harbor on Florida's Atlantic Coast,

b. extensive rail service,

c. access to interstate highways 95 and 10, and U.S. routes 1, 301 and 17,

d. warehousing and trucking facilities, and

e. an international airport.

Table 4.3.1 lists Region Four wage and salary employment by broad industrial category and selected components for 1970 and 1974, and Table 4.3.2 shows the percentage distribution of the region's employment. As we might expect manufacturing, transportation, wholesale and retail trade, finance-insurance-real estate, service, and government dominate Region Four's employment. Thirteen insurance companies have home offices and eight others have their regional offices in Jacksonville. Seaboard Coast Lines' main office is in Jacksonville, along with three Navy installations. The Publix and Winn-Dixie supermarket chains along with others are headquartered in Jacksonville, and Sears-Roebuck is currently building a massive regional warehouse in the area.

The region also has extensive tracts of timber and the manufacturing of paper and allied products is important. Construction also employs a large and growing percentage of the region's labor force as shown in Table 4.3.2.

Table: 4.3.1

Region 4 Employment by Broad

Industrial Categories and Selected Components

Industry	1970	1974
Total employment	229,227	273,437
Agriculture and other NEC	5,500	5,300
Mining	143	607
Construction	14,242	21,743
Manufacturing	32,954	34,928
Durables	12,142	15,145
Fabricated metals	1,912	2,871
Transportation equipment	3,463	4,158
Nondurables	20,812	19,783
Food and kindred products	5,988	5,719
Paper and allied products	8,128	7,229
Chemicals	1,296	1,694
Transportation, communication, utilities	22,119	23,282
Communication	6,218	7,392
Transportation	15,901	15,890
Utilities	857	1,030
Wholesale trade	18,623	20,970
Retail trade	39,331	46,254
Finance, insurance, real estate	19,269	26,617
Finance	6,588	8,841
Insurance	10,814	13,850
Real estate	1,867	3,926
Services	33,865	44,769
Government	41,761	47,960
Federal	13,176	12,676
State	4,964	7,522
Local	23,621	27,762

Source: Florida Department of Commerce, *Labor Market Trends.*

Table: 4.3.2

Region 4 Nonagricultural Employment by Broad Industrial Categories--Percentage Distribution

Industry	1970	1974
Total nonagricultural employment	100.00%	100.00%
Mining	0.07	0.18
Construction	6.37	8.11
Manufacturing	14.73	13.03
Durables	5.43	5.65
Fabricated metals	0.85	1.07
Transportation equipment	1.55	1.55
Nondurables	9.30	7.38
Food and kindred products	2.68	2.13
Paper and allied products	3.63	2.70
Chemicals	0.58	0.49
Transportation, communication, utilities	9.89	8.68
Communication	2.78	2.76
Transportation	7.11	5.93
Utilities	0.38	0.38
Wholesale trade	8.32	7.82
Retail trade	17.58	17.25
Finance, insurance, real estate	8.61	9.92
Finance	2.94	3.30
Insurance	4.83	5.17
Real estate	0.83	1.46
Services	15.14	16.70
Government	18.67	17.89
Federal	5.89	4.73
State	2.22	2.81
Local	10.56	10.35

Source: Bureau of Economic and Business Research, University of Florida.

4.4 Location Quotients

A useful descriptive technique for analyzing an area's economy is the location quotient. A location quotient is the ratio of the percent employed locally in a particular industry divided by the percent employed nationally in the industry; i.e.,

$$\frac{\%\text{ employed in industry i in Region Four}}{\%\text{ employed in industry I in the U.S.}}$$

So a location quotient is a units free index of relative concentration of employment in a particular industry. A location quotient greater than 1.0 implies that the industry under study is more concentrated in the region than in the nation as a whole, and that some of the output of this industry is produced for markets outside the region (is a regional export industry).

Table 4.4.1 provides the location quotients for Region Four nonagricultural industries by broad industrial categories and for selected components. As we might have expected the following industries are more concentrated in Region Four than in the U.S.:

a. paper and allied products
b. communication
c. transportation
d. wholesale trade
e. retail trade
f. finance
g. insurance
h. real estate
i. federal government

We would expect that a regional trade center like Jacksonville, and Region Four, would show high levels of concentration in these industries. Although not listed, shipbuilding and repairing has a location quotient of over 5.1. Finally, construction activity is relatively important in Region Four.

As we mentioned above, industries with location quotients greater than 1.0 produce a portion of their output for markets outside the region. The behavior and prospects for future growth for these regional exporting industries are crucial to the economic health of the community. This is so because these regional exporting industries bring income into the area from the outside. This inflow of income from the outside generates the demands for locally produced goods and services.

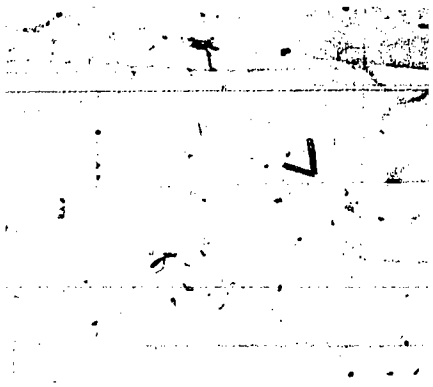


Table: 4.4.1

Region 4 Location Quotients for Nonagricultural Industries by Broad Industrial Category and Selected Components

Industry	1970	1974
Total nonagricultural employment	1.000	1.000
Mining	0.073	0.264
Construction	1.277	1.594
Manufacturing		
Durables	0.344	0.374
Fabricated metals	0.439	0.564
Transportation equipment	0.610	0.679
Nondurables	0.809	0.707
Food and kindred products	1.065	0.971
Paper and allied products	3,652	2,987
Chemicals	0.391	0.362
Transportation, communication, utilities	1.557	1.448
Communication	1.085	1.114
Transportation	1.875	1.681
Utilities	0.393	0.402
Wholesale trade	1.547	1.438
Retail trade	1.111	1.060
Finance, insurance, real estate	1,657	1,869
Finance	1.255	1.337
Insurance	2.625	2.841
Real estate	0.826	1.423
Services	0:924	0.968
Government	1.054	0.981
Federal	1.529	1.360
State	0.589	0.724
Local	1.046	0.952

Source: Bureau of Economic and Business Research calculations using data from the U.S. Department of Commerce, *Survey of Current Business*, and Florida Department of Commerce, *Labor Market Trends*.

For example, the shipbuilding and repairing industry has a location quotient of 5 and is much more concentrated in the region than in the nation. Clearly much if not most of the output of this industry is intended for outside markets. To service the external demand, local goods and services, labor prominent among these, are hired and local income is generated. This gives rise to demands for food, shelter, entertainment, etc., much of which is locally produced. Thus, $1 of export sales results in many extra dollars to total local income. The economic position of a region is analogous to that of a small European nation such as Holland. In Holland the fortunes of export industries are of prime importance to the nation's economy and this is also true for regional economies like Region Four.

4.5 Prospects for Future Growth

Many techniques are available for investigating the behavior and prospects for future growth for the industries of Region Four. Three techniques we shall employ are: a) shift-share analysis, b) econometic forecasts, and c) behavior over the business cycle. We shall apply each of these techniques to the region's economy.

Shift-share analysis was developed by Perloff et al. (1960) as a descriptive and analytic tool to examine the growth prospects and competitiveness of regional economies. We have described how shift-share can be used as a forecasting tool in Section 3.4.3. We can describe the use of shift-share as an analytic technique in a four step process. First, the time period for the analysis is established. Second, the change in total employment and employment in each industry is calculated over the time frame. Third, the changes in employment calculated in step two are broken down and ascribed to three influences: a) national growth, b) industry mix, and c) regional share. Finally, based on the analysis in step three the prospects for each industry in the region can be investigated.

Table 4.5.1 provides a shift-share analysis of the Region Four economy, and some examples will help to make this procedure more understandable. Let us establish the time frame as 1960 to 1974. During this fifteen year period total employment

Table: 4.5.1

Region 4 Shift-Share Analysis for Nonagricultural Industries by Broad Industrial Category and Selected Components

Industry	Change in Employment 1960-1974	National Growth Effect	Industry Mix Effect	Regional Share Effect
Total	102,984	73,389	6,854	22,741
Mining	126	214	-241	153
Construction	9,401	5,484	-779	4,696
Manufacturing	7,351	12,254	-6,968	2,065
Durables	4,331	4,805	-2,087	1,613
Fabricated metals	1,628	552	-168	1,244
Transportation equipment	1,177	1,322	-910	765
Shipbuilding	1,373	994	-4	383
Nondurables	3,020	7,449	-5,523	1,094
Food and kindred products	955	2,117	-2,302	1,140
Paper and allied products	764	2,873	-1,734	-375
Chemicals	40	567	-210	-317
Transportation, communication, and utilities	7,463	7,029	-4,284	4,718
Transportation	3,976	5,294	-4,304	2,986
Communication	3,487	1,735	-438	2,190
Utilities	493	239	-123	377
Wholesale trade	6,619	6,377	382	624
Retail trade	15,799	13,533	2,308	-42
Finance, insurance, real estate	12,085	6,458	1,666	3,961
Services	23,475	9,462	7,988	6,025
Government	20,584	12,165	7,276	1,143
Federal	2,143	4,681	-2,574	36
State	4,732	1,240	1,487	2,005
Local	13,709	6,245	6,045	1,419

Source: Bureau of Economic and Business Research calculations using data from the U.S. Department of Commerce, *Survey of Current Business*, and Florida Department of Commerce, *Labor Market Trends*.

in the region grew by 102,948 due to changes in employment by each of the area's industries. For example, manufacturing employment expanded by 7,351. This expansion in manufacturing employment can be broken down into three component parts: a) national growth effects, b) industry mix effects, and c) regional share effects. The national growth effect indicates how much this industry's employment would have grown had regional employment in manufacturing increased at the same rate that the national economy increased (44 percent for this period of 1960-1974). Since the national economy expanded during this period we would expect Region Four manufacturing employment to also expand during the period. The national growth effect would project an expansion in manufacturing employment of 12,254. However, growth in Region Four manufacturing was only 7,351 for a discrepancy of 4,903.

Why did employment in Region Four manufacturing grow more slowly than the aggregate growth in national employment? Two factors are at work here, industry mix and regional share. Employment in manufacturing in the U.S. grew relatively slowly compared to other U.S. industries between 1960 and 1974. Thus we would expect that any regional economy which has employment heavily concentrated in manufacturing would grow more slowly than the U.S. average simply because manufacturing is a relatively slow growing industry. This industry mix effect was calculated as the difference between the aggregate growth rate of total U.S. employment and the growth rate of U.S. manufacturing times Region Four manufacturing employment in 1960. This industry mix effect equaled -6,967.

The final component is regional share, and it is calculated as a residual. The change in regional manufacturing employment equaled 7,351 due to: a) national gro. effect of 12,254, b) industry mix effect of -6,967, and c) regional share effect of 2,604 equaling the net change of 7,351. This regional share component represents the competitiveness of the region's economy in manufacturing.

To chose another example, employment in finance, insurance, and real estate grew by 12,085 in the fifteen year period. 6,458 was due to the expansion of the

U.S. economy, the national growth effect. 1,666 was due to the industry mix, this was a relatively fast growing sector of the U.S. economy from 1960-1974. Finally, Region Four was quite competitive in this area and attracted 3,961 additional jobs.

Table 4.5.1 lists the shift-share components for the period 1960-1974 for broad industrial sectors and selected components of Region Four. Reading across any row of the table shows the change in industry employment between 1960 and 1974, the national growth effect, industry mix effect, and regional share effect. Reading down any column of the table provides the industry contributions to each total area wide effect.

Before we examine the prospects for future growth and development in the area some background information is useful. During the 1950s and 1960s the composition of economic activity began to change dramatically in most regions of the United States. The South and Southwest experienced rapid population growth and economic development, and these trends are continuing. Table 4.5.2 shows the trends in real personal income, population, and manufacturing employment between 1960 and 1975 for regions of the U.S. The table clearly shows the relatively rapid rate of economic development and population growth in the South as jobs and population continue their inmigration.

Table: 4.5.2

Growth Rates for Selected Economic and Social Variables 1960-1975

Region	Population	Real Personal Income	Manufacturing Employment
U.S.	18.4	77.5	9.2
New England	16.1	65.5	-9.0
Mid-East	10.9	57.8	-13.7
Great Lakes	13.1	65.1	3.2
Plains	8.4	70.5	24.0
Rocky Mountains	31.6	93.2	45.6
Far West	34.2	89.7	19.8
Southwest	24.9	105.8	67.3
Southeast	23.3	114.3	43.3

Source: Business Week.

These regional trends have been especially strong in Florida and particularly in the Jacksonville area. The employment data in Table 4.5.1 shows employment growth in every sector with particular strength shown in construction, transportation, communications, finance-insurance-real estate, services, and government. The shift-share analysis shows for all industries a positive industry mix effect indicating an industrial mix of relatively fast growing industries. This bodes well for the future because this composition of economic activity has potential for increased future growth. The shift-share analysis also gives a substantial and positive regional share effect for all industries. This results from the beneficial competitive position of the area and also indicates continued economic growth and development.

Turning now to an examination of the individual export industries we find a more mixed picture. Construction, food and kindred products, paper and allied products, transportation, communication, and federal government all exhibit negative industry mix effects and possitive regional share effects. Since these industries are expanding more slowly than the average growth rate for all industries, we would not expect too much growth potential. However, the positive regional share effects indicate that the area's competitive position is attractive and new industries have been moving in from other areas at a rapid pace and existing firms have expanded. The conclusion to be drawn is that future growth will continue in these industries but at a slower pace on the average than previously.

Finance, insurance, real estate, wholesale trade, and retail trade have shown positive mix and share effects (the retail trade share is a slight exception). For these industries we would expect substantial future growth. They are all relatively fast growing industries and the area has been able to attract an ever increasing share of this type of activity over time. We see no reason for these trends not to continue. Indeed, Jacksonville is emerging as an attractive location for many types of administrative and headquarters activities along with its role as a regional

trade center. Given the area's excellent location and transportation facilities, we expect a continuation of growth for these industries.

The prospects for future growth in the area have been somewhat confused lately due to the status of the Offshore Power Systems project. If the OPS project becomes a reality, we would expect a substantial impact on the local economy and its labor market. However, with continued delays in the OPS project it appears that future growth and development over the next five years in the area will be along the same lines as in the past.

We can also analyze the prospects for future growth in Region Four with our econometric model developed in Section 3.44. In Table 4.5.3 we have reproduced our 1980 econometric employment projections, and we have displayed once again the area's 1974 employment by broad industrial categories. The last column of Table 4.5.3 lists the derived percentage changes in employment forecasted from the econometric model. These econometric projections represent our best estimation of future employment trends in Region Four. Furthermore, the econometric approach allows us to quantify our notions with respect to growth trends developed from the preceding shift-share analysis.

First, we note that the econometric forecasts are in line with what we expected given the shift-share analysis. Continued strong predicted growth in the area is evident from the table; we expect an 18.62 percent increase in total employment by 1980 for about a 3 percent per year increase. Second, the excessively large growth in agriculture and other is largely due to definitional changes as we explained in Section 3.4.4 and is not significant. Third, as we expected the largest growth rate occurred in finance, insurance, and real estate which also had positive mix and share components. The average compounded rate of growth for this category is almost 5 percent per year, well above the aggregate total. Substantial growth is also projected for retail trade, services, and government as expected. Fourth, the expected slower rates for construction, transportation, and nondurables were also borne out.

Table: 4.5.3

Region 4 Projected Employment Growth Rates

Industry	Actual 1975	Econometric Forecast	Derived Growth Rate Expressed as a Percentage Change
Total	273,437	324,352	18.62
Agriculture and other NEC	5,300	12,450	134.91
Mining	607	507	-16.47
Construction	21,743	24,831	14.20
Manufacturing	34,928	43,157	23.56
Durables	15,145	19,593	29.37
Fabricated metals	2,871	3,864	34.59
Transportation equipment	4,153	5,599	34.82
Nondurables	19,783	23,564	19.11
Food and kindred products	5,719	6,817	19.20
Paper and allied products	7,229	8,610	19.10
Chemicals	1,694	1,569	-7.38
Transportation, communication, utilities	23,282	25,534	9.67
Communication	7,392	8,667	17.25
Transportation	15,890	15,927	0.23
Utilities	1,030	940	-8.73
Wholesale trade	20,970	21,945	4.65
Retail trade	46,254	53,865	16.45
Finance, insurance, real estate	26,617	35,270	32.51
Finance	8,841	11,713	32.49
Insurance	13,850	18,349	32.48
Real	3,926	5,208	32.65
Services	44,769	53,551	19.62
Government	47,960	53,242	11.01
Federal	12,676	14,072	11.01
State	7,522	8,347	10.97
Local	27,762	30,823	11.03

Source: Florida Department of Commerce, *Labor Market Trends*. Calculations by the Bureau of Economic and Business Research, University of Florida.

Finally, the forecasts did produce two somewhat unexpected results. Growth in wholesale trade is projected at a slower rate than expected given its positive mix and share coefficients in Table 4.5.1. However, these mix and share coefficients are quite small, so a slower growth rate is not too unusual. The large projected growth in manufacturing and in durables in particular was not at first expected given the negative industry mix coefficients. This industrial category is growing more slowly at the national level than is the aggregate U.S. economy. However, the region's competitive position is strong as evidenced by the large and positive share effects. Thus, large growth in this category is not out of line with the share analysis or with historical trends for the area.

In the next section we turn our attention to an analysis of the behavior of the area's economy during the 1974-75 recession.

4.6 Behavior of the Regional Economy During the 1974-75 Recession

Since World War II the economies of the Southeastern United States, Florida, and Region Four have grown much more rapidly than the national economy in terms of employment and income (see Table 4.5.2 above). During recessionary periods the contractions have usually been smaller and the recoveries earlier and more vigorous than for the overall national economy. However, the most recent recession and subsequent recovery is quite difficult. The contraction in the whole Southeast was sharper and Florida experienced particularly high unemployment rates and over a 7 percent reduction in total employment. The Jacksonville area economy also suffered its worst postwar recession, but the region's economy suffered relatively less than the state as a whole. It is instructive to examine the behavior of Region Four's economy over the recent past, and to compare it against other areas in Florida and the Southeast.

The sensitivity of a region's economy to the national business cycle is largely a function of the composition of economic activity in the area. For example, if a proportion of employment in the region occurs in durable goods manufacturing which is

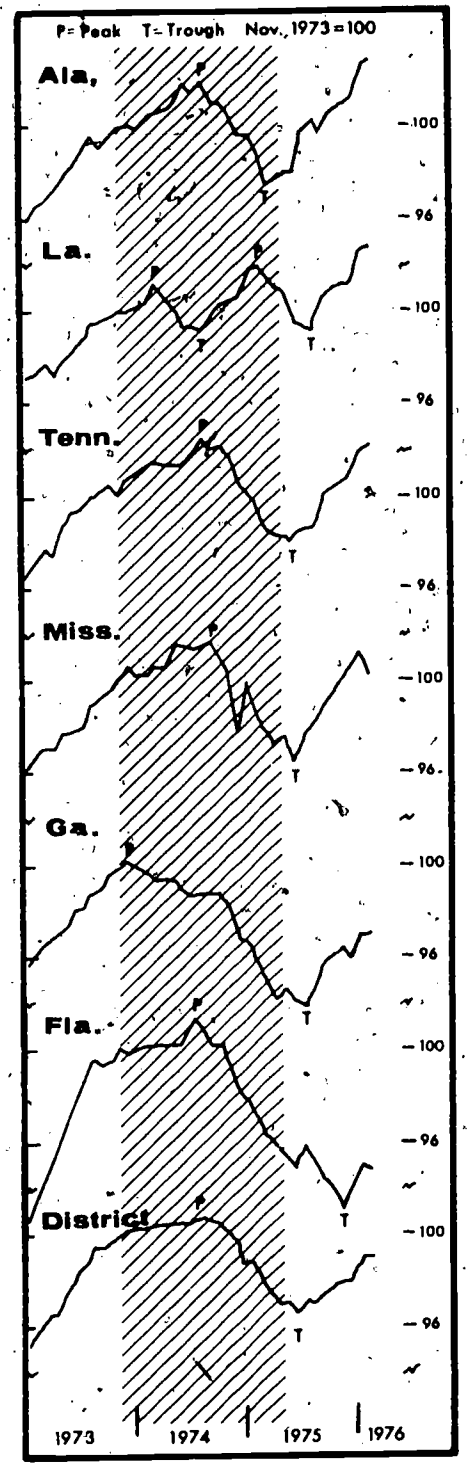
a cyclically sensitive industry, the region's economy then tends to exhibit wide swings over the business cycle. The economy of Detroit is a case in point. By contrast, if the region's employment is largely composed of government and agricultural workers, its economy tends to be rather stable. Washington, D.C., Gainesville, and Tallahassee are good examples.

The manufacturing of durable goods is quite volatile in terms of production and employment because these products can be held in inventory for long periods of time before being sold, and once sold, they can be used over a longer period. Conversely, nondurable goo such as food have relatively stable production and employment trends. These goods are characterized by a steady demand patter, and they are produced as needed which eliminates severe fluctuations in output and employment. Further, linked or ancillary services in the nondurable sector are also more likley to have relatively stable patterns.

For the Southeast as a whole, there is a greater proportion of jobs in non-manufacturing than in other regions of the country. One exception to this rule is construction, and this component makes the Southeast more prone to job fluctuations. In general the regional job mix is favorable to employment stability.

To put the recessionary behavior of Region Four's economy in perspective, we shall first examine the changes in the economies of the states in the Southeastern U.S. In terms of the indivudual states in the Southeast, Florida's job loss was the worst, with a job decline of over 7 percent by the bottom of the recession (see Tables 4.6.1 and 4.6.2) This can be attributed primarily to the high proportion of construction jobs in the state. Construction employment accounts for almost ten percent of Florida's total employment. Construction in Florida badly depressed due to overbuilding in the past expansion, the overall national recession, inflation, and the reduction in aggregate real personal income. The continuing depressed state of the construction industry also implies a slower than average recovery statewide. Moreover, the decline of jobs and production in construction has also adversely affected

Table 4.6.1.--Sixth Federal Reserve Bank District Total Nonagricultural Employment



Note: Shaded area represents U.S. recession.

Source: Fergus (1976, p. 59)

Table: 4.6.2

Total Nonfarm Employment

November 1973=100

Area	Employment Peak[1]	Employment Trough[1]	Decline from Peak	February 1976	Increase from Trough
Sixth District States	100.6	96.4	-4.2	98.9	+2.5
Alabama	101.9	97.5	-4.4	102.9	+5.4
Florida	101.3	93.7	-7.6	94.8	+1.1
Georgia	100.2	93.9	-6.3	96.9	+3.0
Louisiana	101.6	99.2	-2.8	102.8	+3.6
Mississippi	101.6	96.5	-5.1	100.2	+3.7
Tennessee	102.5	98.0	-4.5	102.2	+4.2

Source: Federal Reserve Bank of Atlanta, *Review*, August 1976, p. 57.

employment in such linked sectors as real estate, finance, insurance, furniture manufacturing, and wood products. Thus, construction has undermined some normally more stable employment sectors within the state.

However, Region Four has a well diversified economy, particularly when compared to the rest of the state. This variety in the region's industrial composition provides greater stability for the region over the business cycle. Table 4.6.3 lists total employment, construction employment, and the unemployment rate for Florida's urban areas from 1972 to 1976. As the table illustrates, the unemployment rate in the Jacksonville labor market area has always been below the state average and is among the lowest in the state. More interesting is the behavior of the area's economy during recessions. During 1975 total employment fell 4.9 percent statewide but only 2.1 percent in the Jacksonville area. Similar trends are apparent for the unemployment rate and construction employment.

The recession did not affect all industries in the region equally, and some analysis of the impacts by broad industrial categories is relevant here. In Table 4.5.4 we have graphed employment trends for Duval, Baker, Clay, Nassau, and St. Johns Counties from 1974-1976 (data for Flagler and Putnam Counties were not available in sufficient detail). From the table it is clear that construction employment is quite sensitive to the business cycle as is employment in transportation, communication and utilities. In contrast, employment in services and finance-insurance-real estate is far more stable. This indicates for instance, that VTE training programs which are geared to provide manpower to the construction industry need to take movements of the business cycle into account. Furthermore, downturns in the business cycle tend to affect the hiring rate of entry-level jobs relatively more than that of other jobs although all hiring rates are reduced. Thus, it will be more difficult for VTE graduates to find suitable employment in recessionary periods. Analysis of placement records should take this information into account.

This chapter has provided the reader with background material and a perspective

Table: 4.6.3

Selected Employment Data for Florida's Urban Areas

Year, nonagricultural employment, and percentage change from prior year	Florida	Miami	Ft. Lauderdale-Hollywood	Tampa-St. Petersburg
1972				
Total employment	2,407,500	556,100	211,800	354,000
Percentage change	7.0	7.1	4.7	9.4
Construction employment	203,900	35,600	27,600	30,900
Percentage change	13.2	13.7	21.6	18.4
Unemployment rate (3/72)	3.8	5.9	2.7	2.7
1973				
Total employment	2,756,500	600,400	243,700	408,400
Percentage change	14.5	8.0	15.1	15.4
Construction employment	277,300	44,600	34,300	40,800
Percentage change	36.0	25.3	24.3	32.0
Unemployment rate (3/73)	2.8	3.6	2.6	1.8
Annual average 1974				
Total employment	2,869,700	611,000	255,700	438,400
Percentage change	4.1	1.8	4.9	7.3
Construction employment	267,200	41,500	32,600	41,000
Percentage change	-3.6	-7.0	-5.0	0.5
Unemployment rate (3/74)	3.4	4.9	3.6	2.4
Annual average 1975				
Total employment	2,729,000	596,000	233,700	412,800
Percentage change	-4.9	-2.5	-8.6	-5.8
Construction employment	171,100	37,900	18,700	27,200
Percentage change	-36.0	-8.7	-42.6	-33.7
Unemployment rate (3/75)	10.6	9.7	12.6	8.7
February 1976				
Total employment	2,748,400	618,900	236,200	396,200
Percentage change	0.7	3.8	1.1	-4.0
Construction employment	145,100	21,000	15,100	24,500
Percentage change	-15.2	-44.6	-19.3	-9.9
Unemployment rate	11.1	11.4	13.2	10.9

continued ... .

Table: 4.6.3

Selected Employment Data for Florida's Urban Areas (continued)

Year, nonagricultural employment, and percentage change from prior year	Orlando	Jacksonville	Pensacola	Tallahassee
1972				
Total employment	193,600	231,900	75,200	48,700
Percentage change	10.6	3.4	6.1	4.7
Construction employment	22,800	16,200	7,000	3,700
Percentage change	9.6	7.0	12.9	23.5
Unemployment rate (3/72)	4.1	2.5	2.6	1.9
1973				
Total employment	226,400	250,500	81,000	57,000
Percentage change	16.9	8.0	7.7	17.0
Construction employment	26,700	20,400	8,400	4,100
Percentage change	25.9	25.9	20.0	10.8
Unemployment rate (3/73)	2.2	2.4	2.4	1.2
Annual average 1974				
Total employment	226,700	262,000	84,900	60,200
Percentage change	0.1	4.6	4.8	5.6
Construction employment	23,200	20,000	8,000	3,700
Percentage change	-13.1	-2.0	-4.8	-7.5
Unemployment rate (3/74)	3.2	2.4	2.6	1.3
Annual average 1975				
Total employment	210,200	256,600	84,600	60,000
Percentage change	-7.3	-2.1	-0.4	-0.3
Construction employment	13,800	14,900	6,700	3,200
Percentage change	-40.5	-25.5	-16.3	-13.5
Unemployment rate (3/75)	11.6	7.3	9.4	6.1
February 1976				
Total employment	209,600	257,700	85,100	61,000
Percentage change	-3.0	0.4	8.6	1.7
Construction employment	13,300	13,700	6,400	3,000
Percentage change	-3.6	-8.1	-4.5	-6.3
Unemployment rate	10.5	6.2	6.4	5.3

continued . . .

