

INFORMATION TO USERS

This manuscript has been reproduced from the microfilm master. UMI films the text directly from the original or copy submitted. Thus, some thesis and dissertation copies are in typewriter face, while others may be from any type of computer printer.

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

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

Oversize materials (e.g., maps, drawings, charts) are reproduced by sectioning the original, beginning at the upper left-hand corner and continuing from left to right in equal sections with small overlaps. Each original is also photographed in one exposure and is included in reduced form at the back of the book.

Photographs included in the original manuscript have been reproduced xerographically in this copy. Higher quality 6" x 9" black and white photographic prints are available for any photographs or illustrations appearing in this copy for an additional charge. Contact UMI directly to order.

U·M·I

University Microfilms International
A Bell & Howell Information Company
300 North Zeeb Road, Ann Arbor, MI 48106-1346 USA
313/761-4700 800/521-0600

Order Number 9302990

**A study of the predictors of persistence for students readmitted
to Michigan State University with prior records of academic
failure**

Denovchek, Jane Ann, Ph.D.

Michigan State University, 1992

U·M·I

**300 N. Zeeb Rd.
Ann Arbor, MI 48106**

A STUDY OF THE PREDICTORS OF PERSISTENCE FOR STUDENTS
READMITTED TO MICHIGAN STATE UNIVERSITY WITH
PRIOR RECORDS OF ACADEMIC FAILURE

By

Jane A. Denovchek

AN ABSTRACT OF A DISSERTATION

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

Department of Educational Administration

1992

ABSTRACT

A STUDY OF THE PREDICTORS OF PERSISTENCE FOR STUDENTS READMITTED TO MICHIGAN STATE UNIVERSITY WITH PRIOR RECORDS OF ACADEMIC FAILURE

By

Jane A. Denovchek

This study investigated the persistence of lower division students who were readmitted to Michigan State University from 1980 - 1989 with prior records of academic failure. Using a theoretical model of persistence developed for this population, it was hypothesized that persistence could be modeled by: demographic and defining variables, pre-college ability and achievement, elements of the previous academic record, and GPA upon re-enrollment. The sample was comprised of 389 freshmen and sophomore students who were readmitted Fall Term 1981 through Winter Term 1984 and who met the criteria of having been previously dismissed, recessed, or on academic probation. Persistence (graduated/still enrolled, not enrolled) was evaluated as of Fall Term 1989. Logistic regression analysis was used to examine the proposed model of persistence. The results indicated that approximately one quarter of the sample were persisters. A small but significant gender effect was found, with females more likely to persist than males. GPA upon re-enrollment was also significant and, among the predictor variables considered, was the most strongly correlated with persistence. However, none of the logistic regression models

showed more than a modest ability to correctly classify persisters and dropouts in the sample, and all showed a pronounced tendency to misclassify persisters and dropouts. It was concluded that the theoretical model developed for this study had limited effectiveness for predicting the persistence of students in the sample. The findings also suggest that readmission decisions based upon the variables in the model run a substantial risk of readmitting students who would dropout again, and a smaller risk of denying admission to students who would persist.

ACKNOWLEDGMENTS

I am indebted to colleagues at the Undergraduate University Division at Michigan State University for their support throughout this project, especially to Dr. Lonnie Eiland, who encouraged my research, and to Dr. William Rosenthal, who was instrumental in the data collection. I would also like to acknowledge a special group of academic advisors -- Jean Draper, Betty Greenman, Jevelyn Bonner, Ruth Kilbourne and Mary Austin -- whose experience and counsel were important in the genesis of this study. I owe a special thanks to Jennifer Armstrong for her assistance this spring and to my advisor Dr. Eldon Nonnamaker, and members of my guidance committee, Drs. Louis Stamotakos, Keith Anderson and James Rainey. I am especially grateful to my family for their unwavering support throughout my doctoral program: to my mother, Josephine Denovchek, for being a long time advocate of my continuing higher education; to my husband, Michael Harwell, for his editorial assistance and research expertise, and for having faith in my ability to finish; and to our son, John Riggs, for the special joy and inspiration he brought when I needed it most.

Pittsburgh, PA
June, 1992

TABLE OF CONTENTS

I.	INTRODUCTION	1
	Background of the Problem	2
	Criticisms of Student Persistence Research	3
	Persistence of Readmitted Students with Prior Records of Academic Failure	7
	Statement of the Problem	8
	Definition of Terms.	9
	The Need for the Study	10
	Purpose of the Study	11
	Research Methodology	15
	Limitations of the Study	16
	Organization of the Study	17
II.	REVIEW OF THE LITERATURE	19
	Models of Student Persistence	20
	Spady's Model	21
	Tinto's Model	23
	Bean's Models	27
	Bean and Metzner's Model of Persistence for Non-traditional Students	31
	Kohen, Nestle and Karmas Model	33
	Application of Existing Models of Student Persistence on Readmitted Students with Prior Records of Academic Failure	33
	Methodological Issues in Student Persistence Research	36
	Defining and Measuring Student Dropout and Persistence	36
	Research Design and Data Collection	38
	Data-Analytic Techniques	39
	Factors Affecting Student Persistence	40
	Student/Institution Interactions	41
	Academic and Social Integration	42
	Student/Faculty Relationships	44
	Social Integration	45
	Academic Integration and Grade Performance	47
	Individual Student Characteristics	49

Demographic Factors	51
Age	51
Gender	51
Hometown Size and Location	52
Socio-economic Status (SES)	53
Race	54
Other Pre-entry Factors	56
Achievement and Ability	56
Personality	58
Aspirations and Intentions	59
Certainty of Occupational Goals and Academic Major	59
Transfer Status	61
Enrollment Status	61
External Factors	62
Institutional Characteristics	65
Factors Affecting the Persistence of Readmitted Students with Prior Records of Academic Failure	66
Student/Institution Interactions	68
Pre-Dismissal Academic Record	68
Academic Performance upon Re-enrollment	69
Study Habits	70
Individual Student Characteristics	70
Demographic Factors	70
Enrollment Status	71
Pre-College Ability and Achievement	71
A Proposed Model of Persistence for Students Readmitted to MSU with Prior Records of Academic Failure	72
III. RESEARCH METHODOLOGY	75
Introduction	75
Proposed Model of Student Persistence	76
Research Population	76
Sampling Strategy	77
Research Design	79
Definition and Measurement of Variables	80
Data Collection	83
Data Analyses	84
Primary Research Hypotheses Stated in Null Form	85
Limitations of the Methodology	87
IV. RESEARCH FINDINGS	88
Introduction	88
Description of Sample	88
Preliminary Analyses	94
Results of Tests of Primary Research Hypotheses	100
Summary of the Results	116

V.	DISCUSSION	120
	Review of the Research Study	120
	Review of the Findings	122
	Conclusions	124
	Implications of the Research Findings	126
	Recommendations for Future Research	128
APPENDIX		
A -	Minimum Academic Progress Scale	
	Michigan State University	130
BIBLIOGRAPHY		133

LIST OF TABLES

Table

Table 1	Variables Used To Test The Proposed Model Of Student Persistence	81
Table 2	Percentage of Sample by Gender, Race, Enrollment Status, Previous Academic Status and Major	89
Table 3	Mean, Standard Deviation and Range for Quantitative Variables	92
Table 4	Correlation Matrix for Variables in the Study .	96
Table 5	Logistic Regression Results for Persistence Using Gender, ACT Composite Score, and High School GPA	102
Table 6	Logistic Regression Results for Persistence Using ACT Composite Score, High School GPA, Previous Enrollment Status, Gender, Race, Age, and their Interactions	106
Table 7	Predicted and Observed Frequencies for Persisters and Dropouts Using Previous Academic Status, Gender, Race, Age, and their Interactions, ACT Composite Score and High School GPA	106
Table 8	Logistic Regression Results for Persistence Using GPA upon Re-enrollment, ACT Composite Score, and High School GPA	109
Table 9	Predicted and Observed Frequencies for Persisters and Dropouts Using GPA upon Re-enrollment, ACT Composite Score and High School GPA	109
Table 10	Logistic Regression Results for Persistence for Males (N=176) Using GPA upon Re-enrollment, ACT Composite Score, and High School GPA	111

Table 11	Logistic Regression Results for Persistence for Females (N=139) Using GPA upon Re-enrollment, ACT Composite Score, and High School GPA	111
Table 12	Predicted and Observed Frequencies for Persisters and Dropouts for Males (N=176) Using GPA upon Re-enrollment, ACT Composite Score and High School GPA	112
Table 13	Predicted and Observed Frequencies for Persisters and Dropouts for Females (N=139) Using GPA upon Re-enrollment, ACT Composite Score and High School GPA	112
Table 14	Probability of Students Persisting Based upon Select Values of GPA upon Re-enrollment	113
Table 15	Logistic Regression Results for Persistence Using ACT Composite Score, High School GPA, GPA upon Re-enrollment, Total Credits, Total Terms, Transfer Credits, Repeat Credits, Cumulative GPA, Enrollment Status, and their Interactions	117
Table 16	Predicted and Observed Frequencies for Persisters and Dropouts Using ACT Composite Score, High School GPA, GPA upon Re-enrollment, Total Credits, Total Terms, Transfer Credits, Repeat Credits, Cumulative GPA, Enrollment Status, and their Interactions	118
Table 17	Summary of the Frequency of Correct and Incorrect Classification of Persisters and Dropouts for Models 1E, 3 and 7	119

LIST OF FIGURES

Figure

Figure 1	Frequency by Age, N = 389*		93
----------	----------------------------	-----------	----

CHAPTER I

INTRODUCTION

Across the nation, the problem of student dropout continues to occupy college and university decision-makers as they attempt to balance fiscal and enrollment realities against goals of educational access and academic quality. The well-documented decline in the pool of full time, traditional, adequately prepared prospective students means that colleges and universities can no longer rely upon the influx of newly admitted students alone to replenish enrollments lost when students drop out. Nor can institutions ignore the increase of non-traditional, part-time and underprepared prospects or assume that their educational needs and goals are the same as their full time traditional counterparts. At the same time, institutions must attend to the perception among parents and pollsters that the ability to retain matriculated students is a hallmark of institutional quality (U.S. News and World Report, 1989 and 1991; Grosset, 1990).

In response to these trends, institutions are supporting empirical studies which attempt to identify the student, institutional, and student/institution interaction characteristics most likely to promote student success,

re-enrollment and graduation or completion of specific educational goals. Increasingly, such research initiatives on individual campuses have become an integral part of enrollment management, a function which encompasses both the recruitment and continued enrollment of students. The need to develop specific programs and interventions to increase continued enrollment (i.e., student persistence) has prompted a growing interest in studying why students leave higher education (Hossler and Bean, 1990; Noel, Levitz and Saluri, 1987).

BACKGROUND OF THE PROBLEM

Why some students stay and others leave is a complex phenomenon. The literature suggests that particular variables can be helpful in describing, explaining or predicting student persistence (Astin, 1975; Cope and Hannah, 1975; Pantages and Creedon, 1978; Lenning, Beal and Sauer, 1980; Terenzini in Pascarella, 1982, pp. 55-72; Bean, 1986; Tinto, 1975 and 1987; Ramist, 1981).¹ For example, the experiences which influence the nature and timing of dropout may vary among student subgroups, with certain groups of

1. The term **persistence** is used to describe the staying behavior of students. It is defined as continued enrollment to a specified time (e.g., graduation). Other terms which appear extensively in published research on student persistence, for example, dropout, departure, and withdrawal, are used interchangeably to describe the leaving behavior of students. Attrition typically refers to the problem of students not returning to school from an institutional perspective. Retention is most often used in reference to a program or institutional goal of keeping matriculated students enrolled.

students more dropout prone than others. Factors which have been found to contribute to the lower rate of persistence for certain student subgroups include pre-college deficiencies in academic skills and abilities, changes in circumstances external to the college, and social and intellectual isolation from the dominant academic culture (Tinto, 1975, 1987, 1988; Pascarella and Terenzini, 1980; Ramist, 1981; Bean, 1985, 1986).

Because extant research in this area suggests that student dropout is primarily associated with the first year experience, a large number of studies have focused on freshmen (Pascarella and Terenzini, 1977, 1978, and 1980; Pascarella et al., 1981). Despite numerous attempts to identify predictors of freshmen to sophomore year persistence, reported research results have often been inconsistent or inconclusive. Two general criticisms have been leveled at studies of student persistence. These criticisms may serve as explanations for the inconclusive and inconsistent findings.

CRITICISMS OF STUDENT PERSISTENCE RESEARCH

One criticism of the research on student persistence has been the lack of theoretical models to guide both variable selection and the postulated relationships among the variables chosen for study. The theoretical models of student persistence developed by Spady (1971), Tinto (1975; revised in 1987), Bean (1980; 1982, 1985; with Metzner,

1985), and Kohen, Nestle and Karmas (1978) represent responses to this criticism. Tinto's model of student departure, for example, underlies much of the current research on student persistence. It was developed to explain student persistence at the institutional level and is specifically limited to voluntary dropout, which accounts for approximately 85% of the students who leave institutions of higher education (Tinto in Noel, Levitz and Saluri, 1987). While some researchers posit involuntary dropout (i.e., academic dismissal) as a special case which can be viewed in the context of Tinto's and other similar models of voluntary dropout (Ramist, 1981; Bean, 1986), voluntary and involuntary dropout are likely to be outcomes resulting from different kinds of student/institution interactions. Therefore, models of voluntary dropout may not be sufficient to explain all types of student dropout behavior (Tinto, 1986; Ott, 1988). Moreover, the models which have been developed to explain persistence (e.g., Tinto, 1975, 1987; Bean, 1980, 1982, 1985) are really models of freshmen persistence and, as such, may be limited in their ability to adequately explain or predict withdrawal for students who are not first time traditional freshmen (Tinto, 1987; Kohen, Nestle and Karmas, 1978). One exception to this latter characterization is Bean and Metzner's (1985) model, which was specifically designed to mirror the dropout process for non-traditional students, yet it also presumes first time enrollment. In general, the existing models of student dropout do not explicitly address

the persistence of students who re-enter higher education, especially those students who initially dropped out because of academic failure.

A second criticism of the research on student persistence has been that the methodology of these studies is frequently flawed in critical ways. A common flaw in student persistence research is the failure to explicitly define variables under study (e.g., the type of dropout behavior, persistence) and how these variables are to be measured. For example, in studies where voluntary and involuntary dropout (e.g., academic dismissal) behaviors were not differentiated, the findings tended to indicate no correlation between ability and dropout whereas studies limited to involuntary dropouts typically established an inverse relationship between ability and dropout behavior. In contrast, studies limited to voluntary dropout typically found a positive correlation between ability and dropping out (Tinto, 1975; 1987).

Inconsistent results for postulated relationships, such as that between ability and persistence, are also evident when persistence is defined as something other than continued enrollment or when persistence is measured in different time frames (e.g., after one semester or after one or more years). Inherent in this criticism is the failure to view persistence as a longitudinal process. Failure to do so has resulted in an abundance of studies employing research designs for which information was obtained at a single point in time, and fewer

studies with research designs which permitted the process of student persistence to be examined over time (Tinto, 1982; Lenning, Beal, and Sauer, 1980; Bean, 1986). Many of these studies have also been criticized for the way that data have been collected and analyzed, for example, relying upon survey data with little attention paid to response bias (Webb, 1990) and drawing strong causal inferences from univariate analyses of complex relationships (Pantages and Creedon, 1978; Tinto, 1975).

Fortunately, recent literature on student persistence reflects a more precise definition of the phenomena under study, acknowledging that all leaving behavior is not the same nor is it constant over time (Tinto, 1975, 1982, and 1987). In other words, students who leave an institution voluntarily may be different than those who leave involuntarily. Students who drop out of one institution only to transfer elsewhere may be different than those who drop out of higher education altogether, and those who drop out permanently may be different than those who "stop out" and then return (Panos and Astin, 1968; Tinto, 1987).

Furthermore, patterns of student/institution interactions change over time. Why freshmen leave and why seniors leave may be explained by either the interplay of different variables or by the same variables whose relative importance vis-a-vis persistence has changed (Webb, 1990; Tinto, 1975 and 1987; Bean, 1985; Kohen, Nestle, and Karmas, 1978; Eckland, 1964). Recent literature has also begun to address

longstanding problems in research design and the collection and analysis of data (Bean, 1985; Tinto, 1987; Webb, 1990).

PERSISTENCE OF READMITTED STUDENTS WITH PRIOR RECORDS OF ACADEMIC FAILURE

Among students who leave for reasons of academic failure, a number will elect to return to the college of initial enrollment. For students who are readmitted and subsequently re-enroll, the relative influence of various elements of past academic performance on future persistence is unclear, making it difficult to support either stringent readmission standards or policies of "academic forgiveness" for this group. A few studies have empirically investigated the short term academic achievement of students who were readmitted after academic dismissal, but also suffer from a lack of theoretical models and numerous methodological deficiencies. These studies suggest that while pre-college factors such as high school rank, high school grade point average and test scores may be associated with short term academic achievement for this group of students, the best predictors of subsequent academic achievement for students with prior records of academic failure may be first term grade point average (GPA), GPA at termination, and GPA after the first term of re-enrollment (Ott, 1988; Hansmeier, 1963, 1965). Unfortunately, none of the studies of persistence after academic failure and subsequent readmission have explicitly linked short term academic achievement with

persistence to graduation or any other clearly defined future point in time (Hansmeier, 1965; Planisek, Arnold and Ferraca, 1968; Bierbaum and Planisek, 1969).

The student persistence literature suggests that students with past records of academic failure may be viewed as "at risk" of failing again, with persistence-to-graduation rates for this group believed to range from 10 to 20 percent (Planisek, Arnold and Ferraca, 1968; Bierbaum and Planisek, 1969; Hansmeier, 1965), well below the national average for a typical entering freshmen class. The lack of theoretical models and empirical research specifically directed toward readmitted students with past records of academic failure suggests that not enough is known about what happens to these students after they re-enroll to enable institutions to effectively evaluate policies regarding their readmission or establish programs to promote their academic success and persistence. Such policies and programs are critical given current enrollment trends and the importance placed on ensuring continued enrollment for students who are admitted, and by extension, re-admitted to the institution.

In short, the persistence of students who leave because of academic failure and later return to school remains a largely unexplored area.

STATEMENT OF THE PROBLEM

The problem investigated in this study was the identification of variables which predict the persistence

behavior of students who were readmitted to Michigan State University (MSU) as freshmen or sophomores after academic failure. This included students who had been academically recessed or dismissed, or who were placed on academic probation during their last term of attendance. Thus, the group of students to be studied included both voluntary and involuntary dropouts.

DEFINITION OF TERMS

Persistence:	continued enrollment to graduation or other specified period of time.
Persister:	a student who is enrolled or has graduated at a specified point in time. For the purpose of this study, a persister is a student who was admitted to MSU between Fall Term 1981 and Winter Term 1984 and who was still enrolled or had graduated the tenth day of Fall Term 1989.
Dropout:	a student who is <u>not</u> enrolled at a specified point in time (e.g., tenth day of Fall Term 1989).
Voluntary Dropout:	a student who is <u>not</u> enrolled at a specified point in time, but is eligible for continued enrollment.
Involuntary Dropout:	a student who is <u>not</u> eligible for continued enrollment (i.e., an academically recessed or dismissed student).
Lower Division Student:	an MSU student who has earned 85 or fewer credits (freshman or sophomore standing).
Undergraduate University Division:	the MSU administrative unit responsible for monitoring the academic progress of lower division students.
Readmitted Student:	a student who has previously attended a college or university (e.g., MSU) and is approved for re-enrollment.

Previous Academic Status:	good academic standing, academic probation, academic recess or academic dismissal at the end of the last term of enrollment, defined for this study by the MSU Minimum Academic Progress Scale (See Appendix A).
Prior Record of Academic Failure:	having a previous academic status of academic probation, academic recess or academic dismissal.

THE NEED FOR THE STUDY

The literature clearly supports conducting continuing research on student persistence at the campus level and on specific student subpopulations (Pascarella, 1982; Tinto, 1987; Noel, Levitz and Saluri, 1987; Bean, 1986, Hossler and Bean, 1990). Comprehensive reviews of existing research, such as those by Pantages and Creedon (1978), Tinto (1975, 1987), Ramist (1981), Bean and Metzner (1985), and Pascarella and Terenzini (1991), provide a broad understanding of student departure, but cannot adequately substitute for investigations of persistence for specific groups of students within the unique context of a given institution. Therefore, studying the persistence of readmitted students with histories of academic failure at MSU is an important step toward identifying and understanding the local factors which influence student persistence.

Although academic recess, dismissal, or probationary status does not preclude re-enrollment of students at MSU, the readmission of students with known histories of academic failure requires a judicious appraisal of the potential risk of repeated failure. The predictors of persistence

identified by this study will contribute additional information for the evaluation of this category of readmission candidates at MSU and other comparable institutions.

PURPOSE OF THE STUDY

The purpose of this study was to examine the persistence of students who were readmitted to MSU with prior records of academic failure. This included students who had been academically dismissed or recessed from MSU and students who were on academic probation at the end of their last term of MSU enrollment. Persistence was defined as whether or not students had graduated or were still enrolled for a period of six years after readmission.² The presence or absence of differences in persistence for particular subgroups of students (e.g., by gender, race) within this population was also investigated.

The literature on student persistence suggests that student/institution interactions in the academic and social systems of the institution are critical influences on dropout behavior (Tinto, 1975, 1987; Bean, 1980, 1982, 1985;

2. Since the majority of readmitted students studied had completed at least a partial year of academic work during previous terms of enrollment, it was assumed that a minimum time period of six years after readmission would adequately capture the persistence of these students. This assumption was based on research at four year institutions which indicated that four years after matriculation underestimated persistence while six to ten years accurately reflected the proportion of students who had completed their degree or dropped out (Carroll, 1990; Ramist, 1981; Eckland, 1964).

Pascarella and Terenzini, 1980). This literature also suggests that student/institution interactions in the academic system of the institution may be the most critical factors affecting the persistence of academically dismissed students, commuters, and non-traditional students (Bean and Metzner, 1985; Pascarella et al., 1981; Ott, 1988; Grosset, 1990). However, only one component of student/institutional interactions -- previous academic performance -- is typically available to decision-makers at the point of readmission. Therefore, this study investigated the extent to which demographic and defining factors, pre-entry characteristics, and the academic performance component of student/institution interactions are sufficient to predict persistence for students with prior records of academic failure.

Based on the existing student persistence literature and the current limitations imposed on available data at the point of readmission, it was hypothesized that the persistence of these readmitted students could be modeled by:

- 1) demographic and defining factors (e.g., transfer credits, enrollment and previous academic status)
- 2) pre-college ability and achievement,
- 3) previous MSU academic record and
- 4) academic achievement during the first term of re-enrollment at MSU.

Certain defining factors (e.g., enrollment status) and variables representing student/institution interactions in the academic system of the university (e.g., previous MSU academic record, academic achievement during the first term of re-enrollment at MSU)

were expected to be significant predictors of persistence for these students; demographics and pre-college ability and achievement were not expected to contribute significantly to persistence. It was further postulated that certain combinations of variables would prove more important than others for predicting persistence. These combinations were specified a priori by the following research questions:

1. a. Will there be a significant relationship between Previous Academic Status (e.g., recessed/dismissed, on probation) and Persistence when the effects of ACT Composite Score, High School Class Rank and High School GPA are held constant?
- b. Will there be a significant relationship between Gender and Persistence when the effects of ACT Composite Score, High School Class Rank and High School GPA are held constant?
- c. Will there be a significant relationship between Race and Persistence when the effects of ACT Composite Score, High School Class Rank, and High School GPA are held constant?
- d. Will there be a significant relationship between Age and Persistence when the effects of ACT Composite Score, High School Class Rank, and High School GPA are held constant?
- e. Will there be a significant relationship between the set of interactions among Gender, Race, and Age and Persistence when the effects of ACT Composite Score, High School Class Rank, and High School GPA are held constant?
2. Will there be a significant relationship between Persistence and the set of predictors ACT Composite Score, High School Class Rank, and High School GPA?
3. Will there be a significant relationship between GPA of the first term re-enrolled and Persistence when the effects of ACT Composite Score, High School Class Rank and High School GPA are held constant?
4. Will there be a significant relationship between Persistence and the set of predictors Previous Credits Earned, Cumulative GPA, Total Terms Attended Prior to

Readmission, and Total Number of Repeat Credits when ACT Composite Score, High School Class Rank and High School GPA are held constant?

5. Will there be a significant relationship between Enrollment Status (e.g., part time, full time) during the first term of re-enrollment and Persistence when ACT Composite Score, High School Class Rank and High School GPA are held constant?
6. Will there be a significant relationship between the Number of Transfer Credits for coursework completed at another college or university while not enrolled at MSU and Persistence when ACT Composite Score, High School Class Rank and High School GPA are held constant?
7. Will there be a significant relationship between the set of interactions among Enrollment Status, GPA of the first term re-enrolled, Previous Credits Earned, Cumulative GPA, Total Terms Attended Prior to Readmission, and Total Number of Repeat Credits and Persistence when ACT Composite Score, High School Class Rank and High School GPA are held constant?

The following research hypotheses, stated in null form were generated from the previously specified research questions:

1. a. There will not be a significant relationship between Previous Academic Status and Persistence when the effects of ACT Composite Score, High School Class Rank and High School GPA are held constant.
- b. There will not be a significant relationship between Gender and Persistence when the effects of ACT Composite Score, High School Class Rank, and High School GPA are held constant.
- c. There will not be a significant relationship between Race and Persistence when the effects of ACT Composite Score, High School Class Rank, and High School GPA are held constant.
- d. There will not be a significant relationship between Age and Persistence when the effects of ACT Composite Score, High School Class Rank, and High School GPA are held constant.
- e. There will not be a significant relationship between the set of interactions among Gender, Race and Age and Persistence when the effects of ACT

Composite Score, High School Class Rank, and High School GPA are held constant.

2. There will not be a significant relationship between Persistence and the set of predictors ACT Composite Score, High School Class Rank, and High School GPA.
3. There will not be a significant relationship between GPA of the first term re-enrolled and Persistence when the effects of ACT Composite Score, High School Class Rank and High School GPA are held constant.
4. There will not be a significant relationship between Persistence and the set of predictors Previous Credits Earned, Cumulative GPA, Total Terms Attended Prior to Readmission and Total Number of Repeat Credits when the effects of ACT Composite Score, High School Class Rank and High School GPA are held constant.
5. There will not be a significant relationship between Persistence and Enrollment Status during the first term of re-enrollment when the effects of ACT Composite Score, High School Class Rank and High School GPA are held constant.
6. There will not be a significant relationship between Persistence and the Number of Transfer Credits for coursework completed at another college or university while not enrolled at MSU when the effects of ACT Composite Score, High School Class Rank and High School GPA are held constant.
7. There will not be a significant relationship between Persistence and the set of interactions among Enrollment Status, GPA of the first term re-enrolled, Previous Credits Earned, Cumulative GPA, Total Terms Attended Prior to Readmission, and the Total Number of Repeat Credits when the effects of ACT Composite Score, High School Class Rank and High School GPA are held constant.

RESEARCH METHODOLOGY

The research population of interest was comprised of MSU students who had been readmitted as lower division students since 1980 and who also had prior records of academic failure. The research sample was selected from an initial population of all lower division students who were readmitted

to MSU from Fall Term 1981 through Winter Term 1984. Of this group, students meeting the criteria of having prior records of academic failure served as the subjects for the study.

The research design was longitudinal and correlational in nature. Data on fourteen independent variables and one dependent variable (persistence) were located on computer tapes in the MSU Registrar's Student Master File and were collected through the Undergraduate University Division using a special computer program written for that purpose.

Descriptive statistics were computed to summarize the data for each variable in the study. A correlation matrix was also constructed as part of the preliminary analysis of the data. Logistic regression analysis was the statistical procedure selected to investigate the research hypotheses.

LIMITATIONS OF THE STUDY

This study was limited to the specified population of lower division students at MSU. Upper division students (juniors and seniors) were excluded because, in several instances, they must meet specific readmission requirements which vary from one degree-granting college to another. Lower division students, on the other hand, can be readmitted centrally to a single undergraduate division regardless of major preference and are not subject to the various course/GPA requirements which upper division readmits may have to meet. This exclusion of upper division students

suggests that caution must be exercised in generalizing the results beyond the stated population of MSU students.

The second limitation of the study was the number and nature of the variables selected for inclusion in the prediction models. The complexity of the variables affecting persistence is well-documented. While giving some insight to aspects of this phenomenon for the specific population of interest, the variables included in this study were not exhaustive. Therefore, inferences about the relationship between persistence and variables excluded from the study cannot be made.

For example, it was not the intent of the study to measure all facets of the interaction between student and institution, but rather to focus on factors within existing student academic records which may explain persistence for lower division students who were readmitted to MSU with prior records of academic failure. These factors represent the information currently available when readmission decisions are made. Other variables, such as those measuring student academic and career goals, student satisfaction, student/faculty interaction, student involvement in extracurricular activities, and external factors such as off campus employment and finances, were not included.

ORGANIZATION OF THE STUDY

In Chapter I, Introduction, the background and statement of the research problem, the need for the study, and an

overview of the research questions and methodology were presented. Chapter II, Review of the Literature, follows and contains a review of select models of student persistence and their application to the research population of the study, methodological issues in student persistence research, and a discussion of specific factors affecting student persistence which have been reported in the literature. Chapter II also contains a proposed model of persistence for students readmitted to MSU with prior records of academic failure. Chapter III, Research Methodology, is comprised of a restatement of the research problem and proposed student persistence model, a definition of the research population, an outline of the sampling strategy, research design and data collection and analysis procedures; and definitions and measurement of the variables included in the study. Chapter III also includes a restatement of the primary research hypotheses and a short discussion of the limitations of the research methodology. Chapter IV, Research Findings, contains a description of the research sample and a report of the preliminary analyses of the data. Results of the tests of the primary research hypotheses are also presented and summarized. Chapter V, Discussion, includes a review of the research study and findings, conclusions and implications based on the findings, and recommendations for future research.

CHAPTER II

REVIEW OF THE LITERATURE

Describing, predicting and explaining why students drop out has been a focal point of institutional research for at least five decades. The motivation for colleges and universities to understand the phenomenon of student dropout has remained fairly constant across decades: a significant loss of students means a significant loss of revenues. High levels of student dropout also shape public perceptions of institutional quality and influence consumer attitudes about whether colleges are adequately doing their jobs (Summerskill, 1962; Bean, 1986; Grosset, 1990; U.S. News and World Report, 1989 and 1991). While the reasons for studying student persistence have remained the same, the research itself has evolved in two important ways: the advent of theoretical models and improved research methodology.

The literature review is organized in six parts. First, the work of three major student persistence theorists is presented: Spady (1971), Tinto (1975; revised model, 1987), and Bean (1980; "synthetic" model, 1982; revised "meta-model," 1986). Two additional models (Bean and Metzner, 1985; and Kohen, Nestle and Karmas, 1978) are also summarized. Part two contains a discussion of the

applicability of the major models of student persistence to the research population of the study (i.e., readmitted students with prior records of academic failure). Three important changes in research methodology are outlined and discussed in part three.

Parts four and five of this chapter are devoted to the review of specific factors affecting student persistence, both for the general case and for the research population. Finally, a model of persistence for readmitted students with prior records of academic failure is proposed in part six.

MODELS OF STUDENT PERSISTENCE

A major step in the evolution of student persistence research was the development of theoretical models aimed at explaining the effects that certain variables exert on the staying and leaving behavior of students. Common to all of the student persistence models reviewed below is the premise that dropout behavior is a complex and longitudinal phenomenon. This longitudinal process begins with students who bring a unique set of demographic and pre-entry characteristics to the college environment. These characteristics shape what students expect from their college experience and determine their initial levels of commitment to the institution, to an academic program, or to obtaining a degree.

Although pre-college factors shape initial expectations and influence how students interact with various elements of

the academic and social environments of the college, it is the outcomes of student/institution interactions that directly lead to decisions to stay or leave. The theoretical models of student persistence tend to contain similar variables, but the importance of the variables varies somewhat from model to model. This variation across models is due to how the variables are presumed to interact with each other, the assumptions made about their relative importance vis-a-vis dropout behavior, and the hypothesized significance of other variables external to the college setting.

Spady's Model

Spady (1971) is credited with developing the first theoretical model of student persistence, based on Durkheim's (1961) sociological theory of suicide and drawing upon existing findings. Spady assumed that the decision to leave college was similar to the decision to leave other social systems and defined dropout as a complex social process involving a range of factors that affect student/institution interactions: family background, academic potential, intellectual development, grade performance, social integration, satisfaction and institutional commitment. Spady's attention to the relationship of these factors to persistence, particularly that of social integration, distinguished this work from earlier efforts in student persistence research.

Social integration is a core construct in Spady's model and was adapted directly from Durkheim's theory, which states that suicide is more likely when individuals are insufficiently integrated into society. The extent of social integration is influenced by two distinct elements: moral consciousness (i.e., sharing societal values) and collective affiliation (i.e., personal interactions with other members of the social system), which Spady termed normative congruence and friendship support, respectively.

Because of higher education's unique academic dimension, factors related to academic performance and intellectual development are also prominent elements in the model since becoming fully integrated into the academic 'society' is presumed to be a function of meeting the demands in both the academic and social systems of the college. According to Spady, higher degrees of integration lead to greater satisfaction, institutional commitment, and (ultimately) persistence.

Spady's work also identified the temporal nature of persistence behavior and cautioned that a theoretical model of freshmen dropout could not be universally applied to subsequent dropout behavior. Spady did, however, utilize the same model to examine variables associated with persistence-to-graduation for seniors as well as variables associated with freshmen dropout, but acknowledged that doing so had both theoretical and methodological deficiencies. The most serious of these deficiencies was the assumption that

the same independent variables operate in the same manner over time.

Tinto's Model

Tinto (1975, 1982, 1987) built upon Spady's work and developed a theoretical model of student dropout behavior which has been empirically tested in subsequent research and is widely accepted in the higher education community. Tinto's original (1975) model, like Spady's, drew heavily upon Durkheim's theory of suicide but also utilized cost/benefit elements derived from the study of the economics of education. The model was revised in 1987 to incorporate findings from validation research and to more fully address the temporal nature of student withdrawal by outlining the specific stages of student assimilation into the college culture.

Formulated to explain student dropout at the institutional level, Tinto's model outlines the interactions between students and the institution which influence and lead to different types of dropout decisions. Tinto's assertion that there are different types of dropout behavior which result from different student/institution interactions was a significant contribution to the study of student persistence. Tinto's work suggests that voluntary dropout should be viewed as a different form of dropout than involuntary dropout (i.e., academic failure) and that permanent dropout is

influenced by different student/institution interactions than "stop out" (i.e., temporary dropout).

Tinto's model states that the decision to stay or leave a particular institution is a longitudinal process involving complex interactions between individual students and the academic and social systems of the institution. Student experiences, as reflected in their normative (informal) and structural (formal) integration into these two distinct systems, act upon and continually modify goal and institutional commitments, which are initially influenced by demographic and pre-entry characteristics. The extent to which students become integrated into the social and academic systems of the institution leads to the subsequent levels of goal and institutional commitment inherent in decisions to stay or leave. Ceterus paribus, higher degrees of integration lead to greater levels of commitment, where goal commitment is defined as commitment to degree attainment and institutional commitment reflects commitment or loyalty to a specific institution.

The model assumes that academic integration plays a key role in goal commitment, whereas social integration primarily influences institutional commitment. A limited reciprocal relationship between social and academic integration is also presumed (i.e., high levels of integration in one system may compensate to some degree for lack of integration in another). Thus, students whose interactions result in high levels of social integration and, subsequently, high

institutional commitment may persist even if their goal commitments are low, provided that they are sufficiently integrated into the academic system to meet the minimum academic standards for continued enrollment.

According to Tinto, the interplay between the goal and institutional commitments associated with academic and social integration influences both the decision to drop out and the type of dropout. For example, students who experience full integration in the academic system but not the social system of a college are more likely to dropout 'to' another institution (i.e., transfer) if their institutional commitments are sufficiently low but their goal commitments are high. Where academic and social integration are limited, goal and institutional commitments are also likely to be low and a permanent dropout decision is likely.

The role of external factors vis-a-vis dropout decisions is an inferred, not explicit, part of Tinto's model. While external factors are acknowledged to be possible influences on persistence in and of themselves, they are presented as part of the continual re-evaluation of goal/institutional commitments and the costs/benefits attributed to staying or leaving. High costs would presumably lower goal and institutional commitments if benefits are also perceived to be low (Tinto, 1975).

The lack of explicit treatment of external variables, especially finances, was recognized as an important limitation of Tinto's theory (Tinto, 1982). Other

shortcomings of Tinto's theory include its limited applicability to two year college settings and non-traditional students (Grosset, 1990; Webb, 1990) and its lack of attention to differences in patterns of persistence behaviors by gender, race, age and socio-economic status (SES) (Tinto, 1982; Grosset, 1990). In critiquing the model, Tinto argued that including gender, race, age and SES as demographic characteristics may be insufficient if, for example, the nature of student/institution interactions are qualitatively different based on these variables. Separate analyses and, ultimately, separate theoretical models may be advisable to ensure that persistence for specific subgroups is neither underestimated nor distorted (Tinto in Pascarella, 1982, pp. 3-16; Bean, 1980).

Tinto revised his original model of student persistence to better capture the variability of persistence patterns over time. Tinto expanded upon the concept of persistence as a longitudinal process by including aspects of Van Gennep's social/anthropological study of tribal rites of passage. The rites of passage theory suggests that the movement of individuals from one group to another can be represented in three distinct stages: separation or disengagement from the previous group (e.g., high school, family, community); transition, where there is no affiliation with past or future groups; and incorporation into the new group (e.g., social and academic integration). Viewed in this light, early student dropout may reflect both a lack of social and

academic integration and the inability to disengage from previous group memberships. Dropout which occurs later may reflect disengagement problems as well as an inability to sufficiently cope with the stresses inherent in the transition stage.

Inferences from Tinto's revised model are supported by the results of an ethnographic study of new freshmen, in which interactions with high school friends who did not attend the same university impeded social integration, whereas living on campus lessened interaction with family and high school friends and enhanced social interaction (Christie and Dinham, 1990). Collectively, the introduction of rites of passage stages as salient dimensions of student persistence suggests that dropout decisions may be socially, academically, and culturally bound (Tinto, 1988).

The incorporation of stages into the longitudinal component of Tinto's student persistence model and preliminary evidence supporting the revised model represent significant advances in student persistence research. Still, Tinto, like Spady (1971), cautioned that no single model is likely to be applicable across a student's academic career.

Bean's Models

Bean's work constitutes another major body of theoretically-based research which has been used to explain student persistence. Bean's models are similar to Tinto's insofar as they are institutional (as opposed to system)

models and incorporate existing knowledge of student withdrawal patterns and characteristics. However, Bean's models are derived from theories of work turnover and organizational behavior, and presume that student persistence can be explained by variables whose direct and indirect effects can be specified through path designs and analyses (1980, 1982, 1985, 1986).

Based on the assumption that leaving college is analogous to leaving work organizations, Bean's (1980) model defined dropout as the cessation of students from membership in a specific university. The model contained three categories of variables which were hypothesized to affect student dropout: background variables (e.g., pre-college achievement); organizational determinants (e.g., various types of student/institution interactions); and intervening variables (e.g., satisfaction and institutional commitment). Just as pay in work organizations figures prominently in models of work turnover, academic surrogates for pay -- grade point average (GPA) and student perceptions of self-development, practical value of their education, and institutional quality -- are prominent factors in Bean's model and are expected to influence satisfaction and commitment, the precursors of dropout.

Bean's initial study (1980) utilizing this model highlighted the influence of opportunity variables (e.g., opportunity to transfer) on institutional commitment and the importance of institutional commitment (i.e., loyalty to the

institution) in explaining student persistence. The findings also underscored the strong correlation between past academic (high school) performance and university GPA as well as significant differences in persistence patterns by gender, an observation that subsequently led to separate path models for men and women. As hypothesized, the academic surrogates for pay contributed significantly to both satisfaction and institutional commitment.

Bean (1982) combined elements from Spady (1971), Tinto (1975), Pascarella and Terenzini (1980) and Bean (1980) to create a single "synthetic" model of student dropout. Bean also drew upon the work of Fishbein and Ajzen (1975) who theorized that intentions to perform a certain behavior were important and necessary antecedents to the actual behavior. Hence, an important conceptual difference in this model was the addition of "intent to leave" as the immediate pre-cursor to dropout decisions. In subsequent empirical tests, "intent to leave" was found to be the best predictor of dropout, especially when measured close to the time of expected dropout (e.g., mid-year, end of year); however, it added little to the model's explanatory power as it identified the "who" but not the "why's" of departure (Bean in Pascarella, 1982, pp. 17-34).