Table: 4.6.3

Selected Employment Data for Florida's Urban Areas (continued)

Year, nonagricultural employment, and percentage change from prior year	Lakeland-Winter Haven	Melbourne-Titusville-Cocoa	West Palm Beach-Boca Raton
1972			
Total employment	80,200	73,800	125,100
Percentage change	8.5	3.2	9.3
Construction employment	5,800	3,400	12,700
Percentage change	23.4	25.9	23.3
Unemployment rate (3/72)	5.2	5.7	4.1
1973			
Total employment	90,000	79,400	138,900
Percentage change	12.2	7.6	11.0
Construction employment	7,600	4,900	17,400
Percentage change	31.0	44.1	37.0
Unemployment rate (3/73)	3.9	4.7	2.9
Annual average 1974			
Total employment	95,700	77,200	146,000
Percentage change	6.3	-2.8	5.1
Construction employment	9,800	4,800	16,700
Percentage change	28.9	-2.0	-4.0
Unemployment rate (3/74)	3.7	7.1	3.4
Annual average 1975			
Total employment	97,400	74,400	141,200
Percentage change	1.8	-3.6	-3.3
Construction employment	9,000	3,600	11,200
Percentage change	-8.2	-25.0	-32.9
Unemployment rate (3/75)	8.2	13.4	11.8
February 1976			
Total employment	102,300	73,800	145,100
Percentage change	5.0	-0.8	2.8
Construction employment	8,400	3,500	10,000
Percentage change	-6.7	-2.8	-10.7
Unemployment rate	12.2	13.1	13.7

Source: State of Florida, Department of Commerce, *Labor Market Trends.*

Table: 4.6.4

Employment by Broad Industrial Category
Duval, Baker, Clay, Nassau, and St. Johns Counties

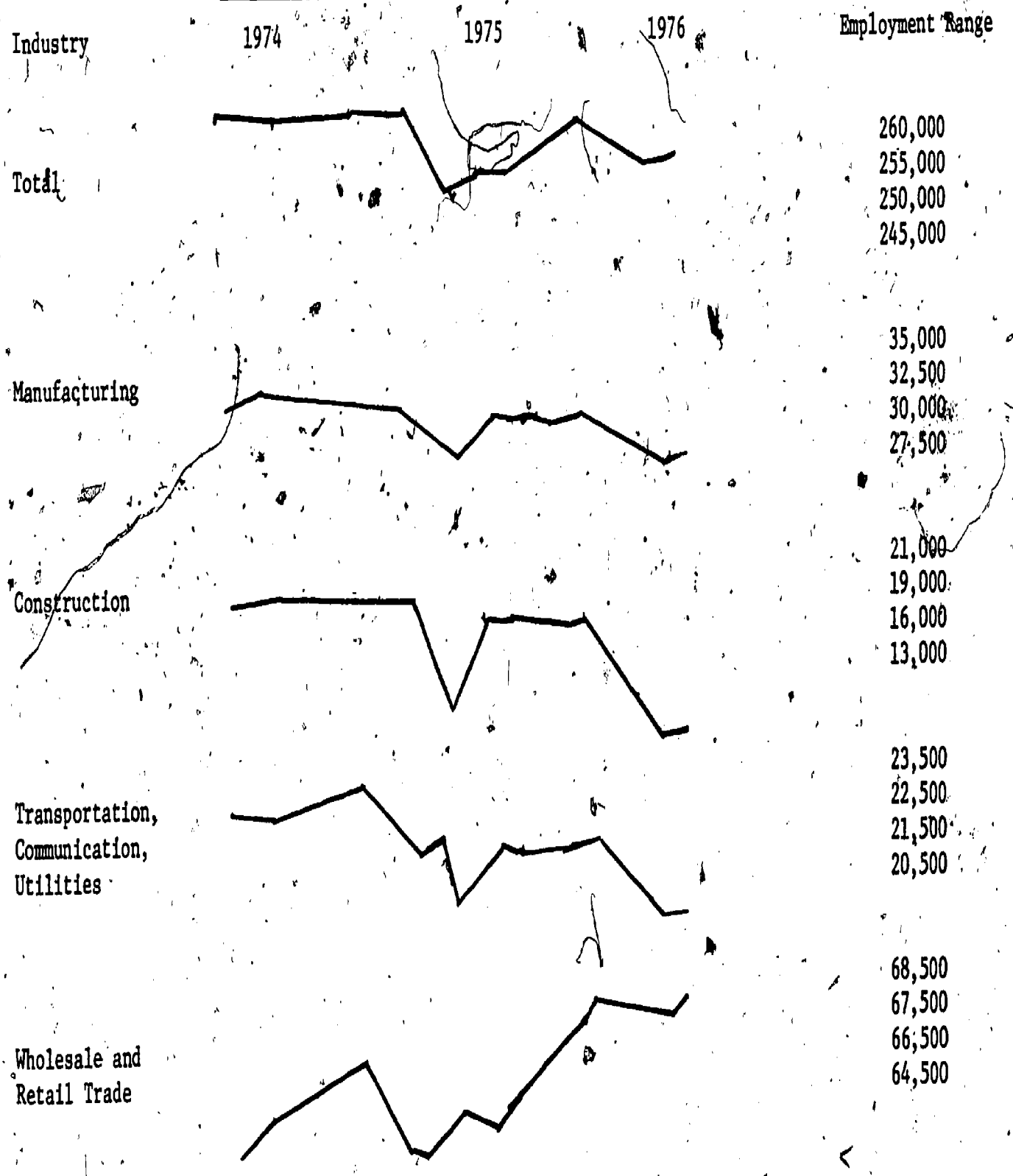
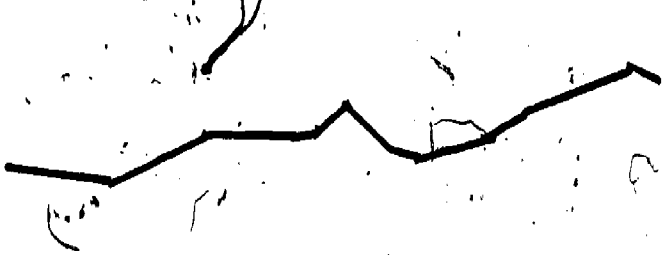


Table: 4.6.4 (continued)

Industry	1974	1975	1976	Employment Range
Finance, Insurance, Real Estate				27,000 26,000 25,000 24,000
Services				47,000 46,000 45,000 44,000
Government				52,500 51,000 49,500 48,000 47,000

from which to view our occupational forecasts. Chapter V presents our detailed 1980 forecasts of the demand and supply of labor by occupations. We examine these projections in terms of their reasonableness, and the cost effectiveness of producing them. Furthermore, to our knowledge, we provide the first set of detailed occupational supply forecasts for a regional economy. While our methology is experimental, the forecasts appear to be both reasonable and useful.

OUTLINE

Chapter V

1980 OCCUPATIONAL DEMAND AND SUPPLY PROJECTIONS FOR THE JACKSONVILLE LABOR MARKET AREA

5.1 Introduction

5.2 The Demand for Labor by Occupation

- 5.2.1 Overview
- 5.2.2 Expansion Demand for Labor by Occupation
- 5.2.3 Replacement Demand for Labor by Occupation

5.3 The Occupational Supply of Labor

- 5.3.1 Introduction
- 5.3.2 1980 Forecast of the Supply of Labor by Occupation

5.4 Implications for Vocational and Technical Education

Chapter V

1980 OCCUPATIONAL DEMAND AND SUPPLY PROJECTIONS FOR THE JACKSONVILLE LABOR MARKET AREA

5.1 Introduction

In the chapter we present our 1980 projections of the demands and supplies of labor by occupation for the Jacksonville labor market area. Demand for labor forecasts are developed by three alternative techniques. Next, a set of occupational supply forecasts are produced by a new procedure. Finally, we examine the implications of our occupational demand and supply projections for VTE programs which serve the region's labor market. This type of detailed labor market information, i.e. projected future occupational demands and supplies of labor, presented in a VTE format is vital for effective program planning. Although the manpower literature has often discussed the usefulness of this kind of labor market analysis by occupations for metropolitan areas, to our knowledge this report constitutes the first attempt to develop such detailed projections.

Some caveats are in order before we turn to our projections. The purpose of this research is to develop a methodology for assessing the needs for VTE programs in urban areas of Florida. Our 1980 projections represent the first test of the methodology. The results should be viewed as illustrative of the kinds of analyses which are useful and practical to implement. Further testing in other areas and greater refinement are in order.

Since this chapter of our report builds directly upon the foundation laid in previous chapters a brief review of this material is useful prior to our discussion of the projections. In Chapter II we reviewed the state of the art in manpower projection and labor market analysis for VTE. We noted that: a) most methodologies

have ignored the supply side of the labor market as they concentrated heavily on explaining the expansion demand for labor, b) replacement demands have received inadequate attention, c) the cost-effectiveness of alternative techniques were not evaluated, d) meshing of projected demands and supplies was not undertaken, and e) the implications of the projections for VTE programming and planning were not evaluated. Chapter II then set the stage for Chapter III where we developed our conceptual framework for analyzing a labor market and formulated three empirical demand forecasting models. We examined the cost-effectiveness of 1980 industrial employment projections produced by three techniques, time trend, shift-share, and econometric. Chapter IV provided important background material on the socio-economic trends influencing the Jacksonville labor market, and we analyzed the region's prospects for future growth.

This chapter of the report provides 1980 occupational demand and supply projections for the Jacksonville labor market area. The chapter is composed of four main sections. Following the introduction we present and analyze our 1980 occupational demand projections. The demand for labor at a future date can be divided into two parts, expansion demand and replacement demand. We examine each of these. In Section 5.3 we provide a forecast of the 1980 labor supply by occupations and discuss the methodology used to produce the forecast. We examine the implications of our 1980 projections for VTE programs in Section 5.4 by: a) meshing the demand and supply forecasts to identify those occupations which may have excess demands or supplies, b) relating the occupational analysis to VTE program clusters, and c) examining VTE program completions.

5.2 The Demand for Labor by Occupation

5.2.1 Overview

As we noted in Section 3.3 the demand for labor is comprised of an expansion component and a replacement component. The expansion demand for labor is due to growth and change in the economy. Replacement demands are

generated as workers die, retire, move or change occupations. In Section 3.4 we developed three techniques to forecast the expansion demand, and we presented 1980 employment forecastions by industry. Below we examine the expansion demand for labor by occupation as derived from each industrial employment forecast. Following the expansion demand analysis we provide forecasts of replacement demand by occupation. Summing the expansion and replacement demands gives the total demand for labor by occupation for the forecast horizon 1974-1980.

5.2.2 Expansion Demand for Labor by Occupation

The purpose of this section is two fold: 1) to expain our technique for projecting the occupational demand for labor and 2) to present our 1980 occupational demand forecasts. In Section 3.4 we present three sets of 1980 employment forecasts by broad industrial categories which we generated by three methodologies; time trend, shift-share, and econometric. As we noted there each of the forecasting methodologies produced "reasonable" industrial employment forecasts. However, to be useful for VTE needs assessment forecasts of the demands for labor by industry must be translated into occupational forecasts. Below we discuss how this task was accomplished.

As we discussed above in Chapters II and III the Bureau of Labor Statistics has developed a methodology for translating industrial employment into occupational employment. This methodology was described above and in the Bureau's *Tomorrow's Manpower Needs* (1969). Since 1969, the Bureau's methodology has been institutionalized in the Occupational Employment Statistics (OES) program, a federal/state cooperative effort now operating in 33 states. As we explained in Chapter II the OES program has three parts, the collection of data by survey, the formulation of industry-occupation matrices based on the survey data, and the generation of occupational demand forecasts.

An industry-occupation matrix is a cross tabulation of 201 industrial employment categories by 440 occupational classifications (*Tomorrow's Manpower*

Needs, Supplement No. 4, 1974). As such the matrix gives the occupational staffing patterns by industries. The matrix was designed to allow the translation of demands for labor by industry into occupational demands. The matrix is general in its specification so that no specific methodology for generating industrial employment demands is required. Given the existence of an industry occupation matrix for the study region the translation into occupational demands is straightforward. The vector of employment demand for the 201 industries is simply multiplied by the industry-occupation matrix. In this study an industry-occupation matrix for the Jacksonville labor market area (Planning Region Four) was made available by the Flroida Department of Commerce, Division of Employment Security, Research and Statistics Division. Florida participates in the OES program and Florida's OES program is described in Tarr and Campbell (1975).

In developing our methodology for needs assessment we generated three sets of 1980 employment projections by industries (see Section 3.4). Using the industry-occupation matrix we can translate these forecasts into the demands for labor by occupations. Table 5.2.1 presents our 1980 forecasts of the demand for labor by occupation, and Table 5.2.2 provides the percentage distribution of employment by occupation derived from Table 5.2.1. In each table we included: a) forecasts generated by all three techniques, time trend, shift-share, and econometric, b) forecasts by the Florida Department of Commerce for the region in 1980, and c) actual 1970 occupational employment for the region to put the numbers in context.

We include the Florida Department of Commerce 1980 projections because they were produced using the standard BLS-prescribed methodology and offer some perspective on our forecasts. Although BLS uses the same industry-occupation matrix and the same technique for converting from industrial employment demand to occupational employment demand as we use, they employ a

Table: 5.2.1

Region 4: 1980 Occupational Employment Forecasts by Categories

	Actual 1970[1]	Florida Department of Commerce[2]	Time-Trend[3]	Shift-Share[4]	Econometric[5]
Total all occupations	232,671	339,690	328,996	349,200	324,352
Professional, technical, kindred	27,609	43,280	42,746	45,150	42,330
Engineers	2,040	2,580	3,522	4,391	3,581
Scientists	252	260	217	224	251
Mathematicians	65	90	91	86	80
Science technicians	2,081	2,910	3,234	3,316	3,373
Medical workers except technicians	2,115	5,840	3,855	4,949	3,824
Health technicians	707	1,870	1,288	1,697	1,284
Other technicians	1,116	1,180	1,625	1,149	1,571
Computer specialists	847	1,210	1,378	1,491	1,359
Social scientists	280	380	654	578	616
Teachers	9,360	13,010	12,260	12,040	12,129
Writers, artists, entertainers	2,125	3,280	3,503	3,309	3,554
Other professional	6,621	10,660	11,119	11,920	10,708
Managers, officials, proprietors	26,459	40,900	39,492	40,844	40,101
Buyers, sales, loan managers	5,374	8,500	8,061	8,330	8,293
Administrators, inspectors	3,518	3,590	4,798	4,618	4,469
Other managers	17,567	28,800	26,633	27,896	27,339
Sales workers	15,719	24,800	22,587	24,178	23,557
Clerical workers	55,493	76,620	79,595	87,713	81,566
Secretaries, typists	15,343	22,900	24,966	26,440	24,749
Office machine operators	2,784	3,220	3,427	3,628	3,549
Other clerical workers	37,366	50,490	51,202	57,645	53,268
Craftsmen, foremen, kindred	32,495	45,320	45,396	48,728	45,782
Construction craftsmen	9,435	14,740	15,371	17,034	15,572
Foremen, not classified	4,432	5,740	5,815	6,267	5,984
Metalworking craftsmen	1,987	2,290	2,509	2,882	2,795
Mechanics, repairmen	9,946	13,070	12,694	12,992	11,921
Printing craftsmen	1,112	1,400	1,295	1,542	1,399
Transportation, utility craftsmen	1,673	2,490	2,382	2,515	2,587
Other craftsmen	3,910	5,590	5,330	5,496	5,524
Operatives	29,175	36,510	34,459	35,148	33,224
Operatives except transport	18,231	22,740	20,124	22,142	21,120
Transport equipment operatives	10,944	13,330	14,335	13,006	12,104
Service workers	29,492	48,610	46,454	48,191	40,014
Cleaning service	5,403	10,000	7,445	8,116	7,612
Food service	8,481	12,920	10,645	10,794	10,458
Health service	1,926	7,660	3,938	5,416	3,936

continued . . .

Region 4: 1980 Occupational Employment Forecasts by Categories (continued)

	Actual 1970[1]	Florida Department of Commerce[2]	Time-Trend[3]	Shift-Share[4]	Econometric[5]
Service workers (continued)					
Personal service	3,155	7,030	4,066	3,635	4,049
Protective service	10,527	5,810	15,250	15,030	15,100
Private household	5,800	5,200	5,110	5,200	5,100
Laborers except farm	12,579	19,240	15,617	16,548	15,228
Farmers and farm workers	3,650	2,710	2,650	2,700	2,550
Farmers and farm managers	1,049	710	550	110	250
Farm laborers	2,601	2,000	2,100	2,590	2,300

Sources: [1]Our calculations using the 1970 Region 4 Industry-Occupation Matrix and the 1970 wage and salary employment for Region 4.

[2]Florida Department of Commerce, *Florida Employment Directions: Industries and Occupations 1970-1980, Planning District 4*, Tallahassee, Florida, 1976. *Note:* These are on a "total employment" basis.

[3]Our calculations using the 1980 projected employment totals from trend extrapolations and the Region 4 1980 Industry-Occupation Matrix.

[4]Our calculations using the 1980 employment projections from shift-share analysis and the Region 4 1980 Industry-Occupation Matrix.

[5]Our calculations using the 1980 employment projections from an econometric model and the Region 4 1980 Industry-Occupation Matrix.

Table: 5.2.2

Region 4: 1980 Percentage Distribution of Employment by Broad Occupational Categories

	Actual 1970[1]	Florida Department of Commerce[2]	Time-Trend[3]	Shift-Share[4]	Econometric[5]
Total all occupations	100.00%	100.00%	100.00%	100.00%	100.00%
Professional, technical, kindred	12.83	12.74	12.99	12.93	13.05
Engineers	1.03	0.76	1.07	1.26	1.10
Scientists	0.11	0.08	0.07	0.06	0.08
Mathematicians	0.03	0.03	0.03	0.02	0.02
Science technicians	0.88	0.86	0.98	0.95	1.04
Medical workers except technicians	0.90	1.72	1.17	1.42	1.18
Health technicians	0.03	0.55	0.39	0.49	0.40
Other technicians	0.47	0.35	0.49	0.33	0.48
Computer specialists	0.36	0.36	0.42	0.43	0.42
Social scientists	0.12	0.11	0.20	0.16	0.19
Teachers	4.90	3.83	3.73	3.45	3.74
Writers, artistis, entertainers	0.90	0.97	1.06	0.95	1.10
Other professional	2.81	3.14	3.38	3.41	3.30
Managers, officials, proprietors	11.25	12.04	12.00	11.70	12.36
Buyers, sales, loan managers	2.28	2.50	2.45	2.39	2.56
Administrators, inspectors	1.50	1.06	1.46	1.32	1.38
Other managers	7.47	8.48	8.10	7.99	8.43
Sales workers	6.68	7.30	6.87	6.92	7.26
Clerical workers	23.59	22.56	24.19	24.95	25.15
Secretaries, typists	6.52	6.74	7.59	7.57	7.63
Office machine operators	1.18	0.95	1.04	1.04	1.09
Other clerical workers	15.88	14.86	15.56	16.51	16.42
Craftsmen, foremen, kindred	13.81	13.34	13.80	13.95	14.11
Construction craftsmen	4.01	4.34	4.67	4.88	4.80
Foremen, not classified	1.88	1.69	1.77	1.79	1.84
Metalworking craftsmen	0.84	0.67	0.76	0.83	0.86
Mechanics, repairmen	4.23	3.85	3.86	3.72	3.68
Printing craftsmen	0.47	0.41	0.39	0.44	0.43
Transportation, utility craftsmen	0.71	0.73	0.72	0.72	0.80
Other craftsmen	1.66	1.65	1.62	1.57	1.70
Operatives	12.40	10.75	10.48	10.07	10.24
Operatives except transport	7.75	6.69	6.12	6.34	6.51
Transport equipment operatives	4.65	3.92	4.36	3.72	3.73
Service workers	12.52	14.31	14.12	13.80	12.34
Cleaning service	2.30	2.94	2.26	2.32	2.35
Food service	3.60	3.80	3.24	3.09	3.22
Health service	0.82	2.25	1.20	1.55	1.21

continued . . .

Region 4: 1980 Percentage Distribution of Employment by Broad Occupational Categories (continued)

	Actual 1970[1]	Florida Department of Commerce[2]	Time-Trend[3]	Shift-Share[4]	Econometric[5]
Service workers (continued)					
Personal service	2.99	2.07	1.24	1.04	1.25
Protective service	4.48	1.71	4.64	4.30	4.30
Private household	2.47	1.53	1.55	1.52	1.57
Laborers except farm	5.35	5.66	4.74	4.73	4.69
Farmers and farm workers	1.55	0.80	0.81	0.77	0.79
Farmers and farm managers	0.44	0.21	0.17	0.03	0.08
Farm laborers	1.11	0.59	0.64	0.74	0.71

Sources: [1]Our calculations using the 1970 Region 4 Industry-Occupation Matrix and the 1970 wage and salary employment for Region 4.

[2]Florida Department of Commerce, *Florida Employment Directions: Industries and Occupations 1970-1980, Planning District 4*, Tallahassee, Florida 1976. *Note:* these are on a "total employment" basis.

[3]Our calculations using the 1980 projected employment totals from trend extrapolations and the Region 4 1980 Industry-Occupation Matrix.

[4]Our calculations using the 1980 employment projections from shift-share analysis and the Region 4 1980 Industry-Occupation Matrix.

[5]Our calculations using the 1980 employment projections from an econometric model and the Region 4 1980 Industry-Occupation Matrix.

different forecasting procedure and a different concept of employment. First, BLS uses a regression model to forecast employment demands by industry. Their model represents a cross between an econometric model and a time trend model. A typical BLS employment equation would take the form:

$$E_{ijt} = f(E_{iust}, Pop_{jt}, Time)$$

where: E = employment, Pop = population, Time = time, i = industry identifier, j = region identifier, us = U.S. economy, and t = time identifier.

A regression equation of this type is estimated for each of the 201 industrial categories. This is not a behavioral-based approach as in the econometric model but rather it is a forecasting equation like our time trend technique. A further similarity of time trend and BLS procedures is that neither technique allows for the interaction of an industry on another. This is so because all the explanatory variables in both models are determined outside the models. No equation links developments in one local industry to the developments in another in these models.

The second difference is in the concept of employment. In our work we have used reported wage and salary data (ES 202) exclusively because this data series is consistent over time and is quite reliable. BLS uses a concept called "total employment." In Technical Paper No. 1 (1970) BLS describes the total employment concept and provides methodology for conversion from wage and salary employment to total employment. Total employment includes wage and salary employment and makes adjustments to wage and salary employment to account for: a) unpaid absences, b) multiple job holders, c) self-employed, and d) unpaid family workers. In concept this seems appropriate and more inclusive than wage and salary employment, but it is difficult to put into practice. Problems arise because the data on each of the four adjustment categories is sketchy. Furthermore, wage and salary workers account for over 95 percent of total employment based on our analysis. In addition, for

purposes of VTE assessment a wage and salary concept is more appropriate since few VTE graduates will be self-employed or unpaid family workers. Finally, since the ES 202 wage and salary data is pretty hard and the BLS adjustments are of questionable accuracy, we chose to use the wage and salary concept in this study. Fortunately, industry-occupation matrices are available for wage and salary workers, so our choice of an employment concept did not pose any problems.

Inspection of Table 5.2.1 demonstrates that the total 1980 occupational demand for labor forecasts are clustered quite tightly. Shift-share provides the highest forecast of 349,200 and the econometric model provides the lowest, 324,352. However, the range is less than 10 percent. Looking at the broad occupational categories we note a 10 percent range in forecasted demands for sales workers, laborers, and operatives. There is a 7 percent range in the clerical forecasts largely explained by differences in the projected demands for secretaries, and a 7 percent range in the craftsmen forecasts due to variations in the forecasts for construction craftsmen. Finally, a 5 percent range exists for the demands for service workers with the largest disparity in the category of protective workers.

Table 5.2.2 displays the projected 1980 percentage distribution of occupational employment derived from Table 5.2.1. As we can see even 1 percent disparities among the 1980 projected percentage distributions are rare and exist only for service workers (where a 2 percent difference is recorded), laborers, and clerical workers. Comparisons with the actual 1970 percentage distributions of occupations do not reveal any dramatic changes forecasted for 1980. Occupational structures change rather slowly. Those employed as operatives and farmers are projected to represent a smaller share of total occupational employment while those employed as clerical workers, managers, and sales workers will constitute a relatively larger share.

Table: 5.2.3

Region 4: Projected Average Annual Expansion Demands for Labor by Occupation

	Florida Department of Commerce[1]	Time Trend[2]	Shift-Share[3]	Econometric[4]
Total all occupations	9,330	9,052	11,073	9,215
Professional, technical kindred	1,560	1,514	1,753	1,474
Engineers	50	148	235	154
Scientists	0	-3	-3	0
Mathematicians	0	3	2	2
Science technicians	110	115	124	129
Medical workers except technicians	260	174	283	171
Health technicians	120	58	99	58
Other technicians	40	51	3	46
Computer specialists	50	53	64	51
Social scientists	20	37	30	34
Teachers	360	290	268	277
Writers, artists, entertainers	130	138	118	143
Other professional	420	450	530	409
Managers, officials, proprietors	1,410	1,304	1,439	1,364
Buyers, sales, loan managers	310	269	296	292
Administrators, inspectors	120	128	110	95
Other managers	980	907	1,033	977
Salesworkers	860	697	846	784
Clerical workers	2,430	2,410	3,223	2,608
Secretaries, typists	890	962	1,110	941
Office machine operators	60	64	84	77
Other clerical workers	1,480	1,384	2,028	1,590
Craftsmen, foremen, kindred	1,020	1,290	1,625	1,329
Construction craftsmen	350	594	760	614
Foremen, not classified	120	138	184	155
Metalworking craftsmen	20	52	90	81
Mechanics, repairmen	300	275	305	198
Printing craftsmen	20	18	43	29
Transportation, utility craftsmen	60	71	84	91
Other craftsmen	150	142	159	161

continued . . .

Table: 5.2.3

Region 4: Projected Average Annual

Expansion Demands for Labor by Occupation (continued)

	Florida Department of Commerce[1]	Time Trend[2]	Shift-Share[3]	Econometric[4]
Operatives	500	528	597	405
Operatives except transport	270	189	391	289
Transportation equipment operatives	230	339	206	116
Service workers	1,370	1,115	1,289	1,096
Cleaning service	340	204	271	221
Food service	310	216	231	198
Health service	400	201	349	201
Personal service	190	91	48	89
Protective service	-100	-69	-60	-70
Private household	230	472	450	457
Laborers except farm	270	304	397	265
Farmers and farm workers	-90	-110	-95	-110
Farmers and farm managers	-20	-50	-94	-80
Farm laborers	-70	-60	-1	-30

Sources: [1]Florida Department of Commerce, *Florida Employment Directions: Industries and Occupations 1970-1980, Planning District 4*, Tallahassee, Florida 1976. *Note:* these are on a "total employment" basis.

[2]Our calculations using the 1980 projected employment totals from trend extrapolations and the Region 4 1980 Industry-Occupation Matrix.

[3]Our calculations using the 1980 employment projections from shift-share analysis and the Region 4 1980 Industry-Occupation Matrix.

[4]Our calculations using the 1980 employment projections from an econometric model and the Region 4 1980 Industry-Occupation Matrix.

The expansion demand for labor represents demands due to growth and change in the economy. We can readily convert our 1980 total occupation demand forecasts as presented in Table 5.2.1 into expansion demands. This is done by subtracting a base year set of data from our 1980 forecast totals. In Table 5.2.3 we show projected average annual expansion demands for labor by occupation for each of our projection techniques. These average annual demands were developed by subtracting the projected 1980 total from 1970 occupational employment and dividing by ten. Such a procedure implies that the change in demand over the ten year period will occur in a steady fashion. Given the cyclical nature of our economy this type of projection must be used with care in forecasting from year to year. Changes due to business conditions must be allowed for. However, we believe our projections will be reasonably accurate over a four year period. Once again we note that the projections are clustered rather tightly. Differences that do exist are the same as those identified in the discussion of Table 5.2.1.

The expansion demand for labor represents approximately 50 percent of the total demand for labor. The remaining 50 percent is due to replacement needs. Workers retire, change occupations, move, or otherwise leave the labor force, and they must be replaced. We turn next to a discussion of replacement demand.

5.2.3 Replacement Demand for Labor by Occupation

BLS has developed a methodology for estimating replacement demands (*Tomorrow's Manpower Needs*, Supplement No. 4, 1974). We described this procedure and discussed its strengths and weaknesses in Chapters II and III. We briefly review that discussion below. Then we examine some tests BLS has made of its methodology, and we compare the BLS separation rates to 1970 Census data on the age structure of occupational employment in Region Four.

We conclude this section by presenting our 1980 forecasts of the demand for labor by occupation.

The need to replace workers who leave their occupations is clear. Such separations from the labor force can be ascribed to many factors including death, retirement, occupational mobility, geographic mobility, and family responsibilities. For the U.S. as a whole job openings due to separations are estimated to be twice as numerous as those due to growth (*Tomorrow's Manpower Needs*, Supplement No. 4, 1974, p. 2). Even for a fast growing state such as Florida replacement demand is estimated to account for one half of all job openings (Tarr and Campbell, 1975). BLS has developed a procedure for estimating replacement demands. The procedure only accounts for separations due to deaths and retirement for males and due to death, retirement and family responsibilities for females. The separation rates are based on tables of working life. BLS has developed a series of separation rates for each of the 440 industry-occupation matrix categories. Each state has its own set of these separation rates specificially tailored for it to reflect the age structure of employment with the state.

This BLS procedure for calculating separtation rates (*Tomorrow's Manpower Needs*, Supplement No. 4, 1974) is a great improvement over the original 1969 procedure which used national separation rates in each state instead of state specific separation rates. Research has shown that the use of national separation rates result in seriously biased estimates of separations for many occupations in states whose age structures differ significantly from the national average (Supplement No. 4, loc cit.). However, even the current procedure has some serious limitations. Occupational mobility and geographic mobility are not accounted for. Furthermore, the death and retirement rates are based on tables of working life, and they are not occupational specific. The same age specific separation rates are applied to the area's age

distribution of each occupation as if mortality and retirement do not differ by occupation. Retirement patterns and mortality rates do differ significantly among occupations, and tables of working life need to be developed which are occupationally specific.

Although the BLS procedure has its limitations, it is the best available methodology for calculating separations and hence replacement demands. We have used the BLS separation rates in our forecasting work. The Florida Department of Commerce has published separation rates for Region Four using the BLS methodology in *Florida Employment Directions* (1976), and we have reproduced their projections in Table 5.2.4. Given its limitations the replacement estimates will be on the conservative side and should be viewed as lower bounds.

We were unable to locate any empirical tests which evaluate the accuracy of BLS methodology based on separation rates for forecasting the replacement demand for labor. To check the reasonableness of the average annual replacement demands reported in Table 5.2.4 we compared them to the age structure of the labor force by occupation as reported in the 1970 Census. In Table 5.2.5 we have provided some illustrative data on the number of workers 45 years old and over by occupation who were employed in 1970. Since separation or replacement demand is based on death and retirement of those employed, this data provides a base line for comparison. As we would expect if the figures for the annual average separations are summed over the ten year forecasting horizon, they exceed the total number of workers 45 years old or older. This is reasonable since younger workers can also be expected to leave the labor force for various reasons. Furthermore, the separations look reasonable compared to the base line data. Finally, the relatively high number of separations for clerical workers and craftsmen reflect the age and sex distributions of these occupations.