The inclusion of "intent to leave" is a major difference between Bean's (1982) and Tinto's (1975) model as is the explicit treatment of external variables (i.e., variables beyond the control of the institution which may 'pull'

students away from a specific college). The role of external factors was further amplified in Bean's "meta-model" (1986; in Hossler and Bean, 1990) of student persistence in which elements of earlier student persistence models were further ordered and synthesized, and guidelines for conducting persistence research at the institutional level were offered. The "meta-model" presumes that demographic and pre-entry characteristics variables are important only insofar as they shape student/institutional interactions.¹ Students are expected to interact organizationally (i.e., within specific bureaucratic structures related to advising, course offerings, policies and procedures) as well as academically and socially; students are also expected to interact with external factors such as finances, opportunity to transfer, off campus employment and family responsibilities. In turn, these interactions shape student attitudes where satisfaction, sense of self-development, practical value, and self-confidence represent general attitudes about higher education, and institutional fit and institutional commitment represent specific attitudes that affect intentions and continued enrollment or dropout. While student/institution interactions mediate the influence of demographic and pre-entry characteristics on persistence, college GPA and external factors are hypothesized to have direct effects on continued enrollment. Unlike Tinto, Bean assumed that

1. The exception to this is high school performance which has a direct affect on college GPA.

sufficient academic integration precedes good grades rather than results from them, and that academic integration is an outcome rather than a cause of study habits or absenteeism (1985, 1986).

In outlining the "meta model", Bean defines dropouts as students who leave an institution for one or more years without completing their formally declared program of study. Thus, the term dropout includes transfers and "stopouts" (i.e., students who return after one or more years) and excludes new students who leave having completed their educational goals but without degrees. By inference, Bean's "meta-model" captures interactions related to involuntary and voluntary dropouts and can also be applied to non-traditional students, the latter of whom are more likely subject to external factors and may have educational goals unrelated to degree attainment (Bean and Metzner, 1985; Grosset, 1990).

Bean and Metzner's Model of Persistence for Non-traditional Students

Bean and Metzner (1985) outlined a model of persistence for non-traditional students based on the supposition that student/institution interactions in the social system of the college are less important factors for their persistence than are external variables and student/institution interactions in the academic system of the college. The model was developed in response to the fact that the special characteristics of non-traditional students (i.e., being

older, part time, and non-residential) and the effects of these characteristics on student/institution interactions have been largely overlooked in other models, including those due to Spady (1971), Tinto (1975) and Bean (1980).

In this model, four sets of variables are expected to influence continued enrollment: GPA, "intent to leave", environmental factors (e.g., external factors such as finances, outside encouragement, hours of employment, family responsibilities, opportunity to transfer); and background and defining variables (e.g., age, enrollment status, residence, high school performance, race, gender). "Intent to leave" is expected to be influenced by academic variables (e.g., certainty of major, academic advising, study habits) and psychological outcomes (e.g., satisfaction, goal commitment, stress). Social integration variables (e.g., peer and faculty relationships) are expected to have marginal, if any, influence on continued enrollment. Like the reciprocal relationship between academic and social integration in Tinto's (1975) model, a reciprocal relationship is hypothesized between academic and environmental variables. When both are favorable, continued enrollment is expected. When environmental variables are favorable and academic variables are not, persistence is more likely, but when academic variables are favorable but environmental variables are not, persistence is less likely. Ceterus paribus, the influence of environmental variables on persistence supercedes that of academic factors.

Kohen, Nestle and Karmas Model

Kohen, Nestle and Karmas (1978) introduced a theoretical model which assumes that external factors are significant predictors of dropout behavior and that persistence is a process that changes over time. Student dropout is presented as a function of a series of interactions which occur over time between individual student characteristics and their home and work environments as well as the college environment. The ability to persist, as well as the expectation and commitment to persist, are largely dependent upon individual demographic and pre-entry characteristics, with the actual decision to stay affected by interactions in the social and academic environments of the institution and external factors. The impact of these variables is expected to vary according to class levels. For example, this model indicates that pre-college ability and achievements should have greater influence on persistence for freshmen than for seniors.

APPLICATION OF EXISTING MODELS OF STUDENT PERSISTENCE
ON READMITTED STUDENTS WITH PRIOR RECORDS OF ACADEMIC FAILURE

The major models of student persistence are linked by the conceptualization of student persistence as a longitudinal process and the importance attributed to the effects of student/institution interactions on persistence. The development of theoretical models has, however, primarily focused on understanding and predicting either voluntary or

freshmen dropout. Most major theorists acknowledge that models of voluntary and freshmen persistence may not be universally applicable to all students who drop out, yet relatively little attention has been given to developing models which predict or explain involuntary dropout or the persistence of students who are not first time freshmen. This is because most students who leave institutions of higher education do so voluntarily and early in their academic careers (Tinto, 1975, 1987).

For example, Tinto's model was constructed to explain voluntary dropout decisions because voluntary dropout was estimated as constituting approximately 85% of all student dropouts (Tinto in Noel, Levitz and Saluri, 1987). That freshmen are more dropout prone than other classes is also well-documented. Consequently, the other focus of persistence research has also revolved around new matriculants (Ramist, 1981; Pantages and Creedon, 1978; Tinto in Pascarella, 1982 3-16; Noel, Levitz, Saluri, 1987). Indeed, the models which have been developed to explain persistence (e.g., Tinto, 1975, 1987; Bean, 1980, 1982, 1986; Bean and Metzner, 1985) are really models of freshmen persistence and, as such, may be limited in their ability to adequately explain or predict persistence for students who dropout and later re-enroll (Spady, 1971; Tinto, 1982; Kohen, Nestle and Karmas, 1978).

The Bean and Metzner (1985) model does, however, provide a good example of applying student persistence theory and

research to a specific population whose student/institution interactions may be uniquely affected by particular background and defining characteristics (e.g., enrollment status) not captured in the general case models of persistence. Certain aspects of this model may be useful for identifying critical predictors of persistence for readmitted students with prior records of academic failure. Readmitted students, like non-traditional students, form a subpopulation of students distinguishable from the general population of students by specific background characteristics and "pre-" re-entry experiences. The assertion of the Bean and Metzner (1985) model that interactions in the academic system of the college take precedence over those in the social system of the college may also apply to this group of readmitted students.

Still, not all of the factors in the Bean and Metzner may be important predictors of persistence for readmitted students with prior records of academic failure. For example, external factors such as opportunity to transfer may not be applicable to these since they have already expressed an institutional preference by choosing readmission and re-enrollment over admission and enrollment elsewhere. Instead, the fact that readmitted students with prior records of academic failure must meet specific academic achievement goals or standards in order to remain eligible for continued enrollment suggests that the variables which influence the achievement of minimum standards (e.g., prior academic

record, GPA upon re-enrollment) are critical. In short, the importance of prior academic record and GPA upon re-enrollment may supercede other variables in the Bean and Metzner model (i.e., external factors, "intent to leave", academic variables other than GPA, and psychological outcomes).

METHODOLOGICAL ISSUES IN STUDENT PERSISTENCE RESEARCH

The evolution of persistence research is also reflected in changes in research methodology. Three vital changes have been more precise definitions and measurements of dropout and persistence, longitudinal research designs and the use of more complex data-analytic techniques (Webb, 1990).

Defining and Measuring Student Dropout and Persistence

Deficiencies in defining dropout or persistence variables are evident in the mixed and inconclusive findings reported in the literature for variables frequently believed to influence student persistence (e.g., pre-college ability and achievement) (Pantages and Creedon, 1978; Summerskill, 1962). These mixed and inconclusive results are largely due to the erroneous assumption that all dropout behavior is the same and that the antecedents of dropout decisions are the same for all students. Thus, a particularly significant change in defining and measuring persistence was the recognition and empirical support of the fact that there are different types of dropout behavior (e.g., voluntary,

involuntary, permanent and "stop out") (Spady, 1971; Tinto, 1975).

Equating persistence with degree attainment has also led to erroneous conclusions regarding which variables are significantly associated with persistence (Bean, 1986). While degree attainment is one important outcome of persistence, many students persist without obtaining a degree and may be correctly classified as 'successful' if they meet their academic goals but do not earn a degree. This seems to be especially true for non-traditional students whose reason for enrolling may be to complete job training, improve basic skills, transfer, meet others or increase academic and personal self-confidence (Grosset, 1990; Carroll, 1990).

In other cases, definitional problems may result in reported dropout rates which underestimate actual persistence rates. Using the national longitudinal data set for the high school classes of 1972 and 1980, Mallette and Cabera (1990) found, for example, that the two year dropout rate for students who enrolled at four year colleges declined from 30% to 16% and from 33% to 13%, respectively, when transfer students were removed from the sample. From a system perspective, this is important as the inferences drawn from two year persistence rates of 84% and 87% might be quite different than those drawn from a belief that two year persistence rates fall below 70%. Similar findings are evident at the institutional level (Pantages and Creedon, 1978; Mallette and Cabera, 1990).

Research Design and Data Collection

Deficiencies in research design and data collection have also contributed to mixed and inconclusive results and is most evident in early student persistence research. Early student persistence research employed cross-sectional or post-mortem designs, drawing conclusions about student dropout based on data collected at a single point in time or from post hoc analysis of self-reported reasons for leaving (Terenzini, 1980). The recognition that student persistence has a time dimension was an especially important contribution to the student persistence literature, leading researchers to view persistence as a longitudinal process (Spady, 1971; Tinto, 1975). As a result, longitudinal designs reflecting persistence behavior as a process phenomenon are now de rigueur.

However, the absence of consistency in longitudinal designs has limited the generalizability of extant student persistence research. For example, studies in which persistence is measured after one semester tend to report different variables to be as significant vis-a-vis persistence than when persistence was measured after one academic year or after multiple years (Bean, 1980, 1985; Pascarella and Terenzini, 1980; Kohen, Nestle, and Karmas, 1978). Thus, depending upon the time frame considered, the same student at any given institution could, theoretically, be a dropout, stopout, graduate or one who is still persisting. In each case different student/institution

interactions may be operating and, hence, different variables surface as important (Lenning in Pascarella, 1982, pp. 35-54; Lenning, Beal and Sauer, 1980).

Moreover, persistence measured in four year time frames does not appear to adequately capture the overall persistence of first time matriculants (Eckland, 1964; Carroll, 1990). In Eckland's study, nearly 70% of first time freshmen graduated after 10 years, although the four year persistence rate for this class was only 55%. Likewise, for 1972 and 1980 high school graduates who were continuously enrolled each successive fall term for four years, Carroll found that persistence-to-graduation rates increased from 60% to 90% and from 44% to 70%, respectively, when persistence was measured at 6.5 years rather than four.

Deficiencies in data collection are less frequently noted in the literature and when examined, tend to involve insufficient attention to proper survey techniques. Generalizing conclusions based on low response rates and failure to account to response bias (i.e., observed differences between respondents and non-respondents) are two examples of data collection criticisms (Bean, 1985; Webb, 1990).

Data-Analytic Techniques

Another change in the methodology employed in student persistence research has been the use of more complex data-analytic techniques (Ramist, 1981; Webb, 1990). Early

research focused on describing "who" was most likely to drop out and "when" dropout was most likely to occur and data analyses were largely restricted to descriptive statistics. Later studies examined correlates of persistence using uni- and multivariate techniques and sought to predict the probability of drop out or persistence behavior based on various factors. While prediction remains a critical component of persistence research, especially among decision-makers involved in forecasting enrollments, researchers have also focused on identifying underlying causal linkages, seeking to explain as well as predict student persistence behavior (Pantages and Creedon, 1978; Ramist, 1981). For research aimed at prediction and explanation, multivariate analyses are now standard (Webb, 1990; Tinto, 1975; Bean, 1980, 1982, 1985).

In the following sections, specific factors affecting student persistence are reviewed. Particular attention is paid to the extent to which these studies were guided by theoretical models or had methodological deficiencies.

FACTORS AFFECTING STUDENT PERSISTENCE

Most researchers conclude that why some students stay and why other students leave is a complex phenomenon, one which is both difficult to define and measure. While specific variables or clusters of variables may be identified as statistically significant predictors of student persistence, even the 'best' research (i.e., guided by

theoretical models and identified as methodologically sound) explains only part of the observed variability in student persistence, with explanatory measures (e.g., R^2) reported as low as 10% or less (Bean, 1980; Lenning in Pascarella, 1982, pp. 35-54; Webb, 1990).

Still, researchers have begun to identify and substantiate factors which appear to influence student persistence. Research findings have reported four broad factors affecting student persistence: student/institution interactions, individual student characteristics, external factors, and institutional characteristics. These results are reviewed next.

STUDENT/INSTITUTION INTERACTIONS

Understanding the nature of student/institution interactions is an important component of student persistence theory and research. Whereas early research on student dropout assumed that the impact of college environment variables was constant across all students, it is now generally accepted that individual characteristics interact in unique ways with the academic and social systems of the institution. The outcomes of these interactions -- whether termed social or academic integration, satisfaction, congruence or commitment -- are held to be direct influences on decisions to stay or leave (Pantages and Creedon, 1978; Ramist, 1980; Tinto, 1975 and 1987; Bean, 1982).

Academic and Social Integration

The academic and social integration constructs of Tinto's model have been extensively investigated especially by Pascarella and Terenzini (1977, 1978, 1980, 1981) and, in general, have been empirically supported. Pascarella and Terenzini first tested Tinto's 1975 model when they investigated the extent to which freshmen voluntary dropout was related to social and academic integration (1977). Survey instruments were developed to measure academic and social integration based on the assumption that more fully integrated students would have positive perceptions of the social and academic environments, better GPAs, and participate to a greater extent in extra-curricular activities.

Both academic and social integration were found to be significantly associated with persistence after one year. For academic integration, student interest in their academic programs made the largest contribution to explained variance; for social integration, it was informal student/faculty interactions and the perceived challenge in non-academic life. Together academic and social integration were able to significantly discriminate persisters and voluntary dropouts; differences due to gender, aptitude and pre-college expectations were not significant.

The saliency of the social and academic integration constructs of Tinto's 1975 model was also investigated by Pascarella and Terenzini (1980) in another study of freshmen

persistence. Analysis of survey items yielded five scales which were consistent with Tinto's model, were reasonably reliable (.71-.84 reliabilities), and had modest intercorrelations. The latter property suggests that the scales were, to some extent, measuring the two different constructs. Sixteen background and pre-college experience variables as a group did not significantly differentiate persisters and dropouts. When these covariates were held constant, however, the social and academic integration scales did differentiate persisters and dropouts. Moreover, the addition of the scales increased the explained variance by greater than 20%, with scales measuring goal commitment (degree attainment) and student/faculty interactions contributing most to the explained variance.

The Pascarella and Terenzini study was replicated at another institution in order to examine whether Tinto's model held across institutions when differences between institutions included type (one private, one public), selectivity, academic advising systems, and historical persistence rates (Terenzini, Lorang, and Pascarella, 1981). As in the previous study, the covariates did not significantly differentiate persisters and dropouts; however, academic and social integration did. The resulting increase in explained variance was not as dramatic as in the first study (8% versus more than 20%), and only the goal commitment scale made a significant contribution to explained variance; therefore, Pascarella and Terenzini concluded that there may

have been differing patterns of social and academic integration for each institution and that their instrument may not have fully captured these patterns.

Based on Pascarella and Terenzini's work, the differences in the relative importance of social and academic integration variables reported in the literature may be partially attributable to institutional differences, to difficulties in defining and measuring integration or different definitions of dropout behavior. For example, when transfer students were compared to persisters separately from a comparison of all dropouts and persisters, different patterns emerged: the relative importance of the social and academic integration variables differed even though institutional commitment remained significant in both cases (Mallette and Cabera, 1990).

Student/Faculty Relationships

The importance of informal student/faculty interactions vis-a-vis voluntary dropout uncovered in Pascarella and Terenzini's initial validation study of Tinto's model (1977) was further explored in separate studies. Specific patterns of student/faculty interactions outside the classroom were examined for their influence on freshmen persistence when background and other pre-college variables were controlled (1977, 1978). Specific types of interactions were identified and ranged from information and advice on academic programs and course-related matters to informal socializing. It was

assumed that positive student/faculty interactions outside the classroom would be related to increased integration in both the academic and social systems of the college. No significant differences between persisters and voluntary dropouts were found for the covariates (e.g., gender, pre-college ability and achievement, personality measures), and student/faculty interactions distinguished persisters from dropouts. However, only interactions based on course-related matters contributed to the explained variance in persistence. Pascarella and Terenzini concluded that student/faculty interactions were important correlates of persistence, but not all types of interactions were equally important.

Social Integration

Living on campus is seen as one aspect of student/institution interactions which promotes social integration (Christie and Dinham, 1990; Tinto, 1975; Astin, 1975). Living on campus has been found to be positively associated with persistence across institutional types and regardless of gender, race, ability or family background (Astin, 1975), leading researchers to view non-residential students (i.e., commuters and most non-traditional students) as one group which is more drop out prone than others (Bean and Metzner, 1985).

Other student experiences in the social system of the college which have been positively associated with

persistence are working part time on campus, participating in extracurricular activities, and developing interpersonal relationships (Astin, 1975; Pantages and Creedon, 1978).

Peer relationships, in particular, reflect how students interact within the social system of the institution and shape student perceptions of congruence ('fit') within the institutional culture. The literature supports the premise that 'finding one's niche' has an important relationship to persistence. Congruence within a student subculture may substitute for congruence with the dominant college culture, and thereby contribute to social integration for those students who might otherwise perceive themselves as not 'fitting in' (Tinto, 1975). For example, peer relationships in residence halls were found to be critical predictors of living satisfaction which, in conjunction with academic performance and satisfaction with the academic program, was significantly related to dropout (Aitken, 1982).

Social isolation like social incongruence represents failed social integration. Absence of a personal relationship or tie with someone on campus -- whether peer or faculty -- has been found to be a predictor of dropout (Tinto, 1987; Pantages and Creedon, 1978). This observation is underscored by findings of several post-mortem studies which concluded that student decisions to leave were largely independent of any discussions with faculty, advisors, counselors and other college personnel (Lenning, Beal, Sauer, 1980). It is important to note that whether or not students

are socially integrated is largely grounded in student perceptions. Persisters, in general, perceive themselves as having more social interaction than dropouts (Spady, 1971; Terenzini in Pascarella, 1982, pp. 55-72).

It should also be noted that the social integration construct may be less valid for commuter and non-traditional students (Tinto, 1987; Pascarella et al., 1981; Bean and Metzner, 1985; and Grosset, 1990). For these student subgroups, academic integration and external factors appear to play a more crucial role in the decision to stay or leave (Webb, 1990). Whether or not social integration is an important influence on persistence for non-traditional and commuter students may be mediated by age. For example, Grosset (1990) found that social integration differentiated persisters from dropouts for a younger, but not older, cohort of non-traditional students.

Academic Integration and Grade Performance

Academic integration is an outcome associated with student/institution interactions in the academic system of the college. It has been defined and measured by various factors such as student/faculty interactions, intellectual development, satisfaction with academic program, teaching or advising; study habits/skills, and college grade performance (Pascarella and Terenzini, 1977, 1978, 1981; Astin, 1975). While somewhat influenced by all these factors, academic integration appears to be primarily affected by college grade

performance (i.e., college grade point average [GPA]). This is because students must meet the minimum academic standards of the institution in order to be construed as fully integrated (i.e., eligible for continued enrollment) (Tinto, 1975).

Therefore, college GPA is placed as core element in the major theoretical models of student persistence and is consistently presented as an objective measure of congruence with the academic norms of the institution, a product of student/institution interactions, and a factor which is significantly influenced by pre-college ability and achievement (Bean, 1980, 1982, 1986; Bean and Metzner, 1985; Tinto, 1987). GPA has surfaced as an important predictor of persistence across student subgroups, types of dropout, and institutions (Johnson, 1980; Aitken, 1982; Grosset, 1990; Getzlaf, 1984; Pedrini, 1978). It has also been found to be the single most important predictor of academic dismissal (Tinto, 1975 and 1987) and of dropout when "intent to leave" is held constant (Bean, 1980, 1982, and 1985). Post-mortem studies based on student self-reports have cited poor grade performance as one of the top three reasons for dropping out (Pantages and Creedon, 1978; Summerskill, 1962). Depending upon the research design, definition of dropout, number of other variables included, and data-analytic techniques employed, GPA has been found to account for one third to one half of the explained variance and more of the explained

variance than any other single variable (Webb, 1990; Pantages and Creedon, 1978).