Table: 5.2.4

Average Annual Job Openings Due to Separations in Region Four by Broad Occupational Categories

Total all occupations	12,830
Professional, technical and kindred workers	1,590
Engineers	40
Scientists	10
Mathematicians	0
Science technicians	60
Medical workers except technicians	260
Health technicians	100
Other technicians	20
Computer scientists	20
Social scientists	10
Teachers	620
Writers, artists, entertainers	100
Other professional	360
Managers, officials, proprietors	1,270
Buyers, sales, loan managers	230
Administrators and inspectors	110
Other managers	930
Salesworkers	1,110
Clerical workers	4,160
Secretaries and typists	1,480
Office machine operators	150
Other clerical workers	2,530
Craftsmen, foremen, kindred	860
Construction craftsmen	290
Foremen, not classified	120
Metalworking craftsmen	40
Mechanics, repairmen	210
Printing craftsmen	30
Transportation, utility craftsmen	20
Other craftsmen	150
Service workers	2,460
Cleaning service	480
Food service	600
Health service	450
Personal service	390
Protective service	200
Private household	340
Laborers except farm	410
Farmers and farm workers	90
Farmers and farm managers	30
Farm laborers	60

Source: Florida Department of Commerce, *Florida Employment Directions 1970-1980*, Tallahassee, Florida, 1976.

Table: 5.2.5

Region 4: 1970 Age Distribution of the Labor Force by Occupational Category

	Male				Female			
	45-54	55-64	65+	Median	45-54	55-64	65+	Median
Total all occupations	25,635	15,234	4,034	40.0	16,184	9,185	2,597	38.1
Professional, technical, kindred	2,744	1,443	476	39.3	2,157	1,283	373	37.9
Managers, officials, proprietors	4,137	2,404	639	44.3	917	636	142	46.2
Salesworkers	2,575	1,387	542	40.6	1,552	973	326	42.0
Craftsmen	6,596	3,749	647	41.0	335	186	65	41.8
Operatives	3,544	2,069	343	37.3	1,161	653	151	40.9
Clerical workers	2,421	1,305	459	38.6	5,860	2,650	600	34.2
Service workers	1,835	1,495	646	40.3	2,538	1,547	457	38.2
Laborers except farm	1,556	1,174	201	32.5	196	81	25	38.6
Farmers and farm workers	68	51	33	49.2	24	17	23	52.7

Source: U.S. Department of Commerce, 1970 Census of Population, Sixth Count Summary Tape.

Table: 5.2.6

Region 4: Projected Average Annual

Job Openings or Requirements by Occupation

	Florida Department of Commerce[1]	Time Trend[2]	Shift-Share[3]	Econometric[4]
Total all occupations	22,160	21,882	23,903	22,045
Professional, technical kindred	3,150	3,144	3,374	3,104
Engineers	90	188	275	194
Scientists	0	-3	-3	0
Mathematicians	0	3	2	2
Science technicians	170	225	234	239
Medical workers except technicians	520	434	534	431
Health technicians	220	158	199	158
Other technicians	60	71	23	66
Social scientists	30	47	40	44
Computer specialists	70	63	74	61
Teachers	980	910	888	897
Writers, artists, entertainers	230	238	218	243
Other professionals	780	810	890	769
Managers, officials, proprietors	2,680	2,574	2,709	2,634
Buyers, sales, loan managers	540	499	526	522
Administrators, inspectors	230	238	220	205
Other managers	1,910	1,837	1,963	1,907
Salesworkers	1,970	1,807	1,956	1,894
Clerical workers	6,590	6,570	7,382	6,768
Secretaries, typists	2,370	2,442	2,590	2,421
Office machine operators	210	214	234	227
Other clerical workers	4,010	3,914	4,558	4,120
Craftsmen, foremen, kindred	1,880	2,150	2,485	2,189
Construction craftsmen	640	884	1,050	904
Foremen, not classified	240	378	304	275
Metalworking craftsmen	60	92	130	121
Mechanics, repairmen	510	485	515	408
Printing craftsmen	50	48	73	59
Transportation, utility craftsmen	80	91	104	111
Other craftsmen	300	292	309	311

continued . . .

Table: 5.2.6

Region 4: Projected Average Annual

Job Openings or Requirements by Occupation (continued)

	Florida Department of Commerce[1]	Time Trend[2]	Shift-Share[3]	Econometric[4]
Operatives	1,380	1,408	1,477	1,285
Operatives except transport	920	839	1,041	939
Transportation equipment operatives	460	569	436	346
Service workers	3,830	3,575	3,749	3,556
Cleaning service	820	684	751	701
Food service	910	816	831	798
Health service	850	651	799	651
Personal service	580	481	438	479
Protective service	430	672	650	657
Private household	240	271	280	270
Laborers except farm	680	714	807	675
Farmers and farm workers	0	-20	-5	-20
Farmers and farm managers	10	-20	-64	-50
Farm laborers	-10	0	59	30

Sources: [1]Florida Department of Commerce, *Florida Employment Directions: Insustries and Occupations 1970-1980, Planning District 4*, Tallahassee, Florida 1976. *Note:* these are on a "total employment" basis.

[2]Our calculations using the 1980 projected employment totals from trend extrapolations and the Region 4 1980 Industry-Occupation Matrix.

[3]Our calculations using the 1980 projections from shift-share analysis and the Region 4 1980 Industry-Occupation Matrix.

[4]Our calculations using the 1980 employment projections from an econometric model and the Region 4 1980 Industry-Occupation Matrix.

To calculate the total demand for labor by occupation we must sum the projected number of separations and the expansion demand. In Table 5.2.6 we display our 1980 forecasts of the demand for labor by occupation. Four forecasts are included in the table. We generated three forecasts using each of our projection techniques, time trend, shift-share, and econometric. We also have included the Florida Department of Commerce projections. Once again we note that the alternative projections are clustered quite tightly. As before shift-share provides the highest projection for total average annual job openings, 23,903, and time trend produces the smallest, 21,882, for a range of approximately 10 percent. The range among the alternative forecasts for the occupational categories is also narrow, usually less than 10 percent.

5.3 The Occupational Supply of Labor

5.3.1 Introduction

Forecasts of the supplies of labor by occupation are extremely rate. In fact, the supply of labor is often totally ignored in the labor manpower literature. This lack of attention to supply side phenonena is not limited to the labor/manpower field but is prevalent in most regional and national models. Typically attention is lavished on the demand side of most models (see Section 2.4) while the supply side is ignored or assumed to be perfectly elastic in its responses. A particularly relevent case in point is the BLS methodology of *Tomorrow's Manpower Needs* (1969). Great attention is given to assessing future manpower needs, or demands, by occupation, but no procedures are developed to measure the future supplies of labor by either occupation or industries.

Recently attempts have been made to develop methodologies for forecasting the occupational supplies of labor. As we discussed above in Chapter III, Tarr and Campbell (1975) have formulated a procedure for supply forecasting. Their procedure requires a careful analysis of each of the many sources of entry to

an occupation including formal schooling, on-the-job training, inmigration, occupational mobility, and exmilitary. This is a most difficult job given the total lack of data on occupational mobility, on-the-job training, and exmilitary personnel. Perhaps in the future as more complete data becomes available this logical procedure can be implemented.

Faced with the need to develop 1980 occupational supply forecasts, we developed an alternative procedure which we discribed in Section 3.8. We present our 1980 occupational supply forecasts below.

5.3.2 1980 Forecast of the Supply of Labor by Occupation

Table 5.3.1 presents our 1980 forecast of the supplies of labor by broad occupational categories. These projections represent the first set of occupational labor supply forecasts produced for a substate area. The forecast was made using the shift-share procedure discussed in Section 3.8. We should note here that the forecast was not formulated by a mechanistic application of the shift-share procedure. When forecasts of any of the 440 detailed occupations produced what was felt to be unreasonable estimates (i.e. growth rates of over 200 percent or zero or even negative supplies), a further analysis was undertaken and judgement applied. This occurred in perhaps 20 percent of the total number of occupations.

It is difficult to assess the accuracy of our supply estimates because there is no hard data to compare them against. However, we can state that the supply estimates seem most reasonable for two reasons. First, we have forecasted a 1980 occupational labor supply total of 355,657. This total was built up from the forecasts of each of the 440 odd detailed occupations. By contrast in Section 3.4 when we were evaluating the reasonableness of our employment forecasts by industry, we estimated the total labor supply for Region Four by an alternative procedure. In that instance we noted the following: a) the area's labor force participation rate in 1975 was 42 percent,

Table: 5.3.1

Region 4: 1980 Occupational Supply Forecast by Broad Occupational Categories

Total all occupations	355,657
Professional, technical, and kindred workers	43,029
Engineers	3,598
Scientists	423
Mathematicians	83
Science technicians	3,378
Medical workers except technicians	3,836
Health technicians	1,518
Other technicians	1,214
Computer scientists	1,435
Social scientists	290
Teachers	15,187
Writers, artists, entertainers	3,276
Other professional	8,791
Managers, officials, proprietors	42,384
Buyers, sales and loan managers	8,765
Administrators and inspectors	3,774
Other managers	29,845
Sales workers	33,733
Clerical workers	83,636
Secretaries and typists	21,194
Office machine operators	4,659
Other clerical workers	57,783
Craftsmen, foremen, kindred	49,008
Construction craftsmen	15,019
Foremen, not classified	5,630
Metalworking craftsmen	2,495
Mechanics, repairmen	14,959
Printing craftsmen	1,200
Transportation, utility craftsmen	2,619
Other craftsmen	7,086
Operatives	37,472
Operatives except transport	23,339
Transport equipment operatives	14,133
Service workers	47,335
Cleaning service	7,323
Food service	10,450
Health service	5,216
Personal service	4,368
Protective service	13,470
Private household	6,508
Laborers except farm	15,949
Farmers and farm workers	3,111
Farmers and farm managers	815
Farm laborers	2,296

b) the Bureau of Economic and Business Research at the University of Florida forecasts that 1980 population in the area will be 847,100, c) if we assume a constant labor force participation rate of 42 percent, then the 1980 labor force would equal 355,782. The correspondence between these two total labor supply estimates is remarkable and gives us some confidence in our supply methodology.

As a second test for reasonableness we compared our supply projections with our demand forecasts. Such comparisons are interesting for purposes beyond checking our supply forecasts, and we will examine the implications of our 1980 supply and demand forecasts of labor by occupation in Section 5.4 below. Here we wish to note that if comparisons of forecasted manpower demands and supplies were widely diveregent, this would be a cause for concern. Table 5.3.2 presents our projected 1980 unemployment rates by occupation. These were calculated using the 1980 occupational supply projections from Table 5.3.1 and the occupational demand projections from Table 5.2.1. Negative signs in the table indicate a condition of excess demand for an occupational category. For the great majority of occupations our forecasts of excess demand or supply (expressed as unemployment rates in Table 5.3.2) seem reasonable.

To interpret the projections in Table 5.3.2 we need to recall the discussion of labor market concepts (Chapter III) in general and our analysis of the concept of a job opening in particular. To review a bit, the notion of a job opening is <u>not</u> the same as a job vacancy. On the one hand, a job vacancy exists only when an employer is willing and actively seeking to hire workers. On the other hand, a job opening (excess demand for labor in a particular occupational category) involves one of five related concepts.

1. *requirements*: equal to expansion demand plus replacement demand and recorded in Table 5.2.6 for Region Four in 1980,

Table: 5.3.2

Region 4: Projected Unemployment Rates by Broad Occupational Categories

	Florida Department of Commerce	Time Trend	Shift-Share	Econometric
Total all occupations	4.49	7.50	1.82	8.80
Professional, technical kindred	-0.58	0.66	-4.93	1.62
Engineers	28.29	2.11	-22.04	0.47
Scientists	38.53	48.70	47.05	40.66
Mathematicians	-8.43	-9.64	-3.61	3.61
Science technicians	13.85	4.26	1.84	0.15
Medical workers except technicians	-52.25	0.50	-29.01	0.31
Health technicians	-23.19	15.15	-11.79	15.42
Other technicians	2.80	-33.86	5.35	-29.40
Computer scientists	15.68	3.97	-3.90	5.30
Social scientists	-31.03	-125.52	-99.31	-112.41
Teachers	14.33	19.27	20.72	20.14
Writers, artists, entertainers	-0.12	-6.93	-1.01	-8.49
Other professionals	-21.26	-26.48	-35.59	-21.81
Managers, officials, proprietors	4.52	7.80	4.65	6.38
Buyers, sales, loan managers	3.02	8.03	4.96	5.39
Administrators, inspectors	4.88	-27.13	-22.36	-18.42
Other managers	3.50	10.76	6.53	8.40
Salesworkers	26.48	33.04	28.33	30.17
Clerical workers	8.39	4.83	-4.87	2.48
Secretaries, typists	-8.05	-17.80	-24.75	-16.77
Office machine operators	30.89	26.44	22.13	23.82
Other clerical workers	12.62	11.39	0.24	7.81
Craftsmen, foremen, kindred	7.53	7.37	0.57	6.58
Construction craftsmen	1.86	-2.34	-13.42	-3.68
Foremen, not classified	-1.95	-3.29	-11.31	-6.29
Metalworking craftsmen	8.22	-0.56	-15.51	-12.02
Mechanics, repairmen	12.63	15.14	13.15	20.31
Printing craftsmen	-16.67	-7.92	-28.50	-16.58
Transportation, utility craftsmen	4.93	9.05	3.97	1.22
Other craftsmen	21.11	24.78	22.44	22.04

continued . . .

Table: 5.3.2

Region 4: Projected Unemployment Rates by Broad Occupational Categories (continued)

	Florida Department of Commerce	Time Trend	Shift-Share	Econometric
Operatives	2.57	8.04	6.20	11.34
Operatives except transport	2.57	13.76	5.13	9.51
Transportation equipment operatives	5.68	-1.43	7.97	14.36
Service workers	-2.69	1.86	-1.81	2.28
Cleaning service	-36.56	-1.67	-10.83	-3.95
Food service	-23.64	-1.87	-3.29	-0.08
Health service	-46.86	24.50	-3.83	24.54
Personal service	-60.94	6.91	16.78	7.30
Protective service	56.86	-13.21	-11.58	-12.10
Private household	20.09	21.48	20.10	21.63
Laborers except farm	-20.63	2.08	-3.76	4.52
Farmers and farm workers	12.89	14.82	13.21	18.03
Farmers and farm managers	12.88	32.52	86.50	69.33
Farm laborers	12.89	8.54	-12.80	-0.17

Source: Our calculations using data from Tables 5.2.1 and 5.3.1.

2. *availables*: representing the forecasted level of labor supply and recorded in Table 5.3.1 for Region Four in 1980,
3. *outcomes*: the difference between 1 and 2 above, i.e. availables minus requirements, and recorded in Table 5.3.2 as percentages (availables-requirement/available) for Region Four in 1980,
4. *outcomes with responses*: takes into account the expected responses of employers and workers to the forecasts, and
5. *actuals*: refers to the final reconciliation of outcomes and responses (Stevens, 1976).

Our projections of unemployment by occupation in Table 5.3.2 represents the concept of outcomes. It does not allow for the responses by employers and workers to condition of excess demand or supply. This characteristics, of course, limits the usefulness of our occupational unemployment rates. Since we have estimated future job openings in terms of outcomes, we have implicitly denied the possibility of any interaction between the demand and supply sides of our model. Such interactions would take many forms including changes in the structure of relative wages, adjustments in working conditions, geographic migration, and occupational changes. However, a model which would be sophisticated enough to handle such labor market trends, i.e. one which could analyze job openings in terms of outcomes with responses or actuals, is beyond the scope of this project and perhaps beyond the state of the art in manpower forecasting. Furthermore, projections of outcomes with responses or actuals depends upon an analysis of supply side estimates which have not existed before.

Since our estimates represent outcomes, i.e. a comparison of supply and demand projections without further labor market adjustments, they should be viewed as a sophisticated indicator of future labor market conditions. Our

estimates are based on past trends and relationships. Without allowing for the interaction of supply and demand forces to future events such as large excess demands or supplies for an occupation, our results must be used judiciously. For example, in 1980 we really do not expect office machine workers in Region Four to experience a 20 percent to 30 percent unemployment rate which are the projections reported in Table 5.3.2 Labor markets appear to adjust (with some lag to be sure) to disequilibrium, and conditions of work and the like will be affected. Such changes will aid in the adjustment process. This should be interpreted in the following way. If past trends and relationships hold true in 1980 (or change as they have been changing) and if there was no interaction between labor demand and supply, then between 20 percent to 30 percent of the people who wished to be hired as office machine operators would be unemployed. The practical significance of this projection is straightforward; we should exercise great caution in allocating large public resources to train office machine operators for Region Four.

Although our unemployment projections are limited as we have described, they do represent a large step forward. We have produced the first set of supply forecasts, and the first set of unemployment projections which are occupationally specific for a regional economy. We believe that this type of information is important for effective VTE planning. Such projections can contribute to VTE programming and planning by gauging the future state of the regional labor market and assessing the role of VTE in that labor market. In the next section we elaborate on how these projected unemployment rates by occupation can be related to VTE programs and the implications for VTE planning.

5.4 Implications for Vocational and Technical Education

Our 1980 projections of unemployment rates are in terms of occupations. As such they provide valuable information on future labor market trends, However, further analysis is needed to make these projections a useful input for VTE

planning. More specifically, we need to examine the implications of our occupational demand and supply projections for VTE programs. Ideally a crosswalk or mapping procedure which would relate specific occupations to specific VTE programs is needed.

Indeed, one of the most complex and often-mentioned problems facing VTE planners is how to use available occupational information to set planning priorities. Occupational forecasts are difficult to interpret due to the occupational and geographic mobility of workers as the labor markets adjust to discrepancies between supplies and demands (actuals in our terminology) and due to limitations in the forecasting art. Even more important, however, is the fact that the occupational classification system differs significantly from the educational classification system. This makes a systematic matching of labor market trends to VTE program outputs a difficult (but necessary) task.

Unfortunately, the exising classification systems do not permit a clear cut mapping of categories from one system to another. The major barrier which precludes a perfect meshing of manpower forecasts and educational programs is that the various classification systems were developed for different purposes. The VTE classification codes were developed to: a) standardize the reporting of educational statistics, b) facilitate educational planning, and c) simplify terminology. Since instructional programs are designed to provide skill training in a number of related subjects, they often include a variety of occupations. By contrast, the occupational classification system used in manpower forecasting under the OES program is based on the Census Bureau's classification scheme. This system was formulated to identify particular jobs which require extensive training or in which a large number of people are employed. In some ways it is unfortunate that the cluster of jobs included in an occupational title differs from the cluster of jobs under an instructional program.

The Bureau of Labor Statistics has been sensitive to this problem, and they have recently completed an important study in this regard. A revised supplement no. 3 to the four volume *Tomorrow's Manpower Needs* (1969) entitled *Matching Occupational Classifications to Vocational Education Program Codes* (1975) has been published. The document provides conversion tables for translating occupational titles into VTE program codes. However, the report notes that the conversion tables are "... only a temporary aid for those concerned with matching the various occupational classification systems. The final clarification of occupational classification systems awaits the completion of the Standard Occupational Classification System sponsored by the Office and Management and Budget (p. 2)."

The BLS matching procedure utilizes the *Dictionary of Occupational Titles* (U.S. Department of Labor, 1965) classification system as a bridge between the OES matrix information and VTE program codes. The linkage between VTE program codes and the *Dictionary of Occupational Titles* was worked out in 1969 (*Vocational Education and Occupations*). Since the OES matrix categories are nearly identical to those in the *Dictionary of Occupational Titles*, no conversion problems occur with regard to linking the OES categories and those in the *Dictionary of Occupational Titles*. This BLS publication (1975) provides an effective crosswalk between VTE program codes and the OES matrix. We shall make use of this crosswalk in our analysis below.

Some caveats are in order before we present our projections and their implications for VTE programs. First, we remind the reader that our purpose here is to develop a needs assessment methodology. We illustrate our methodology and provide a preliminary test of it using actual data from the Jacksonville area labor market. Thus, as before our projections should be viewed as illustrative. We believe that the forecasted trends are useful and reasonably accurate. However, further testing and refinement is called for before they can be safely used for program planning. Second, the basic underlying assumption of our forecasting

procedures are that past trends are a reasonable guide to future events. Both our demand and supply forecasts are based upon the assumption that no dramatic new developments will occur over the forecasting horizon. For example, a major start up and expansion of the Offshore Power Systems project alluded to in Chapter IV would probably affect labor market conditions in the region in ways not accounted for in our projections. Third, the BLS conversion table is still rather crude as the experienced VTE administrator will quickly notice. The table needs to be further disaggregated along VTE program lines to be more useful.

Even with these limitations we have provided the first set of comprehensive occupational supply and demand forecasts for a regional economy. Furthermore, we have carefully translated our occupational forecasts into VTE program codes to maximize their practical usefulness.

In Table 5.4.1 we display the relationship of our 1980 occupational demand and supply forecasts to VTE programs in Region Four. In the first column of the table we have listed the VTE program code as defined by the U.S. Office of Education (*Vocational Education and Occupations*, 1969). The second column provides the name of the instructional program. Column three shows the estimated 1976 employment by occupations. The source for this data was *Florida Employment Directions 1970-1980* (1976) produced by the Florida Department of Commerce and discussed above. We remind the readers that these estimated 1976 occupational employment figures are based upon the BLS concept fo "total employment." Although these 1976 figures are not strickly comparable to the 1980 projections, they do provide a useful baseline, and a point of reference for comparison.

The following two columns depict our 1980 projections of labor demand. The total 1980 demand figure represents the sum of expansion plus replacement needs. In Section 5.2 we presented three sets of occupational demand projections. To avoid cumbersome repetition we have selected our econometric projections for use in Table 5.4.1 and for further analysis. Our rationale is two fold. First, we have

the most confidence in our econometric procedure because it is the most flexible and sophisticated tool. We shall elaborate further on this point in our conclusions. Second, the econometric projections are the most conservative estimates of demand. Expansion and replacement demands listed in column 4 were calculated as the difference between 1980 projected total demand and the estimated 1976 level of occupational employment. This is a valid procedure since the projected total 1980 employment needs in column 5 represents both expansion and replacement needs. These estimates of expansion and replacement needs will also be on the conservative side because the 1976 estimates are based on the total employment concept while the 1980 figures use the wage and salary concept. For VTE programs this is of quite limited significance since the vast majority of occupations in which VTE graduates find employment are of the wage and salary type.

Columns 6 and 7 in Table 5.4.1 show the output of VTE programs. The 1975 output data in column 6 refers to VTE program completions in school year 1974-75. This unpublished data was graciously provided by the Florida Department of Education. The 1980 output figures are estimates based on existing enrollments in grades 10-12 and current completion rates. They are based on the strict assumption that VTE program configurations will not change over time. Any such changes would require corresponding modifications in column 7.

The final column of the table provides our projections of the labor supply in 1980. We have taken out occupation supply projections discussed in Section 5.3 and translated them into VTE program codes using the BLS 1976 crosswalk.

To illustrate the use of Table 5.4.1 we will examine a few health related occupations. For instance, in 1976 it is estimated that 190 persons will work in Region Four as dental hygienists. By 1980 our econometric model forecasts that 265 dental hygienists will be needed to satisfy the market demand for this occupation. This represents a net increase of 75 positions due to a combination of replacement and expansion needs. The Florida Department of Education reported

that 15 students completed courses in dental hygiene in 1975 in Region Four. Looking at the enrollment data for this course of instruction we estimate that 15 completions per year will occur between 1976 and 1980. If we further assume that all of the new graduates seek employment in their occupation in Region Four, this will add 60 new hygienists to the supply pool by 1980. Given the continuation of past trends over the next four years we expect the supply for dental hygienists will equal 200 by 1980.

Two implications can be drawn from these figures on dental hygienists. First, if past trends continue unchanged by policy reponses or other ajustments in the labor market, we expect there will be an excess demand for dental hygienists in Region Four. Second, this potential excess demand condition can serve as an indicator to VTE administrators. It identifies an area for possible program expansion. Such projections by themselves are not sufficient evidence, but they are sophisticated indicators of needs. If the placement and follow up records of recent graduates of the dental hygiene program are strong and spot checking in the labor market corroborates the projections, then an expansion of the program should be investigated.

As another example let us examine the projections for practical vocational nursing. In 1976 the Florida Department of Commerce estimated that 2,540 persons were employed in this occupation. Our 1980 supply projection listed in column 8 appears to be in conflict because it equals only 2,186. We remind the reader that the Department of Commerce uses the "total employment" concept whereas we use the wage and salary approach to measuring employment. This difference is particularly important in the health professions becuase the adjustment procedures used by BLS to inflate the wage and salary employment to total employment is quite weak. *Technical Paper No 1* (1973, p. 21-24) discusses the weaknesses and limitations of the BLS adjustments in the health professions. We prefer not to use the total employment concept.

Our projections indicate significant excess demand for this occupation by 1980 since demand is forecast 2,570 and supply at 2,186. 1975 completions were only 16 and we foresee 55 new entrants if present programs are continued. Again, our table has identified an area for further investigation.

For a third illustration of the table let us analyze the distributive education program in automotive sales. 13,430 were reported working in the occupation in 1976. By 1980 we projected total employment needs of 13,695 for a net increase of 265. VTE program completions were low in 1974-75, and we project 15 new program completors by 1980. This small number of completions is consistent with our projections of labor market conditions in this occupational category. We forecast substantial excess supply of labor here, and VTE programs in Region Four seem to be designed properly in that they are not offering much training in this field.

At this point many of the strengths and weaknesses of Table 5.4.1 are evident. First, the table is somewhat crude in its translation of labor market information by occupation into VTE program codes. The main problem is that the classification schemes used in labor market analysis and in education are quite different. Since the mapping from one to the other is not perfect, some occupational categories are included with more than one VTE program. There is no standardized procedure to allocate the occupational category among VTE programs at this time. Second, not every VTE peogram has a corresponding occupational category. Such VTE programs were excluded from the BLS crosswalk and can not be analyzed.

On the positive side Table 5.4.1 represents an advance over previous analyses. It is an attempt to gain a comprehensive, labor market wide, analysis of VTE's role and impact. Estimates of supply and demand for labor by occupations are laid out in a logical pattern. This labor market information is carefully translated into a VTE program context, so it is useful to VTE administrators and planners. Using the table one can quickly identify programs which are not consistent with local labor market trends. Such programs warrant further examination.

Table 5.4.1 is the culmination of our analysis of Region Four's labor market. We have examined: a) prospects for growth and change, b) 1980 forecasts of supply and demand for labor by occupations, and c) the implications of our analysis of the labor market for VTE programs in Region Four. We have taken a long stride towards our goal of developing a needs assessment methodology. We believe that labor market information presented as in Table 5.4.1 can make a contribution to more effective VTE programming. However, our work is incomplete at this point. We have yet to examine the VTE delivery system in Region Four. We turn to this task in the following chapter.

The VTE delivery system is complex. Seven county school boards and two junior colleges provide direction and form to the VTE effort in Region Four. To examine whether the VTE system is effective we must investigate the needs of: a) students, b) administrators, c) funding, d) facilities, e) faculty, and f) the public. We have developed a two-part methodology to assess these needs. On the one hand, we conduct a review of the literature on VTE programs and their problems in the U.S. as a whole and in Florida in particular. We analyze and report on national, state, and Region Four needs assessments which were conducted recently in the first sections of Chapter VI. On the other hand, to determine if the needs of students, faculty, facilities, funding, and the public are being met we conducted extensive field work and on-site visitations in Region Four. The final sections of Chapter VI discuss our findings.

NOTE: Table 5.4.1 on the following pages is presented primarily for the purpose of illustrating part of the methodology being developed in this study. The table cannot be viewed as conclusive and should not be used to currently plan vocational programs in planning Region Four. Readers of this report should be aware of the fact that further testing and validation of the methodology will be needed before projected "Total Demand" and "Total Supply" data can be seen as definitive.

Table: 5.4.1

Region 4: Employment Opportunities Related to Vocational Education Programs, 1976-1980

OE Code	Industrial Program	1976 Employment[1]	1980 Projected Labor Supply: Expansion and Replacement Needs[2]	1980 Projected Labor Supply: Total Demand[3]	1980 Projected Labor Supply: Vocational Education Output 1975[4]	1980 Projected Labor Supply: Vocational Education Output 1980[5]	1980 Total Supply[6]
	Agricultural						
01.01	Production	3,090	-540	2,550	11	50	3,111
01.0101	Animal science	2,930	95	3,025	7	24	2,935
01.0104	Farm business management	100	223	327	NA	NA	104
01.02	Agricultural supplies & services	480	7	487	NA	NA	500
01.0202	Feeds	210	-5	205	NA	NA	227
01.0299	Agricultural supplies & services, other	480	7	487	NA	NA	500
01.0301	Agricultural power & machinery	190	1	191	43	175	239
01.0401	Food products	290	-73	217	NA	NA	309
01.0504	Landscaping	2,830	-788	2,042	27	120	2,201
01.0505	Nursery Operation & management	1,840	-348	1,492	10	75	1,633
01.99	Agriculture, other	310	-70	259	28	135	271
	Distributive Education						
04.01	Advertising services	1,620	425	2,045	NA	NA	2,055
04.02	Apparel and accessories	9,750	-4	9,946	9	25	14,243
04.03	Automotive	13,430	265	13,695	3	15	19,594
04.04	Finance and credit	2,480	627	3,117	26	125	3,080
04.05	Floristry	440	39	479	NA	NA	615
04.06	Food distribution	14,530	4,377	18,907	88	420	9,414
04.07	Food services	2,530	58	2,588	NA	NA	2,822
04.08	General merchandise	45,210	1,838	47,048	211	900	55,047
04.09	Hardware, building materials, farm & garden supplies	14,690	297	14,987	NA	NA	21,461
04.10	Home furnishings	1,770	37	1,807	NA	NA	2,587

continued . . .

Table: 5.4.1 (continued)

04.11	Hotel and lodging	2,360	167	2,527	NA	NA	2,740
04.12	Industrial marketing	8,770	573	9,343	NA	NA	11,919
04.13	Insurance	3,550	239	3,789	7	53	5,027
04.15	Personal services	2,891	-67	2,824	NA	NA	2,764
04.16	Petroleum	3,240	740	3,980	NA	NA	4,309
04.17	Real estate	2,800	192	2,992	547	700	3,784
04.19	Transportation	6,760	-776	5,984	1	20	6,471
04.20	Retail trade, other	11,500	-734	10,766	NA	NA	11,806
	Health Occupations						
07.0101	Dental Assisting	1,200	316	1,516	18	32	1,033
07.0102	Dental Hygiene	190	75	265	15	60	200
07.0201	Cytology	50	9	59	25	123	65
07.0202	Histology	670	150	820	17	NA	706
07.0203	Medical laboratory assisting	670	150	820	NA	NA	706
07.0301	Nursing, associate degree	2,430	526	2,956	83	295	2,479
07.0302	Practical vocational nursing	2,540	30	2,570	16	55	2,186
07.0303	Nursing assistance	4,840	-14	4,826	45	175	4,166
07.0304	Psychiatric aide	600	82	682	5	20	655
07.0305	Surgical technician	290	51	341	16	65	306
07.0402	Physical therapy	990	41	1,031	NA	NA	935
07.0601	Opthalmic dispensing	140	13	153	NA	NA	196
07.0902	Electrocardiograph technician	290	51	341	NA	NA	306
07.0903	Inhalation therapy	310	13	323	20	80	250
07.0904	Medical assistant, office	680	27	707	23	150	685
07.039906	Health services	NA	NA	NA	45	200	NA
07.090000	Health occupations	NA	NA	NA	25	125	NA
07.090700	Medical emergency	NA	NA	NA	43	160	NA
	Home Economics						
09.0201	Care and guidance of children	7,290	-1,347	5,943	6	NA	7,327
09.0202	Clothing managment, production, & services	1,910	-45	1,865	NA	NA	2,060
09.0203	Food management, production, & services	2,330	180	2,510	NA	NA	2,773
09.0205	Institutional and home management & supporting services	980	-90	890	NA	NA	1,046

continued . . .

Table: 5.4.1 (continued)

	Office Occupations						
14.0101	Accountants	2,090	406	2,496	378	1,270	2,607
14.0102	Bookkeepers	6,970	1,357	8,327	NA	NA	9,033
14.0103	Cashiers	4,920	955	5,875	NA	NA	6,373
15.0104	Machine operators, billing, bookkeeping	1,480	281	1,761	NA	NA	2,084
14.0105	Tellers	1,080	210	1,290	NA	NA	1,399
14.0201	Computer & console operators	3,050	137	3,187	1	50	3,912
14.020201	Keypunch & coding equipment operators	1,210	226	1,436	NA	NA	1,885
14.0203	Programmers	1,030	527	1,557	49	150	1,705
14.0204	Systems analysts	340	108	448	NA	NA	474
14.302	File clerks	1,720	334	2,054	NA	NA	2,228
14.303	General office clerks	21,470	5,158	26,628	NA	NA	28,342
14.0399	Filing, office machines, general clerical	9,190	1,780	10,970	305	1,050	11,976
14.0401	Communications systems clerks & Operators	1,720	505	2,225	25	100	2,230
14.0403	Mail and postal clerks	2,560	752	3,312	NA	NA	3,308
14.0404	Mail preparing & handing machine operators	280	159	439	NA	NA	436
14.0405	Messengers & office boys & girls	210	40	250	NA	NA	272
14.0406	Receptionists	1,540	450	1,990	NA	NA	1,995
14.0499	Informaion & communication occupations, other	9,840	1,620	11,460	NA	NA	12,382
14.0501	Planning & production clerks	420	82	502	181	650	544
14.0502	Quality control clerks	960	185	1,145	NA	NA	1,242
14.0503	Shipping & receiving clerks	2,450	970	3,420	NA	NA	3,723
14.0504	Stock & inventory clerks	2,250	435	2,685	NA	NA	2,912
14.0505	Traffic, rate, & transport clerks	310	60	370	NA	NA	401
14.0602	Interviewers & testing technicians	1,360	260	1,620	NA	NA	1,530
14.0603	Personnel assistants	2,850	549	3,399	250	925	3,460
14.0702	Secretaries	14,360	3,994	18,354	NA	NA	15,720
14.0703	Stenographers	330	-30	300	350	1,000	280

continued . . .

Table: 5.4.1 (continued)

14.0801	Administrative assistants	19,980	1,983	21,953	75	195	23,966
14.0802	Budgent management analysts	90	41	131	NA	NA	111
14.0804	Data methods & systems procedures analysts	160	30	190	NA	NA	176
14.0805	Office managers & cheif clerks	2,500	342	2,842	NA	NA	3,094
14.0899	Supervisory & administrative occupations, other	430	62	492	NA	NA	520
14.0901	Clerk typists	4,680	1,303	5,983	NA	NA	5,123
14.0902	Typists	4,690	1,303	5,983	480	1,535	5,123
14.99	Office occupations, other	4,210	3,240	7,450	174	550	8,082
	Technical Education						
16.0105	Chemical technology	1,120	392	1,512	NA	NA	1,442
16.0107	Electrical technology	520	179	699	NA	NA	700
16.0108	Electronic technology	1,680	213	1,893	0	75	2,046
16.0113	Mechanical technology	890	362	1,252	NA	NA	1,255
16.0117	Scientific data processing	660	210	870	NA	NA	919
16.019903	Drafting	830	270	1,100	35	120	950
16.0203	Food processing technology	170	60	230	NA	NA	228
16.0601	Commercial pilot training	60	32	92	NA	NA	71
	Trade & Industrial Occupations						
17.01	Air conditioning	830	170	1,000	196	600	1,049
17.0101	Cooling	830	170	1,000	NA	NA	1,049
17.0102	Heating	830	170	1,000	NA	NA	1,049
17.02	Appliance repair	510	80	590	111	45	642
17.0201	Electrical appliances	510	80	590	NA	NA	642
17.0202	Gas appliances	510	80	590	NA	NA	642
17.03	Automobile services	480	219	699	NA	NA	590
17.0301	Body & fender	880	32	912	55	260	1,021
17.0302	Mechanics	6,350	623	6,973	174	580	7,997
17.0401	Aircraft maintenance	1,080	106	1,186	NA	NA	1,260
17.0402	Aircraft operations	120	60	180	NA	NA	140
17.0403	Ground operations	570	85	655	NA	NA	650
17.06	Business machine maintenance	600	180	780	NA	35	756
17.07	Commercial art	470	130	600	28	100	558
17.0701	Interior design	640	97	737	NA	NA	852

continued . . .

Table: 5.4.1 (continued)

17.0703	Product design	470	130	600	NA	NA	558
17.08	Commerical fishing occupations	1,380	182	1,562	NA	NA	1,507
17.0901	Photographic laboratory & darkroom occupations	490	50	540	11	100	662
17.10	Construction & maintenance trades	3,640	167	3,807	11	60	3,605
17.1001	Carpentry	4,570	584	5,154	68	400	5,011
17.1002	Electricity	2,240	381	2,621	49	240	2,528
17.100301	Maintenance, heavy equipment	2,460	290	2,750	10	30	2,600
17.100302	Operation, heavy equipment	2,040	281	2,321	NA	NA	2,454
17.1004	Masonry	880	148	1,028	48	250	991
17.1005	Painting & decorating	2,180	284	2,464	NA	NA	2,437
17.1006	Plastering	430	20	450	NA	NA	468
17.1007	Plumbing & pipe fitting	1,470	250	1,720	15	80	1,659
17.1008	Dry wall installation	340	5	335	NA	NA	366
17.1009	Glazing	140	30	170	NA	NA	195
17.1010	Roofing	510	85	595	NA	NA	580
17.1099	Construction & maintenace trades, other	5,040	95	5,135	26	120	5,122
17.11	Custodial services	10,280	-1,467	8,813	8	80	8,716
17.12	Diesel mechanic	510	5	515	3	12	545
17.13	Drafting	830	290	1,100	47	215	950
17.14	Electrical occupations	2,240	380	2,620	NA	NA	2,528
17.1401	Industrial electrician	1,330	213	1,543	3	40	1,562
17.1402	Lineman	1,740	280	2,020	NA	NA	2,043
17.1403	Motor repairmen	100	-5	95	NA	NA	100
17.1501	Communications	1,330	213	1,543	1	45	1,562
17.1503	Radio/television	680	70	750	100	370	800
17.16	Fabric maintenance services	2,600	400	3,000	NA	NA	3,050
17.1601	Dry cleaning	610	-15	595	NA	NA	650
17.1602	Laundering	1,160	-30	1,130	NA	NA	1,150
17.1901	Composition, make up, & typesetting	440	30	470	NA	NA	420
17.1902	Printing press occupations	530	40	540	11	125	496
17.1903	Lithography, photography, plate making	70	5	75	NA	NA	65

continued . . .

Table: 5.4.1 (continued)

17.1904	Photo engraving	70	5	75	NA	NA	65
17.2002	Radiographer	230	40	270	NA	NA	245
17.2101	Instruments, other than clocks or watches	1,340	30	1,370	NA	NA	1,400
17.2102	Watchmaking and repair	130	5	135	NA	NA	140
17.2301	Foundry	100	5	115	NA	NA	110
17.2302	Machine shop	850	225	1,075	24	82	975
17.2303	Machine tool operation	780	35	815	NA	NA	825
17.2304	Metal trades, combined	470	70	540	NA	NA	530
17.2305	Sheet metal	660	190	850	62	150	760
17.230602	Electric welding	1,920	100	2,020	52	200	2,040
17.230603	Combination welding	1,920	100	2,020	188	700	2,040
17.2307	Tool & die making	80	20	100	NA	NA	90
17.2399	Metalworking, other	400	15	415	18	80	405
17.2601	Barbering	420	-145	275	NA	NA	295
17.2602	Cosmethology	2,090	255	2,345	23	155	2,450
17.2801	Fireman training	1,010	1,990	3,000	61	220	2,560
17.2802	Law enforcement training	2,110	4,090	6,200	16	200	5,050
17.2899	Public service occupations, other	100	45	145	NA	NA	125
17.2901	Baker	660	90	750	NA	NA	800
17.2901	Cook/chef	4,920	-380	4,500	5	40	4,400
17.2903	Meat cutter	870	20	890	NA	NA	925
17.2904	Waiter/waitress	5,310	-200	5,110	NA	NA	5,200
17.31	Samll engine repair	1,200	150	1,350	82	380	1,400
17.32	Stationary energy sources occupations	390	15	405	NA	NA	420
17.3301	Dressmaking	570	15	585	NA	NA	610
17.3302	Tailoring	640	35	675	NA	NA	705
17.3399	Textile production & fabrication, other	5,000	150	5,150	NA	NA	5,400
17.34	Leather working	310	70	380	NA	NA	430
17.3401	Shoe manufacturing	50	5	55	NA	NA	62
17.3402	Shoe repair	50	5	55	3	20	60
17.35	Upholstering	310	60	370	19	80	390
17.3699	Woodworking, other	190	30	220	NA	NA	205

continued . . .

Table: 5.4.1 (continued)

NA Not available. Vocational education enrollment data was not available at this level of disaggregation.

Sources: [1]Florida Department of Commerce, *Florida Employment Directions: Industries and Occupations 1970-1980*, Planning District 4, Tallahassee, Florida, 1976.

[2]Our calculations as a residual item.

[3]Text Table 5.2.6.

[4]Unpublished data, Florida Department of Education.

[5]Our calculations.

[6]Text Table 5.3.1.

OUTLINE

Chapter VI

THE DELIVERY OF VOCATIONAL AND TECHNICAL EDUCATION: A NATIONAL, STATE, AND LOCAL ASSESSMENT

6.1 Introduction

6.2 National Issues in VTE

- 6.2.1 Human Capital and Labor Market Efficiency of VTE Programs
- 6.2.2 Vocational Education Administration

6.3 Florida and Jacksonville Evaluations of the Needs for VTE

- 6.3.1 Statewide Evaluations of VTE in Florida
- 6.3.2 Needs Assessments for VTE in the Jacksonville Labor Market Area

6.4 Report on the Field Survey Work

- 6.4.1 Introduction
- 6.4.2 Survey Methodology
- 6.4.3 Local Administration and Organization
- 6.4.4 Evaluation of Facilities and Equipment
- 6.4.5 Funding
- 6.4.6 Students and Student Needs
- 6.4.7 Faculty
- 6.4.8 Business Needs

Chapter VI

THE DELIVERY OF VOCATIONAL AND TECHNICAL EDUCATION: A NATIONAL, STATE, AND LOCAL ASSESSMENT

6.1 Introduction

This chapter contains four main sections. Following the introduction, we discuss national VTE issues. It is important to note that some of the problem areas identified in national studies were encountered in the State of Florida and to a lesser degree in the Jacksonville area. Next, we critique other Florida and Jacksonville VTE needs assessments which were conducted in the recent past. Many of the weaknesses and omissions of these previous needs assessments have been dealt with in this project. The last section is devoted to the field work conducted in the Jacksonville area. The methodology of the field work will be described and the findings disussed in considerable detail.

A common criticism of needs assessments in general is that they rely primarily on casual empiricism to justify many of their conclusions (Drewes and Kutz, 1975). Seldom are any of the institutional arrangements within a given area explored and analyzed. However, such information is often important since it provides insights into issues which "numbers" do not reveal. This chapter is our response to this exigency.

6.2 National Issues in VTE Education

The purpose of this section is to discuss some problems and concerns identified in nationwide studies of VTE programs. This discussion will help to place our analysis of the VTE programs in Region Four in proper context. Two broad areas will be discussed in this section. First, the VTE literature has focused extensively on

the human capital aspect of VTE. That is to say, VTE augments the human capital of students making them more productive, enhancing their employment opportunities, and increasing their earnings. The second area we shall examine concerns issues related to the formal VTE administrative structure at both the state and local level. Of particular interest is the degree of local autonomy and procedures for program monitoring.

6.2.1 Human Capital and Labor Market Efficiency of VTE Programs

By statute one major goal of VTE is to provide students with salable labor market shills. However, nationally VTE programs are often unable to respond to changing labor markets in a cost effective manner (Lecht, 1974, P. 161).

Program inertia rather than flexibility appears to be the rule. For example, enrollment in new and innovative programs is relatively small compared to "traditional" VTE programs such as agriculture, home economics or industrial occupations. However, employment growth at the national level has been concentrated in the service sectors of the economy and on the average VTE programs have not been responsive to this trend. This is particularly true in rural areas throughout the country, where not only are fewer courses offered than in urban areas, but less program flexibility also is apparent.

A further complication arises because many programs are only peripherally related to the job market. Such programs are primarily avocational rather than vocational, in that students who participate in them do not expect to utilize their training in a wage earning capacity. Some examples are high school cosmetology programs and automotive mechanics at the secondary level. Sustained by student interest, this type of program contributes little to meeting demands of the job market or to augmenting the employability or earning capacity of students. However, in many states state aid is usually geared to the number of

students in a program, popular programs are the paying programs in terms of revenue. Therefore, little incentive exists for local administrators to either eliminate these avocational programs or to transfer them to non VTE programs, even though such programs are inconsistent with the statutory goals of a VTE program.

In Florida efforts are now underway to insure a closer coordination of VTE programs and the local and state labor markets they serve. One manifestation of this effort is the recent institution of a comprehensive system for gathering placement follow up data on VTE graduates. Although the system is only two years old and is still in the "shakedown" stage, it promises to provide valuable information on the effectiveness of VTE programs. A refined analysis of the labor market experiences of VTE graduates should be published by the end of this year. However, at this time we must note that the Florida State Advisory Council on Vocational and Technical Education complained in its most recent annual report (1975, p. 4) that, "Valid data is often not available for planning purposes, [and that] a large number of completers of vocational and technical education programs are not finding employment in areas for which they have been trained." Further efforts at: a) coordinating VTE programs and labor market needs, and b) generating accurate analyses of the placement records of VTE graduates would be beneficial. Finally, such efforts are being actively pushed by a Florida Legislature which is concerned about the efficiency of its educational programs in all areas. This bodes well for the future labor market efficiency of Florida's VTE programs.

National analyses of VTE programs have identifed a related concern which results from the traditional offerings of VTE perpetuation of male and female jobs (Drewes and Katz, 1975; Lecht, 1974). Enrollment data at the national level clearly demonstrates that females are concentrated in secretarial, home economics, and health care programs. Alternatively, males are primarily involved

in the industrial trades program. In view of recent labor force trends, this schism seems archaic. Title IX of the Elementary and Secondary Education Act is designed to ameliorate this problem. Moreover, community colleges in Florida are making an effort to remove sexual discrimination in program enrollments by actively recruiting female in traditionally male dominated occupations such as carpentry. However, progress is slow.

The primary goals of all VTE programs are straightforward: to increase the employability and wage earning potential of students. At the national level the results have been mixed (Stromsdorfer, 1972). First, Stromsdorfer's (1972) national assessment of VTE found little evidence to suggest that exposure to VTE programs encourages students to remain in high school until they graduate. Second, he notes that only 25 percent of the trainees actually get jobs in their specific fields of training, and 50 percent of the graduates seek additional education. This finding is consistent with analyses by the Florida State Advisory Council on VTE quoted above. Finally, evidence collected by Parnes (1968) and Stromsdorfer (1972) suggests that VTE training does increase earnings and employment, but these benefits are highly cyclical. This is primarily due to the emphasis on programs related to construction and manufacturing, on the average, evident in the nation.

Since substantial public resources are devoted to VTE programs, it is important to compare their labor market efficiency to that of other manpower training programs. A rigorous analysis of the relative cost-effectiveness of VTE training vis à vis other educational and training programs does not exist. What evidence there is (Stromsdorfer, 1972) is limited and inconclusive. However, since there continues to be complaints about the employment experiences of VTE graduates, we need to further examine this issue. It is apparent that VTE programs throughout the nation are not fully meeting the needs of business and industry for trained workers and do not seem to be fully meeting the needs of workers for training.

Since business is the major source for demand for manpower, it is vital for VTE to meet business needs for skilled labor. Unfortunately, the National Association of Manufacturers reports (1970) that the overall effectiveness of national VTE programs is not satisfactory. VTE graduates are not adequately prepared to meet industry's manpower needs because:

a. the transition from school to work has proved difficult for many,

b. VTE training is often either too narrow in scope, (i.e., a specific job in a broad occupation) so students are not adequately prepared for related company positions, or too broad with graduates not possessing entry level skills,

c. VTE graduates do not adapt well to changes in technology, and

d. there is no discernible difference in proficiency at learning a specific job skill between VTE graduates and non VTE graduates (Mueller, 1969).

Improved communications between county VTE program directors and instructors and industry would seem to be the logical solution. However, there exists a wide communications gap which is difficult to bridge. On the one hand, some firms have become disillusioned and started their own training programs (National Associations of Manufacturers, 1970). On the other hand, VTE administrators and instructors in general neither seek nor appreciate industry inputs (Burt, 1969). Much apprehension and mistrust is evident on both sides. In the Region Four area the situation appears somewhat different. Although the communications gap between VTE educators and firms is still evident, there is at least movement towards greater communication. Both groups seem to recognize the community of interest they share. This is evidenced in a number of ways. For example, in both Duval and St. John's counties VTE administrators and administrators from Florida Junior College conduct many "spot checks" of the demands for particular types of labor with key business leaders throughout the

year to gauge the local labor market. Furthermore, firms throughout the region are beginning to request help in training particular kinds of labor. Although such efforts are not universal or daily experiences at this time, there is movement present. Finally, we note that there was an enthusiastic response by both business leaders and county VTE program directors to the idea of a joint business and VTE needs assessment conference. However, there is much work to be done in this area.

National evidence also indicates that VTE programs are also not fully meeting student needs. The main reason is that most job training is highly firm specific, so it is difficult for publicly provided programs to meet these needs. In response most firms do a large portion of their own job training typically in an on-the-job setting. A Department of Labor study (1968) revealed that less than 30 percent of all workers sampled said that they learned their jobs through formal training (i.e., in schools of all kinds). Furthermore, almost 60 percent of all workers sampled learned their job skills through on-the-job training programs. While it is certainly true that employers are demanding even more extensive formal training for their new employees and the *Manpower Report of the President* (1975) foresees a continuation of this trend, recent studies by Somers (1971) and Wirtz and Goldstein (1975) indicate the continued pervasiveness of on-the-job training as the major source of job training. This being the case, it may be impossible for VTE programs to fully displace on-the-job training. A further question is, should VTE programs attempt to do so?

Proposed solutions to the effectiveness problem of VTE generally revolve around the implementation of a VTE and industry coop program. The Department of Labor notes (1968, p. 91), "...the expansion of the number of young people in cooperative work-study programs would make a significant contribution toward bridging the gap from school to work." Perlman (1969) explains that VTE programs should stress education with the goal of becoming a vocational college not a

training center. He argues that VTE should provide industry with broadly educated students with training in depth in a general vocational area or cluster. The cooperating employer's role would be to train the student for a specific job, providing him with the requisite skill training.

6.2.2 Vocational Education Administration

Generalizations with respect to VTE administration can often be misleading, but some issues are quite relevant for the purposes of this study. In many states the State Plan for the Administration of VTE (which is required by federal law) is often merely a pro forma document produced to insure the continuation of federal grants (Drewes and Katz, 1975, p. 1-48). Since the state plan constitutes a contract between the state and the federal government for provision of VTE programs, the state plan is often not a real planning document. This is certainly true in Florida. The Florida State Advisory Council on Vocational and Technical Education concludes (1975, p. 5), "A thorough review should be made of all procedures used to gather and analyze data contained in the State Plan as a planning document for vocational and technical education." Since most state plans are not true planning documents, a systematic monitoring and evaluation of VTE programs is often lacking at the state level. Accordingly, local decision-making with respect to program offerings may be based on considerations other than present and projected manpower needs. This may often be an inefficient utilization of resources, and it contributes to the problem of program rigidity discussed above.

This problem is not easily solved since much of the data needed to evaluate and effectively administer VTE programs is not available in most states (Drewes and Katz, 1975). This has been a particular problem area in Florida. As we pointed out above placement data for VTE graduates is just recently being gathered. Furthermore, evaluations of the data, projections, and analyses in The Florida State Plan for Administration of Vocational and Technical Education

have been quite critical in recent years (Harris et al., 1972; Florida State Advisory Council of Vocational and Technical Education, 1975). Again, quoting from the Advisory Council's *Annual Report* 1975, p. 11-12), "The procedures used to project labor market data in The State Plan should be evaluated in order that their accuracy might be verified.... Unemployment projections used in The State Plan are so unrealistic as to bring into question the degree to which education programs are indeed compatible with labor market needs...."

A related concern which is identified in national studies of VTE programs is the relationship between state level planning agencies and local semi-autonomous school boards, school superintendents, principals, and county VTE program directors (Drewes and Katz, 1975; Lecht, 1974). The relationship between state level planners and local administrators is quite important. State guidelines on program content are a necessity. However, the selection of programs to be implemented and the evaluation of ongoing programs can often be a source of conflict between state and local VTE administrators. State manpower data is often disregarded by local administrators, who trend to rely on area skill surveys and their own knowledge of local business conditions. In such cases, manpower projections have little influence in program evaluations. Since the funds are usually distributed on a per full-time equivalent student basis, local administrators are inclined to respond to student interest rather than to business needs or labor market trends either present or projected. This supports the conclusions previously discussed--that VTE is too often locked into training students for traditional occupations which are characterized by cyclical influences. However, as we have noted for Florida the trend is away from such behavior as better data is generated and as new planning and programming procedures are being implemented. We shall discuss these trends more fully below.

This dilemma of state versus local control is not easily resolved. Within broad guidelines local autonomy in the day to day running of VTE programs is both necessary and desirable. An excessively centralized bureaucracy is rarely efficient or responsive to human needs. However, for the nation as a whole local areas do not seem to be willing nor able to initiate new and innovative programs on their own (Lecht, 1974). Typically new program needs are determined at the state level, and new programs are initiated under state auspices. Furthermore, local VTE administrators appear unwilling or unable to terminate outdated programs, or programs which are unrelated to the labor market. Conflicts between state VTE planners and local VTE program directors may be inevitable given the different incentive structures faced by each group. Such conflicts further impair the flexibility of local VTE program offerings.

We must add that in the Region Four area local VTE administrators at the secondary and post secondary level are capable of initiating new and innovate programs. This is particularly true in the health related occupations. For example, new programs in emergency medical technology and inhalation therapy have been initiated recently in the region.

However, conflicts between state planners and local VTE administrators continue both in Florida and in the nation. Furthermore, this problem is most apparent in rural areas of the U.S., Florida, and Region Four. These rural areas are characterized by high per student costs (relative to urban areas) and limited porgram offerings. Furthermore, agribusiness (male) and homemaking (female) programs are dominant in these areas. This emphasis is clearly in terms of local needs, but declining employment trends in agriculture certainly warrant some program diversification which would be responsive to needs outside of the immediate area. The trend towards "agribusiness" is one response to this problem. However, it is the responsibility of state VTE planners to assume the leadership role in such situations.

Crucial to the effectiveness of VTE programs is the determination of whose employment needs are to be met, the local or the national economy. In large urban areas, this is not a severe problem as employment needs generally follow national trends. VTE programs can be adjusted to reflect specific local needs. However, rural VTE programs should reflect needs, some of which are not locally oriented. It would be inefficient to duplicate all urban programs due to the high average student costs. However, the excessive reliance on agriculturally related programs is not justified and often does not provide students with salable labor market skills.

In summary VTE at the national level appears to be lagging behind trends in labor markets. Resources are sometimes being allocated to programs which have not exhibited high growth rates in employment and earnings. Moreover, many of these occupations are highly cyclical. Other programs are primarily avocational in nature, and these make no contribution toward meeting business needs. Therefore, a restructuring of VTE goals and programs may be warranted. Furthermore, industry needs for skilled manpower are not at present being fully met by VTE programs at the national level.

State planning is a necessity to meet this need. Local officials are often myopic with respect to future manpower requirements, and because of perverse incentives in the disbursement of funds, they are often unlikely to assume a leadership role in the restructuring of VTE to meet future needs. This conclusion is particularly valid in rural areas. Therefore, improved state planning practices coupled with greater state and local coordination will introduce needed flexibility into the VTE system.

6.3 State and Local Evaluations of the Needs for Vocational and Technical Education

This section examines recent efforts to assess the needs for vocational education programs in Florida. The studies can be divided into two categories according to their areas of coverage, statewide and Region Four. We shall discuss each of these in turn in Sections 6.3.1 and 6.3.2 below.

6.3.1 Florida Needs Assessment

In 1972 the Florida State Advisory Council on Vocational and Techincal Education commissioned a five volume evaluation of VTE in Florida. Volume I by Harris and McInnis evaluates the State Plan for Administering VTE. Volume II by Harris reports on a benefit-cost analysis of VTE programs. The extent of VTE services offered to the handicapped is examined in Volume III by Raepple, and in Volume IV Purrington analyses the expectations and satisfactions of parents and students with VTE. Finally, Volume V by Latta and Schmidt evaluates the VTE management information system. Below we shall describe and comment on each of these.

Volume I by Harris and McInnis examines the Florida State Plan for the Administration of Vocational Education. The authors provide a detailed critique of the State Plan with respect to its degree of compliance with federal regulations. The analysis is legalistic in tone and assumes a detailed knowledge of the 1968 amendments to the Vocational Education Act. Of particular interest to our study is the authors' discussion of the compliance of the State Plan with federal regulations concerning long run and annual program planning.

Federal law requires that each state's plan describe the present and future needs for VTE in the state. The 1968 Vocational Education Act amendments state (Section 123), "...due consideration will be given to the results of periodic evaluations of state and local vocational programs, services, and activities in light of information regarding current and projected manpower

needs and opportunities on the local, state, and national levels." Further the state employment service is to cooperate in this effort.

Harris and McInnis note that the data presented in the State Plan to satisfy this requirement is inadequate and internally inconsistent. For example, they report that while projected demands for some occupations such as office occupations were predicted to contract, the State Plan indicates an increase program offerings in this occupation. Similar plans are in store for occupations such as carpenters and metal workers where future demands are also expected to decline. Many other discrepancies like these exist throughout the report.

These problems in the State Plan are reminiscent of the problems at the national level discussed above. The Florida State Plan like the plans of many other states appears to be a pro forma document. In depth analyses of labor market trends were not conducted. Data is used as so much window dressing. The motivation behind the plan seems to be to insure continued federal aid by complying with federal regulations in form only.

Volume II of the statewide evaluation provides a benefit-cost analysis of VTE programs by Harris. Twenty-one VTE programs were evaluated. Below we describe Harris' study design, results and critique his methodology. Harris divides the state into four geographic areas, and he randomly selects two area vocational-technical centers from each area whose programs he would study. Programs were selected for study if they satisfied four criteria: a) a program had to be offered in each area vocational-technical center chosen, b) a minimum of fifteen students had to be enrolled, c) the program mix studies was to include males and females, and d) the programs had to serve high school and non high school students.

Harris chose a random sample of program graduates and early leavers, and he used follow up questionnaires as the main source of data on benefits.

Benefits accrue to both VTE students and society, and Harris calculates benefit-cost ratios for each group. Public and private benefits equal the difference between annual earnings of skilled workers (the VTE graduates) and unskilled workers in entry level positions. Private costs include foregone earnings and out of pocket expenses, while public costs are composed of direct and indirect program expenses.

The calculated benefit-cost ratios for the first working year of VTE graduates are generally less than one. Furthermore, there is no discussion of how long the benefits from the VTE programs will last. However, Harris reports high rates of return as yearly net benefits are extrapolated into the future. There is much confusion in the study at this point as to what is being measured, and how it is measured. Each program under study had its net benefit stream extrapolated out to different time periods without any rationale. Furthermore, the discounting of benefits back to the present and the measurements of benefit-cost ratios is not standard nor is it explained clearly.