Pascarella, et al. (1981) illustrates the importance of college GPA in explaining and predicting student persistence. This study examined three types of freshmen voluntary dropout at a non-residential campus (stop outs, early dropouts and persisters) based on 19 pre-enrollment variables (e.g., demographics, pre-college ability and achievement, aspirations, and intentions) and two measures of academic achievement: first term GPA and credits earned. The 19 pre-enrollment variables explained approximately 3.6% of the variance in persistence for the three groups, and of those variables, only nine (ability and achievement, race, age and select measures of intentions) made significant contributions to the explained variance. When achievement variables were added, the explained variance increased to approximately 12.2%, due largely to first term GPA. Moreover, the addition of GPA improved the model's ability to correctly identify the type of dropout. When only pre-college variables were included, stopouts and persisters appeared to be the same.

INDIVIDUAL STUDENT CHARACTERISTICS

Demographic factors and pre-entry characteristics (e.g., ability and achievement, personality, aspirations, certainty of occupational goals/academic major, transfer and enrollment status) have been associated with student persistence. Most theoretical models of student persistence include individual

student characteristics since they are assumed to shape how students initially interact with the institution. However, the effects of individual student characteristics on student persistence are largely viewed as indirect (i.e., mediated by student/institution interactions) (Noel, Levitz and Saluri, 1987; Tinto, 1975, 1987; Bean, 1980, 1986).

Collectively, the studies which have investigated the relationship between demographic/pre-entry characteristics and persistence have made three important contributions to student persistence research. First, they have identified dropout prone subgroups for whom counseling, advising and intervention programs have been specifically developed (Pantages and Creedon, 1978). Second, these studies have underscored the importance of controlling for pre-entry differences (Panos and Astin, 1968; Lenning in Pascarella, 1982, pp. 35-54; Pantages and Creedon, 1978; Ramist, 1981; Lenning, Beal and Sauer, 1980; Kohen, Nestle and Karmas, 1978; Pascarella, et al., 1981). Third, research results indicating that certain demographic and pre-entry characteristics are significant in relation to persistence have led the major student persistence theorists to conclude that a single model of persistence may be inadequate (i.e., the student/institution interactions which influence dropout decisions may be sufficiently different to merit separate models for specific student subgroups) (Tinto, 1982, 1987; Bean and Metzner, 1985; Bean, 1985; Kohen, Nestle and Karmas, 1978).

DEMOGRAPHIC FACTORS

Age

A preponderance of 'no difference' results has been reported for age in relation to persistence (Summerskill, 1962; Pantages and Creedon, 1978; Noel, Levitz and Saluri, 1987). Although some studies have hypothesized that age, as an index of maturity and certainty of goals, would be positively associated with persistence, major literature reviews conclude that any positive association between age and persistence is offset by the effects of other factors such as employment or family responsibilities. However, most of the studies reviewed had samples which were homogeneous with respect to age (i.e., included only first time, residential freshmen and not transfer, commuter or re-enrolling students). Because of this, the influence of age on persistence is not entirely clear, especially for non-traditional students who are typically older and non-residential (Grosset, 1990).

Gender

Gender appears to have no effect on persistence. However, gender differences in 'why' and 'when' students leave is well-documented (Summerskill, 1962; Pantages and Creedon, 1978; Lenning, Sauer and Beal, 1980; Tinto, 1975 and 1987). Women are more likely to be 'stop outs', and to leave earlier and voluntarily; men tend to cite academic reasons (e.g., academic failure) for leaving and, if they stay, are

more likely to remain continuously enrolled. These observations suggest that gender may interact with other variables to produce different results at different times. Theoretically, this may be explained by the hypothesis that the student/institution interactions which influence persistence may be different for men and women and that these differences may vary over time (Tinto, 1982). If this is the case, then how persistence is defined and measured may influence research findings vis-a-vis the significance of gender as a predictor of student persistence. For example, differences in persistence by gender were found after two years (Foote, 1980), four years and ten years (Eckland, 1964). In particular, four year measures of persistence favored men and ten year measures favored women.

Hometown Size and Location

Hometown size and location have generally not been found to be significantly related to student persistence. In the few studies where a significant relationship between hometown size or location and dropout was found, reviewers have exercised caution about literal interpretations, suggesting instead that these results may be attributed to differences in pre-college preparation (Summerskill, 1962; Pantages and Creedon, 1978; Bean, 1980). This presumption is born out in other research which specifically included type of high school in the analysis. In these studies, differences in persistence were found based on measures of high school

quality and type of high school curricula (Pantages and Creedon, 1978; Kohen, Nestle, and Karmas, 1978). For example, students in the 1972 and 1980 high school classes whose high school preparation was an academic (college preparatory) curriculum were more likely to be four year persisters than those graduating from a vocational curriculum (Carroll, 1990).

Socio-economic Status (SES)

The research results on the relationship between socio-economic status (SES) and persistence are inconclusive. SES variables have not been uniformly defined and measured, and differences in persistence rates which have been attributed to certain SES variables (e.g., family income and level of parental education) have disappeared when pre-college ability and achievement are controlled (Panos and Astin, 1968; Pantages and Creedon, 1978). Moreover, results for SES may be confounded by race. Hispanics and African and Native Americans are, for example, more likely to come from lower SES backgrounds, suffer related academic deficiencies and have increased rates of dropout due to poor academic performance (Lenning in Pascarella, 1982, pp. 35-54; Tinto, 1987). Consequently, the variability in research findings for SES in relation to persistence is usually attributed to absence of statistical controls for race and other pre-entry characteristics (e.g., ability), unclear definitions of dropout (e.g., not differentiating involuntary and voluntary

dropout), and differences in how SES is defined and measured (Pantages and Creedon, 1978).

Race

Evidence suggests that both rates and patterns of dropout vary by race, with the probability of degree attainment lowest for Hispanics and African Americans, even when ability and aptitude are controlled (Lenning, Beal, Sauer, 1980; Pantages and Creedon, 1978). Race has also been found to be a significant predictor of early academic dismissal, regardless of pre-college ability and achievement (Ott, 1988).

Tinto suggests that race, particularly minority status, represents marginality, a factor which contributes to isolation and incongruence which ultimately contribute to dropout decisions. This explanation is consistent with research results which suggest that minority students, regardless of specific race, pre-college ability or achievement, are less likely to persist on majority campuses than majority students (Tinto in Pascarella, 1982, pp. 3-16; Bynum and Thompson, 1983; Hossler and Bean, 1990).

Pascarella (1975) specifically examined the viability of Tinto's model as a predictive model for African Americans in a nine year study of racial differences in factors associated with B.A. completion. Because this study was a system-based study (i.e., involved 350 institutions and approximately 5500 students), institutional characteristics such as predominant

race, selectivity, size and student transfer rates were included in addition to variables specifically drawn from Tinto's 1975 model. A total of nineteen predictor variables were included, and they accounted for 15 to 29 percent of the variance in persistence rates for gender and race subgroups, a result comparable with other institutional tests of Tinto's model. As in other validation studies of Tinto's model, student/institution interaction variables (e.g., student/faculty relationships, academic and social integration) were positively associated with persistence. However, specific interactions (e.g., the relative importance of social versus academic integration, types of student/faculty interactions) varied by race. Pascarella concluded that race alone may not account for all the variability in persistence and that persistence for different races may be explained by different student/institution interactions (i.e., certain student/institution interactions may be more significant than others, depending upon race). Eagle and Arnold (1990) performed another system study, in which initial disparities in persistence by race were eliminated when institutional type and levels of student aspiration (BA aspirants versus 'some college'/'not necessarily degree') were controlled. This seems to reinforce the observation that race may be correlated with other pre-entry factors, and that, for specific races, institutional factors (e.g., type) may have some bearing on student/institution interactions.

OTHER PRE-ENTRY FACTORS

Achievement and Ability

Measures of pre-college achievement and ability (i.e., high school GPA, high school rank, standardized tests such as ACT and SAT) have been reported in the literature as significant predictors of student persistence (Summerskill, 1962; Demitroff, 1974; Foote, 1980; Lenning in Pascarella, 1982, pp. 35-54; Aitken, 1982; Webb, 1990). However, the nature of the relationship between persistence and pre-college achievement and ability, however, appears to vary across the spectrum of ability. For example, high school GPA and, less conclusively, standardized tests, have been found to have significant inverse relationships to academic dismissal (i.e., academically dismissed students, in general, appear to be less able than their voluntary dropout counterparts) (Ott, 1988; Lenning in Pascarella, 1982, pp. 35-54).

High school grades have also been found to be the best single predictor of college grades with poor grades a better predictor of dropout than good grades are of persistence (Pantages and Creedon, 1978; Demitroff, 1974). In other words, students with low high school grades are more likely to earn low college grades and be more dropout prone than students with high grades in high school, whereas students with high grades in high school are more likely to earn high college grades but are not necessarily more likely to persist (Webb, 1990; Demitroff, 1974). Demitroff (1974) also found

that high school rank predicted who was likely to cancel registration during any given term, a behavior which was significantly associated with dropping out (i.e., not enrolling for the next possible term).

In a few studies, a 'no difference' finding was reported for pre-college measures of ability and achievement and persistence. These studies usually suffer from methodological flaws, specifically the failure to define dropout. The 'no difference' finding for pre-college ability is particularly evident in studies where voluntary and involuntary dropouts (i.e., academic dismissals) were considered to be the same (Tinto, 1975) or where students who transferred were included as dropouts. For example, transfer students were found to be more like persisters in terms of ability and achievement than students who were academically dismissed or who permanently dropped out (Pantages and Creedon, 1978).

Pre-college achievement (high school GPA) has a stronger association with persistence than any other single pre-college characteristic studied. Even so, it accounts for a relatively small percentage of the variance between persisting and dropping out, roughly less than 10% (Lenning in Pascarella, 1982, pp. 35-54).

The potency of pre-college ability and achievement as predictors of persistence appears to diminish with time (Tinto, 1975, 1982, 1987). For example, Kohen, Nestle, and Karmas (1978) found that pre-college ability and achievement

were significant factors related to persistence in year one but not in subsequent years. Apparently, those who persist become more homogeneous in regard to pre-college measures of achievement and ability, so fewer differences are found.

Personality

Personality factors (usually defined in terms of Minnesota Multiphasic Personality Inventory [MMPI] classifications) have been extensively studied for their links to student dropout behavior. Results, however, have been mixed and inconclusive, leading reviewers such as Pantages and Creedon (1978) and theorists like Tinto (1987) to conclude that a drop out personality per se is insupportable. Moreover, personality correlates are viewed as being largely beyond institutional control and as having little practical value in admissions, advising and intervention programs designed to promote persistence. These conclusions and observations are bolstered by the fact that existing literature has reported an absence of any significant relationship between personality and persistence or attributed mixed results to methodological deficiencies (Lenning in Pascarella, 1982, pp. 35-54). For example, differences in personality between persisters and dropouts tend to disappear when drop out is precisely defined (e.g., voluntary and involuntary dropouts are not included in the same analyses) (Pantages and Creedon, 1978).

Aspirations and Intentions

Persisters tend to have higher levels of commitment to college and higher aspirations regarding degree completion than do dropouts (Astin, 1975; Tinto, 1975; Eagle and Arnold, 1990; Carroll, 1990). Students who express graduate and professional school aspirations are more likely to persist than those with lower aspirations; students who expect to dropout or transfer do so in significantly higher percentages than those who do not express such intentions, regardless of ability and SES (Tinto, 1987; Pascarella, et al., 1981; Bean, 1980; Lenning, Beal and Sauer, 1980). Bean (1982, 1985, 1986), in particular, has consistently found strong associations between 'intent to leave' and persistence.

Certainty of Occupational Goals and Academic Major

Although it has been presumed that greater certainty of occupation goals and interests is positively related to persistence, research results are mixed. Self-reported certainty of major was one student attitude factor found to be positively related to persistence (Demitroff, 1974), yet objective measures of occupational certainty such as number of major changes and declared versus undeclared status do not appear to be either significant or stable over time.

For example, freshmen who seemed to be certain (i.e., had declared and sustained the same major from summer orientation through fall enrollment) were actually more likely to change majors and/or dropout after two years than

undeclared students (Titley, 1980). In contrast, Foote (1980) found significant differences in two year persistence rates between determined and undetermined students, where persistence avored determined students (i.e., students who retained their initial choice of major for the two years examined). While differences in persistence were found between determined and undetermined students in Foote's study, only 13% of the freshmen in this study had determined majors: 87% of the entering class was uncertain (i.e., remained undeclared or changed majors one or more times during the two year span).

Academic major at point of entrance was also one of five variables investigated by Newlon and Gaither (1980) for its influence on persistence. Significant differences by major were observed, with higher four year persistence rates found for students in business, science, and professional fields such as engineering, and lower rates for students in humanities, social sciences and undecided majors regardless of their status (new freshmen or junior transfer). Because ability was not controlled, these results may simply reflect ability differences and/or GPA pre-requisites for certain academic programs. In a later study, Ott (1988) found that academic major was a significant predictor of early academic dismissal, with the probability of dismissal greater for students in quantitatively-oriented majors like agriculture, math and physical sciences, even when pre-college ability and achievement were controlled.

Finally, the influence of vocational and occupational goals on persistence appears to be affected by institutional type. The relationship between occupational certainty and persistence has been found to be significant for vocational/technical schools but not for four year institutions (Carroll, 1990; Eagle and Arnold, 1990).

Transfer Status

While students who transfer represent a distinct type of initial dropout, few studies were identified which examined the persistence of transfer students at their next institution. At one four year commuter institution, students who entered as junior transfers were found to have significantly lower persistence rates than students who entered as new freshmen. In another study based on Bean's 1980 model, academic interaction variables were found to be more important influences on institution commitment for transfer students than were social interactions (Johnson, 1980).

Enrollment Status

Full time or part time enrollment status has been investigated relative to persistence. Analyses based on the national longitudinal data on the high school classes of 1972 and 1980 found that students were less likely to be enrolled one year later if they began as part time students than if they began their college careers as full time students

(Carroll, 1990). Institutional studies which include enrollment status as a possible predictor of persistence are largely limited to two and four year commuter institutions but furnish strong evidence that part time students are more likely to dropout than are their full time counterparts (Bean and Metzner, 1985; Webb, 1990). Seen in the context of theoretical models where student/institution interactions are important predictors of dropout, it seems clear that part time students have less opportunities to interact across the social and academic systems of the institutions than do students who attend full time (Bean and Metzner, 1985; Haggerty, 1985; Astin, 1975).

EXTERNAL FACTORS

External factors have been investigated for their relationships with persistence. Particular attention has been given to investigating the effects of financial aid on persistence. Financial difficulty has been frequently cited in post-mortem studies as the primary reason or among the top three reasons for dropping out (Summerskill, 1962; Pantages and Creedon, 1978). Many research findings indicate that having scholarships, grants, ROTC benefits and money from parents positively affects persistence whereas loans do not. (Pantages and Creedon, 1978; Astin, 1975). Other research findings suggest that the significance of various financial aid factors is less clear. For example, Iwai and Churchill (1982) examined students' system of financial support, noting

that previous studies investigated a single type of assistance or assumed independence among types of assistance. Iwai and Churchill argued that students rely upon multiple types of assistance throughout their academic careers and found that persisters had broader systems of financial support than did non-persisters. The numbers and types of financial sources differed by gender, class level, achievement, and type of dropout; therefore, Iwai and Churchill concluded that factors other than finances were operating on dropout decisions.

Murdock's (1987) meta-analysis of the associations between financial aid and persistence was done to determine whether study characteristics in student persistence research contribute to the mixed results frequently found for financial aid variables. Murdock argued that if financial aid successfully increases educational access and choice, then research results should show no difference (small to zero effect sizes) in persistence rates for aided and non-aided students. Across thirty-one studies, differences in research results were examined by institutional type, how persistence was measured (in time and how transfer and stopout students were treated), and presence/absence of controls for ability. Murdock concluded that financial aid promotes persistence; however, the effect is very small. An important finding was that effect size was zero when study characteristics included controls for ability, suggesting that aided and non-aided students of comparable ability

persist at the same levels. Also, when the measure of persistence varies in terms of length of time, the length of time mediates effect size. Larger effect sizes were found when persistence was measured after longer periods of time, inferring that the presence or absence of financial aid becomes more important as students advance their academic careers.

Murdock's study also underscores the importance of clearly defining persistence. Larger effect sizes favoring aided students were found when transfers and stopouts were treated as persisters and not dropouts. From this it can be inferred that for specific institutions, financial aid may influence voluntary dropout and decisions about transfer or re-enrollment.

Another external variable studied for its relation to persistence is employment, where working off campus and/or working in excess of 20 hours per week appear to be negatively associated with persistence (Bean and Metzner, 1985; Astin, 1975; Pantages and Creedon, 1978). Other external variables such as family responsibilities, outside encouragement and opportunity to transfer have also been investigated. Except for opportunity to transfer which was found to be a significant predictor of persistence (Bean, 1980, 1982, 1986), these variables are difficult to define and measure and, as a result, findings for them have been inconclusive (Bean and Metzner, 1985; Grosset, 1990).

INSTITUTIONAL CHARACTERISTICS

Most persistence studies are based on single institutions. Since system-based research has been limited, information on how institutional characteristics affect persistence is less abundant. The few studies which have examined persistence across institutions have attributed some of the variability in persistence levels to differences in institutional type, quality, and size (Pantages and Creedon, 1978; Noel, Levitz and Saluri, 1987; Lenning Sauer, Beal, 1980). Tinto (1987) and Astin (1975) found institutional type associated with persistence levels, with higher levels favoring private four year institutions versus two year or public institutions. Similarly, Webb (1990) found differences in both rates and predictors of persistence between residential campuses and commuter institutions. Trend analyses based on the national data set for 1980 high school graduates also linked persistence to institutional type (Carroll, 1990).

Measures of quality such as admissions selectivity, student/faculty ratios, and faculty credentials have also been positively associated with higher rates of persistence. It has been suggested, however, that size may be a mitigating factor for both type and quality factors where having smaller enrollments is usually linked with higher persistence, regardless of type or quality (Tinto, 1975).

The review of factors affecting student persistence underscores the centrality of student/institution

interactions in persistence behavior and suggests which factors may be most likely to promote the student/institution interactions that are positively related to persistence (e.g., certain types of student/faculty relationships, full time enrollment, high college GPAs, on campus residence). The importance of controlling for pre-college differences (e.g., demographics, ability) is also reinforced as is the probability of mixed or inconclusive findings associated with ambiguous or imprecise definitions and measurement of variables (e.g., dropout, SES, social/academic integration).

In the next sections, the factors specifically affecting the persistence of students with prior records of academic failure are reviewed.

FACTORS AFFECTING THE PERSISTENCE OF READMITTED STUDENTS WITH PRIOR RECORDS OF ACADEMIC FAILURE

Approximately 15% of student withdrawal nationally is the result of some form of involuntary dropout (i.e., academic dismissal) (Astin, 1975; Tinto, 1975); however, not all of these students are permanent dropouts, since a portion of them will elect to re-enroll. Across higher education students with discontinuous enrollment -- whether due to voluntary and involuntary dropout -- are less likely to earn degrees than students who remain continuously enrolled, regardless of institutional type (e.g., four year college, community college or vocational school) or student type (e.g., gender, SES, or race) (Eagle and Arnold, 1990). For

those who elect to re-enroll and have histories of academic failure, persistence-to-graduation rates are believed to be low with estimates ranging from 10 - 20%, and probabilities of being dismissed again ranging from 35 - 75% (Bierbaum and Planisek, 1969; Hansmeier, 1965).

The persistence of students with prior records of academic failure has been largely excluded from the development and discussion of theoretical models of persistence. A few empirical studies aimed at predicting or explaining the persistence of this group of students have been done but are subject to the same deficiencies found in studies of freshmen and voluntary dropout. The most serious of these deficiencies is the lack of theoretical models and the absence of longitudinal designs.

The findings which have been reported suggest that readmitted students with prior records of academic failure form a subgroup of students who are distinguishable from other students by their previous college experiences and achievements as well as their pre-college experiences and achievements. For example, the academic records of readmitted students who failed a second time were found to be different from first time academic failures. They have more 'f's' on their records, have lower GPAs during their first term of enrollment, and tend to be in the lowest quartile for measures of ability and reading comprehension (Dole, 1963). There is also evidence that the importance of pre-college factors as predictors of academic achievement may diminish

for readmitted students with prior records of academic failure. Pre-college ability, in particular, appears to be a less potent predictor of GPA upon re-enrollment for students with prior records of academic failure than it is of first term GPA of new freshmen (Dole, 1963; Hansmeier, 1963, 1965).