The study is flawed by a number of major and minor methodological problems which cast doubts upon its conclusions. Most important among these is the lack of an adequate control group which is necessary to gauge net program benefits. In Harris' study VTE graduates are compared to unskilled workers in the same geographic area with respect to earnings. No controls for self-selection bias (the most able may undertake VTE) or a myriad of other distorting socio-economic variables are made even through socio-economic data was collected. Thus, the two groups are not similar in all respects except for VTE training, and valid comparisons are not possible. Furthermore, no allowances are made for changing economic conditions or for displacement effects (VTE graduates may displace other workers with no net benefits to society).

In addition, some serious statistical problems result from the procedures used in conducting the questionnaire survey. Useable returns are few in number

and no attempt was made to sample the non-respondent group. This is a sure source of bias. Further problems result from the way programs to be studied are selected. First, high school and non high school students are combined, but each group has very different opportunity costs (primarily foregone earnings) and training costs. Such aggregation produces important distortions. Second, only few programs are studied, auto mechanics, air conditioning and refrigeration, cosmetology, and nursing, due to the restrictive nature of the criteria for program selection. This is a very small sample of VTE programs.

Thus, it is difficult to accept Harris' findings at face value. While the study is illustrative of VTE program benefits and costs for four programs, it is not conclusive. Further research along these lines would seem appropriate. Finally, we should add that Harris' findings of mixed results for VTE benefit-cost ratios are consistent with the mixed success of VTE programs at the national level reported by Stromsdorfer (1972).

Volume III of the statewide evaluation by Raepple is concerned with examining the availability of VTE programs for the handicapped. The study describes VTE policies for these services, target groups, and the role VTE plays in rehabilitation efforts by government agencies. Raepple concludes that present VTE programs are not adequately meeting the needs of the handicapped in Florida for three main reasons:

a. VTE instructors are reluctant to integrate handicapped students into their regular VTE courses,

b. uncoordinated planning by governmental agencies, and

c. hesitancy of VTE administrators to accept new programs.

Purrington (1972) examines the expectations and satisfactions of parents and students with VTE programs in Volume IV of the statewide evaluation. Students in traditional high schools, VTE students, and parents of both groups were surveyed by mail questionnaire. The limiting features of this approach

are that samples from only ten schools were used and there was a high nonresponse rate. Nevertheless, the study generates some interesting insights. First, satisfaction with all school programs both VTE and non VTE varies widely. However, VTE students and their parents are significantly more satisfied with their programs than counterparts in traditional high school programs.

The study also identifies some problems students and their parents felt exist in current VTE programs. First, a need for improved VTE guidance and placement is noted. Second, classroom facilities and equipment are not always adequate. Finally, students and parents expressed the desire for upgrading VTE programs to meet labor market needs more closely thus better insuring that VTE graduates will find jobs in the occupations for which they were trained.

The final volume of the statewide evaluation analyses the VTE management information system (Latta and Schmidt, 1972). The existing manpower information system was created by the Florida Department of Education to implement the recommendations of the Florida State Advisory Council on VTE. The system is composed of six parts: a) student data, b) instructor data, c) program course data, d) space and facility utilization, e) student placement and follow up, and f) fiscal data. The system is being implemented across the state. However, limited state funding has been an impeding factor. Furthermore, the needs for a revised enrollment system and coordination with the Florida Employment Service is recognized.

The five volume statewide evaluation of VTE in Florida provides background for our discussion of the needs assessment studies conducted in the study area, manpower Region Four centered around Jacksonville. Some of the problems which were identified at the state level have counterparts at the local level.

6.3.2 Needs Assessments for Vocational Education in the Jacksonville Labor Market Area

In recent years seven separate studies of the needs for VTE programs have been conducted in the Jacksonville labor market area. Table 6.3.2 displays each study along with some important descriptive data. From the table we can draw some important conclusions.

First, only one of the needs assessments, that by the Florida Department of Commerce (1976), covers the whole Jacksonville labor market area (which is Duval, Nassau, Baker, Clay, Putnam, Flagler, and St. Johns counties). Thus, many sources of both the demands for and supplies of labor are ignored in what is really one coherent labor market area centered around Jacksonville. Results from such limited analysis may then be misleading with respect to area wide trends. Second, background material describing labor market trends is typically omitted from most analyses (the Battelle and C.E.T.A. studies are exceptions). The reader is provided with tables of "projected job openings" or the like with little or no further analysis. Without the appropriate background materials these projections are quite difficult to interpret and to analyze, so most local VTE administrators and guidance counselors do not find these projections particularly useful in their work. A related problem is that labor market projections are rarely categorized by VTE programs which further reduces their usefulness. The experienced VTE administrators in the area use these projections judiciously, we are glad to report. Spot checking with key business leaders is often conducted.

A third shortcoming of the existing needs assessments is their sloppy use of labor market concepts described in Chapter III. For example, many of the needs assessments conclude that shortages of particular kinds of labor will exist in the future and VTE programs need to be implemented to meet these projected needs. However, this notion of a "shortage" is quite naive since the

Table: 6.3.2

Recent Assessment Studies of the Needs for VTE Programs in the Jacksonville Labor Market Area

Author and Date	Counties Covered	Demand Side Methodology	Supply Side Methodology	Other Comments
[illegible]nical Employment in [illegible]heast Florida, [illegible]r, et al., 1972	Duval, Nassau, Baker	Employer Survey	None	restricted in scope and coverage to a small area and very few occupations no descriptive material on the local labor market
Duval County Job Opportunity Survey, McFarland & Assoc., 1973	Duval	Employer Survey	School enrollment survey & graduation forecast & union interviews	methodology is naive in that many sources of entry are ignored and labor market concepts not used appropriately no description of local labor markets
Career Opportunities in Duval and Nassau Counties for Selected Vocational-Technical Skills: 1973-1975, McFarland & Assoc., 1973	Duval, Nassau	Employer Survey	School enrollment survey & graduation forecast & union interviews	methodology is naive in that many sources of entry are ignored and labor market concepts not used appropriately no description of local labor markets
A Model for a State-Wide system for Community Occupational Needs Assessment, Tucker & Rowell, 1974	Duval	Employment Service Listings	None	net job openings are only a demand side phenomenon here equal to expansion and replacement demands no description of local labor market trends
Comprehensive Manpower Plan FY 1976, CETA, Duval Co., 1975	Duval, Nassau, Baker	Employer Consultations	None	descriptive and indicative, there are no hard numbers or forecasts good economic profiles of counties involved

(continued . . .)

Table: 6.3.2 (continued)

Study, Author and Date	Counties Covered	Demand Side Methodology	Supply Side Methodology	Other Comments
Jacksonville Regional Occupational Needs Survey, Battelle, 1975	Duval, Nassau, Baker	Employer Survey	School Survey	quite naive, leaving many sources of entry and exit to an occupation unexplained and unanalyzed good descriptive discussion of future economic trends
Florida Employment Directions, Florida Department of Commerce, 1975	Duval, Baker, Nassau, Clay, Flagler, St. Johns, Putnam	BLS, *Tommorrow's Manpower Needs*	None	this is the most comprehensive demand side model now in existence no supply side analysis no description of local labor market trends

occupational and geographic mobility of workers is totally ignored as are possible changes in relative wage rates. Furthermore, the linkage between a "shortage" and the implementation of a VTE program is not as apparent as is stated. The cost of implementing the VTE program must be weighed against the potential benefits. While the experienced administrators in the area do attempt such a balancing, without the existence of rigorous analyses to go on such efforts are largely ad hoc. Other important labor market concepts such as what constitutes demands (i.e., effective demand, indicated by a willingness to pay, or merely notional), and needs are also often handled in a very haphazard manner.

Fourth, only three of the seven studies attempted any supply side analysis at all. Without some knowledge of the supply of labor by occupations, demand projections are of limited value for VTE needs assessments. In fact, demand analyses alone can be downright misleading. Even the three studies which did examine the supply side were very limited in their scope. All of these (Battelle, 1975; McFarland, 1973; and McFarland, 1973) only examined the supply of new entrants into an occupation from school training programs. Since only 30 percent of the labor force acquired its skills in this manner (U.S. Department of Labor, 1968), this is clearly inadequate. Furthermore, many other sources of occupational entry exist, including occupational mobility, geographic mobility, and new entrants to the labor force, and many of these are not measured.

A final problem afflicting six of the seven need assessments is their inadequate methodology for projecting the demands for labor by occupations. Only the Florida Department of Commerce study (1976) used the methodology developed by the Bureau of Labor Statistics in *Tomorrow's Manpower Needs* (1969), which is similar to our procedure and was described above in Chapter III. This procedure which employs an industry-occupational matrix to reflect industrial

staffing patterns has provided accurate occupational demand forecasts (BLS, 1975). These six studies made use of employer surveys. In the employer survey procedure a sample of local employers is queried with respect to their present and future occupational employment requirements. This procedure has been shown to be notoriously inadequate because it does not deal with effective demands (a willingness to hire) and because changing economic conditions influence the willingness of employers to hire workers (Campbell and Tarr, 1975). Florida State guidelines for needs assessment recommended the use of the area skills survey up until 1973 although BLS had previously recommended that the employer survey methodology not be used to determine present and future occupational demands (BLS, 1969). Below we shall briefly describe each of the seven studies. Since the geographic and occupational scope of the studies vary, comparisons of their results and projections are difficult. However, where comparisons are possible, we shall make them. We will organize the descriptions and comparisons with respect to geographic scope starting with the most restrictive and working up to the area wide study.

Two studies have focused on Duval County alone, a) *Duval County Job Opportunity Survey*, McFarland and Associates (1973), and b) *A Model for a Statewide System for Community Occupational Needs Assessment*, Tucker and Rowell (1974). The McFarland study was a two month effort whose objective was to quantitatively assess the demands for and the supplies of labor occupations as a guide to determining the need for VTE programs. The methodology used was quite simple. A sample of 205 Duval County employers was selected, and 100 personal interviews of the largest employers and 100 mail survey samples were conducted. The employers were asked about their current and future occupational requirements for the 1973-75 period. We have discussed the limitations of this approach above.

In the interviews with employers the McFarland researchers also asked employers six interesting questions concerning the local labor market and employer satisfaction with VTE graduates. First, employers noted most difficulty in finding employees with the following skills: experienced secretaries (7.5 percent), clerical-typists (5.6 percent), industrial machine operators (4.9 percent), welders (4.9 percent), experienced draftsmen (3.5 percent, and mechanics (3.1 percent), where the number in parenthesis indicate the percentage of respondants citing the skills. Business managers mainly ascribed their hiring difficulties to a tight local labor market which existed at the time of this study in 1973. Third, while most managers had little idea of what VTE could do to solve their problems, some mentioned expanding offerings in mechanics, welding, electrical construction, and drafting. Fourth, managers have in general a high opinion of VTE graduates with 40 percent describing VTE graduates excellent or good, but 25.3 percent felt VTE graduates were poor and 34.5 percent found them to be only fair. There did not seem to be any significant deviation by industy type of occupation. Of those who rate VTE graduates as fair or poor, 52 percent found the training to be shallow and inadequate, and 23 percent mentioned work habit problems. Finally, employer responses as to how to improve the VTE programs varied but can be categorized as:

a. institute more work experience into the curriculum,

b. improve faculty and equipment, and

c. upgrade students basic reading and mathematical skills.

On the supply side the McFarland study also used a survey procedure of public and private schools. These institutions were asked about their present and future numbers of graduates by vocational education cluster. Other important sources of occupational supply were not included in the analysis.

Finally, the projected demands for and supplies of labor were compared and shortfall of supply was deemed to indicate a need for expansion in a VTE

program. Given the methodology limitations and restricted scope of this study, such conclusions are not warranted.

The other study which focused on Duval County was by Tucker and Rowell (1974). The purpose of this study was to identify job needs at the local level and to relate job needs to training programs in the educational system. The methodology used in this study was different from that in the McFarland report. Tucker and Rowell rely exclusively on published data. On the demand side quarterly employment reports from the Department of Commerce are used to measure current employment. Unfilled job openings are determined from the Job Bank Information System of the Florida Employment Service. A fundamental limitation of this approach is that many employers do not use the Florida Employment Service in their recrujtment programs. This is particularly true of the higher skilled and better paying jobs. However, since VTE graduates in skill categories are generally at the entry level this problem may be mitigated somewhat. Projections of future "net jobs" and unfilled jobs are made by simple extrapolations of existing employment and unfilled jobs listed at the employment service. This is inadequate. No interaction of labor demand and labor supply is allowed for and changes in relative wages, industrial structure and the like are ignored.

On the supply side data from the Florida Department of Education on enrollments and graduates by program are used. There is no attempt to measure other sources of entry into an occupation besides the formal training route, which as we have mentioned, may account for only 30 percent of those in an occupation. Furthermore, no attempt is made to match "unfilled jobs" against school program enrollments because the number of unfilled jobs is determined solely on the demand side through extrapolation of job bank information.

While we have remarked on the many serious methodological weaknesses of the Tucker and Rowell approach, their research has provided much useful infor-

mation on the types of jobs, wages, and experience required for jobs listed with the employment service. They provide extensive tabular listings on occupations by salary range, occupations by length of time the job opening remains, educational requirements per occupation, experience requirements, and a composite weighted index of occupations based on the data on salaries, experience, education, etc. Furthermore, the authors took pains to relate occupational information to VTE curricula.

Although the McFarland and Tucker and Rowell analyses were both conducted for Duval County, comparisons are somewhat difficult due to different definitions of occupations and of job openings. However, it seems appropriate to compare McFarland's estimates of "employee increases needed" to Tucker and Rowell's "projected net jobs." Each study makes projections for the 1974-75 period. Below we have listed some common occupational definitions for which projections are available from both studies.

Projections of Job Openings 1974-75

Occupation	Tucker and Rowell	McFarland
Stenographers and typists	239	1,835
Clerical	221	7,732
Welders	94	2,059
Mechanics	206	2,284

It is clear that these projections are very different as we might have expected. Since Tucker and Rowell's procedure is known to underestimate the demand for labor and the employer survey used by McFarland is known to overestimate employment, the directions of these differences is not unusual. The magnitudes of the differences, however, are quite large.

McFarland and Associates also conducted a study for Duval and Nassau counties in 1973. This study is identical methodologically to their Duval County study and repeats the Duval County data. Thus, we shall not discuss it further.

Three studies were conducted which covered Duval, Nassau, and Baker counties:

a. Baker et al., *Technical Employment in Northeast Florida* (1972),

b. C.E.T.A., *Comprehensive Manpower Plan for FY 1976* (1975), and

c. Battelle, *Jacksonville Regional Occupational Needs Survey* (1975).

The Baker study comprised five volumes and was conducted for the Duval County School Board. Its purpose was to assess technical occupations in the area, so that the feasibility of a new curriculum entitled pre-technical could be investigated. The pre-technical curriculum was designed to fill the gap between the college preparatory and VTE programs. The study's objectives included identifying so called technical occupations, determine employment in each technical occupation, forecast future employment needs, and determine the skills necessary for success in the occupations. An employer survey was conducted for this purpose, but only a limited number of government agencies and larger firms were contacted. No supply side analysis was undertaken.

In 1974 Baker, Nassau, and Duval counties formed the Northeast Florida Manpower Consortium, and with Duval County as the prime sponsor, C.E.T.A. funds were successfully applied for. Under C.E.T.A., prime sponsors are required to develop manpower plans to insure the continuation of federal grants. The document describes the consortium's C.E.T.A. program in terms of its objectives, operations, client groups served, and plans for the upcoming year along with fiscal data on the program's operations. The document is descriptive in nature. No quantitative projections are included, but it does include a useful economic profile of each county in the consortium. However, the study notes that, "An analysis of 226 occupations considered important in the area suggests that the

local supply of workers is generally adequate for the demand. Of the professional and non-professional occupations served by the Florida Department of Commerce, 95.1 percent were rated as having an adequate supply of workers to meet the area's need (p. 11-12)." However, the Florida Department of Commerce notes that shortages (we are not told what precisely constitutes a shortage) are indicated in the following occupations: nursing, clerk-typists, secretaries, stenographers, and mechanics. Furthermore, business firms in the area are claimed to agree with this prognostication. Finally, a table entitled "Opportunities for Work in the Jacksonville Area 1974-1975" is included at the end of the report. However, the analysis is in qualitative terms. Service and clerical occupations are rated from A (strong demand for workers, serious shortage of qualified applications) to E (few or no workers employed in occupation in this area). The [illegible] are consistent with reports from the Florida Department of Commerce [illegible] firms in the area.

The third needs assessment conducted for Duval, Baker, and Nassau counties was by Battelle. On the demand side an employer survey (both by mail and by personal interview) was conducted. The limitations of this approach have already been discussed. On the supply side a survey of graduates from public and private schools was conducted. Once again the limitation of this approach is that it ignores most other sources of occupational entry. The demand and supply are matched and a total over or undersupply of labor is determined. This represents a requirements approach as in our estimates in Chapter V. However, as we noted this approach does not account for potential adjustments in the labor market due to imbalances. The limitations should be set out as we have done. Otherwise this approach is misleading for two reasons. First, it assumes that no labor market adjustments will occur to mitigate any imbalances. Second, since all sources of supply and demand by occupations have not been accounted for, a mechanical matching of inaccurate components can

only be misleading if it was used alone. No mention is made of potential limitations or caveats for the use of the projected under/over supplies. The naivete which surrounds the uses of labor market concepts like demand, and shortage is troubling. With all its limitations the study does provide a useful description of the area's economic base and prospects for the future of the area's economy. Furthermore, the study includes a useful appendix which lists VTE programs with occupations grouped under each program. This is useful for crosswalking between occupational projections and the implications for VTE programs. Comparisons of the projections of the three studies examined above is not possible because they are qualitative in nature, and because they give projections for different occupations and different time periods.

The final needs assessment for the Jacksonville labor market area was conducted by the Florida Department of Commerce. This analysis is unique for three reasons. First, it is the only study which covered the entire seven county labor market area. Second, it is the only quantitative study which is conducted on an ongoing basis. Finally, it is the only study which used a demand side methodology endorsed by the U.S. Bureau of Labor Statistics. The major limitations of the study are:

a. it does not examine the supply side, and

b. it does not relate the demands for labor by occupations to VTE programs.

The demand side methdology follows the BLS procedures as described in the BLS publication *Tomorrow's Manpower Needs* (1969). Briefly, the procedure can be described as a series of steps. First, employment forecasts by detailed industries are made by simple regression techniques. A typical employment forecasting equation takes the form:

$$E_{ijt+1} = f(E_{iust+1}, Pop_{ijt+1})$$

where: E = employment, i = industry index, j = region index, us = U.S. economy, t = time period, Pop = population. Second, an updated industry occupation matrix for the target year (which reflects industrial staffing patterns) is applied to the industrial employment forecasts. This produces projections of occupational demands for the target year. By subtracting the target year's occupational employment from the current year's occupational employment, the expansion (or growth) demand for labor by occupation is obtained. Third, the BLS tables of working life and replacement factors are applied to the current year's occupational employment to estimate the numbers of workers who will leave each occupation over the forecasting horizon, called replacement demand. Finally, by adding replacement and expansion demands the total occupational demand for labor is determined. We have already discussed the limitations of this approach in Chapter III, and we shall not repeat that discussion here. Since the other existing needs assessments we reviewed have more limited geographic scopes and covered different time periods, we cannot compare the forecasts of these studies to the Florida Department of Commerce analysis.

6.4 Field Surveys of VTE in the Jacksonville Labor Market

6.4.1 Introduction

This portion of our report describes the methodology and results of our field work in the jacksonville labor market area. On site visits and discussions with students, instructors, and administrators provided us with much valuable information which would otherwise be unavailable. In fact, none of the previous Jacksonville area needs assessments conducted field interviews with all these groups: students, instructors, administrators, and employers. When field work was pursued as in the Battelle and McFarland studies, it was limited to a few groups and never included facility and equipment monitoring. Thus, we find them inadequate in terms of a comprehensive needs assessment of VTE, and we have tried to remedy these deficiences in our work.

Section 6.4.2 describes our survey methodology. In Section 6.4.3 we discuss the local organization of VTE administration, and in Section 6.4.4 we evaluate VTE facilities and equipment. Funding is the topic of 6.4.5 and students and student needs are discussed in 6.4.6. Faculty and business needs are examined in Sections 6.4.7 and 6.4.8 respectively.

6.4.2 Survey Methodology

We feel that field work is an important component of a comprehensive needs assessment for VTE. In only three of the seven needs assessments conducted recently in Region Four was any field work pursued (see Section 6.3). This section discusses the methodology we used in our field work.

A total of eleven visits were made to Baker (2), Nassau (2), Clay (2), St. Johns (1), and Duval (4) counties, and they can be categorized in the following manner. First, efforts were made to interview each of the county directors of VTE in addition to the occupational dean at Florida Junior College, and these interviews proved to be extremely valuable. The directors and the dean were quite willing to discuss problems which they encountered in their day to day operations, and they provided valuable assistance by describing the type of manpower data which would be most useful to them. Thus, an excellent rapport was established, and permission was received to visit the VTE facilities in each of the counties and FJC.

Although unlimited access was granted to the VTE facilities in each county, the recommendations of the director and his staff determined for the most part which facilities were actually toured. Their recommendations proved to be quite adequate for the purposes of this study. Within each county, the quality of the facilites varied greatly, and no attempt was made to distort the evaluation process by selecting facilties of one particular type or another.

At each facility personal interviews were conducted with students, faculty members, and administrators. A structured questionnaire was used in these interviews with the purpose of determining the needs and problem areas encountered by each of these groups. However, special efforts were made so that the subject's responses were not channeled into any one direction. Thus the characteristics of each county in addition to those within each county emerged.

Well over one hundred interviews were conducted in the field, and information gleaned from these interviews comprises the basis for the evaluations and conclusions which followed. Before beginning the analysis however, one caveat should be made clear. In some cases problems will be analyzed which may only be characteristic of one or two counties in the area, and insignificant in the others. Although care will be taken to note these instances, specific references will not be given. The interviews were conducted in a most candid and open manner, and "off the record" comments were commonplace. Therefore, neither individuals nor particular locations will be cited.

6.4.3 Local Organization

We must begin this section with a disclaimer. We are not professional education administrators, and our comments and analysis here will be somewhat cursory. The purpose of this section is to sketch out the organizational structure of the VTE delivery system in Region Four. To the uninitiated the organizational structure appears Byzantine. In Region Four seven county school broards and two community colleges have responsibilities for providing VT grams. Each of these nine units operates in an autonomous manner. This fragmented administrative structure frustrates a close coordination of program offerings. There is no one administrative unit which has responsibility for monitoring the total VTE effort in the region. Although there does exist an area director for VTE, the geographic boundaries of his district are not

consistent with the Region Four labor market. Furthermore, his role is to provide technical assistance to the seven local school boards and two community colleges in conducting needs assessments or facilities surveys. His duties do not include labor market analyses in the region or program coordination. This is unfortunate because each of these nine administrative units are in fact serving the same labor market.

Within each of the nine administrative units the lines of responsibility are quite clear. In each county the county school board has the primary administrative responsibility for all public school programs including VTE. As the chief executive officer of the school board the county superintendent of schools has the day to day operating responsibility for VTE and non VTE public school programs. Each county has a VTE program director who is directly responsible to the superintendent (or his close assistant often called a curriculum coordinator). The VTE program director administers his county's VTE programs. Given the autonomous nature of each county school board, the school board and superintendent have a great deal of control over the type of VTE program in their county.

The specific roles and duties of the VTE program directors vary widely according to the population and income of a given county. For example, our field interviews revealed that in counties with relatively small populations and low per capita incomes, it is common for the VTE program director to have additional duties in other areas of the county school administration. This is in conflict with state regulations. Therefore, the VTE program director is not able to devote all of his time to VTE, and the programs may suffer as a result. Similarly, occupational specialists are primarily involved with the recruitment and placement of students into VTE programs. However, actual day to day responsibilities vary greatly from county to county. The position of occupational coordinator exists only in Duval County, and these individuals are

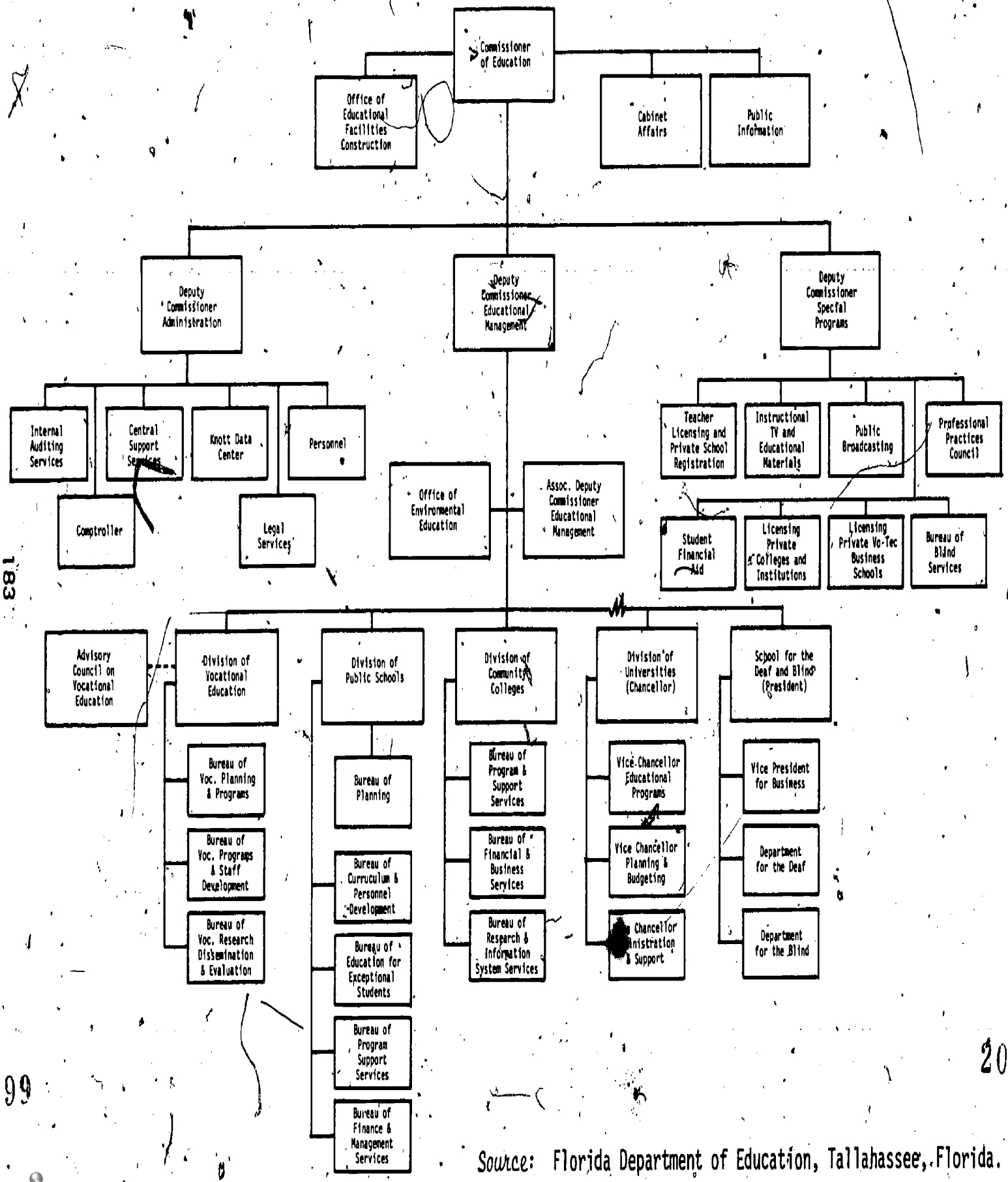
responsible for administering the School-Industry Education program, a co-op program, in the county. Finally, instructors also may participate in program development, upgrading, and student placement in addition to normal teaching responsibilities. However, these activities depend more on the initiative of the instructor rather than being attributed to a particular county or counties. Therefore, it is important to note that instructional arrangements at the county level within a labor market area can vary significantly.

The institutional arrangement of the community colleges is somewhat different from the county school systems. Instead of a county school board the community colleges are responsible to their boards of trustees. Day to day administrative control is provided by the college president and his deans. The internal administrative structure of the community college is similar to that in a university with faculty, department chairmen, and deans.

Viewing the organization structure of the VTE effort in Region Four from the state perspective we noted that nine autonomous units have VTE program responsibility. This fractionalized administrative structure is perpetuated at the state level. Table 6.4.1 shows the organizational structure of the Florida Department of Education. Note that the divisions of vocational education, public schools, and community colleges are separate administrative entities.

Efforts are underway at the state and local level to better coordinate VTE program offerings. At the local level progress toward greater program coordination is most apparent in Duval County. In fact, the efforts by Duval County VTE administrators at FJC and the county VTE program director are most laudable and can serve as a model for other areas. Within Duval County extensive communication and greater program coordination are occuring. To a somewhat lesser entent coordination between St. Johns River Community College and the Putnam County school board is also in progress.

TABLE: 6.4.1--STATE OF FLORIDA DEPARTMENT OF EDUCATION



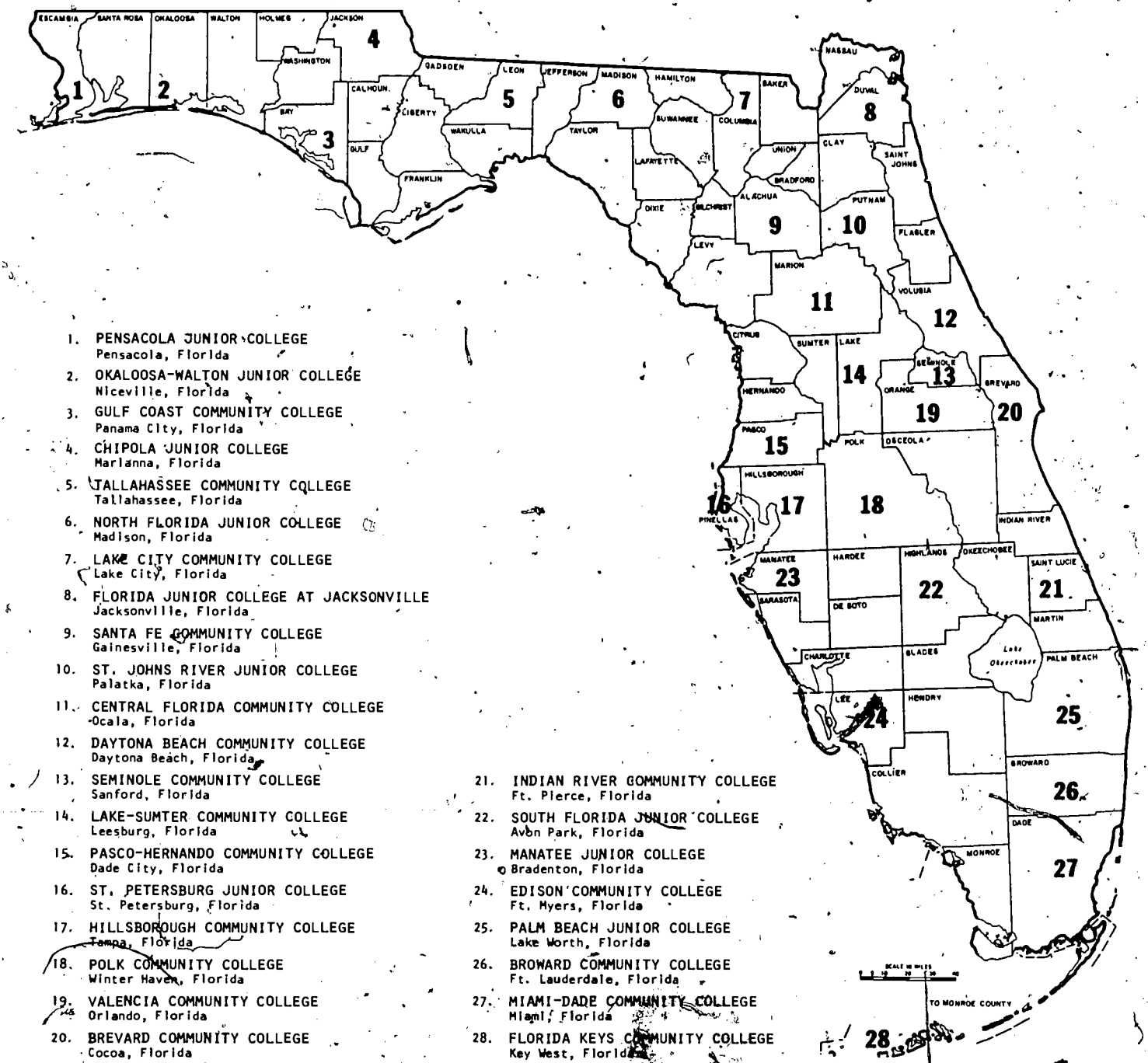
Source: Florida Department of Education, Tallahassee, Florida.

Duval County VTE officials also coordinate their programs with Nassau County. Administrators in both counties report that the program coordination which has resulted strengthened VTE programs in both areas. Further coordination occurs between FJC and VTE programs in Duval, Baker, and Nassau counties, since all three counties are involved in C.E.T.A. programs with Duval County serving as the prime sponsor. Ties between the other counties in the Jacksonville labor market area, St. Johns, Clay, Putnam, and Flagler, are much more tenuous. Also coordination between Duval, Nassau, and Baker counties and the other counties in the region also could be improved. This is a problem since VTE programs in all these counties service the same labor market.

At the state level efforts are underway to provide a closer coordination of VTE programs. The primary vehicle for this is the regional coordinating councils. The coordinating councils include county VTE program directors, community college representatives, and the area VTE director. The idea is a good one, and it can aid in greater VTE program coordination. Howeven, a basic problem with this approach is the geographic delineation of the coordinating councils. The boundaries of a coordinating council are not consistent with labor markets, but instead they are based upon community college districts. In Table 6.4.2 we display the vocational program planning regions based upon the community college districts. As the chart shows four different coordinating councils exist in Region Four. The coordinating council boundaries bear no relationship to labor market areas. District Seven includes Dixie, Gilchrist, Columbia, Union, and Baker counties. District Eight covers Nassau and Duval counties while District Ten encompasses Clay, Putnam, and St. Johns counties. Flagler county is included in District Twelve.

Further efforts at developing a coordinated planning procedure are currently underway. The staff of the Bureau of Planning, Programming, and Budgeting (PPB) has developed a draft for "A Program Planning Model for

TABLE 6.4.2--FLORIDA COMMUNITY COLLEGES



1. PENSACOLA JUNIOR COLLEGE
   Pensacola, Florida
2. OKALOOSA-WALTON JUNIOR COLLEGE
   Niceville, Florida
3. GULF COAST COMMUNITY COLLEGE
   Panama City, Florida
4. CHIPOLA JUNIOR COLLEGE
   Marianna, Florida
5. TALLAHASSEE COMMUNITY COLLEGE
   Tallahassee, Florida
6. NORTH FLORIDA JUNIOR COLLEGE
   Madison, Florida
7. LAKE CITY COMMUNITY COLLEGE
   Lake City, Florida
8. FLORIDA JUNIOR COLLEGE AT JACKSONVILLE
   Jacksonville, Florida
9. SANTA FE COMMUNITY COLLEGE
   Gainesville, Florida
10. ST. JOHNS RIVER JUNIOR COLLEGE
    Palatka, Florida
11. CENTRAL FLORIDA COMMUNITY COLLEGE
    Ocala, Florida
12. DAYTONA BEACH COMMUNITY COLLEGE
    Daytona Beach, Florida
13. SEMINOLE COMMUNITY COLLEGE
    Sanford, Florida
14. LAKE-SUMTER COMMUNITY COLLEGE
    Leesburg, Florida
15. PASCO-HERNANDO COMMUNITY COLLEGE
    Dade City, Florida
16. ST. PETERSBURG JUNIOR COLLEGE
    St. Petersburg, Florida
17. HILLSBOROUGH COMMUNITY COLLEGE
    Tampa, Florida
18. POLK COMMUNITY COLLEGE
    Winter Haven, Florida
19. VALENCIA COMMUNITY COLLEGE
    Orlando, Florida
20. BREVARD COMMUNITY COLLEGE
    Cocoa, Florida
21. INDIAN RIVER COMMUNITY COLLEGE
    Ft. Pierce, Florida
22. SOUTH FLORIDA JUNIOR COLLEGE
    Avon Park, Florida
23. MANATEE JUNIOR COLLEGE
    Bradenton, Florida
24. EDISON COMMUNITY COLLEGE
    Ft. Myers, Florida
25. PALM BEACH JUNIOR COLLEGE
    Lake Worth, Florida
26. BROWARD COMMUNITY COLLEGE
    Ft. Lauderdale, Florida
27. MIAMI-DADE COMMUNITY COLLEGE
    Miami, Florida
28. FLORIDA KEYS COMMUNITY COLLEGE
    Key West, Florida

Source: Florida Department of Education, Tallahassee, Florida.

Vocational Education." This proposed planning model is a great improvement over the current system, and our critical comments should not be construed as a demolition job but rather as constructive suggestions. First, we discuss the strengths of the proposed planning model, and then we offer some constructive criticism and suggestions. Finally, we compare the proposed planning model with a suggested alternative.

The proposed planning model is a coherent and workable procedure for improving the planning process and program coordination in vocational education. The background materials on the vocational education delivery system and the crucial influences of the labor market are discussed in a relevant and sophisticated manner. Labor market projections are developed from the now operational OIDS system, and these are integrated into the planning process from the outset. Finally, the lines of direction and authority are clearly spelled out in the model. In conclusion, the proposed planning model is a sophisticated, consistent procedure which if implemented would vastly improve vocational education planning and program coordination in Florida.

While the proposed planning model is certainly a step in the right direction two areas merit criticism and revision. First, the proposed model is too centralized, and its approach is too hierarchical. We can characterize the model generally as a top down approach--the PPB staff specifies the labor market demand and supply projections by occupations, then the PPB staff presents this data and their planning profile to the regional program director and the regional coordinating council for implementation. This is both a poor planning procedure and a poor management procedure. It is a poor planning procedure because it ignores the intimate knowledge of local labor market conditions and program functioning which the area coordinators, regional coordinating councils, and regional program directors possess. The omission of business and industry leaders from the planning process is particularly vexing since the goal of

vocational education is to train for jobs. This knowledge of local area conditions provided by local people is valuable in augmenting the sophisticated labor market analysis provided by the PPB staff using the OIDS system, and it could insure the reasonableness of those labor market forecasts and planning profiles.

In addition, the proposed hierarchical top-down approach is also a poor management technique. The proposed model has the PPB staff determining program needs and presenting the planning profile to the regional program director and the regional coordinating council for implementation. However, the model notes (p. 7), "Identify the role and services of the Department of Education Regional Program Director and his staff including the type of techinical assistance to be provided to the membership of the Council. This is of critical importance because of the major role which the Regional Program Director and his/her staff must assume in the successful completion of the planning process." It is unrealistic to assume that the Regional Program Director, his staff, or the Regional Coordinating Council will help complete the plan and implement it with any alacrity because the planning profile is essentially imposed on them by the PPB staff. Those who are to implement a plan need to provide input to that plan at its initial stages; so they feel it is their plan, and they have a stake in its outcome.

The second area where the planning model is weak is its reliance on the regional coordinating councils. The problem here is that the district boundaries of the coordinating councils are based on community college districts. As we have noted above these community college districts are not based on economic regions, as the State of Florida Planning Districts, nor are they based on regions for which OIDS data is available. Sine the proposed planning model is to use OIDS data, this appears to be a serious problem.

Given the criticisms of the proposed planning model, we endeavored to construct a planning model which integrates our criticisms into the proposed model. Table 6.4.3 is a flow chart of the planning process from the proposed model, and Table 6.4.4 is a flow chart of our alternative model. Table 6.4.5 contains an explanation of the steps in our planning alternative.

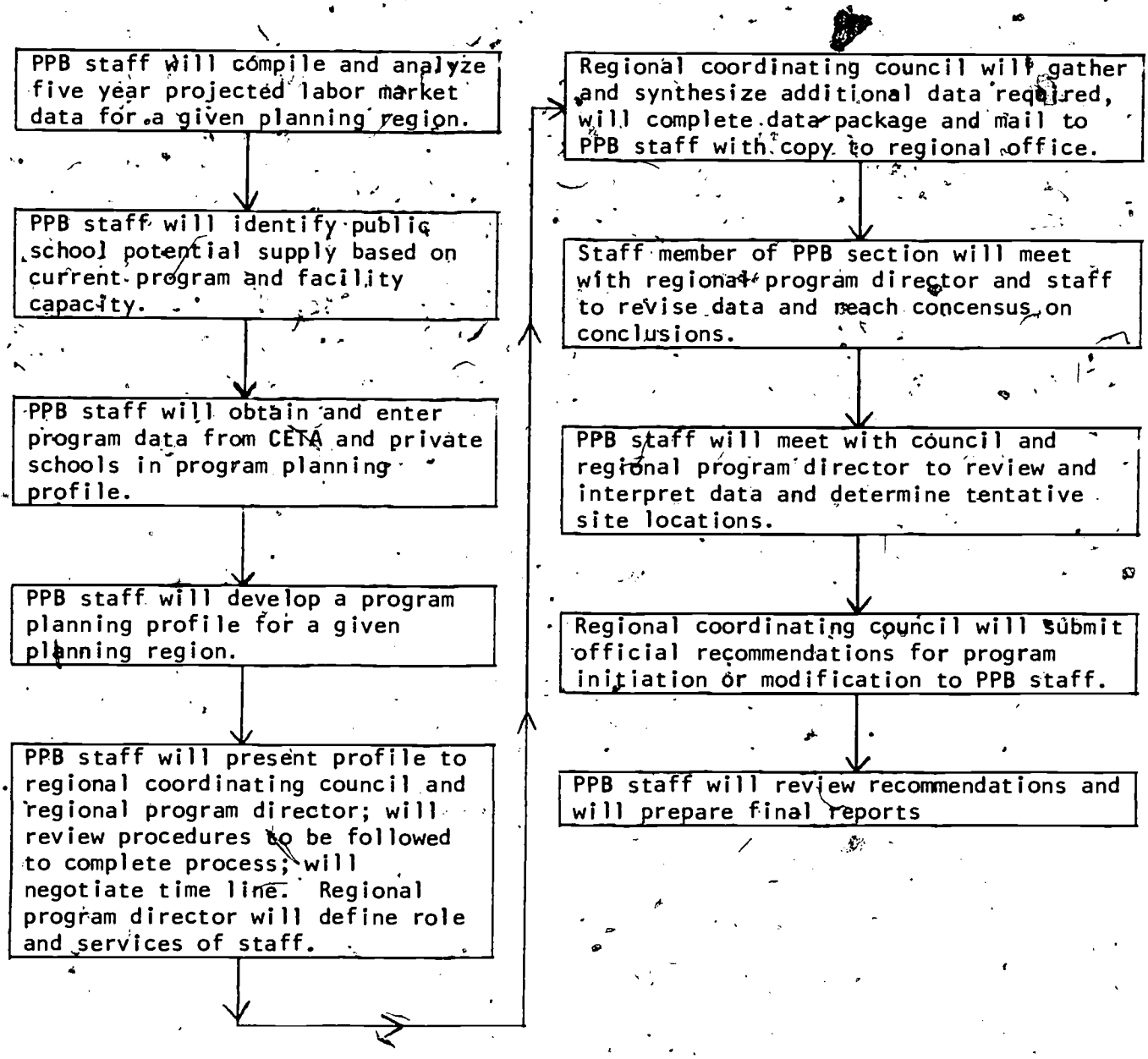
6.4.4 Evaluation of Facilties and Equipment

A major finding of our field work is that of program unevenness, both within and across counties, and this is best illustrated in terms of facilities and equipment. Although general statements in this area may not be appropriate, one conclusion, drawn from numerous examples, is that the better facilities and equipment are indigenous to those areas which have relatively high per capita income as well as population growth. For example, in terms of facilities some programs in the poorer rural counties are housed in condemned buildings. Furthermore, it was brought out in the interviews that some of these structures are unlikely to be replaced in the near future. Money for repairs at one school had to be raised through a candy drive. Another structure (used for welding), though not condemned, had very poor ventilation and was heated by a stove in the center of the room. Other examples could be cited, however, these facilities stand in stark contrast to the excellent facilities and equipment of the Southside Skills Center (Duval), St. Augustine Technical Center (St. Johns), and Orange Park Vocational High School (Clay). It should be noted that the latter two facilities are located in rapidly growing areas adjacent to Duval County. However, these facilities are not representative of other facilities even within the same county. In fact, a wide diversity of facilities is the rule rather than the exception.

Similar statements can be made with respect to equipment, texts, and consumables (solvents, hand cleaner, wood, etc.). For example, some of necessary equipment in the industrial trades courses in three rural counties

Table: 6.4.3

PROPOSED PROGRAM PLANNING PROCESS



Source: Department of Education, "Proposed Planning Process."

Table: 6.4.4

ALTERNATIVE PROGRAM PLANNING PROCESS

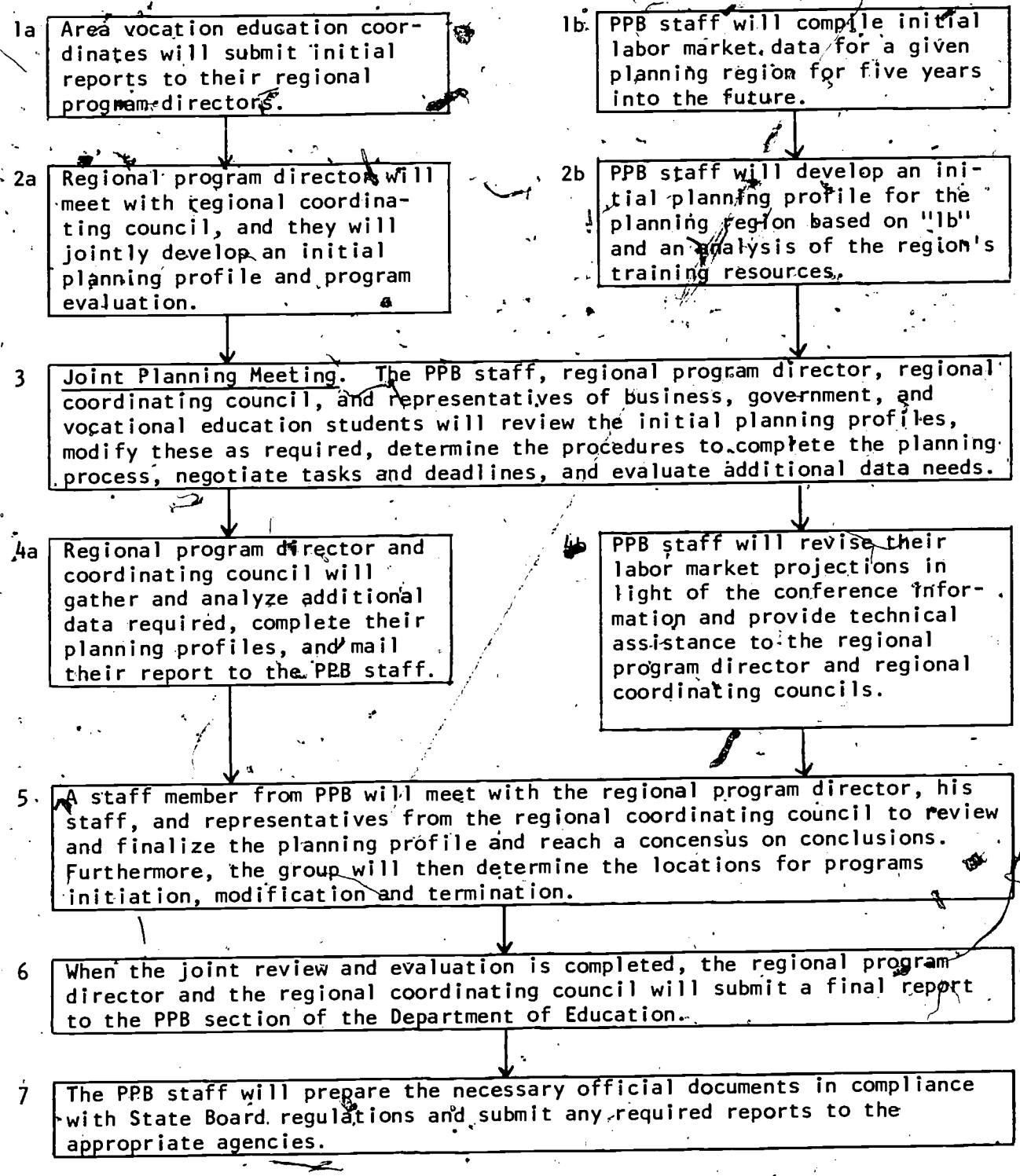


Table: 6.5

1a Area vocational education coordinators will provide initial reports to their regional program directors including an evaluation of existing programs, placement patterns, local labor market trends, input and reports from the regional advisory and craft committees, staff and faculties needs reports and inputs form industry leaders and students.

1b PPB staff using the OIDS system will make 5 year projections of occupational demands and supplies--all manpower supply systems including migration, CETA, public schools, private schools, etc. will be counted in the potential supply of labor.

2a The regional program director will compile the reports from the area coordinators, and he will meet with his regional coordinating council. An initial planning profile will be developed jointly.

2b PPB staff will also develop an initial planning profile based on "1b" and an analysis of the region's training resources.

3 The planning conference is the cornerstone of an effective planning process. Here the initial planning profiles developed at the local level with an intimate knowledge of local labor market conditions and program functioning, will be coordinated and reconciled with the planning profiles developed by the PPB staff with their expert knowledge of national and state economic trends, industry staffing patterns and funding forecasts. The initial planning profiles will be reconciled, procedures for completing the plan will be determined, tasks and deadlines will be decided, and additional data needs evaluated. Finally, an evaluation of any shortcomings in last periods plans and forecasts will be discussed and the necessary modifications will be made.

4 The planning conference will point up any weaknesses in the initial planning profiles, additional data needs, and further analyses necessary.

4a The regional planning director and coordinating council will gather and analyze any additional data and submit their report to the PPB staff.

4b The PPB staff will revise their labor market analysis and provide technical assistance to the regional program director and coordinating council in completing their work.

5 The regional planning director, his staff, a representative from the regional coordinating council, and a staff member from PPB will review and finalize the planning profile. Then they will determine the locations for program initiation, modification, and termination.

6 When the joint review, evaluation, and site determination process is completed, the regional program director and regional coordinating council will submit a final report to the PPB.

7 Given the final report the PPB staff will prepare the required official documents and submit the necessary reports to the designated agencies.

was obsolete, nonexistent in several instances, or inoperative due to lack of funds for repairs. Instructors often had to use their own tools to compensate for this inadequacy. Other components were sometimes donated, because purchasing funds are often unavailable. Obsolescence was also a problem in the older facilities of the higher income counties. This "equipment gap" is further exacerbated by inadequate textbooks and consumables. In one auto mechanics program the textbook has been published in 1964. Furthermore, only $500 had been allocated to consumables, and this did not even cover the annual cost of solvents. It is not uncommon for instructors to pay for certain items out of their own salaries without reimbursement in this situation. The better endowed facilities had the most recent textbooks and repair manuals, and they received up to three and four times greater allocations for consumables while teaching the same auto mechanics course.

Although only extraordinary cases have been cited, they are indicative of countless examples of program unevenness of a somewhat less severe nature. It has been assumed in this study that the Jacksonville area is one employment area. However, it seems likely that job-entry level training is more accessible in Duval County and in certain areas of Clay and St. Johns counties than in other areas. The assignment of a student to one facility may render him with a comparative disadvantage in the job market, and this is the inequity of program unevenness. Evidence of this phenomenon came forth in the interviews with several occupational specialists in rural areas who stated that they are not able to place their students into jobs. Rather, they attempt to give their graduates access to institutions where they can receive training which is equivalent to virtually any high school VTE program in Duval County. Thus, these students must seek post secondary training so that they can compete with high school graduates from Duval County. This is certainly an accolade for the programs in Duval County and at the Orange Park Vocational High School and the St. Johns Skill Center.

The most vexing problem all VTE administrators face is with their older equipment. This problem was voiced repeatedly in the field work. The capital equipment purchased for VTE training often remains in workable condition long after it is made obsolete by changes in technology. Since the equipment is still serviceable at such points in time, it is difficult to justify the purchase of newer equipment. This equipment problem is particularly apparent in older ongoing programs.

The funding process is the primary contributor to the problem of program uneveness, and we examine the adequacy and conduct of VTE funding next.

6.4.5. Funding

A complete and consistent analysis of the costs and funding for VTE programs is not now available. Furthermore, given the current state of VTE funding and cost categories such an analysis is not even possible at this time. A quote from a report by the Florida Post-Secondary Education Finance Committee (1975, p. 4-5) best explains the problem:

> There is no single or predominant pattern in the way vocational education, adult basic education, adult general education and community instructional services are provided in Florida. The same service may be available in several delivery systems, and where this occurs, it may be funded through different formulae. For example, full-time high school students who also attend a county based area vocational-technical center are not funded by the State for all of their work in both institutions. Where additional work is undertaken by high school students in an area vocational-technical school located in a community college, the state fully funds both delivery systems.
>
> When the Committee undertook to conduct an analysis of actual program costs and to make appropriate comparisons, it learned that this is not presently possible. There is no agreed upon structure which defines programs, permits identification of those programs which are the same and indicates the differences between those which are not.

While such data limitations can be frustrating we can provide some rather coarse analyses of existing funding data. From the Advisory Council's *Annual Report* (1975, p. 74) we note that in 1973-74 the State of Florida spent

$147,218,784 to put 938,019 students at all levels of VTE for an average cost of $156.95 per student.

In Region Four area cost per student varied widely as we can see from the data below:

Cost Per Student in VTE Programs in Selected Region Four Counties: 1974-75

Baker	$419	Duval	$296	St. Johns	$477
Clay	$266	Nassau	$355		

Source: Our calculations from unpublished enrollment and cost data supplied by the Florida Department of Education.

This pattern is repeated in the cost per full-time equivalent (FTE) student displayed below:

Cost Per Full-Time Equivalent Student in VTE in Selected Region Four Counties: 1974-75

Baker	$1,604.37	Duval	$1,468.16	St. Johns	$1,738.76
Clay	$1,507.50	Nassau	$1,546.35		

Source: Our calculations from unpublished data supplied by the Florida Department of Education.

This data indicates that the larger programs are less expensive to operate measured on either a per student or per FTE basis. This implies that VTE programs exhibit economies of scale which stands to reason given the capital intensive nature of VTE. The implication to be drawn here is that the larger programs tend to be lower cost programs. Furthermore, when we recall the facilities and equipment limitations which exist in rural areas, the problem of program unevenness can only be exacerbated. Rural areas tend to have older equipment and are faced with higher cost per student programs than urban areas.

An analysis of the VTE funding process helps to explain why some of the problems with respect to facilities and equipment exist. Over the past few years the Florida Legislature has made efforts to adequately fund both new and ongoing VTE programs. In 1973 the Florida Legislature enacted a new state

school financing law which was designed to allow for the differential expenses of alternative public school programs. The Florida Education Financing Program was modified since the 1973 legislation. The current school funding formula can be described as:

$754.51 X District Cost Differential X Cost Factor X Full-Time Equivalent Student

Local tax effort is required to share the burden of the initial $745 base rate per FTE student and both rich and poor counties must apply equal tax efforts through not equal dollar amounts. The district cost differential factor is designed to allow for varying costs of living and costs of supplying educational services throughout the state. The cost factors represent the different costs of various educational programs. There are now six VTE cost categories ranging from a factor of 1.17 to 4.26. For example, Cost Category V with a 4.26 factor includes programs in emergency medical technology, data processing, and diesel mechanics. Cost Category VI having a factor of 1.17 includes programs of instruction in entry skills for agriculture, distribution, and diversified occupations.

In theory this funding formula would provide adequate revenues to operate the state's VTE programs. However, for some counties in Region Four this is clearly not the case. As we reported above, in some rural counties there is insufficient operating revenues to provide sufficient equipment, textbooks, consumables, and tools in particular. The problem results because the county school boards and their superintendents are not required to provide the VTE programs the state funds which these programs generate. That is to say, VTE programs generally have a relatively high cost factor compared to other educational programs. When students enroll in such programs, this generates a relatively large amount of state support per FTE as the funding formula indicates. However, there is a tendency for county school superintendents to,

skim the funds so generated and spend them for non VTE programs. While this is perfectly legal, it operates to the detriment of VTE programs.

Our field work revealed that this problem is endemic to all the counties in Region Four although the virulence of the problem varies widely. In those counties where the school board and superintendent are committed to VTE, this is not much of a problem. In fact, such counties prefer noticeable support for VTE in their areas. However, in other countries, particularly those in rural areas, this problem is quite apparent.

For the community colleges the funding formula is somewhat different. First, the community colleges are not governed by the Florida Education Funding Program. Second, the community college funding formula does not include any factor for local effort because the community colleges generate fees instead. Third, the cost factor weights and categories are different since these are constituted on a broad program basis. The problem of superintendent skimming does not exist in the community college environment.

The funding of VTE is complicated by the system of priority fundings for equipment and contributions for operating costs. These funds are provided by the federal government under PL 90-576, and the State allocates these funds. During the interviews with VTE administrators, it was brought out many times that there are biases in the state VTE priorities funding formulae which work against lower income counties with stable populations, thereby perpetuating program unevenness. Priority funding is classified into three categories. Priority one funding occurs when a new VTE program (s) is housed in a new facility. Therefore, funds are allocated to the construction costs of the building in addition to the necessary equipment. Since new facilities are allocated primarily on the basis of population growth since this largely determines the number of students, priority one funding is concentrated in Duval County and the "bedroom" communities in Clay and St. Johns. Priority two funding encompasses new programs which are housed in old facilities. This category provides funds only for

Table: 6.4.6

Region 4 Vocational and Technical Education: Unduplicated Enrollment
July 1, 1974-June 30, 1975

(Not counting community colleges)

Program	Baker		Clay		Duval		Flagler		Nassau	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Agribusiness	285	28.5	303	5.6	978	2.0	200	18.9	382	15.4
Business	221	22.1	2,094	38.6	13,163	27.3	192	18.2	269	10.2
Consumer & homemaking	158	15.8	600	11.1	3,165	6.6	86	8.1	319	12.8
Distributive education	---	---	369	6.8	3,934	8.2	---	---	---	---
Diversified	---	---	43	0.8	435	0.9	11	1.0	7	0.3
Home economics gainful	181	18.1	847	15.6	10,174	21.1	262	24.8	501	20.2
Health occupations	---	---	198	3.7	307	0.6	---	---	153	6.2
Industrial arts	33	3.3	554	10.2	12,229	25.4	162	15.3	598	24.1
Industrial occupations	121	12.1	324	6.0	2,997	6.2	143	13.5	239	9.6
Job entry	---	---	---	---	48	0.1	---	---	12	0.5
Work experience	---	---	87	1.6	648	1.3	---	---	4	0.2
Technical	---	---	---	---	72	0.1	---	---	---	---
Total	999	100.0	5,419	100.00	48,130	100.0	1,056	100.0	2,484	100.0

continued . . .