The variables which have been investigated with respect to the persistence of readmitted students with prior records of academic failure have been limited to selected aspects of student/institution interactions and demographic and pre-entry factors. These results are reviewed in the following sections.

STUDENT/INSTITUTION INTERACTIONS

Student/institution interactions have been investigated for their influence on persistence for students with prior records of academic failure. These factors include pre-dismissal academic records, academic performance upon re-enrollment and study habits.

Pre-D dismissal Academic Record

Except for one study (Lautz et al., 1970), the literature reports a strong and significant association between pre-dismissal academic records and academic performance after readmission. Term and cumulative GPA at dismissal, first term GPA, the number of failing grades, and measures of the magnitude of failure (e.g., quality points below the minimum academic standard) have been found to be

associated with initial academic achievement for these students (Hansmeier, 1965; Dole, 1963; Planisek, Arnold and Ferraca, 1968; Schuster, 1971). One study, in particular, underscored the influence of pre-dismissal GPA on persistence (Planisek, Arnold and Ferraca, 1968). In this study, the percentage of explained variance increased from 46% to 84% when GPA at dismissal was added to a prediction model containing thirteen other predictor variables (e.g., demographic, pre-college ability, personality measures).

The number of credits earned prior to dismissal also seems to affect the probability of continuing past the first term of re-enrollment. For example, Bierbaum and Planisek (1969) found that second time failure for freshmen was substantially higher than that for seniors (a range of 79-84% for freshmen compared to 0-40% for seniors across four colleges within a research university).

Academic Performance upon Re-enrollment

GPA during the first term of re-enrollment distinguished readmitted students who failed a second time from those who were successful after one year (i.e., had graduated, withdrew voluntarily with a 2.00 or better average or were still enrolled) (Hansmeier, 1963, 1965; Dole, 1963). Initial GPA upon re-enrollment -- while critical in terms of meeting the minimum academic standards for continuance -- may not account for all variance in persistence for these students.

Schuster's study (1971) of readmitted students who had previously been dismissed highlights the problem of equating initial grade performance with persistence 'over time'. Two prediction models were developed based on selected variables, one designed to predict actual readmission decisions and another to predict GPA after one term. The variables which were found to predict readmission decisions were not uniformly the same as those which predicted first term GPA, and Schuster concluded that the criteria employed to make readmission decisions were not necessarily the same as the factors which influenced first term GPA.

Study Habits

Lautz et al., (1970) found that self-reported study habits differentiated academic failure students who 'passed' (i.e., 2.00 or better) after one term of re-enrollment and those who did not.

INDIVIDUAL STUDENT CHARACTERISTICS

Demographic Factors

Age, home town size, and SES (e.g., parental education and father's occupation) were not found to be significant correlates of persistence for students with prior records of academic failure (Gustavus, 1972; Lautz et al., 1970; Hansmeier, 1965). As in the case of research on voluntary dropout, it is important to note that the samples used in these studies were homogeneous with respect to age (e.g.,

were limited to students who were age 21 or younger at readmission). Gender per se does not appear to account for the variation in persistence for this group of readmitted students. However, differences by gender were found for specific pre-college measures of ability and achievement as well as for marital status, with marriage favoring persistence for men (Lautz et al., 1970; Planisek, Arnold and Ferraca, 1968; Hansmeier, 1965).

Differences in persistence by race for students with prior records of academic failure were not reported in any of the studies reviewed.

Enrollment Status

In general, studies on readmitted students with prior records of academic failure did not include enrollment status as a variable or had research samples which were homogeneous with respect to enrollment status (i.e., were limited to full time students). In a single case, enrollment status was not found to be significantly correlated with GPA after one term of re-enrollment (Bluhm and Couch, 1972).

Pre-College Ability and Achievement

Locally administered entrance examinations for verbal, math, and reading comprehension as well as ACT and SAT scores differentiated 'passing' students (i.e., 2.00 GPA or better) from those who failed again after one term of re-enrollment (Dole, 1963; Planisek, 1968). Except for those in the lowest

quartile for high school rank and GPA, long term (e.g., 10 years) persistence does not appear to be significantly predicted by these variables (Eckland, 1964; Astin, 1975; Grosset, 1990; Tinto, 1975).

While less comprehensive than the body of literature for first-time and voluntary dropouts, and absent theoretical models, the findings of studies examining the persistence of readmitted students with prior records of academic failure suggest the primacy of academic factors in their persistence behavior (i.e., factors linked to student/institution interactions in the academic system of the college). Therefore, these interactions form the basis of the proposed model of persistence for this study.

A PROPOSED MODEL OF PERSISTENCE FOR STUDENTS

READMITTED TO MSU WITH PRIOR RECORDS OF ACADEMIC FAILURE

Models of persistence for students with prior records of academic failure have been absent in the literature, and the models developed to explain and predict persistence of freshmen or voluntary dropout (e.g., Tinto, Bean, Bean and Metzner) may not be universally applicable to this subgroup of students. The models reviewed in this chapter were complex ones which call for a wider array of information on pre-college characteristics, student/institution interactions, and goal and institutional commitments than is typically available to decision-makers at the point of readmission.

Therefore, based on a review of the student persistence literature and knowledge of current readmission practices at MSU, a model of persistence for readmitted students with prior records of academic failure was proposed which posits that the persistence of these students can be adequately predicted by a simple model incorporating demographic and defining variables (e.g., enrollment status), pre-college ability and achievement, and select student/institution interactions in the academic system of the university (e.g., previous MSU academic record, GPA upon re-enrollment).

It was further postulated that certain defining variables (e.g., enrollment status) and variables representing student/institution interactions in the academic system of the university (e.g., previous MSU academic record, GPA upon re-enrollment) would be significant predictors of persistence for students with prior records of academic failure and would account for a significant portion of explained variation.

Demographic and pre-college ability and achievement are included in the model given that the literature indicates that they may interact with other variables; however, they are not expected to contribute significantly to predicting persistence.

If the proposed model of persistence is correct, then these defining variables and student/institution interactions are adequate to predict the persistence of these students, implying that the theoretical models reviewed in this chapter

can not be generalized wholesale to readmitted students with prior records of academic failure. If the proposed model is incorrect, then one or more of the models discussed in this chapter may be applicable to these students.

CHAPTER III

RESEARCH METHODOLOGY

Introduction

The investigator examined the usefulness of various predictors of persistence for students who were readmitted to Michigan State University (MSU) with prior records of academic failure. The model of persistence proposed in Chapter II for readmitted students with prior records of academic failure posits that the persistence of these students can be adequately predicted by certain defining variables (e.g., enrollment status) and student/ institution interactions in the academic system of the college (e.g., previous academic record, GPA upon re-enrollment).

Included in this chapter is an outline of the methodology which was employed to empirically test the proposed model of student persistence. Special attention was paid to addressing the methodological deficiencies of earlier studies of persistence. A restatement of the proposed model, a description of the research population and the sampling strategy, the design of the study, the definition of key variables and how these variables were measured, data collection strategies, and data analyses are presented in the

following sections. Limitations of the methodology are also discussed.

Proposed Model of Student Persistence

It was hypothesized that the persistence of students readmitted to MSU with prior records of academic failure could be predicted (i.e., modeled) by: 1) demographic and defining factors, 2) pre-college ability and achievement, 3) previous MSU academic record, and 4) academic achievement (GPA) during the first term of re-enrollment.

It was further posited that only certain defining factors (i.e., enrollment status) and variables representing student/institution interactions in the academic system of MSU (i.e., previous MSU academic record and GPA upon re-enrollment) would be significant predictors of persistence for this group of students. Demographic factors and pre-college ability and achievement variables were not expected to be significant predictors of persistence. However, these variables were included in the model based on specific findings and methodological issues reported in the literature (e.g., the need to control for pre-college differences, possible gender or race interaction effects).

Research Population

The population of interest consisted of MSU students who had been readmitted to the Undergraduate University Division (i.e., lower division students with fewer than 85 earned

credits) since 1980 with prior records of academic failure and who subsequently re-enrolled. Students who were academically dismissed or recessed, or who were on academic probation at the end of their last term of enrollment were considered to have a prior record of academic failure.

Sampling Strategy

The research sample was selected from an initial population of all lower division students ($N = 1815$) who were readmitted to the University during the period of Fall Term 1981 through Winter Term 1984. This population of lower division students was identified from the larger population of all previously enrolled MSU students by using a computer program written in the Undergraduate University Division for that purpose.

The Fall Term 1981 through Winter Term 1984 data collection time period was selected for three reasons. First, it was anticipated that inferences drawn from the sample of students readmitted during this period would be generalizable to a longer span of time. Information from the Undergraduate University Division and the Office of Planning and Budgets indicated that approximately six hundred lower division students were re-admitted each year during 1980-1989 in similar proportions by term (fall, winter, spring) and previous academic status (dismissed/recessed or probation versus good standing). This suggests that the pattern of readmissions from Fall Term 1981 through Winter Term 1984 was

representative of the pattern of readmissions from 1980 through 1989.

Second, the practice of academic forgiveness was not applied to students who were readmitted during this time due to changes in readmission policies and practices which occurred in the 1970's. There is evidence that select adjustments were made to the academic records of some students readmitted prior to 1980 in order to, for example, reduce the magnitude of failure or to allow students to repeat required courses even if they had already exceeded the number of allowable repeat credits. This suggests that readmitted students who were classified as having a prior record of academic failure during the 1960's and 1970's might not be comparable to students classified as having a prior record of academic failure in the 1980's. Including the earlier student records in the sample would complicate inferences and would not reflect current practices in evaluating students with prior records of academic failure.

Third, the Fall Term 1981 through Winter Term 1984 data collection period permitted the persistence of readmitted students to be followed for a minimum of six years after re-enrollment, up to the tenth day of Fall Term 1989. Tracking readmitted students for at least six and up to eight years should have adequately captured their persistence (Carroll, 1990; Ramist, 1981; Eckland, 1964).

For these reasons, data collected during Fall Term 1981 through Winter Term 1984 were likely to be similar to data

collected during the decade of the 1980's, and this time frame avoids the difficulties that may plague data collected before 1980. This time frame also permitted student persistence to be tracked for up to eight years.

The academic records of the lower division students who were readmitted from Fall Term 1981 through Winter Term 1984 were examined to determine their academic status (i.e., dismissed or recessed, on probation) at the end of their last term of enrollment prior to readmission. Academic dismissal/recess or probation at the end of the last term enrolled was determined using the Minimum Academic Progress Scale.¹ Of the 1815 lower division students examined, 389 (21%) were categorized as having prior records of academic failure and served as subjects in the study.

Research Design

The design of this study can be characterized as correlational; a single group of subjects was measured on many variables (Campbell and Stanley, 1963). The design was

1. The Minimum Academic Progress Scale (MAPS) is based on credits attempted, quality points earned, and the number of quality points needed to ensure a minimum 2.00 GPA upon graduation. Included in the scale are ceilings on repeat credits (30 max) and the number of credits attempted in relation to specific levels of credits earned. An academic action results when a student exceeds the number of allowable "points below a 2.00" for a given number of credits attempted, credits earned and credits repeated. The specific action taken (probation, recess, dismissal) is also outlined by the scale and is based on the application of specific definitions and standards. (See Appendix A)

also longitudinal in the sense that student persistence was tracked over time.

Definition and Measurement of Variables

One dependent variable and fourteen predictor variables were defined and measured based on a review of student persistence theory and literature. These variables are presented in Table 1.

The dependent variable was student persistence. A student who was readmitted between Fall Term 1981 and Winter Term 1984 and who had graduated or was still enrolled at MSU as of the tenth day of Fall Term 1989, was classified a persister. Students who did not satisfy these criteria were classified as dropouts.

The fourteen predictors included demographic (age, gender, race) and defining variables (enrollment status, previous academic status, number of transfer credits earned while not enrolled at MSU), pre-college ability and achievement variables (ACT composite score, high school class percentile, high school GPA), and variables representing certain student/institution interactions in the academic system of the college (previous academic record as measured by earned credits, cumulative GPA, repeat credits, number of prior terms attended, GPA upon re-enrollment). The quality of the information provided by these variables can be evaluated using three overlapping criteria: precision, reliability, and validity.

TABLE 1

Variables Used To Test The Proposed Model Of Student Persistence

<u>Variable</u>	<u>Measured By</u>
Persistence	0=dropped out 1=graduated or still enrolled
Age	Years
Gender	1= male 2= female
Race	1= Caucasian 2= Afro-American 3= Chicano 4= Hispanic 5= Native American 6= Asian Pacific Islander 7= Other
Enrollment Status	1=>12 credits carried (full time), first term re-enrolled 2=<12 credits carried (part time), first term re-enrolled
Previous Academic Status	1=On academic probation prior to readmission 2=Academically dismissed or recessed prior to readmission
Transfer Credits	Total number of credits earned while not attending MSU and officially transferred to MSU academic record
ACT Composite Score	1 - 36
High School Rank	High School Class Percentile
High School GPA	0.00 - 4.00
Credits Earned	Total number of credits earned at the end of the last term attended
Cumulative GPA	0.00 - 4.00, at the end of the last term attended
Repeat Credits	Total number of repeat credits
Prior Terms Attended	Total number of terms attended at MSU prior to readmission
GPA after re-enrollment	0.00 - 4.00

The precision of the data associated with the variables in Table 1 was quite high because the definition and measurement of these variables was relatively unambiguous (e.g., gender, transfer credits, prior terms attended). Variables like high school GPA and high school percentile rank are also typically defined and measured in a fairly precise manner. There is also substantial documentation indicating that the ACT composite score variable is (relatively) precisely defined and measured (Buros Eighth Mental Measurement Yearbook, 1978).

The precision of measurement of the variables in Table 1 suggests that the reliability (i.e., consistency) of these variables was also likely to be quite high. This includes the ACT composite score variable, which has been shown to possess good reliability (Buros Eighth Mental Measurements Yearbook, 1978). However, the nature of the data and the data collection strategies prohibited the calculation of traditional reliability indices.

Another measurement issue for the variables in Table 1 was validity. In general, validity is defined as the extent to which the inferences from an instrument (i.e., variable) are valid for the intended purpose (Messick, 1990). The only variables in Table 1 for which this appeared to be an issue were high school GPA and percentile rank, and the ACT composite score variable. The issue was whether inferences about, for example, pre-college ability using the ACT composite score were valid for the intended purpose.

Substantial documentation exists suggesting that the ACT does provide valid characterizations of pre-college ability and the likelihood of a student succeeding in college (Buros Eighth Mental Measurement Yearbook, 1978). There is also evidence that variables reflecting high school GPA and a student's high school percentile rank are valid indicators of pre-college ability in student persistence research (Pantages and Creedon, 1978; Tinto, 1975; Ramist, 1981; Bean, 1980, 1981).

On the whole, the precision and reliability of the variables in Table 1 should have been high. The validity of inferences about the construct measured (e.g., pre-college ability) using these variables should also have been high.

Data Collection

Student and academic data for re-admission applicants resides on the Registrar's Student Master File at MSU. Pertinent data were identified and the dataset was retrieved through the Undergraduate University Division using a special computer program written for that purpose, as noted earlier. The data collected were retrospective in nature, and all data were recorded by MSU student number to ensure confidentiality. The data were taken from a printout of the Student Master File and transferred to a coding form. Information on the coding form was then entered into a computer datafile.

Data Analyses

Descriptive statistics (e.g., frequencies, means, standard deviations) were computed to summarize the data for each variable in the study. Graphs of the data for selected variables (e.g., age) were also constructed. Special attention was paid to detecting differences in persistence by gender, race, and major, given that some of the studies reviewed earlier found main and/or interaction effects for these variables. A Type I error rate of .05 was used for each omnibus significance test.

Logistic regression was selected to investigate the research questions. This procedure is used to examine the relationship between dichotomous dependent variable (i.e., persistence) and a set of predictor variables (Hosmer and Lemeshow, 1989). Logistic regression has been recommended over many competitors (Press and Wilson, 1978; Halperin, Blackwelder, and Verter, 1971), and has frequently been used in persistence research (e.g., Lee, 1992; Webb, 1990). Moreover, if the predictors are random variables (which is the case in the present study), as opposed to being fixed by the investigator, logistic regression can be considered to be a multivariate procedure (Hosmer and Lemeshow, 1989, p. 25).

Logistic regression models provided overall tests of the relationship between persistence and various sets of predictors which, if significant, were followed by post hoc analyses testing each estimated regression coefficient against zero. The post hoc analyses served to assess the

contribution of individual variables in predicting persistence.

An important application of logistic regression is to use the information provided by the set of predictors to classify students in the sample into one of two discrete groups (i.e., persister or dropout). In this study, the ability of a set of predictors to accurately classify students as persisting or dropping out was compared to the known status of students, providing an indication of the usefulness of the predictive model. Should a logistic regression model be found to accurately classify students in the sample, the model might (after sufficient cross-validation) be used for forecasting purposes (i.e., predicting the persistence of students with previous records of academic failure who wish to be readmitted but who were not in the original sample).

Primary Research Hypotheses Stated in Null Form:

1. A. There will not be a significant relationship between Previous Academic Status and Persistence when the effects of ACT Composite Score, High School Class Rank and High School GPA are held constant.
- B. There will not be a significant relationship between Gender and Persistence when the effects of ACT Composite Score, High School Class Rank, and High School GPA are held constant.
- C. There will not be a significant relationship between Race and Persistence when the effects of ACT Composite Score, High School Class Rank, and High School GPA are held constant.

- D. There will not be a significant relationship between Age and Persistence when the effects of ACT Composite Score, High School Class Rank, and High School GPA are held constant.
 - E. There will not be a significant relationship between the set of interactions among Gender, Race and Age and Persistence when the effects of ACT Composite Score, High School Class Rank, and High School GPA are held constant.²
2. There will not be a significant relationship between Persistence and the set of predictors ACT Composite Score, High School Class Rank, and High School GPA.
 3. There will not be a significant relationship between GPA of the first term re-enrolled and Persistence when the effects of ACT Composite Score, High School Class Rank, and High School GPA are held constant.
 4. There will not be a significant relationship between Persistence and the set of predictors Previous Credits Earned, Cumulative GPA, Total Terms Attended Prior to Readmission and Total Number of Repeat Credits when the effects of ACT Composite Score, High School Class Rank, and High School GPA are held constant.
 5. There will not be a significant relationship between Persistence and Enrollment Status during the first term of re-enrollment when the effects of ACT Composite Score, High School Class Rank, and High School GPA are held constant.
 6. There will not be a significant relationship between Persistence and the Number of Transfer Credits for coursework completed at another college or university while not enrolled at MSU when the effects of ACT Composite Score, High School Class Rank, and High School GPA are held constant.
 7. There will not be a significant relationship between Persistence and the set of interactions among Enrollment Status, GPA of the first term re-enrolled, Previous Credits Earned, Cumulative GPA, Total Terms Attended Prior to Readmission and Total Number of Repeat Credits when the effects of ACT Composite Score, High School Class Rank, and High School GPA are held constant.

2. Statistical results indicating that any of the null hypotheses, 1A-1E, are not accepted would signal a need to investigate persistence within student subgroups (e.g., Previous Academic Status).

Limitations of the Methodology

Limitations of the methodology directly affect inferences made about the research questions. One limitation in the study is imposed by its correlational design. The lack of experimental manipulation precludes making any causal inference, and, thus, conclusions about the relationship between the persistence of readmitted students and various predictors (e.g., GPA upon re-enrollment) are strictly correlational in nature (Campbell and Stanley, 1963).

Another limitation of the methodology is the choice of target population (1980-1989) and sample (1981-1984) and the retroactive collection of data. Shifts in policies and procedures for readmitting students and/or evaluating their academic status, such as the 1991 change in the Minimum Academic Progress Scale, may limit the applicability of the results of this study to future readmitted students with prior records of academic failure.

CHAPTER IV

RESEARCH FINDINGS

Introduction

The results of the data analyses are organized in three sections. First, the sample is described using frequencies, ranges, means, standard deviations and sample sizes for the variables included in the study. Next, the results of preliminary analyses are reported, including tests of correlation coefficients for pairs of variables and chi square tests. Finally, the results of the logistic regression models used to test each research hypothesis are reported.