Table: 6.4.6

Region 4 Vocational and Technical Education: Unduplicated Enrollment
July 1, 1974-June 30, 1975 (continued)

(Not counting community colleges)

Program	Putnam		St. Johns		District totals		District enrollment as a percent of Florida	Florida totals	
	Number	Percent	Number	Percent	Number	Percent		Number	Percent
Agribusiness	790	16.4	199	5.3	3,137	4.7	6.1	51,119	6.8
Business	1,002	20.8	612	16.2	17,553	26.3	[illegible]	139,326	18.6
Consumer & homemaking	764	15.8	220	5.8	5,312	8.0	5.3	100,200	13.4
Distributive education	---	---	224	5.9	4,527	6.8	10.8	41,983	5.6
Diversified	57	1.2	22	0.6	575	0.9	6.5	8,899	1.2
Home economics gainful	845	17.5	245	6.5	13,055	19.6	10.2	127,934	17.1
Health occupations	---	---	362	9.6	1,020	1.5	4.1	24,581	3.3
Industrial arts	753	15.6	324	8.6	14,653	22.0	11.0	133,214	17.8
Industrial occupations	613	12.7	978	25.9	5,415	8.1	5.8	93,660	12.5
Job entry	---	---	---	---	60	0.1	1.6	3,675	0.5
Work experience	---	---	---	---	739	1.1	4.8	15,417	2.1
Technical	---	---	596	15.8	668	1.0	7.1	9,446	1.3
Total	4,824	100.0	3,782	100.0	66,714	100.0	8.9	749,454	100.0

Source: Unpublished data courtesy of the Florida Department of Education.

equipment, and it is also concentrated in the previously cited areas which have a considerable degree of program diversity compared to Nassau and Baker (see enrollment data Table 6.4.6). The final category is priority three, and it is concerned with current expenses and replacement costs for ongoing programs in old facilities.

This system of priority funding essentially limits low income counties with relatively stable populations to the third category. High average costs per student in these areas generally do not justify the introduction of new programs which would bring in priority two funds. It may well be that from the statewide perspective of cost-effectiveness it is desirable to limit program growth in rural areas with stable populations. However, such a response does not then take account of the inequities of program unevenness. In addition, replacement funds made available under priority three are allocated on an annual basis with no carryover. Since equipment depreciates at varying rates, and is available only in large units, this method of replacement funding is extremely inefficient.

Other factors in the funding process also contribute to program unevenness. First, the economic conditions of a county are considered in the funding process and in terms of equal local tax efforts. Thus, the combination of a poor local effort due to a poor attitude with respect to education, relatively low property tax potential, and priority three funding and its deficiences is likely to result in inferior VTE training relative to Duval County for example. Second, although a Florida Inventory of School Housing Survey is done, these studies do not seem to be utilized for funding allocations. This survey could help to prevent the continued use of condemned buildings. Finally, VTE staffs in the smaller, low income counties often must assume numerous duties. Therefore they are not able to apply for federal and state grants to the extent that the larger counties do. Even if a grant is obtained, local matching funds are often unavailable.

The funding problems coupled with these related factors tends to perpetuate the status quo in VTE. National evidence suggests that VTE programs are often not relevant to current and projected manpower needs. This program rigidity exists in some programs offered in the Jacksonville labor market area particularly in the rural areas. The trend in program unevenness is likely to worsen, to the detriment of students and business needs, unless a fresh approach is taken to state planning and organization. Such movement at the state level is now underway as we have reported above.

6.4.6 Students and Student Needs

This section will be devoted to students and their needs in VTE in the Jacksonville region. First, an attempt will be made to classify students according to their mode of program entry. Second, the method of program selection will be analyzed. Third, the relevance of coop programs and their role in VTE will be discussed. Finally, student needs in terms of placement will be evaluated.

Students in VTE can be classified in the following manner. The first group consists of high school students, who are often exposed to VTE explorer programs in their early high school years. In the eleventh and twelfth grades, they pursue a specific area of program instruction. This is a basic scenario for all counties visited with the exception of Duval, which has three year programs to accommodate the SIE program. In addition, the adequacy of the explorer programs will vary greatly from school to school, and from county to county.

The other major category of students are those participating in VTE in a post secondary program. Disregarding adult education courses, these students are assigned to either FJC, the St. Augustine Tech Center, or the St. Johns River Community College. An important characteristic of this group is that many receive stipends from either a) VA benefits in the case of retired

military personnel or b) CETA (Comprehensive Employment and Training Act of 1973). To receive funding under the CETA program, an individual must meet one of the following criteria: a) unemployed, b) under-employed, or c) economically disadvantaged. A final group in the post-high school classification are those students who pay tuition for their program instruction. This group represents a plurarlity of those enrolled in community colleges in Region Four.

The primary need of any potential VTE entrant is that of program guidance conseling. In this area high school students face several problems. A recurrent theme in the interviews was that guidance counselors were primarily oriented to pre-college or academic funding. Students were able to enroll in VTE programs by their own persistence or they are dumped into VTE programs because they have been disruptive. Although occupational specialists are responsible for VTE recruitment, they are handicapped in that they are often unable to meet with students on an individual basis until the student expresses an interest in VTE. This interest is often discouraged by academic guidance counselors, who are generally ignorant of VTE programs. At the post secondary level this is not a problem since students generally have a clear perception of their goals.

The placement of students within a particular program is also the responsibility of the occupational specialist. Aptitude tests and student interests are the primary placement tools. However, since VTE does maintain an "open door" policy, student interest generally takes precedence. Further, those students who require remedial skills in reading and mathematics are often assigned to VTE, and there is little recourse except to place the individual according to his interest.

A serious shortcoming in the placement process is the lack of good occupational employment information. Although programs in career exploration operate at the grammar school level and there are the wheel and explorer

programs in junior and senior high school, students we interviewed were often unaware of their employment potential upon graduation. Great use of manpower projections by occupations, earnings profiles and the like are a necessary adjunct to the exploration type programs now in use to aid students in their career decisions.

The drawbacks of guidance and placement at the post secondary level are similar to those previously cited. Students often stated that they learned of the programs through friends. Preplacement counseling programs are an attempt to deal with this problem but their effectiveness has not yet been established. Further, student interest is the primary determinant of his program selection. This is consistent with findings at the national level, which state that post secondary institutions tend to place more emphasis on student demand rather than manpower requirements as the criterion for program need particulary in existing programs. Popular porgrams are the paying programs.

The recipients of VA and CETA stipends have special concerns. Within this group there are individuals who view VTE as an opportunity to enhance their employment potential, and they are generally dedicated to their work. However, they commonly have not been exposed to any manpower projections prior to program entry. Individuals without stipends would also fall within this group.

In contrast there is a substantial number of individuals whose primary interest is the receipt of their stipend rather than VTE training. This group will continually shift from one program to another until their benefits (VA or CETA) are exhausted. It is unlikely that they will seek employment in their areas of training.

This situation occurs at the St. Augustine Tech Center, FJC, and St. Johns River, and it was cited as a real problem by both instructors and administrators. Many of these individuals are retired military personnel,

and they view VTE in terms of avocational rather than vocational training. According to instructors this phenomenon has reduced the rate of program completors, diluted the quality of vocational training, and tarnished the generally excellent reputation of the institutions involved. Recently steps have been taken to ameliorate this problem. Students are now required to make progress towards completing a degree. Furthermore, time itself will help to relieve this problem as fewer men are eligible for veterans administration educational stipends.

With the exception of Duval County, coop programs have not been instituted in a comprehensive manner. The lack of student transportation and cooperative employers were commonly cited constraints. There is also a need for additional personnel to handle the administrative duties in terms of placement and follow up.

However, Duval County runs an extremely effective coop program, School-Industry Education (SIE). The program operates in the following manner. Students who desire entrance into SIE begin their VTE training at the 10th grade level. Thus, it is a three year commitment for them, rather than the more common two year training period. If the student is judged to have job-entry skills by his instructor, then in his senior year, he can fulfill his requirements for graduation by working in an outside job.

The placement of these students is the responsibility of the occupational coordinator in a specific program area (business, mechanical trades, etc.). Occupational coordinators are required to have prior work and teaching experience in their designated area. Since the placement of students into jobs is a necessity for the success of the program, occupational coordinators work full-time in this area in addition to the maintenance of follow-up records.

The SIE program has been a success in several respects. First, it is a tremendous "selling point" to those students who are considering vocational education. Second, over 2,900 students were placed in the program, and they earned over $3.7 million in salaries, thereby indirectly contributing to the costs of their own education. Third, students are able to obtain waivers from various regulations which would ordinarily prohibit persons under eighteen years of age from working in certain hazardous occupations. Finally, the student is able to acquire valuable work experience and contacts for full-time employment upon graduation.

SIE differs from other coop programs in that the student is trained at the job-entry level prior to placement. However, it is unlikely that this program can be implemented in other areas, despite its advantages. The cost of maintaining a staff of coordinators may be prohibitive in most counties. Severe problems in transportation and placement are also likely to be encountered.

Traditional coop programs are primarily concerned with on-the-job training prior to the completion of a VTE program. This could be very important for those facilities which are lacking the equipment necessary for the attainment of job-entry level instruction, and some efforts have been made along these lines. However, coordination has been lacking, and any success can be primarily attributed to a few individuals rather than to a concerted county effort. Post-graduate placement is a vital area of student needs, and it is generally conducted on an ad hoc basis in most areas. Administrators, instructors, and students all participate in the process to some degree, but coordinated efforts are nonexistent at both the high school and post-high school levels. Very little assistance is provided by the state employment service in most areas, and this lack of cooperation is consistent with national findings.

Important changes in this situation are now going forward. As of 1974 the State Legislature has required each school board to conduct placement and follow up studies to determine the effectiveness of their programs. As we noted above the first set of useful data should be available later this year. In addition, in Duval County efforts at coordination between counties in the context of the Duval-Nassau Coordinating Council have made good progress. Furthermore, Duval County VTE administrators have established a cooperative sharing of labor market information with the Florida Employment Service. Finally, the community colleges in Region Four have established placement programs for their graduates and follow up data is being collected.

Even with this progress placement remains a problem for most of the VTE students we interviewed in areas outside of Duval County. Although job openings can sometimes be obtained by placement offices and occupational specialists, the task of matching required job skills to students is often the responsibility of the instructor in most of Region Four. The instructor's contacts with business associates and former employers allow them to determine if a student has the necessary skills and work habits demanded by a particular job. However, many students reported that they receive no help whatsoever from these sources.

Student placement is still a major source of frustration at all levels of VTE, and a structured system for providing employment information is essential. Furthermore, counties contiguous to Duval are somewhat myopic in that they sometimes do not consider employment opportunities in Jacksonville. However, an effective placement system is vital not only for meeting student needs, but also the needs of business. Such a placement system must view the entire labor market area as its service region. Finally, greater coordination between the employment service, VTE, and business and industry is needed to make placement efforts more successful. While the greater future use of

the regional coordinating councils should help resolve some of these placement problems, we remind the reader that four coordinating councils service portions of the Region Four labor market.

6.4.7 Faculty

This section will attempt to assess the overall capability of VTE instructors, and it will discuss the major problems which they encounter. In the field work at least one instructor from virtually every VTE program was interviewed, and most were quite willing to discuss both their shortcomings and the primary difficulties associated with their work. Furthermore, the relationship between instructors and their craft committees will be analyzed.

The instructors can be grouped into three categories: retired military personnel, former workers in the private sector, and those who have college training combined with their prior technical experience. Overall, it would appear that the technical expertise of the instructors was quite high. However, in a small number of interviews, some instructors did admit that they were not qualified to teach in their respective VTE programs. Usually, they attempted to remedy this situation by enrolling in training courses and attending program workshops.

Although generalizations can be misleading, several complaints were made in reference to the shortcomings of retired military personnel in their roles as instructors. The most commonly cited inadequacies were their lack of knowledge of how the private sector operates in addition to not having prior teaching experience. Since personal job experiences are often more relevant than "textbook" training in VTE, the first criticism is particularly relevant. However, most of the instructors in all categories had not had prior teaching experience or training, and this drawback was generally overcome in time.

It should be noted that many of the instructors have enrolled in college programs in order to improve their teaching skills. Work toward advanced degrees was not uncommon. Furthermore, we found that those instructors with the highest credentials tend to gravitate to the newer facilities with the most modern equipment. This does not imply that all of those individuals are superior teachers, but in a general sense, this pattern can be viewed as augmenting the comparative advantage of those areas with better facilities and equipment.

Without question, the most difficult problem faced by the instructors in the county schools is the proper method of dealing with disruptive students. These individuals seldom have fundamental skills in reading and mathematics. Yet, since most VTE programs still maintain an "open door" policy, academic guidance counselors utilize this device to remove problem students from academic courses by transferring them into VTE programs, particularly in the mechanical and building trades. The use of VTE as a "dumping ground" for problem students is indicative of the bias against VTE by academicians at the local level. It is also consistent with findings at the national level. Although instructors in some cases can screen prospective program entrants with personal interviews, this practice is not widespread.

In the field work instructor reactions to this difficulty fell into two categories. One group complained that these problem students brought down the quality of the program, were the cause of theft and vandalism of equipment, and contributed to the poor work habits of other students through demonstration effects. In contrast, the second group of instructors rarely mentioned these difficulties. Rather, they could demand rigorous work habits of all of the students in the program, and reluctant or disruptive students either voluntarily left the program due to the work requirements, or they were dismissed for violating safety rules in the work area. Nevertheless, many of these students were able to gain at least a cursory knowledge of mathematics, but more

importantly, knowledge directly applied to a skill. Thus, they responded to the practical training of VTE, and they would have a marketable skill upon graduation from the program. From this discussion during the interviews, it became rather simple to separate the highly motivated instructors from those that were indifferent.

Other difficulties faced by instructors are the development and upgrading of program content, and the placement of their students into full-time jobs. The first problem is usually attributed to a lack of teaching experience, whereas the second results from the ad hoc nature of student placement in many parts of Region Four (refer to 6.4.6). However, effective craft committees can aid the instructor in both of these areas. First, by acting in an advisory capacity, they can insure that a program stresses the training necessary for job-entry level skills. Second, craft committees can serve as lobbying groups for funds and provide donations of equipment and materials. This function is particularly important in the smaller, rural counties, where the participation of a community business leader on a craft committee can be the source of considerable economic and political power. Finally, craft committees represent a source of much needed employment information.

The reactions of the instructors to their craft committees were rather mixed. Although some of the committees had proved to be quite helpful, others merely went through the formalities of meeting once a year. In some instances craft committees did not even exist. These findings are quite consistent with other studies commissioned by the Florida State Advisory Council on Vocational and Technical Education.

6.4.8 Business Needs

The needs of business are strongly related to caliber of VTE training and to the efficient placement of VTE graduates. Field work in the business sector has not been conducted for this project. However, a conference to

assess business needs and to open avenues of communication between VTE program directors and individuals from the private sector would be most beneficial. The idea of such a conference was enthusiastically received by both educators and the business community but we did not have the time to conduct such a conference for this study. Hopefully a future effort will be directed to this area.

It should be noted that FJC presently runs employer programs, and these are utilized by businesses for the job upgrading of their employees. As a result of its success major businesses in Duval County have reduced their own training programs in favor of those operated by FJC. This is because of the effectiveness in terms of costs and skills acquistion of the FJC programs. Therefore, it is one example where program coordination has served the needs of business.

OUTLINE

Chapter VII

CONCLUSIONS AND RECOMMENDATIONS

7.1 Introduction

7.2 Conclusions

- 7.2.1 Uses of Manpower Information in VTE Programming and Planning
- 7.2.2 A Preferred Methodology for Projecting the Expansion Demand for Labor
- 7.2.3 The Calculation of Replacement Demand
- 7.2.4 Forecasting the Supply of Labor by Occupations
- 7.2.5 Meshing of Supply and Demand Forecasts
- 7.2.6 Crosswalking from Occupational Projections to VTE Programs
- 7.2.7 Conclusions Drawn from our Field Work

7.3 Recommendations for Improving our Needs Assessment Methodology

Chapter VII

CONCLUSIONS AND RECOMMENDATIONS

7.1 Introduction

The purposes of this chapter are to highlight our major conclusions and to discuss our recommendations. Each of the earlier chapters contains a detailed summary of the methodology which we have developed, so here we will concentrate our attention on the implications of our research for further development of our needs assessment methodology.

The objective of this report is to develop and test systematic procedures for assessing the needs for vocational and technical education (VTE) in Florida. We have developed a five-part approach to the methodology: 1) set forth an overall economic analysis of the region and its potential for economic and population growth, 2) develop and test alternative procedures for projecting the demand for labor by occupation for a given urban area, 3) develop and test methodology for projecting the supply of labor by occupation for an urban labor market, 4) develop procedures for meshing forecasts of occupational demand and supply for urban areas, so that prospective shortages and surpluses of manpower can be readily identified, and 5) conduct extensive field surveys of VTE programs, facilities, students, teachers, and administrators.

It is fair to say that this study has broken new ground. First, we show how existing manpower projection techniques for an urban labor market areas can be improved, expanded, and make more meaningful VTE planning. Specifically, we believe that the Occupational Information Delivery System (Tarr and Campbell, 1975) now implemented at the state level in Florida can be fully adapted for

use in individual urban areas. Second, we develop a systematic and comprehensive procedure to project the future supply of labor by occupations. While further testing of the technique is needed, we provide the first set of detailed occupational supply projections for an urban area. Third, we relate our occupational supply and demand forecasts to VTE program codes in a format we believe VTE administrators will find useful.

However, as we noted in Chapter 1, this study falls short a full needs assessment. We have gone only part of the way. For example, we do not attempt to perform cost-benefit analysis on potential changes of VTE programs which may be warranted in light of our labor market analyses. Futhermore, it is clear that the procedures we have formulated have conceptual and data problems which require further work and continuing study. As we suggest below, it will be important to test these procedures in other urban settings.

7.2 Conclusions

7.2.1 Uses of Manpower Information in VTE Programming and Planning

Accurate manpower information on past and prospective labor market trends for urban areas is essential for effective VTE planning and programming. This is acknowledged by VTE administrators in both the State of Florida and in Region Four. Sincere efforts are underway at the state level to produce more accurate and more useful labor market information. Manifestations of this trend include the initiation of The Occupational Information Delivery System (Tarr and Campbell, 1975; cf. Chapter 3) and the proposed "Program Planning Model for Vocational Education" (1976; cf. Chapter 6). In Region Four the utilization of manpower information by VTE administrators appears very uneven. VTE administrators in the more urbanized counties were more familiar with state and local sources of labor market than their counterparts in the outlying areas.

Also our field work revealed that little if any use is made of national manpower information or national labor market trends and projections. This is myopic for two reasons. First, national labor market trends and national economic events will have a large impact on all regional labor markets. Ignorance of such trends may result in inappropriate planning and programming. Second, it may be appropriate in some instances to train students for occupations in the national labor market as opposed to the strictly local labor market. In such cases, knowledge of national labor market trends is essential.

A final point with respect to the uses of manpower information is that more mileage can be derived from the existing set of data and projections. There is a need for the systematic use of existing information not only for planning new programs but also for student guidance and placement and for the evaluation of ongoing programs. Furthermore, more accurate assessments of the adequacy of existing facilities and equipment for meeting present and future training demands would be promoted by a greater utilization of existing manpower information.

Consistent with findings at the national level reviewed in Chapters 2 and 3 is the fact that manpower information is sometimes abused by VTE administrators. Such abuses can be divided into two categories. First, manpower information is sometimes used to justify programs pre-selected on other grounds, and manpower data and projections are rarely the motivating factors in program terminations. Such abuses do not promote a close coordination of VTE programs and labor market needs.

The second category of abuse of manpower information concerns the sloppy use of labor market concepts. As we noted in Chapter 6 in the context of our review of the existing set of VTE needs assessment studies, the authors of these studies did not use labor market concepts in a care-

ful manner. The most serious source of confusion is due to the naive use of the terms job opening, job vacancy, and needs. A common procedure in these needs assessments is to project the future demands for and supplies of labor. These projections are then compared in a mechanistic fashion and whenever projected demands exceed supplies the existence of a job vacancy is declared and a need for training is said to be present.

Such conclusions are not warranted as we indicated in chapter 3. Since comparisons of projected demands and supplies represent outcomes, they only constitute projected job openings not job vacancies. A job vacancy means than an employer is willing and able to hire additional workers, and this concept would require a far more sophisticated model for its proper estimation than a job opening's model. Finally, even if we possessed a forecasting model powerful enough to accurately assess future job vacancies, the existence of a job vacancy does not necessarily imply that VTE programs should be expanded to meet this need. A careful analysis of the costs and benefits derived from this training would be necessary first.

7.2.2 A Preferred Methodology for Projecting the Expansion Demand for Labor

One objective of this research was to test and evaluate alternative procedures for assessing future demands for manpower by occupation in urban areas. In this regard we evaluated three techniques for projecting the future expansion demand for labor. The time trend, shift-share, and econometric techniques were described and forecasts derived from each were displayed above. As we noted all the techniques provided reasonable looking projections which were tightly clustered.

We feel the econometric technique is the best procedure to use for projecting expansion demands for labor. All three techniques required approximately equal time and resources to develop by trained personnel.

One disadvantage of the econometric technique vis à vis its competitors is that it requires an analyst familiar with regression analysis for its implementation. However, we feel this drawback is far outweighed by the other advantages of the econometric approach.

The econometric technique is the most flexible tool we employed. The technique is useful not only for forecasting, but it can also be used for policy analysis and the simulation of alternative futures. For example, at the present time in Region Four the status of the Off-Shore Power Systems (OPS) project is unclear. Only the econometric model can evaluate the potential future labor market implications of a full implementation of OPS, a partial start up, or the discontinuation of OPS. Futhermore, once an econometric model is built, it can be used to estimate the labor market implications of such changes very inexpensively. This is not the case for either the time trend of shift-share techniques. For instance, to analyze the effects of the OPS system, each of these other models would have to be extensively reworked in a largely ad hoc manner. The costs of rigorously estimating alternative futures are much higher in these cases than for the econometric model.

A final beneficial characteristic of the econometric approach is that this kind of model can be linked to existing state and national econometric models. Such a linking would allow analysts to estimate the impact on Region Four's labor markets due to national or state economic developments. We believe that further work on urban econometric manpower models in Florida is needed to test the generality of the model in a wider range of urban areas and to explore more fully the linking of state and local manpower simulation models.

7.2.3 The Calculation of Replacement Demand

We have utilized the BLS procedures for calculating replacement demands for labor by occupations. Our rationale for this choice was simple: it is the only existing methodology for estimating replacement demands. While the procedure does seem to provide reasonable projections, we wish to remind the reader of the limitations of this BLS methodology. First, the separation rates for men only account for death and retirements, and the rates for women include only death, retirement and child bearing as causes for separation from the labor force. Other important factors which affect labor market separation rates, including geographic mobility and occupational change, are ignored. Second, although separation rates are developed for each state, the rates are based on standard tables of working life. This will result in two types of distortions: a) the rates are predicated upon a constant age and sex distribution of labor by occupations over the forecast horizon and b) the rates are not occupational specific even though death and retirement rates vary among occupations. In addition, BLS procedures for calculating replacement demands are designed for application at the state level. We have assumed in this study that they can be used for local labor markets.

Replacement demands are estimated to equal 50% of the total demand for labor in Florida (Tarr and Campbell, 1975), and our analysis confirms this estimate. Therefore, further work in this area would be beneficial. We might add that work along these lines is now in progress at BLS. However, we see the need to further develop and test procedures for making estimates of replacement demands in metropolitan labor markets. Specifically, how valid is it to use state coefficients in local areas?

7.2.4 Forecasting the Supply of Labor by Occupations

Supply forecasts by occupation are a necessary component of a VTE needs assessment. Without such supply forecasts projections of labor can have only limited use. The difficulties of making occupational supply projections are well recognized. The technique developed in this report is being used for the first time.

Our technique has much to recommend it. First, it is both systematic and comprehensive in its scope. Second, it is a low cost technique which is rather straightforward. Thus, the technique can be readily used by VTE planners. Third, although there does not exist any basis for comparison, the procedure seems to provide reasonable supply estimates. As we noted in chapter 5 comparisons of our supply projections with our demand forecasts implied 1980 unemployment rates for Region Four ranging from 1.8% to 8.8%. These estimates are all consistent with historical unemployment rates in the region.

Our supply forecasting procedure does have some important limitations which need to be emphasized. First, we have not conducted an analysis of potential forecasting errors. Furthermore, the technique needs to be applied in other areas to insure that we are not getting results which are a special case applicable only to Region Four.

Second, since the technique utilizes the OES forecasts of future U. S. occupational demands as its driving element, it is subject to a number of conceptual and empirical limitations. On the conceptual side it is not quite proper to use national occupational demand projections in forecasting local occupational supplies. A more proper approach would have been to use a U. S. occupational supply projection. Unfortunately, comprehensive and systematic occupational supply forecasts do not now exist.

A third limitation of our supply forecasting technique is that the shift-share approach is a nonbehavioral technique. Thus, it is based upon statistical regularities which have existed at two points in the past. There is no guarantee that these past regularities will be repeated in the future.

A final limitation of the supply projection technique is that at times it produced clearly unrealistic forecasts (ie. occupational growth rates of 250% or 300%). Such problems occurred in approximately 20% of the occupational categories. In such circumstances we used "enlightened judgement" based upon past national, state, and local trends to produce more realistic forecasts.

Even with all its limitations we feel our supply estimates are both reasonably accurate and valuable. Only with time can the accuracy of our 1980 supply forecasts be assessed. Nevertheless, our supply projections represent the first set of systematic and comprehensive occupational supply projections produced for a regional economy. Supply estimates are crucial for gauging the future conditions of labor markets. Furthermore, without such supply estimates the implications of manpower forecasts for VTE programs cannot really be determined. Finally, since our procedures seem promising, further testing and refinement are in order.

7.2.5 Meshing of Supply and Demand Forecasts

The comparison or meshing of occupational demand and occupational supply projections is an important step in needs assessment. An undistorted picture of future labor market conditions is developed only through a combined analysis of supply and demand factors. This meshing of supply and demand forecasts highlights those occupations for which there may exist excess demands or supplies in the future. Such information is an important

input to VTE planning and programming.

Our forecasting methodology is based upon the requirements approach to the labor markets because the methodology does not allow for adjustments by the labor market to potential future excess demands or supplies of labor. Such adjustments can take many forms including: geographic migration, occupational migration, changes in the structure of relative wages, expanded VTE programs, or shifts in the production technologies of firms. The meshing of our supply and demand projections then identifies potential unmet labor market requirements (either surpluses or shortfalls) without allowing for labor market adjustments due to such gaps. The estimation of responses by the labor market to potential future imbalances is beyond the state of the art at this time, however, our model is one of the more sophisticated in existence.

7.2.6 Crosswalking from Occupational Projections to VTE Programs

The manpower information developed in this study is classified by occupations and not by VTE program codes. Since we utilized the OES program's industry-occupation matrix to translate our industrial employment forecasts into occupational categories, this problem was expected. We should emphasize that procedures for directly forecasting the demands and supplies of labor by VTE programs do not exist, and all the manpower information we have studied is classified by occupations in accordance with either the Census Bureau or the *Dictionary of Occupational Titles* classification systems. For our manpower projections to be most useful in VTE programming and planning, the analyst must translate the projections into VTE program codes.

In this report we provide a table in which our forecasts of occupational demands and supplies are related to VTE program codes. Furthermore, the table lists the latest number of VTE graduates by program and

a projection of total VTE graduates by program over the forecasting horizon. The format of the table allows VTE administrators to analyze potential future labor market trends in relationship to specific VTE programs. To our knowledge this is the first time that occupational projections have been carefully related to VTE programs in a comprehensive and systematic fashion.

We use a BLS crosswalk to translate our occupational projections into VTE program codes. This crosswalk is not perfect as we pointed out in Chapter 5. The fundamental problem is that the VTE program codes and the occupational classification system were developed for very different purposes, so a complete mapping is impossible. However, this is the best methodology now available. More importantly, the results we obtained appear to be highly informative; of course, final judgements on the procedure will depend upon how useful and accurate VTE administrators find the information we have generated. Again, there is need for continuing study of our methodology.

7.2.7 Conclusions Drawn from our Field Work

The most important conclusion we can draw from the field work is the existence of program unevenness within the Region Four. This can be attributed to a number of factors. First, average costs per student in the same program will vary greatly from county to county. Costs are higher in those counties which have low total enrollments. This indicates the presence of economies of scale in VTE, which means that VTE resources are utilized more efficiently in the larger counties thereby resulting in lower costs per student. VTE is capital intensive relative to academic courses and the VTE cost factors reflects this fact. The high initial costs for machinery and equipment are mitigated by its intensive usage. The irony of the situation is that counties with small VTE programs must

spend more money per student, and therefore, they have limited program diversity. In contrast, counties with large VTE programs can offer substantial program diversity because of greater efficiency. Therefore, program duplication in each county is unwarranted in terms of cost effectiveness.

However, program unevenness extends beyond the element of program diversity. It is also present within the same program. For example, we noted that it is impossible to conduct an analysis of actual VTE program costs, because there is no common structure which permits the identification of similar programs and indicates the differences of those which are not. Thus, comparisons made between programs with the same title, but located in a different facility or county, are not appropriate. This aspect of program unevenness was encountered on numerous occasions in the field work.

Finally, a third factor contributing to program unevenness is the lack of coordination between the nine semi-autonomous administrative units which have responsibilities for providing VTE in Region Four. Although greater efforts at coordination are underway, the use of Regional Coordinating Councils defined on the basis of community college districts may frustrate these efforts. We have argued that Region Four is a consistent labor market area, so coordination of VTE planning and programming can most fruitfully occur in a labor market wide context.

A final issue which should be discussed is that of local autonomy and state planning. Essentially, this is concerned with the degree of centralization in VTE planning. Although state planning should be encouraged, it must not ignore the intimate knowledge of local labor market conditions and program functioning which is possessed at the county level. The implementation of a "top down" planning hierarchy would neglect

valuable sources of information, exclude many knowledgeable individuals from the planning process, and ultimately, it would likely be a substantial source of friction between state and local VTE administrators. Therefore, it is suggested that the local officials be included in the planning process from its inception, rather than at its termination.