All data analyses were conducted using the SAS computer package (SAS Institute, Inc., 1989).

Description of Sample

Of the 389 students who were re-admitted during Fall Term 1981 through Winter Term 1984, 27.8% (N=108) were classified as persisters (i.e., students who had graduated or were still enrolled as of the tenth day of Fall Term 1989) and 72.2% (N=281) were classified as dropouts (i.e., students who were not enrolled as of the tenth day of Fall Term 1989). Frequencies and percentages for pertinent demographic and

TABLE 2

Percentage of Sample by Gender, Race, Enrollment Status,
Previous Academic Status and Major¹

	<u>Total</u>	<u>Persisters</u>	<u>Dropouts</u>
<u>Gender</u>			
Male	57.3	47.2	61.2
Female	42.7	52.7	38.8
<u>Race²</u>			
White	73.1	80.5	70.1
Afro-American	22.5	15.7	25.2
Chicano	1.0	-	1.4
Hispanic	.3	-	.3
Native American	.5	.9	.4
Asian Pacific Islander	1.8	2.8	1.4
Other	.8	-	1.1
<u>Enrollment Status</u>			
Full Time	51.7	58.3	49.1
Part Time	48.3	41.7	50.9
<u>Previous Academic Status</u>			
Recess/Dismissal	34.7	32.4	35.6
Academic Probation	65.3	67.6	64.4
<u>Major</u>			
No-Pref (undeclared)	26.7	25.0	27.4
Agriculture	5.7	7.4	5.0
Business	13.6	13.9	13.5
Engineering	11.3	8.3	12.5
Human Ecology	4.9	6.5	4.3
Natural Science	6.4	2.8	7.8
Pre-Vet Med	.5	.9	.4
Education	2.6	1.9	2.8
Pre-Nursing	2.6	4.6	1.8
Communication	12.6	15.7	11.4
Social Science	11.8	12.0	11.7
Urban Planning	1.3	.9	1.4
<u>Term of Re-enrollment</u>			
Fall 1981	19.8	22.2	18.8
Winter 1982	11.8	10.1	12.5
Spring 1982	2.6	6.5	1.1
Fall 1982	18.8	18.5	18.9
Winter 1983	10.8	11.1	10.7
Spring 1983	3.1	4.6	2.5
Fall 1983	21.6	16.7	23.4
Winter 1984	11.6	10.1	12.1

1. Three students had missing data for race and were dropouts; otherwise, the total sample size was 389. The total number of persisters was 108 and dropouts, 281.

2. The categories reported for race are those utilized by MSU.

defining variables are reported in Table 2.

Males comprised 57.3% of the sample and females 42.7%, with females somewhat more likely to persist: 52.7% versus 47.2%. Dropouts, on the other hand, were more likely to be male (61.2%) than female (38.8%).

The sample was predominantly made up of white students (73.1%), who also represented a large proportion of persisters (80.5%). Afro-American students comprised 22.5% of the sample, 25.2% of the dropouts, and 15.7% of the persisters. Collectively, Chicano, Hispanic, Native American, Asian Pacific Islander and other races accounted for only 4.4% of the overall sample, which led to the decision to recode all non-white students who were not Afro-American as "Other" for subsequent data analyses. This resulted in three categories of race: White, Afro-American and Other.

Slightly more than one half (51.7%) of the sample were full time students during their first term of re-enrollment (i.e., were enrolled for 12 or more credits); 48.3% of the subjects were part time students (i.e., were enrolled for fewer than 12 credits). Persisters were more likely to be full time students during their first term of re-enrollment (58.3%) than part time (41.7%). Dropouts were evenly distributed across enrollment status, with full time students comprising 49.1% of dropouts and part time students 50.9%.

The majority of students had been on academic probation prior to their readmission (65.3%), compared to students whose previous academic status was academic recess or

dismissal (34.7%). Both persisters and dropouts were similar in terms of previous academic actions: 32.4% of persisters and 35.6% of dropouts had been academically recessed or dismissed. A total of 67.6% of the persisters and 64.4% of the dropouts had been on academic probation at the end of their last term of enrollment prior to readmission.

Over one quarter (26.7%) of the sample was made up of "no-pref" students (i.e., students with undeclared majors). Students with majors in engineering, business, communication, and social sciences comprised another 49.4% of the sample. There were modest differences in the frequency of persisters and dropouts across majors. For example, engineering students represented 11.3% of the sample but a smaller proportion of persisters (8.3%) and a slightly larger proportion of dropouts (12.5%). Similarly, natural science students represented 6.4% of the sample but a slightly larger percentage of dropouts (7.8%).

More students were readmitted in the fall terms (19.8%, Fall 1981; 18.8%, Fall 1982; 21.6%, Fall 1983) than in winter (11.8%, 1982; 10.8%, 1983; 11.6%, 1984) or spring terms (2.6%, 1982; 3.1%, 1983). In general, persisters and dropouts were represented in similar proportions by term of re-enrollment.

The sample sizes (N), ranges, means and standard deviations (SD) for the quantitative variables employed in the study are reported in Table 3. Although the ages of the students ranged from 19 - 36, a histogram of ages (Figure 1)

TABLE 3

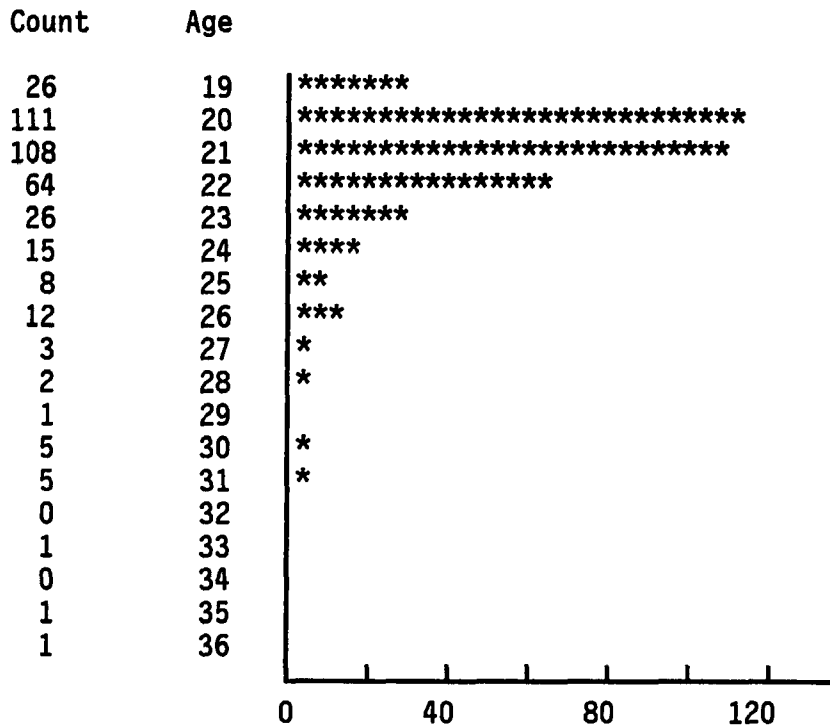
Mean, Standard Deviation and Range for Quantitative Variables

	<u>Overall</u>			<u>Persisters</u>		<u>Dropouts</u>	
	N	Observed Range	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$
AGE	389	19 - 36	21.7 (2.5)	108	21.6 (2.9)	281	21.7 (2.4)
ACT	317	4 - 31	20.2 (5.7)	87	19.7 (6.0)	230	20.3 (5.6)
HSGPA	384	1 - 4	2.86 (.40)	105	2.84 (.42)	279	2.86 (.38)
HSRANK	304	0 - 1	.70 (.17)	77	.70 (.15)	227	.70 (.18)
TRANSFER CREDITS	389	0 - 68	6.4 (13.4)	108	5.4 (12.2)	188	7.5 (14.4)
CREDITS REPEATED	389	0 - 39	7.3 (7.5)	108	6.1 (5.9)	281	7.7 (7.9)
TOTAL CREDITS	389	0 - 84	41.3 (21.4)	108	43.3 (19.5)	281	40.5 (22.1)
TOTAL TERMS	389	1 - 18	4.4 (2.4)	108	4.2 (2.4)	281	4.5 (2.4)
CUM GPA	389	0 - 2	1.37 (.43)	108	1.39 (.38)	281	1.36 (.45)
REENROLL GPA	389	0 - 4	1.76 (1.04)	108	2.24 (.86)	281	1.58 (1.04)

indicates that nearly 80% of the students were 19 to 22 years old and fewer than 8% were older than 25. The average age of all students was 22 years across both persisters and dropouts.

FIGURE 1

Frequency by Age, N = 389*



Histogram frequency

* = approximately 4 students

For the total sample, the average high school GPA was 2.86, the average ACT composite score was 20, and the students were, on average, in the 70th percentile in their high school class. The means and standard deviations of the pre-college achievement and ability variables were comparable for persisters and dropouts. Eighty-five students had missing data for high school percentile rank, seventy-two students had missing ACT composite scores, and five had missing high school GPAs.

The average number of transfer and repeated credits for the sample were 6.4 and 7.3, respectively. Persisters tended to have slightly fewer transfer credits (5.4) and repeated credits (6.1) than did dropouts, who had an average of 7.5 transfer credits and 7.7 repeated credits. Persisters earned slightly more credits (43.3) than dropouts (40.5) and had been enrolled for a shorter time (4.2 versus 4.5 terms).

None of the students in the sample had cumulative GPAs above a 2.00 prior to re-enrollment, and the mean cumulative GPA prior to re-enrollment was 1.37. Persisters had marginally higher cumulative GPAs (1.39) than did dropouts (1.36). The sample mean for GPA after the first term of re-enrollment was 1.76, with persisters showing higher GPAs after their first term of re-enrollment (2.24) than dropouts (1.58).

The descriptive analyses suggest slight differences in persistence by gender, modest differences in persistence by enrollment status and previous academic status, and moderate differences in GPA upon re-enrollment. The pre-college ability and achievement variables were quite similar across persisters and dropouts.

Preliminary Analyses

Preliminary analyses were conducted to investigate the pattern of correlations among the independent variables and persistence, as well as simple correlations between variable pairs. Correlation coefficients for variable pairs are

reported in Table 4. Because of the nature of the variables involved (e.g., both dichotomous and quantitative), a variety of correlations were employed (e.g., Pearson, point biserial, phi). Scatterplots of the correlations involving quantitative variables were examined for irregularities prior to the analyses.

The results of the correlation analyses indicated that GPA upon re-enrollment was significantly correlated with persistence; however, the correlation was modest ($r = .29$; $p = .00$), with approximately $R^2 = .08$ or 8% of the variance in persistence attributable to GPA upon re-enrollment.

Gender was also significantly correlated with persistence ($r = .13$; $p = .01$), suggesting that the proportion of females who persisted (52.7%) was greater than the proportion of males who persisted (47.2%). However, the strength of the relationship or explained variance (represented by the squared correlation) is quite small (1.7%). This suggests that the persistence of readmitted students with prior records of academic failure varies across gender, but the magnitude of the effect is quite small. A significant but modest correlation was also found between gender and ACT composite score ($r = -.38$; $p = .00$), but not other measures of pre-college achievement (e.g., high school GPA). This suggests that gender, in conjunction with other variables (e.g., pre-college ability), may influence persistence. Therefore, the presence of a gender effect when pre-college ability and achievement were held constant was

TABLE 4

CORRELATION MATRIX FOR VARIABLES IN THE STUDY

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1 PERSIST																	
2 PREVSTAT	.03																
3 GENDER	.13*	.02															
4 RACE	.09 (386)	-.01 (386)	.15* (386)														
5 AGE	.01	.01	-.08	-.03 (386)													
6 ACT	.05 (317)	.01 (317)	-.38* (317)	-.45* (315)	-.13* (317)												
7 HSGPA	.03 (384)	.04 (384)	.02 (384)	-.19* (381)	-.24* (384)	.27* (315)											
8 HSRANK	.01 (304)	-.02 (304)	.05 (304)	-.01 (302)	-.04 (304)	.00 (269)	.60* (303)										
9 REENROLL GPA	.29* (386)	.01 (386)	.00 (386)	-.11* (386)	-.01 (386)	-.11* (317)	.08 (384)	-.03 (304)									
10 TOTAL CREDITS	-.06 (386)	.07 (386)	-.01 (386)	-.04 (386)	.26* (386)	-.01 (317)	-.03 (304)	.01 (304)	.10* (304)								
11 CUM GPA	-.03 (386)	-.01 (386)	.02 (386)	.02 (386)	-.02 (386)	-.01 (304)	.16 (317)	.09 (384)	.10* (304)	.63* (304)							
12 CREDITS REPEATED	.10 (386)	.13* (386)	-.12* (386)	.09 (386)	.16* (386)	.02 (317)	.00 (384)	.01 (304)	-.06 (304)	.39* (304)	.39* (304)						
13 TOTAL TERMS	.05 (386)	.13* (386)	-.01 (386)	.05 (386)	.19* (386)	-.02 (317)	.01 (384)	-.11 (304)	-.02 (304)	.67 (304)	.61* (304)	.54* (304)					
14 ENROLL STAT	.08 (386)	-.06 (386)	-.04 (386)	.06 (386)	.18* (386)	-.07 (317)	-.04 (384)	-.05 (304)	-.15* (304)	.05 (304)	-.02 (304)	.02* (304)	.06 (304)				
15 TOTAL TERMS	.06 (386)	.08 (386)	-.06 (386)	.02 (386)	.07 (386)	.02 (317)	-.04 (384)	-.10 (304)	-.03 (304)	.05 (304)	-.02 (304)	.12* (304)	.10* (304)	-.06 (304)			
16 MAJOR	-.04 (386)	.10 (386)	.16* (386)	.10* (386)	.05 (386)	-.16* (317)	.02 (384)	.01 (304)	.12* (304)	.14* (304)	.08 (304)	.01 (304)	.07 (304)	.04 (304)	.03 (304)		
17 TRANSFER CREDITS	-.09 (386)	-.11 (386)	-.04 (386)	-.07 (386)	.27* (386)	.06 (317)	-.19* (384)	.04 (304)	.01 (304)	.39* (304)	.18* (304)	-.04 (304)	-.18* (304)	.08 (304)	.02 (304)	.08 (304)	

* $p < .05$; unless noted otherwise, $N = 389$

tested in research hypothesis 1B; and a gender by ACT composite score interaction effect was tested in research hypothesis 1E.

A small but statistically significant correlation was also found between gender and major ($r = .16$; $p = .00$). Across the five largest majors (undeclared, business, engineering, communication, and social science), women appear to be less frequently represented in engineering (11.4%) and more often found in social science (58.7%) and communication (46.9%) relative to their proportion in the total sample (42.7%). Similarly, race was found to have a significant but small correlation with major ($r = .10$; $p = .04$). The distribution of the five largest majors by race indicates, for example, that Afro-American students constituted 22.5% of the sample but were less frequently found in engineering (16.3%) and business (15.3%) and more frequently found in communication (32.7%) and the social sciences (32.6%).

High school GPA and high school percentile rank were moderately and significantly correlated ($r = .60$; $p = .00$). Since the pattern of correlations of these two variables with the other measured variables was similar, high school percentile rank was dropped from the logistic regression models used to investigate the primary research questions. Dropping high school class rank had the effect of increasing the sample size from 269 to 315 for most of the regression analyses.

The largest correlations were between total terms and total credits ($r = .67$; $p = .00$), total terms and cumulative GPA ($r = .61$; $p = .00$) and total terms and repeat credits ($r = .54$, $p = .00$). Total credits and cumulative GPA were also correlated ($r = .63$; $p = .00$). These correlations were not unexpected as cumulative GPA is calculated using total credits and repeated credits, and total terms represents total time enrolled at MSU. In general, the number of credits earned would be expected to increase as the number of terms enrolled at MSU accumulates.

There were also significant but modest correlations between age and: total credits ($r = .26$; $p = .00$), total terms ($r = .19$; $p = .00$), total repeat credits ($r = .16$; $p = .02$) and transfer credits ($r = .27$; $p = .00$). This suggests that age is, to some extent, related to length of time enrolled at MSU (i.e., older students are more likely to have been enrolled more terms and have accumulated more credits -- total, repeat and/or transfer). However, there was no significant correlation between age and by extension, length of time enrolled, and persistence.

Although race was not correlated with persistence, there were small to modest correlations between race and other demographic and pre-college variables, notably race with ACT ($r = -.45$; $p = .00$), high school GPA ($r = -.19$; $p = .00$), and gender ($r = .15$; $p = .00$). Race was also associated with GPA upon re-enrollment ($r = -.11$; $p = .03$). The extent to which race affects persistence when pre-college ability and

achievement are held constant was examined in research hypothesis 1C; the presence of a race by gender interaction effect was tested in 1E.

The most striking observation regarding the correlation coefficients reported in Table 4 was the absence of strong and significant correlations between the predictor variables and persistence. This suggested that the logistic regression models developed to investigate the primary research questions were unlikely to be strong predictors of persistence. The presence of modest correlations between pairs of variables other than persistence also suggested that interaction effects may be present, especially among demographic variables such as gender, age, and race and among certain elements of the previous academic record (e.g., GPA upon re-enrollment and number of repeat credits). The presence of interaction effects was investigated in hypotheses 1E and 7.

Term of re-enrollment and major were not expected to influence persistence and were not included in the primary research hypotheses. However, since preliminary analyses indicated that students were not evenly distributed across either term of re-enrollment or major, chi square tests were conducted to examine whether differences in persistence could be attributed to term of re-enrollment or major. A chi square test of the relationship between the term readmitted and persistence was not significant ($\chi^2_7 = 12.78; p = .08$). Similarly, while more students were enrolled in certain

majors (e.g., no-pref, business) than in other majors (e.g., education, agriculture), the relationship between major and persistence was also nonsignificant ($\chi^2_7 = 7.63$; $p = .47$).¹ In other words, major and term of enrollment showed similar proportions of persisters and dropouts.

Results of Tests of Primary Research Hypotheses

RESEARCH HYPOTHESIS 1A

There will not be a significant relationship between Previous Academic Status and Persistence when the effects of ACT Composite Score, High School Class Rank and High School GPA are held constant.

Hypothesis 1A was accepted. The results of the analysis indicated that there was no relationship between persistence and academic status when ACT composite score and high school GPA were held constant. ACT composite score and high school GPA were entered in step one of the logistic regression procedure, producing a nonsignificant chi square test statistic based on 2 degrees of freedom ($\chi^2_2 = .74$; $p = .69$). Previous academic status was entered in step two of the procedure and its contribution was assessed by subtracting the chi square test statistic with ACT composite score and high school GPA in the model (.74) from the chi square test statistic with all three predictors in the model

1. For this analysis, the four majors (pre-vet med, 2; pre-nursing, 10; education, 10; and urban planning, 5) which had frequencies of less than 10 were collapsed into one group (n=27).

(1.04).² The contribution of previous academic status was not significant. Thus, the model showed no ability to predict the probability of persistence, given previous academic status, suggesting that persisters and dropouts cannot be differentiated using previous academic status (recessed/dismissed, on academic probation). In short, the likelihood of persisting or dropping out after readmission was no different for students whose initial dropout was involuntary (i.e., due to academic recess or dismissal) than for students who left voluntarily after the term in which they were placed on academic probation.

RESEARCH HYPOTHESIS 1B

There will not be a significant relationship between Gender and Persistence when the effects of ACT Composite Score, High School Class Rank, and High School GPA are held constant.

Hypothesis 1B was not accepted. When the effects of ACT composite score and high school GPA were held constant, gender was a significant predictor of persistence ($\chi^2_1 = 9.71; p < .05$). Thus, the contribution of gender to predicting persistence beyond that attributable to ACT composite score and high school GPA was significant. The full model (i.e., the logistic regression model including ACT composite score, high school GPA and gender) was also

2. The difference between the two test statistics also represents a chi square statistic and is compared to a critical value equal to the difference in the degrees of freedom of the tests in the two steps of the analysis (in this analysis, $3 - 2 = 1$) (Hosmer and Lemeshow, 1989, p. 32).

TABLE 5

Logistic Regression Results for Persistence
Using Gender, ACT Composite Score, and High School GPA

Variable	Estimated Regression Coefficient	Standard Error	p-value
INTERCEPT	2.697	1.208	.025
ACT	-0.011	0.025	.665
HSGPA	-0.065	0.374	.861
GENDER	-0.868	0.282	.002

$$\chi^2_3 \text{ (full model)} = 10.44; p = .02$$

significant, the results of which are reported in Table 5. In post hoc analyses, tests of the individual estimated regression coefficients against zero were done, using $\alpha = .01$ per test. Using this criterion, only the coefficient for gender was significant.

Using logistic regression analysis, the estimated probability of a student persisting can be calculated for specific values of a variable. For example, the probability of a student persisting, given their gender, can be calculated by using $1 - \text{the estimated logit of the probability of an event (defined for this sample as dropping out)}$ (See Hosmer and Lemeshow, 1989, p. 27).

Here:

$$\text{logit} = \text{intercept} + \text{estimated regression coefficient} \times \text{ACT Composite Score} + \text{est. reg. coef.} \times \text{High School GPA} + \text{est. reg. coef.} \times \text{Gender}$$

and

$$\text{probability (dropping out)} = e^{\text{logit}} / (1 + e^{\text{logit}}),$$

where e = exponential function.

For male students (coded as 1) with an ACT composite score of 20 and a high school GPA of 2.89 (See Table 2):

$$\begin{aligned}\text{logit} &= 2.6979 - .0111(20) - .0652(2.89) - .8689(1) \\ &= 1.419\end{aligned}$$

$$\begin{aligned}\text{probability (dropping out)} &= e^{1.419} / (1 + e^{1.419}) \\ &= .80\end{aligned}$$

and

$1 - \text{probability (dropping out)} = .20$, meaning the probability that a male student with the specified ACT composite score and high school GPA values will persist, according to the model developed using the sample, is .2. For females, $e^{.549} / (1 + e^{.549}) = .63$ and the probability of persisting [$1 - \text{probability (dropping out)}$] is .37. In other words, females in this sample were almost twice as likely as males to persist, but the probability of persisting was not large for either group. These results are consistent with the overall persistence rate for this sample, which was approximately 28%.

RESEARCH HYPOTHESIS 1C

There will not be a significant relationship between Race and Persistence when the effects of ACT Composite Score, High School Class Rank, and High School GPA are held constant.

Hypothesis 1C was accepted. The addition of race in step two of the logistic regression procedure (after high school GPA and ACT were entered) did not improve the model's predictive ability ($\chi^2_2 = 4.49$; $p > .05$). The nonsignificant effect of race means that when differences in

pre-college ability and achievement were controlled, white, Afro-American and other non-white students who were readmitted to MSU with prior records of academic failure were equally likely to persist or dropout.

RESEARCH HYPOTHESIS 1D

There will not be a significant relationship between Age and Persistence when the effects of ACT Composite Score, High School Class Rank, and High School GPA are held constant.

Hypothesis 1D was accepted. The addition of age to the logistic regression model containing ACT composite score and high school GPA did not produce a significant result ($\chi^2_1 = 2.11; p > .05$). Using the regression model, the likelihood of correctly classifying persisters and dropouts using age, when the effects of ACT composite score and high school GPA are held constant, was no better than chance. This result was anticipated because the distribution of ages was tightly clustered around the mean (age 22) and there was little variability in age among either persisters or dropouts.

RESEARCH HYPOTHESIS 1E

There will not be a significant relationship between the set of interactions among Gender, Race and Age and Persistence when the effects of ACT Composite Score, High School Class Rank, and High School GPA are held constant.

Hypothesis 1E was not accepted. The addition of previous academic status, age, gender, race and their interactions to the logistic regression model (after ACT

composite score and high school GPA had been entered in step one of the procedure) was significant ($\chi^2_{14} = 27.84$; $p < .05$). The results of the full model are reported in Table 6. The estimated regression coefficients which were statistically different from zero, using the $\alpha = .01$ criterion, were associated with gender ($p = .00$); race ($p = .00$) and one interaction (gender x race, $p = .00$). These results suggest that both main effects and interaction effects contributed to the predictive power of the full model.

The ability of this model to correctly classify persisters and dropouts was only modest (74%). The classification frequencies for persisters and dropouts using this model are reported in Table 7. The model did a substantially better job of correctly classifying dropouts (94.8%) than persisters (17.6%). For the 82 students not correctly classified, dropouts were more frequently misclassified as persisters (44.4%) than persisters were as dropouts (24.3%).

The results for hypotheses 1A - 1E suggest that when pre-college ability and achievement (i.e., ACT composite score, high school GPA) were held constant, persistence was somewhat sensitive to gender but insensitive to the individual effects of previous academic status, age, or race. However, ability of gender and the demographic and defining variables and their interactions (Table 7) to accurately classify persisters and dropouts was not exceptionally high (74%).

TABLE 6

Logistic Regression Results for Persistence Using
ACT Composite Score, High School GPA, Previous Enrollment
Status, Gender, Race, Age, and their Interactions

Variable	Estimated Regression Coefficients	Standard Error	p-value
INTERCEPT	65.610	17.003	.000
ACT	0.023	0.032	.475
HSGPA	0.071	0.439	.871
PREVSTAT	-8.709	7.692	.257
GENDER	-32.832	3.866	.000
DUMMY1(RACE)	-53.865	12.583	.000
DUMMY2(RACE)	-50.952	12.989	.000
AGE	-0.311	0.886	.725
I1	0.195	0.172	.257
I2	28.095	0.806	.000
I3	27.815	N/A	N/A
I4	-0.199	0.723	.782
I5	-0.213	0.746	.775
I15	-0.024	0.593	.967
I16	0.272	0.207	.189
I17	3.108	5.934	.600
I18	2.104	5.951	.723

χ^2_{16} (full model) = 28.57; p = .03
I = interaction term

TABLE 7

Predicted and Observed Frequencies for Persisters and Dropouts
Using Previous Academic Status, Gender, Race, Age,
and their Interactions, ACT Composite Score and High School GPA

		PREDICTED		
		Drop out	Persister	Total
OBSERVED	Drop out	218 (75.7%)	12 (44.4%)	230
	Persister	70 (24.3%)	15 (55.6%)*	85
	Total	288	27	315

Correct classification of persisters and dropouts,
(218 + 15)/315 = 74%

Correct classification of persisters, 15/85 = 17.6%

Correct classification of dropouts, 218/230: 94.8%

*If persistence was perfectly predicted by the model,
this frequency would be 85.

Based on the findings for hypotheses 1A -1E, it appears that a portion of the variability in persistence for readmitted students with prior records of academic failure is due to gender. Therefore, subsequent analyses were first performed for the entire sample and then stratified by gender.³ However, the small number of students available for hypothesis 7 using the stratified sample necessitated testing this hypothesis using the entire sample.

RESEARCH HYPOTHESIS 2

There will not be a significant relationship between Persistence and the set of predictors ACT Composite Score, High School Class Rank, and High School GPA.

Hypothesis 2 was accepted. For the entire sample, the pre-college predictors of ability and achievement, ACT composite score and high school GPA, were not significant ($\chi^2_2 = .74$, $p = .69$). Based on the preliminary analyses, high school rank was dropped as a predictor variable in the logistic regression model and does not appear in research hypothesis 2. ACT composite score and high school GPA were not significantly correlated with persistence for males ($\chi^2_2 = .001$; $p = .99$; $N = 176$) or females ($\chi^2_2 = .51$; $p = .77$; $N = 139$). These findings suggest that measures of pre-college achievement and ability such as ACT composite score and high school GPA were equally poor predictors of

3. Student persistence research is frequently stratified by gender (e.g., Bean, 1982; Grosset, 1990; Pascarella, 1975).

persistence for readmitted students with prior records of academic failure, regardless of gender.

RESEARCH HYPOTHESIS 3

There will not be a significant relationship between GPA of the first term re-enrolled and Persistence when the effects of ACT Composite Score, High School Class Rank, and High School GPA are held constant.

Hypothesis 3 was not accepted. GPA upon re-enrollment was a significant predictor of persistence for readmitted students with prior records of academic failure ($\chi^2_1 = 29.7$; $p < .05$). For the full model (i.e., ACT composite score, high school GPA, GPA upon re-enrollment), the estimated regression coefficient associated with GPA upon re-enrollment was negative and statistically different from zero, suggesting an inverse relationship between GPA upon re-enrollment and the event (dropping out). In other words, students who had higher GPAs upon re-enrollment were less likely to dropout (i.e., more likely to persist) than students with low GPAs during their first term back. The results of the full model are reported in Table 8.

The predicted and observed classification of persisters and dropouts using the full model is reported in Table 9. Adding GPA upon re-enrollment to the logistic regression model, while holding the effects of ACT composite score and high school GPA constant, resulted in a modest increase in the ability of the model to correctly classify persisters and dropouts. The overall correct classification rate was 73.3%;

TABLE 8

Logistic Regression Results for Persistence Using GPA upon Re-enrollment, ACT Composite Score, and High School GPA

Variable	Estimated Regression Coefficient	Standard Error	p-value
INTERCEPT	2.148	1.158	.063
ACT	0.040	0.024	.098
HSGPA	-0.155	0.401	.697
REGPA	-0.780	0.158	.000

$$\chi^2_3 \text{ (full model)} = 30.42; p = .00$$

TABLE 9

Predicted and Observed Frequencies for Persisters and Dropouts Using GPA upon Re-enrollment, ACT Composite Score and High School GPA

		PREDICTED		
		Drop out	Persister	Total
OBSERVED	Drop out	224 (74.2%)	6 (46.2%)	230
	Persister	<u>78 (25.8%)</u>	<u>7 (53.8%)</u>	<u>85</u>
	Total	302	13	315

Correct classification of persisters and dropouts: 73.3%
 Correct classification of persisters: 8.2%
 Correct classification of dropouts: 97.4%

however, the model more accurately classified dropouts (97.4%) than persisters (8.2%). For the 84 students who were incorrectly classified, 46.2% were classified as persisting when in fact they had dropped out, while 25.8% were classified as dropping out when they actually persisted.

The effects of GPA upon re-enrollment on persistence were next examined for males and females separately. The

sample sizes for males and females were 176 and 139, respectively. ACT composite score and high school GPA were entered into the logistic regression models first and were not significantly related to persistence.⁴ The addition of GPA upon re-enrollment to the logistic regression model produced significant results for both males and females:

$\chi^2_1 = 17.1$; $p < .05$ for males; $\chi^2_1 = 12.9$; $p < .05$ for females. The results of the analyses for males and females are reported in Tables 10 and 11. In both cases, the estimated regression coefficients associated with GPA upon re-enrollment were statistically different from zero and negative, suggesting that GPA upon re-enrollment is inversely associated with dropping out and that students who earned higher GPAs (> 2.00) upon re-enrollment were most likely to persist.

The predicted and observed classifications of male and female persisters and dropouts are reported in Tables 12 and 13. The predictive model accurately classified more persisters and dropouts for males (79.5%) than females (60.4%). For both males and females, GPA upon re-enrollment more accurately classified dropouts (98.6% and 84.3%, respectively) than persisters (2.9% and 18%, respectively). The predictive models for males and females more frequently misclassified dropouts as persisters, although the actual

4. As reported in research hypothesis 2, $\chi^2_2 = .001$; $p = .99$ for males and $\chi^2_2 = .51$; $p = .77$ for females.

TABLE 10

Logistic Regression Results for Persistence for Males (N=176)
Using GPA upon Re-enrollment, ACT Composite Score,
and High School GPA

Variable	Estimated Regression Coefficient	Standard Error	p-value
INTERCEPT	2.765	1.664	.096
ACT	0.025	0.041	.537
HSGPA	-0.043	0.566	.938
REGPA	-0.884	0.243	.000

χ^2_3 (full model) = 17.07; p = .00

TABLE 11

Logistic Regression Results for Persistence for Females (N=139)
Using GPA upon Re-enrollment, ACT Composite Score,
and High School GPA

Variable	Estimated Regression Coefficient	Standard Error	p-value
INTERCEPT	2.236	1.739	.198
ACT	-0.004	0.036	.892
HSGPA	-0.086	0.612	.887
REGPA	-0.720	0.215	.000

χ^2_3 (full model) = 13.45; p = .00

number of misclassified dropouts for males was quite small (2). The misclassification of students who were predicted to dropout when they actually persisted was nearly twice as large for females (35.3%) than for males (19.7%).

The probability of persisting for specific values of GPA upon re-enrollment for students can be estimated using the logit analysis discussed earlier. Some of these results are

TABLE 12

Predicted and Observed Frequencies for Persisters and Dropouts for Males (N=176) Using GPA upon Re-enrollment, ACT Composite Score and High School GPA

		PREDICTED		
		Drop out	Persister	Total
OBSERVED	Drop out	139 (80.3%)	2 (66.7%)	141
	Persister	<u>34 (19.7%)</u>	<u>1 (33.3%)</u>	<u>35</u>
	Total	173	3	176

Correct classification of persisters and dropouts: 79.5%

Correct classification of persisters: 2.9%

Correct classification of dropouts: 98.6%

TABLE 13

Predicted and Observed Frequencies for Persisters and Dropouts for Females (N=139) Using GPA upon Re-enrollment, ACT Composite Score and High School GPA

		PREDICTED		
		Drop out	Persister	Total
OBSERVED	Drop out	75 (64.7%)	14 (60.9%)	89
	Persister	<u>41 (35.3%)</u>	<u>9 (39.1%)</u>	<u>50</u>
	Total	116	23	139

Correct classification of persisters and dropouts: 60.4%

Correct classification of persisters: 18%

Correct classification of dropouts: 84.3%

reported in Table 14, using the average ACT composite scores and high school GPAs for the sample. The probability of persistence for readmitted students with prior records of academic failure sample decreases as GPA upon re-enrollment

TABLE 14

Probability of Students Persisting
Based upon Select Values of GPA upon Re-enrollment

<u>GPA upon Re-enrollment</u>	<u>All Students</u>	<u>Males</u>	<u>Females</u>
4.0	.65	.58	.73
3.0	.45	.37	.56
2.0	.28	.19	.39
1.0	.15	.09	.24

declines. Differences in the probability of persistence favoring females are consistent with other findings in this study related to gender.

RESEARCH HYPOTHESIS 4

There will not be a significant relationship between Persistence and the set of predictors Previous Credits Earned, Cumulative GPA, Total Terms Attended Prior to Readmission and Total Number of Repeat Credits when the effects of ACT Composite Score, High School Class Rank, and High School GPA are held constant.

Hypothesis 4 was accepted. For the analysis employing the entire sample, the contribution of total credits, total terms, repeat credits and cumulative GPA, when the effects of ACT composite score and high school GPA were held constant, was not significant ($\chi^2_4 = 10.04$; $p > .05$). For males, the contribution of total credits, total terms, repeat credits and cumulative GPA, collectively, with ACT composite score and high school GPA held constant, was significant ($\chi^2_4 = 12.32$; $p < .05$); however, the results for the full model for males (i.e., elements of the previous academic

record, ACT composite score and high school GPA) remained nonsignificant ($\chi^2_6 = 12.3$; $p = .06$). Therefore, classification results are not reported. The contribution of these elements of the previous academic record for females was not significant ($\chi^2_4 = 3.6$; $p > .05$), nor was the full model ($\chi^2_6 = 4.1$; $p = .66$). These results suggest that, in terms of predicting persistence, the contribution of the previous academic record may be different for males and females; however, these variables, collectively, did not improve the classification of persisters and dropouts for either group.

RESEARCH HYPOTHESIS 5

There will not be a significant relationship between Persistence and Enrollment Status during the first term of re-enrollment when the effects of ACT Composite Score, High School Class Rank, and High School GPA are held constant.

Hypothesis 5 was accepted. When the effects of ACT composite score and high school GPA were held constant, enrollment status during the first term of re-enrollment (part time < 12 credits or full time ≥ 12 credits) was not significantly correlated with persistence for the entire sample ($\chi^2_1 = 4.8$; $p > .05$), or for females ($\chi^2_1 = 2.04$; $p > .05$) or males ($\chi^2_1 = 2.5$; $p > .05$). This result suggests that factors other than full time versus part time status during the first term of re-enrollment were influencing persistence for this group of students.

RESEARCH HYPOTHESIS 6

There will not be a significant relationship between Persistence and the Number of Transfer Credits for coursework completed at another college or university while not enrolled at MSU when the effects of ACT Composite Score, High School Class Rank, and High School GPA are held constant.

Hypothesis 6 was accepted. With the effects of ACT composite score and high school GPA held constant, the number of transfer credits was not significantly correlated with persistence for the entire sample ($\chi^2_1 = 1.5$; $p > .05$), or for males ($\chi^2_1 = 1.07$; $p > .05$) or females ($\chi^2_1 = 1.14$; $p > .05$). The presence or absence of transfer work completed elsewhere while not enrolled at MSU does not appear to influence persistence upon re-enrollment at MSU for readmitted students with prior records of academic failure.

RESEARCH HYPOTHESIS 7

There will not be a significant relationship between Persistence and the set of interactions among Enrollment Status, GPA of the first term re-enrolled, Previous Credits Earned, Cumulative GPA, Total Terms Attended Prior to Readmission and Total Number of Repeat Credits when the effects of ACT Composite Score, High School Class Rank, and High School GPA are held constant.

Hypothesis 7 was not accepted. In this analysis, GPA upon re-enrollment, transfer credits, cumulative GPA, total terms, total credits, total repeat credits and their interactions were added in step two of the logistic regression procedure (after ACT composite score and high school GPA had been entered). The contribution of these variables to the model for the entire sample was significant

($\chi^2_8 = 83.8$; $p < .05$).⁵ The results of the full model are reported in Table 15. None of the regression coefficients were statistically different from zero, using $\alpha = .01$.

The results of using the full model to classify students in the sample as persisters and dropouts are reported in Table 16. Overall, the model accurately classified 73.7% of the persisters and dropouts, which was no better than the models used to investigate hypotheses 1E and 3 (reported in Tables 8, and 10, respectively) that utilized fewer variables. The model did a better job in predicting dropouts (90.4%) than persisters (28.2%), and was more likely to misclassify dropouts as persisters (47.8%) than persisters as dropouts (22.7%).

Summary of the Results

Almost three quarters of the students who were readmitted from Fall Term 1981 through Winter Term 1984 and who had prior records of academic failure did not persist (i.e., did not graduate or were not enrolled as of the tenth day of the Fall Term 1989). Persistence tended to favor females and students whose GPA upon re-enrollment exceeded 2.00. Other variables such as race, age, previous academic status, enrollment status, transfer credits and elements of the previous academic record were not significantly correlated with persistence. Interactions among demographic

5. As noted in the preliminary analyses, sample size considerations precluded repeating this analysis by gender.

TABLE 15

Logistic Regression Results for Persistence Using
 ACT Composite Score, High School GPA, GPA upon Re-enrollment,
 Total Credits, Total Terms, Transfer Credits, Repeat Credits,
 Cumulative GPA, Enrollment Status, and their Interactions

Variable	Estimated Regression Coefficients	Standard Error	p-value
INTERCEPT	-4.963	3.337	.137
ACT	0.049	0.028	.084
HSGPA	-0.071	0.435	.047
REGPA	-0.300	0.854	.725
TOTAL CRED	-0.297	0.148	.045
TOTAL TERMS	-0.297	1.500	.071
TRANSFER CRED	0.216	0.180	.231
REPEAT CRED	-0.363	0.252	.149
CUM GPA	4.685	2.887	.104
ENSTAT	3.816	1.929	.047
I19	-0.007	0.058	.900
I22	0.636	0.397	.109
I23	0.080	0.046	.079
I24	-3.422	1.670	.040
I25	-0.949	0.419	.023
I26	0.148	0.067	.028
I27	0.008	0.026	.100
I28	-0.510	0.750	.496
I29	-0.057	0.211	.784
I30	-0.066	0.043	.124
I31	0.113	0.067	.092
I32	-0.001	0.008	.854
I33	-0.001	0.004	.699
I34	-0.570	0.915	.533
I35	0.226	0.197	.251
I36	0.002	0.024	.927
I37	-0.051	0.042	.226
I38	0.003	0.001	.058
I39	-0.247	0.121	.040
I40	0.009	0.021	.670
I41	0.006	0.005	.219

χ^2_{30} (full model) = 84.50; p = .00
 I = interaction terms

TABLE 16

Predicted and Observed Frequencies for Persisters and Dropouts Using ACT Composite Score, High School GPA, GPA upon Re-enrollment, Total Credits, Total Terms, Transfer Credits, Repeat Credits, Cumulative GPA, Enrollment Status, and their Interactions

		PREDICTED		
		Drop out	Persister	Total
OBSERVED	Drop out	208 (77.3%)	22 (47.8%)	230
	Persister	<u>61 (22.7%)</u>	<u>24 (52.2%)</u>	<u>85</u>
	Total	269	46	315

Correct classification of persisters and dropouts: 73.7%

Correct classification of persisters: 28.2%

Correct classification of dropouts: 90.4%

and defining variables and among enrollment status, transfer credits, GPA upon re-enrollment and elements of the previous academic record (e.g., cumulative GPA) were significant. In general, the logistic regression models which were significant showed only a modest ability to correctly classify persisters and dropouts, and in most cases had substantial misclassification rates. The overall classification rates for models 1E, 3, and 7 and their associated misclassification rates are summarized in Table 17.