7.3. Recommendations for Improving our Needs Assessment Methodology

We can identify five main areas in which future research efforts can strengthen our needs assessment methodology. First, we have developed a generalized methodology for needs assessment which we feel is appropriate for any urban area of Florida, and we tested our procedures in the Region Four (Jacksonville) labor market. However, we can not guarantee the transferability of our methodology to other urban areas without further testing. It may be that Region Four is a special case in some sense. Thus, the application of our methodology in other urban areas is warranted.

Second, we have formulated techniques to project the future demands for and supplies of labor by occupations. These techniques produced apparently reasonable results as we have noted. Nevertheless, we feel that a further refinement of these techniques would increase their accuracy and reduce their costs of implementation. This is particularly true for the supply model which has not been fully tested at this time.

Third, further work on the crosswalk between occupational forecasts and VTE program codes would be beneficial. This is an important element in our methodology. Improvements in the mapping from occupational classes to VTE program codes would augment the usefulness of the occupational demand and supply projections.

Fourth, the estimation of separation rates is subject to a number of limitations. These include the following: a) they are not occupation specific, b) geographic mobility is ignored, c) occupational mobility is

not accounted for, and d) replacement rates exist only for states, not for urban areas. When we consider the fact that replacement demand constitutes 50% of the total demand for labor, the importance of more accurate estimates of replacement demand is obvious.

Finally, we did not adequately assess the needs of business and industry in our work. The idea of a regional workshop was enthusiastically received by business and industry leaders in Region Four. We envision that such sessions which would bring business leaders and VTE program directors together would be most beneficial. Not only would this provide a way of examining the needs of business and industry for VTE programs, but it would also develop more channels of communication between the two groups in particular labor market areas.

We believe that workshops held on a regular basis between VTE officials and business and industry within a given labor market area will not only improve needs assessments per se but also develop more channels of communication.

BIBLIOGRAPHY

Section I: Manpower Forecasting

Ahamad, Bashir, and Mark Blaug (eds.), *The Practice of Manpower Forecasting: A Collection of Case Studies*, San Francisco, California: Jossey-Bass, Inc.; 1973.

Arnold, Walter M., *Vocational, Technical and Continuing Education in Pennsylvania: A Systems Approach to State-Local Program Planning*, Harrisburg, Pennsylvania: Pennsylvania Research Coordinating Unit for Vocational Education, 1969, 534 pp.

Arrow, Kenneth J., "Higher Education as a Filter," *Journal of Public Economics*, Vol. 2 (1973), pp. 193-216.

Arrow, Kenneth J., and Capron, William M., "Dynamic Shortages and Price Rises: The Engineer-Scientist Case," *Quarterly Journal of Economics*, Vol. 13, No. 2 (May, 1969), pp. 292-308.

Baker, William E. et al., *Revised Summary Report: Technical Employment in Northeast Florida*, Volumes 1-5, Jacksonville, Florida: Duval County School Board, 1972.

Battelle Memorial Institute, *Michigan Manpower Study: An Analysis of the Characteristics of Michigan's Labor Force in the Next 15 Years*, Lansing, Michigan, 1966.

Ben-Porath, Yoram, "Labor-Force Participation Rates and the Supply of Labor," *The Journal of Political Economy*, Vol. 18 (May/June, 1973), pp. 697-704.

Berkowitz, Monroe, and Johnson, William G., "Health and Labor Force Participation," *The Journal of Human Resources*, Vol. 9 (Winter, 1974), pp. 117-128.

Bezdek, Roger H., *Long-Range Forecasting of Manpower Requirements: Theory and Applications*, New York: Instutute of Electrical and Electronics Engineers, Inc., 1974.

Bosworth, Derek., Evans, Graham J., and Lindley, Robert M., "Mechanistic Manpower Models," in J. Stuart Wabe (ed.), *Problems in Manpower Forecasting*, Lexington, Massachusetts: D.C. Heath and Company, 1974, pp 61-84.

Bradon, Paul V. et al., *Occupational Training Information Systems Final Report*, Stillwater, Oklahoma: Oklahoma State University, 1970.

Breneman, David W., *Examining Past Assessments: Yesterday's Manpower Projections in Retrospect*, Washington, D.C.: The Brookings Institution, January 1975.

Buechner, William R., *Technological Change and Occupational Composition of the American Labor Force, 1950-1960*, Springfield, Virginia: National Technical Information Service, 1972.

Burt, Samuel M., *Industry and Community Leaders in Education, The State Advisory Councils on Vocational Education*, Kalimazoo, Michigan, W.E. Upjohn Institute, 1969.

Cain, Glen G., Hansen, W. Lee, and Wiesbord, Burton, "Occupational Classification: An Economic Approach," *Monthly Labor Review*, 90:2 (February 1967), pp. 48-52.

CETA, *Comprehensive Manpower Plan FY 1976*, Jacksonville, Florida, 1975.

Crossman, R.F.W., "A Model for the Prediction of Manpower Requirements," *Monthly Labor Review*, 88:6 (June, 1965), pp. 669-671.

Crossman, R.F.W. et al., *The Impact of Technological Change on Manpower and Skill Demand: Case Study Data and Policy Implications*, Berkeley, California: University of California, 1966.

Cummings, Richard L., "Approaches to Manpwer Planning," *International Review of Education*, Vol. 16, No. 2 (1970), pp. 178-191.

Darmstadter, Joel, "Manpower in a Long-Term Economics Projection Model," *Industrial Relations*, Vol. 5, No. 3 (May, 1966), pp. 28-58.

Dempsey, Richard E., "The Bureau of Labor Statistics Employment Projections Program," in D.W. Stevens (ed.), *Occupational Employment Projections for Program Planning Purposes*, Columbia, Missouri: The University of Missouri-Columbia, 1976.

Denison, Edward F., *Accounting for United States Economic Growth, 1929-1969*, Washington, D.C.: The Brookings Institution, 1974.

Devine, Eugene J., *Analysis of Manpower Shortages in Local Government: Case Studies of Nurses, Policemen and Teachers*, New York, New York: Praeger, 1970.

Doeringer, Peter B., and Piore, Michael J., *Internal Labor Markets and Manpower Analysis*, Lexington, Massachusetts: D.C. Heath and Company, 1971.

Drewes, D.W., and Katz, Douglas S., *Manpower Data and Vocational Education: A National Study of Availability and Use*, Raleigh, North Carolina: North Carolina State University, 1975.

Dubinsky, Odessa, and Mayall, Donald, "Forecasting Area Labor Demand from Employer Survey Data: The Area Skill Survey Technique," *Proceedings of the American Statistical Association*, 1966, pp. 464-467.

Ferber, Robert, and Sasaki, Kyohei, "Labor Force and Wage Projections in Hawaii," *Industrial Relations*, Vol. 5, No. 3 (May, 1966), pp. 72-85.

Florida Department of Commerce, *Florida Employment Directions: Industries and Occupations 1970-1980*, Tallahassee, Florida: Division of Employment Security, 1976.

Florida State Advisory Council on Vocational and Technical Education *1975 Annual Report*, 1975.

Florida Post-Secondary Education Finance Committee, *Final Report*, 1975.

Freeman, Richard B., *Occupational Training in Proprietary Schools and Technical Institutes*, Cambridge, Massachusetts: Harvard Institute of Economic Research, November 1973.

Goldstein, Harold, "America's Manpower Needs for the Seventies: Manpower Trends in the 70s," *American Vocational Journal*, Vol. 46 (April, 1971), pp. 18-25.

_____, "BLS Occupational Trend Projections: An Appraisal," *Monthly Labor Review*, 86:10 (October, 1963), pp. 1135-1138.

Hansen, W. Lee, "Labor Force and Occupational Projections," *Proceedings of the Industrial Relations Research Association*, Madison, Wisconsin: University of Wisconsin-Madison, 1965.

Harris, Marshall A., McInnis, Malcom C., Jr., *An Evaluation of the Florida State Plan for the Administration of Vocational Education: Statewide Evaluation of Vocational-Technical Education in Florida*, Vol. 1, Tallahassee, Florida: Florida State University, 1972.

Harris, Marshall A., *Benefit-Cost Comparison of Vocational Education Programs: Statewide Evaluation of Vocational-Technical Education in Florida*, Vol. 2, Tallahassee, Florida: Florida State University, 1972.

Hollister, R.G., "An Evaluation of a Manpower Forecasting Exercise," in Mark Blaug (ed.), *The Economics of Education: I*, London: Penguin, 1968, pp. 338-348.

Johnson, Denis F., and Methee, George R., "Labor Force Projections by State, 1970-1980," *Monthly Labor Review*, 89/10 (October, 1966), pp. 1098-1104.

Kidder, David E., *Review and Synthesis of Research on Manpower Forecasting for Vocational-Technical Education*, Columbus, Ohio: The Ohio State University, 1972.

Latta, Raymond F., and Schmidt, Max L., *Continued Evaluation of a Management Information System for Vocational-Technical Education: Statewide Evaluation of Vocational-Technical Education*, Vol. 5, Tallahassee, Florida: Florida State University, 1972.

Lecht, Leonard A., Matland, Marc A., and Rosen, Richard J., *A System for Collecting Advance Information on the Character and Extent of Employment Generated by New Government Contracts*, Washington, D.C.: National Planning Association for the U.S. Department of Labor, Manpower Administration Report, October 1972, and Phase II Report, June 1974.

Mangum, Garth L., and Nemore, Arnold L., "The Nature and Function of Manpower Projections," *Industrial Relations*, Vol. 5, No. 3, (May, 1966), pp. 1-16.

McCracken, David J., and Gillespie, Wilma B., *Information Needs of Local Administrators of Vocational Education, Final Report*, Columbus, Ohio: Center for Vocational and Technical Education, Ohio State University, 1973.

McFarland and Associates, *Duval County Job Opportunity Survey*, Jacksonville, Florida, 1973.

_____, *Career Opportunities in Duval and Nassau Counties for Selected Vocational-Technical Skills: 1972-1975*, Jacksonville, Florida, 1973.

Medvin, Norman, "Occupational Job Requirements: A Short-Cut Approach to Long-Range Forecasting," *Employment Service Review*, Vol. 4, Nos. 1 and 2 (January-February, 1967), pp. 61-74.

_____, "Occupational Job Requirements: A Short-Cut Approach to Long-Range Forecasting: Report on Test Results in Several Cities," *Manpower Information for Vocational Education Planning*, Final Report, Leadership Series No. 21, Edited by Robert C. Young, Columbus, Ohio: Center for Vocational and Technical Education, Ohio State University, 1969.

Melville, Gary Q., and Roesler, Elmo H., *The Business-Industry Survey: Its Use In Institutional Planning*, Columbus, Ohio: E.R.I.C. Clearinghouse on Vocational and Technical Education, 1975.

Mincer, Jacob, *Schooling, Experience, and Earnings*, New York: Columbia University Press, 1974.

Meuller, Eva, et al., *Technological Advance in an Expanding Economy: Its Impacts on a Cross-Section of the Labor Force*, Ann Arbor, Michigan, 1969.

National Association of Manufacturers, *Industry Education Coordinator*, New York, 1971.

Niedercorn, J.H., *An Econometric Model of Metropolitan Employment and Population Growth*, Santa Monica, California: Rand Corporation, 1967.

Oi, Walter Y., *Scientific Manpower Forecasts From the Viewpoint of a Dismal Scientist*, Princeton, New Jersey: Princeton University, May 1974.

Parnes, Herbert S., "Manpower Analysis in Education Planning," in Mark Blaug (ed.), *The Economics of Education: I*, London: Penguin, 1968, pp. 263-273.

Parsons, Donald O., *Models of Labor Market Turnover: A Theoretical and Empirical Survey*, Columbus, Ohio: The Ohio State University, March 1975.

Perlman, Richard, *On the Job Training in Milwaukee: Nature, Extent, and Relationship to Vocational Education*, Milwaukee, Wisconsin: University of Wisconsin, 1969.

Purrington, Gordon S., *Expectations and Satisfactions of Parents and Students with Vocational and Technical Education. Statewide Evaluation of Vocational-Technical Education in Florida*, Vol. 4, Tallahassee, Florida: Florida State University, 1972.

Raepple, Katherine, *The Role of Florida Vocational-Technical Education in Providing Services for the Handicapped. Statewide Evaluation of Vocational-Technical Education in Florida*, Vol. 3, Tallahassee, Florida: Florida State University, 1972.

Rosenthal, Neal, "Projections of Manpower Supply in a Specific Occupation," *Monthly Labor Review*, 89:11 (November, 1969), pp. 1262-1266.

Scoville, James G., *Manpower and Occupational Analysis: Concepts and Measurements*, Lexington, Massachusetts: D.C. Heath and Company, 1972.

Somers, Gerald G., *The Availability of Data on Company Training Programs: A Feasibility Study*, Madison, Wisconsin: University of Wisconsin, 1971.

Stevens, David W., *Employment Projections for Planning Vocational-Technical Education Curricula: Mission Impossible*, Columbia, Missouri: The University of Missouri-Columbia, 1976.

Stevens, David W. (ed.), *Occupational Employment Projections for Program Planning Purposes*, Columbia, Missouri: The University of Missouri-Columbia, 1976.

Stiglitz, Joseph E., *The Theory of 'Screening', Education, and the Distribution of Income*, Stanford, California: Stanford University, 1974.

Stromsdorfer, Ernst W., and Fackler, James S., *An Economic and Institutional Analaysis of the Cooperative Vocational Education Program in Dayton Ohio*, Columbus Ohio: E.R.I.C. Clearinghouse on Vocational and Technical Education, 1973.

Stromsdorfer, Ernst W., "Aspects of Geographic and Occupational Mobility in Planning for State Vocational Educational Programs," Edited by Robert C. Young, *Manpower Information for Vocational Education Planning*, Final Reprot, Leadership Series No. 21, Columbus, Ohio: The Center for Vocational and Technical Education, Ohio State University, 1969, pp. 137-153.

Stromsdorfer, Ernst W., *Cost Effectiveness Studies of Vocational and Technical Education*, Columbus, Ohio: E.R.I.C. Clearinghouse on Vocational and Technical Education, 1972.

Strand, Kenneth, and Dernburg, Thomas, "Cyclical Variations in Civilian Labor Force Participation," *Review of Economics and Statistics*, Vol. 46 (November, 1965), pp. 378-381.

Sturmthal, A., *A Study of Methods for Forecasting Employment*, Washington, D.C.: Manpower Administration, U.S. Department of Labor, December 1967.

Swerdloff, Sol, "Manpower Projections: Some Conceptual Problems and Research Needs," *Monthly Labor Review*, 89:2 (February, 1966), pp. 138-143.

Tarr, James R., and Campbell, Timothy A., *Development and Design of An Occupational Information and Delivery System for Florida*, Tallahassee, Florida: State Man-Power Services Council, Florida Department of Commerce, May 1975.

Thal-Larsen, Margaret, *Requirements and Design of a Labor Market Information System for a Large Metropolitan Area*, Prepared for Manpower Administration, U.S. Department of Labor, November 1972.

Tucker, Katie D., and Rowell, James R., Jr., *A Model for Assessing Community Occupational Needs Through Inter-Governmental Data Analysis*, Gainesville, Florida: Center for Community Needs Assessment, University of Florida, 1974.

Tucker, Katie D., and Rowell, James R., Jr., *A Model for a Statewide System for Community Occupation Needs Assessment*, Gainesville, Floirda: Center for Community Needs Assessment, University of Florida, 1974.

U.S. Bureau of the Census, *1970 Occupation and Industry Classification Systems in Terms of Their 1960 Occupation and Industry Elements*, Technical Paper No. 26, July 1972.

U.S. Department of Commerce, *U.S. Industrial Outlook 1972 With Projections to 1980*, 1971.

U.S. Department of Commerce, *U.S. Industrial Outlook 1973 With Projections to 1980*, 1972.

U.S. Department of Health, Education and Welfare, *Vocational Education and Occupations*, 1969.

U.S. Department of Labor, Bureau of Labor Statistics, *Tomorrow's Manpower Needs*, Vols. 1, 2, 3, 4 (1969), Vol. 4 (1972), Supplement Nos. 1 and 2 (1970), Supplement No. 3 (1973), Supplement No. 4 (1974), Supplement No. 3, Revised (1975).

U.S. Department of Labor, *Dictionary of Occupational Titles*, Third Edition, 1965.

U.S. Department of Labor, Bureau of Labor Statistics, *The U.S. Economy in 1980: A Summary of BLS Projections*, Bulletin 1673, 1970.

U.S. Department of Labor, Bureau of Labor Statistics, *BLS Handbook on Methods*, Bulletin 1711, 1971.

U.S. Department of Labor, Bureau of Labor Statistics, *Employment and Earnings, United States, 1909-71*, Bulletin 1312-8, 1972.

U.S. Department of Labor, Bureau of Labor Statistics, *Handbook of Labor Statistics 1972*, Bulletin 1735, 1972.

U.S. Department of Labor, Bureau of Labor Statistics, *Jobseeking Methods Used by Unemployed Workers*, Special Labor Force Report 150, 1973.

U.S. Department of Labor, Bureau of Labor Statistics, *Technical Paper No. 4*, 1973.

U.S. Department of Labor, Bureau of Labor Statistics, BLS/MA Occupational Employment Statistics Program, *OES Survey Operations Manual*, Second Edition, April, 1974.

U.S. Department of Labor, Bureau of Labor Statistics, *Occupational Supply: Concepts and Sources of Data for Manpower Analysis*, Bulletin 1816, 1974.

U.S. Department of Labor, Manpower Administration, *Manpower Report of the President*, 1975.

Wabe, J. Stuart (ed.), *Problems in Manpower Forecasting*, Lexington, Massachusetts: D.C. Heath and Company, 1974.

Williamson, Oliver E., Wachter, Michael L., and Harris, Jeffrey E., "Understanding the Employment Relation: The Analysis of Idiosyncratic Exchange," *The Bell Journal of Economics*, 6:1 (Spring 1975), pp. 250-275.

Wirtz, Willard, and Goldstein, Harold, *A Critical Look at the Measuring of Work*, Washington, D.C.: The National Manpower Institute, August 1975.

Young, Robert C., Clive, William V., and Miles, Benton E., *Vocational Education Planning: Manpower, Priorities, and Dollars*, Columbus, Ohio: The Ohio State University, 1972.

Section II: Regional Economic Models

Adams, F.G., Brooking, C.G., and Glickman, N.J., "On the Specification and Simulation of a Regional Econometric Model: A Model of Mississippi," *Review of Economics and Statistics*, Vol. 57, No. 3 (August, 1975), pp. 286-298.

Anderson, Robert J., Jr., "A Note on Economic Base Studies and Regional Forecasting Models," *Journal of Regional Science*, Vol 10, No. 2 (April, 1970), pp. 325-333.

Artle, Roland, *Studies in the Structure of the Stockholm Economy*, American Edition, Ithaca, New York: Cornell University Press, 1965.

Ashby, L.D., *Growth Patterns in Employment by County, 1940-1950-1960*, Washington, D.C.: U.S. Department of Commerce, 1965.

Bell, Frederick W., "An Econometric Forecasting Model for a Region," *Journal of Regional Science*, Vol. 7, No. 2 (April, 1967), pp. 109-128.

Bezdek, Roger H., *The Long-Range Forecasting of Manpower Requirements: Theory and Applications*, New York: IEEE Press, 1974.

_____, "The 1980 Economic Impact-Regional and Occupational of Compensated Shifts in Defense Spending," *Journal of Regional Science*, Vol. 15, No. 2 (August, 1975), pp. 183-198.

Blanco, Cicely, "Prospective Unemployment and Interstate Population Movements," *Review of Economics and Statistics*, Vol. 46, No. 2 (May, 1964), pp. 221-222.

Bretzfelder, Robert B., "Sensitivity of State and Regional Income to National Business Cycles," *Survey of Current Business*, Vol. 53, No. 4 (April, 1973), pp. 22-27.

Brown, H. J., "Shift-Share Projections of Regional Growth: An Empirical Test," *Journal of Regional Science*, Vol. 9, No. 1 (April, 1969), pp. 1-18.

_____, "Shift-Share Projections Revisited: A Reply," *Journal of Regional Science*, Vol. 13, No. 2 (August, 1973), p. 121.

Chau, Laurence C., *An Econometric Model for Forecasting Income and Employment in Hawaii*, Honolulu, Hawaii: Economic Research Center, University of Hawaii, 1970.

Crow, Robert T., "A Nationally Linked Regional Econometric Model," *Journal of Regional Science*, Vol. 13, No. 1 (August, 1973), pp. 187-205.

Czamanski, Stanislaw, *An Econometric Model of Nova Scotia*, Halifax, Nova Scotia: Institute of Public Affairs, Dalhousie University, 1968.

Dutta, M., and Su, V., "An Econometric Model of Puerto Rico," *The Review of Economic Studies*, Vol. 36, No. 107 (July, 1969), pp. 319-333.

Emmerson, Richard et al., "On the Analysis of Regional Growth Patterns," *Journal of Regional Science*, Vol. 15, No, 1 (April, 1975), pp. 17-28.

Engle, Robert F., "Issues in the Specification of an Econometric Model of Metropolitan Growth," *Journal of Urban Economics*, Vol. 1, No. 2, (April, 1974), pp. 250-267.

Fergus, James T., "Recession and Recovery in the Southeast: A New Perspective," *Monthly Review Federal Reserve Bank of Atlanta*, Volume 61, No. 4 (May, 1976), pp. 54-62.

Fishkind, Henry H., *The Regional Impact of Monetary Policy: An Econometric Simulation of the Indiana Economy, 1958-73*, an unpublished doctoral dissertation, Indiana University, 1975.

Floyd, C.F., and Sirmans, C.F., "Shift-Share Projections Revisited," *Journal of Regional Science*, Vol. 13, No. 2 (August, 1973), pp. 115-120.

Forrester, Jay W., *Urban Dynamics*, Cambridge, Mass.: M.I.T. Press, 1969.

Fromm, Gary, and Klein, Lawrence, "A Comparison of Eleven Econometric Models of the United States," *American Economic Review*, Vol. 63, No.2 (May, 1973), pp. 385-393.

Fuchs, V.R., *Changes in the Location of Manufacturing in the United States Since 1929*, New Haven: Yale Press, 1962.

Gerking, Shelby D., *Some Statistical Problems in Estimating Stochastic Input-Output Models*, unpublished doctoral dissertation, Indiana University, 1975.

Ghali, Mohab, *A Survey of Planning and Forecasting Models for Hawaii*, Honolulu, Hawaii: Economic Research Center, University of Hawaii, September, 1970.

Glickman, Norman J., "An Econometric Forecasting Model for the Philadelphia Region," *Journal of Regional Science*, Vol. 11, No.1 (April, 1971), pp. 155-178.

_____, "Son of the Specification of Regional Econometric Models," *Papers and Proceedings of the Regional Science Association*, Vol.28 (1974), pp. 155-178.

Green, Roger J., *A Long Run Econometric Forecasting Model for Illinois*. Champaign, Illinois: University of Illinois Bureau of Economic and Business Research, 1967.

Greenberg, M.R., "A Test of Alternative Models for Projecting County Industrial Production at the 2, 3, and 4 digit Standard Industrial Code Levels," *Regional and Urban Economics*, Vol. 1, No.4 (December, 1972) pp. 397-433.

Greenwood, Michael J., "Research on Internal Migration in the United States: A Survey," *Journal of Economic Literature*, Vol. 73, No.2 (June 1975), pp. 397-433.

Greenwood, Michael J., "An Analysis of Geographic Labor Mobility in the U.S.," *Review of Economics and Statistics*, Vol. 51, No.2 (May, 1969), pp. 184-194.

_____, "Lagged Responses in the Decision to Migrate," *Journal of Regional Science*, Vol. 10, No. 3 (December, 1970), pp. 375-384.

Greytak, David, "A Statistical Analysis of Regional Export Estimating Techniques," *Journal of Regional Science*, Vol. 9, No. 3 (December, 1969), pp. 387-396.

_____, "Regional Consumption Patterns and the Heckscher-Ohlin Trade Theory," *Journal of Regional Science*, Vol. 15, No. 1 (April, 1975), pp. 39-47.

Hamilton, H.R., et al., *Systems Simulation for a Regional Analysis: An Application to River Basin Planning*. Cambridge, Massachusetts: The M.I.T. Press, 1969, pp. 54-88.

Hellman, D. and Marcus, M., *A Critical Analysis of Employment Projection Methods: A Test Case of New Jersey*, New Brunswick, New Jersey, 1970.

Hickman, Bert G. (editor), *Econometric Models of Cyclical Behavior*, New York: Columbia University Press, National Bureau of Economic Research, Studies in Income and Wealth, No. 36, 1972.

Hirsch, Albert A., Liebenberg, Maurice and Green, George R., *The BEA Quarterly Econometric Model*, U.S. Department of Commerce, BEA Staff Paper No. 22 (Mimeograph), July, 1973.

Hirsch, Albert A., "The BEA Quarterly Model as a Forecasting Instrument," *Survey of Current Business*, Vol. 53, No. 8 (August, 1973), pp. 24-39.

Houston, O., "Shift-Share Analysis: A Critique," *Southern Economic Journal*, Vol. 32, No. 4 (December, 1967), pp. 577-581.

Ingram, James C., "State and Regional Payments Mechanisms," *Quarterly Journal of Economics*, Vol. 73, No. 4 (November, 1959), pp. 319-32.

Isard, Walter, *Philadelphia Region Input-Output Study*, working paper, Vol. I and II. Philadelphia, Pennsylvania: Regional Science Research Institute, March 1967.

Isard, Walter and Langford, Thomas W., *Regional Input-Output Study: Recollections, Reflections and Diverse Notes on the Philadelphia Experience*. Cambridge, Massachusetts: The M.I.T. Press, 1971.

James, Frank and Hughes, James, "A Test of Shift-Share Analysis as a Predictive Device," *Journal of Regional Science*, Vol. 13, No. 3 (December, 1973), pp. 397-417.

Kain, John F., Ingram, Gregory K., and Ginn, J. Royce, *The Detroit Prototype of the NBER Simulation Model*, New York: National Bureau of Economic Research, 1971.

Klein, L.R., "The Specification of Regional Econometric Models," *Papers and Proceedings of the Regional Science Association*, Vol. 23, 1969, pp. 195-215.

_____, et al., "Notes on Testing the Predictive Performance of Econometric Models," *International Economic Review*, Vol. 15, No. 2 (June, 1974), pp. 366-384.

Laber, Gene, "Employment Growth and Changes in Unemployment at the County Level," in Niles M. Hansen (editor), *Growth Centers in Regional Economic Development*, New York: Free Press, 1972, pp. 282-295.

Lane, T., "The Urban Base Multiplier: An Evaluation of the State of the Art," *Land Economics*, Vol. 43, No. 2 (April, 1966), pp. 339-347.

L'Esperance, Wilford, Nestel, G. and Fromm, D., "Gross State Product and an Econometric Model of a State," *Journal of the American Statistical Association*, Vol. 64, No. 327 (1969), pp. 787-807.

Marcis, Richard G., and Reed, David J., "Joint Estimation of the Determinants of Wages in Subregional Labor Markets in the United States: 1961-1972," *Journal of Regional Science*, Vol. 14, No. 2 (August, 1974), pp. 259-267.

Mattila, John M., "A Metropolitan Income Determination Model and the Estimation of Metropolitan Income Multipliers," *Journal of Regional Science*, Vol. 13, No. 1 (April, 1973), pp. 1-16.

Milliman, J.W., "Large-Scale Models for Forecasting Regional Economic Activity: A Survey," in *Essays in Regional Economics*, J. Kain and J. Meyer (editors), Cambridge, Mass.: Harvard University Press, 1971.

Mitchell, "Estimation of Large Econometric Models by Principle Components and Instrumental Variable Methods," *The Review of Economics and Statistics*, Vol. 53, No. 2 (May, 1971), pp. 140-146.

Perloff, Harvey S., Dunn, E.S., Lampard E.E., and Muth, R.F., *Regions, Resources and Economic Growth*, Baltimore, Maryland: Johns Hopkins Press, 1960.

Pfister, Richard L., "State and Regional Payments Mechanism: Comment," *Quarterly Journal of Economics*, Vol. 74, No. 4 (November, 1960), pp. 641-648.

Pfouts, Ralph W. (editor), *The Techniques of Urban Economic Analysis*, West Trenton, New Jersey: Chandler-Davis, 1960.

Raimon, Robert L., "Interstate Migration and Wage Theory," *Review of Economics and Statistics*, Vol. 44, No. 4 (November, 1962), pp. 428-438.

Ratajczak, Donald, *A Quarterly Econometric Model for California*, Los Angeles: University of California, Los Angeles (mimeograph), 1972.

Richardson, Harry W., *Input-Output and Regional Economics*, London: Weidenfeld and Nicolson, 1972.

_____, *Regional Growth Theory*, New York: John Wiley and Sons, 1973.

Richter, Charles, "Some Limitations of Regional Econometric Models," *Annals of Regional Science*, Vol. 6, No. 1 (April, 1972), pp. 28-34.

Roberts, Blaine R., "The Florida Econometric Forecast," *Dimensions*, University of Florida, September-October, 1975, pp. 10-18.

Scott, Ira O., "The Regional Impact of Monetary Policy," *Quarterly Journal of Economics*, Vol. 69, No. 2 (May, 1955), pp. 269-284.

Tiebout, Charles, *The Community Economic Base Study*, New York: The Committee for Economic Development, 1962.

Williamson, Robert B., "What the Literature Holds for the Practicing Regional Analyst," *Growth and Change*, Vol. 2, No. 1 (January, 1971).

Zimmerman, Rae, "A Variant of the Shift and Share Projection Formulation," *Journal of Regional Science*, Vol. 15, No. 1 (April, 1975), pp. 29-39.

U.S. Water Resources Council, *1972 O.B.E.R.S. Projections*, Vol. 2, Washington D.C.: U.S. Government Printing Office, 1972.