TABLE 17

Summary of the Frequency of Correct and Incorrect
Classification of Persisters and Dropouts for
Models 1E, 3 and 7

<u>Model</u>	<u>Predictors</u>	<u>Correct Classification</u>	<u>Frequency of Classifying Persisters as Dropouts</u>	<u>Frequency of Classifying Dropouts as Persisters</u>
1E	Race, Previous Status, ACT, HSGPA Interactions	74%	24.3%	44.4%
3	REENROLL GPA, ACT HSGPA (all students)	73.3%	25.8%	46.2%
	Males	79.5%	19.7%	66.7%
	Females	60.4%	35.3%	60.9%
7	ENSTAT, TRCRED, TOTCRED, TOTTERMS CREDREP, CUM GPA, REENROLL GPA, ACT, HSGPA, Interactions	73.7%	22.7%	47.8%

CHAPTER V

DISCUSSION

Review of the Research Study

The purpose of the study was to examine the persistence of lower division students who were readmitted to Michigan State University with prior records of academic failure. A theoretical model of persistence for readmitted students with prior records of academic failure was developed by the investigator, based upon a review of the student persistence literature and drawing upon models of persistence for first time and voluntary dropouts. The results of testing this model may have implications for practice, because the information available for evaluating readmission applications at Michigan State University, at the time of the study, was largely comprised of previous academic records and indices of past achievement/ability (e.g., high school GPA, ACT scores).

The proposed model posited that student/institution interactions in the academic system of the institution (e.g., elements of the previous MSU academic record, GPA upon re-enrollment) would be important predictors of persistence for this group of students. The effects of demographic (e.g., gender, race, age) and defining variables (e.g.,

previous academic status, enrollment status) were also investigated, however only certain defining variables (i.e, enrollment status) were expected to be significant predictors of persistence for these students.

The research design and data-analytic techniques were selected in an attempt to address the methodological criticisms frequently leveled at studies of student persistence. For example, the study design was longitudinal in the sense that the sample spanned eight terms of readmission, and the persistence of the students readmitted during these terms was monitored for a minimum of six years. In addition, every attempt was made to clearly define and measure the variables. Finally, a multivariate procedure was chosen for the data analyses.

The sample selected for the study was comprised of lower division students who had been readmitted to Michigan State University, Fall Term 1981 through Winter Term 1984, and who met the criterion of having prior records of academic failure (academic recess/dismissal, academic probation). The persistence (graduated/still enrolled, not enrolled) of the students in the sample was evaluated as of the tenth day of Fall Term 1989. The nature of both the study design and the data collection suggests that the results of the study should be generalizable to the population of students with prior records of academic failure who were readmitted to Michigan State University between 1980 and 1989.

Data for fourteen predictor variables and one dependent variable (persistence) were collected from the MSU Registrar's Student Master File using a computer program written for that purpose. A preliminary analysis of the data was conducted, and descriptive statistics (e.g., means, standard deviations, frequencies) as well as correlations were reported for the variables used in the study. Logistic regression analysis was employed to test the primary research hypotheses, which had been generated to investigate the proposed model. All analyses were conducted using the SAS computer package, and a Type I error rate of .05 was set for each omnibus significance test. Due to a gender effect (hypothesis 1B), the sample was stratified by males and females for hypotheses 2 - 6. However, sample size precluded stratification by gender for hypothesis 7. Chi square test statistics were reported along with classification tables representing actual and predicted persistence and dropouts for each of the significant logistic regression models.

Review of the Findings

Perhaps the most dramatic finding was the high rate of dropping out among this group of readmitted students; barely more than one quarter of the students in the sample actually persisted. For these students, having a GPA greater than 2.00 at the end of the first term of re-enrollment was the most likely contributor to persistence (among the variables included in the study), with females having slightly better

odds of persisting than males. Although GPA upon re-enrollment was significantly associated with persistence, the correlation reported in Table 4 suggests that GPA upon re-enrollment accounts for only a small amount of the variability in persistence (approximately 8%). Similarly, though significant, gender appears to account for less than 2% of the variability in persistence.

As expected, there was no correlation between persistence and demographic and defining variables other than gender (i.e., race, age, previous academic status); however, interaction effects among demographic and defining variables and persistence were found. Similarly, no relationship between pre-college ability and achievement (i.e., ACT composite score, high school GPA) and persistence was found, nor was there a correlation between transfer credits and persistence.

Although one defining variable -- enrollment status -- and elements of the previous academic record (credits earned, total terms, repeat credits, and cumulative GPA) were expected to be correlated with persistence, no significant relationships between these variables and persistence were found. However, there were interaction effects among variables related to the academic record and persistence.

None of the predictive models showed more than a modest ability to correctly classify the persisters and dropouts in the sample, and there was substantial misclassification of persisters and dropouts using the predictive models. As

reported in Table 17, for example, Models 1E, 3, and 7 showed a consistent pattern of incorrectly classifying students who were dropouts as persisters, and to a lesser extent, classifying persisters in the sample as dropouts.

Conclusions

The failure of nearly three-quarters of the students in the sample to persist means that only one in four of these readmitted students are likely to graduate and/or continue their enrollment. This finding suggests that the readmission policies for lower division students may be excessively liberal or, in light of the results for the predictive models reported earlier, that the criteria upon which readmission decisions are based at Michigan State University may omit important factors related to the persistence of these students. The low six-to-eight year rate of persistence reported for this sample (27.8%) is, however, consistent with low four year persistence-to-graduation rates (10 - 20%) reported in two earlier studies (Planisek, Arnold and Ferraca, 1968; Bierbaum and Planisek, 1969). Having a prior record of academic failure appears to make this group of readmitted students "at risk" for dropping out again.

The theoretical model of persistence developed in this study was not particularly effective for predicting the persistence of students in the sample. The prediction of persistence using the logistic regression models was only moderately better than what would be expected in the absence

of any information (i.e., by chance), and was approximately the same regardless of the number of variables and interaction terms employed. The modest predictive power of the regression models was, however, consistent with other findings in student persistence research (e.g., Bean, 1980; Pascarella, et al., 1981; Webb, 1990).

Of the variables examined in this study, only gender and GPA upon re-enrollment were significantly correlated with persistence, with GPA upon re-enrollment appearing to be the best single predictor of persistence. In other words, students in this sample who were most likely to persist had first term re-enrolled GPA's greater than 2.00: their persistence was not correlated with their previous academic record, previous academic status (i.e., academic probation, recess/dismissal), enrollment status, transfer credits, pre-college ability and achievement, and/or demographic variables other than gender. The finding that GPA upon re-enrollment was significantly and positively related to persistence when pre-college ability and achievement were held constant is consistent with the findings reported in Hansmeier (1963, 1965), even though persistence in these studies was measured for a substantially shorter period of time (one year).

It is also worth noting that the absence of a significant relationship between ACT composite score and high school GPA and persistence supports the observation of Tinto (1975, 1987) and others (e.g., Pascarella and Terenzini,

1991; Dole, 1963) that measures of pre-college ability and achievement lose their potency as predictors of persistence as the time between matriculation and persistence (i.e., dropping out or graduated/still enrolled) increases.

The presence of a gender effect implies that the predictive power of the logistic regression models varied across males and females. This finding supports those student persistence theorists (e.g., Tinto, Bean) who suggest that the nature and extent of student/institution interactions may be qualitatively different across certain subgroups of students (e.g., males and females). As in other studies where persistence is measured "over time" (e.g., Eckland, 1964), the long term persistence of students in this sample favored females.

Finally, results of the study suggest that readmission decisions based on these models (i.e., variables) would be problematic: there would be substantial risk of readmitting students who would dropout a second time and a smaller risk of denying readmission to students who would actually persist.¹

Implications of the Research Findings

The relatively small likelihood that readmitted students with prior records of academic failure will persist warrants

1. In the case of GPA upon re-enrollment, the risk would be associated with officially sanctioning continued enrollment beyond the first term of re-enrollment.

institutional attention. The lack of a good predictive model (i.e., one which could be used to evaluate the potential risk of failure for readmission candidates and provide reasonable assurance that potential persisters would be admitted and that potential dropouts would not be readmitted) implies that readmission decisions for students with prior records of academic failure will continue to be made without an empirically based procedure capable of differentiating among potential persisters and dropouts.

Therefore, the investigation of specific (academic) interventions designed to increase the probability of persistence merits some consideration. Minimally, the goal of these interventions should be to promote interactions in the academic system of the university (e.g., student/faculty relationships, study skills training, tutoring, academic and career advising) most likely to ensure, for example, that GPA upon re-enrollment would exceed 2.00. The selection and design of appropriate and effective interventions also suggests a need for more extensive and formal assessment of student background and intentions (i.e., beyond a review of the academic transcript) prior to the approval of readmission. Attentiveness to potential differences in the academic needs of males and females may also be important in the assessment process. The structuring of specific academic support services and resources based on the assessment of individual (academic) needs of readmission candidates could

become conditions of readmission and be monitored and evaluated as the student progresses.

However, it cannot be assumed, based on the results reported in this study, that attentiveness to student/institution interactions in the academic system of the institution alone will promote high GPAs upon re-enrollment or will mitigate the effects of student/institution interactions in the social system of the university or factors external to the college environment.

The misclassification of persisters and dropouts might be reduced, and the predictive ability of the models in this study might be improved, if other factors were included. For example, theoretical models of student persistence for first time and voluntary dropouts frequently include student/institution interactions in the social system (e.g., peer and faculty relationships, residence), external factors (e.g., employment) as well as other interactions in the academic system of the university (e.g., study skills and habits). Of course, there is no guarantee that a model with additional variables will capture the full range of variability in persistence for these students in a way that could inform readmission decision making.

Recommendations for Future Research

Future investigations of the persistence of students with prior records of academic failure need to carefully address several theoretical and methodological issues. Other

theoretical models of student persistence for readmitted students with prior records of academic failure need to be developed and studied. These models need to examine the extent to which this group of students is similar to first time and/or voluntary dropouts, in terms of student/institution interactions which were not examined in the present study (e.g. student/faculty and peer relationships, intentions), as well as the extent to which these students share characteristics of non-traditional students (e.g., the role of external factors). Finally, the stability of empirically-based regression models showing promise for predicting the persistence of readmitted students with prior records of academic failure should be tested through cross validation studies or replication.

Future research for this population should also consider employing qualitative methodologies, which are increasingly being recommended in student persistence research (Hossler and Bean, 1990; Pascarella and Terenzini, 1991; Christie and Dinham, 1990). Such an approach could help to identify the nature and extent of important student/institution interactions which are not evident from the academic record. The results of this effort would be twofold. First, such information may suggest a more appropriate model of persistence than the one developed in this study and/or by student persistence theorists. Second, it may provide diagnostic evidence needed to identify types and possible points of academic and/or social interventions.

APPENDIX A

MINIMUM ACADEMIC PROGRESS SCALE

MICHIGAN STATE UNIVERSITY

Minimum Academic Progress Scale
Michigan State University¹

Academic performance of undergraduate students is evaluated through the use of a four year graduated scale structured so that students must have a 2.00 grade-point average at the time 180 credits are earned. This scale, the Minimum Academic Progress Scale (MAPS), takes into account on a cumulative basis the credits earned, the grade points earned, the credits attempted, and the credits repeated. It gives for a specific number of credits earned the number of grade points below a 2.00 average a student may have with a specific number of credits repeated to meet the minimum level of acceptable academic performance. It also gives the number of credits which may be attempted for a specific number of credits earned.

Any student whose academic record does not meet one or more of the requirements of the MAPS for the number of credits earned is subject to appropriate academic action.

Definition of Terms

CREDITS EARNED. Total MSU credits earned on the numerical system, the Credit-No Credit system, the Pass-No Grade system, and by examination plus all credits accepted in transfer from other institutions.

CREDITS REPEATED. Total credits repeated, both at Michigan State University and at other institutions.

CREDITS ATTEMPTED. Total MSU credits for which a term grade has been recorded (including Credit-No Credit, Pass-No Grade) or for which the W (no grade) symbol was recorded, plus all credits accepted in transfer from other institutions.

POINTS BELOW A CUMULATIVE 2.00 AVERAGE. Difference between total MSU points and the number of MSU points necessary for cumulative 2.00 grade-point average.

CUMULATIVE GRADE-POINT AVERAGE. Cumulative grade-point average is computed by dividing total MSU points carried for all terms by total credits carried for all terms.

CREDITS CARRIED. Total of credits in all MSU courses for which a term grade has been recorded.

ACADEMIC RECESS. The student whose points below a cumulative 2.00 falls below the acceptable limit on the MAPS, but who has neither repeated nor attempted more credits than

1. Excerpted from the Michigan State University Academic Programs 1989-91, pp. 13-15.

permitted by the MAPS, is subject to academic recess according to full time or part time enrollment status and whether the student was a first time or continuing student their initial term below MAPS.

ACADEMIC DISMISSAL. Academic dismissal will result at the end of the term in which one or more of the following occurs:

1. Thirty-one or more credits have been repeated.
2. Total credits earned falls below the number required by the MAPS for total credits attempted.
3. All grades in the schedule of 12 or more credits attempted on the numerical system are 0.0.
4. Failure to comply with the conditions of readmission as specified at the time of readmission.

Instruction for the Use of the Minimum
Academic Progress Scale (MAPS) (p. 132)

Credits earned appear in the column at the left. Credits repeated appear across the top. To use the scale, find the line corresponding to the number of credits earned and move across the table to the column headed by number of credits repeated. The number at the point the line and the columns intersect is the maximum number of MSU points below a cumulative 2.00 grade-point average permitted for the number of credits earned and repeated.

EXAMPLE: A student with 19 to 21 credits earned and 4 to 6 credits repeated may be no more than 9 points below a cumulative 2.00 average.

The column at the extreme right in the scale gives the maximum permissible number of credits attempted for a given number of credits earned appearing in the columns at the extreme left in the scale.

Minimum Academic Progress Scale

Credits Earned	Credits Repeated											Credits Which May Be Attempted
	0	1-3	4-6	7-9	10-12	13-15	16-18	19-21	22-24	25-27	28-30	
1- 3	6	3	1	0								12
4- 6	8	7	6	4	4	2	2	0	0	0	0	18
7- 9	10	9	8	6	6	4	4	2	2	0	0	27
10- 12	10	9	8	6	6	4	4	2	2	0	0	36
13- 15	10	9	8	6	6	4	4	3	2	2	0	45
16- 18	11	10	9	9	7	7	4	4	3	2	2	48
19- 21	11	10	9	9	7	7	4	4	3	2	2	51
22- 24	11	10	9	9	7	7	4	4	3	2	2	54
25- 27	11	10	9	9	7	7	4	4	3	2	2	57
28- 30	12	11	10	10	7	7	5	5	3	2	2	60
31- 33	12	11	10	10	7	7	5	5	3	2	2	63
34- 36	12	11	10	10	7	7	5	5	3	2	2	66
37- 39	13	12	10	10	8	8	5	5	3	2	2	69
40- 42	13	12	10	10	8	8	5	5	3	2	2	72
.												.
151-180	0	0	0	0	0	0	0	0	0	0	0	225

BIBLIOGRAPHY

BIBLIOGRAPHY

- Aitken, N. D. (1982). College student performance, satisfaction, and retention: Specification and estimation of a structural model. Journal of Higher Education, 53(1), 32-50.
- America's Best Colleges. (1989, 1991). U.S. News and World Report.
- Astin, A. W. (1975). Preventing students from dropping out. San Francisco, CA: Jossey-Bass Publishers.
- Bean, J. P. (1980). Dropouts and turnover: The synthesis and test of a causal model of student attrition. Research in Higher Education, 12, 155-187.
- Bean, J. P. (1982). Student attrition, intentions and confidence. Research in Higher Education, 17, 291-320.
- Bean, J. P. (1985). Interaction effects based on class level in an explanatory model of college student dropout syndrome. American Educational Research Journal. 22(1), 35-64.
- Bean, J. P. (1986). Assessing and reducing attrition. In D. Hossler (Ed.), Managing college enrollments. New Directions for Higher Education, #53. San Francisco, CA: Jossey-Bass Publishers.
- Bean, J. P., & Metzner, B. S. (1985). A conceptual study of nontraditional undergraduate student attrition. Review of Educational Research, 55(4), 485-540.
- Bierbaum, G. A., & Planisek, R. (1969). An index and procedure for readmitting the academically dismissed student. (ERIC Document Reproduction Service No. ED 063555).
- Bluhm, H. P., & Couch, S. (1972). Characteristics and academic performance of readmitted students. College and University, 47(3), 168-75.
- Buros, O. K. (1978). The eighth mental measurements yearbook. Highland Park, NJ: Gryphon Press.

- Bynam, J. E., & Thompson, W. E. (1983). Dropouts, stopouts and persisters: The effects of race and sex composition of college classes. College and University, 59, 39-48.
- Campbell, D. T., & Stanley, J. C. (1963). Experimental and quasi-experimental designs for research. Chicago: Rand-McNally.
- Carroll, C. D. (1990). Trends in post secondary persistence. Paper presented at the annual meeting of the American Educational Research Association.
- Christie, N., & Dinham, S. (1990). Elaboration of Tinto's model of college student departure: A qualitative study of freshman experiences. Paper presented at the annual meeting of the American Educational Research Association.
- Cope, R., & Hannah, W. (1975). Revolving college doors: The causes and consequences of dropping out, stopping out and transferring. New York: Wiley.
- Demitroff, J. F. (1974). Student persistence. College and University, 49, 553-565.
- Dole, A. A. (1963). The prediction of academic success upon readmission to college. Journal of Counseling Psychology, 10, 169-175.
- Eagle, E., & Arnold, C. Trends in post secondary persistence revisited: Decreasing persistence or changing educational goals? Paper presented at the annual meeting of the American Educational Research Association.
- Eckland, K. (1964). College dropouts who came back. Harvard Educational Review, 34, 402-415.
- Foote, B. (1980). Determined- and undetermined-major students: How different are they? Journal of College Student Personnel, 21, 29-34.
- Getzlaf, S. B., Sedlacek, G. M., Kearney, K. A., & Blackwell, J. M. (1984). Two types of voluntary undergraduates attrition: An application of Tinto's model. Research in Higher Education, 20, 257-268.
- Grosset, J. (1990). A proposed approach for use of Tinto's model with non-traditional students. Paper presented at the annual meeting of American Educational Research Association.

- Gustavus, W. T. (1972). Successful students, readmitted students, and dropouts: A comparative study of student attrition. Social Science Quarterly, 53(1), 136-144.
- Hackman, J., & Dysinger, W. S. (1970). Commitment to college as a factor in student attrition. Sociology of Education, 43(3), 311-324.
- Haggerty, M. (1985). A comparison of selected variables of adult persisters and non-persisters over age 24 at an urban commuter university. Unpublished doctoral dissertation, University of Pittsburgh.
- Halperin, M., Blackwelder, W. C., & Verter, J. I. (1971). Estimation of the multivariate logistic risk-function: A comparison of the discriminant function and maximum likelihood approaches. Journal of Chronic Diseases, 24, 125-158.
- Hansmeier, T. W. (1963). An investigation of factors related to the success after readmission or reinstatement of college students academically dismissed. Unpublished doctoral dissertation, Michigan State University.
- Hansmeier, T. W. (1965). Factors related to the success of college students academically dismissed. College and University, 40(2), 194-202.
- Hosman, D. W., & Lemeshow, S. (1989). Applied logistic regression. New York: John Wiley & Sons.
- Hossler, D., Bean, J., & Associates (1990). The strategic management of college enrollments. San Francisco, CA: Jossey-Bass Publishers.
- Iwai, S. I., & Churchill, W. D. (1982). College attrition and the financial support systems of students. Research in Higher Education, 17(2), 105-113.
- Johnson, R. H. (1980). The relationship of academic and social integration: A study across institutions and institutional types. Unpublished doctoral dissertation, University of Michigan.
- Kohen, A. I., Nestle, G., & Karmas, C. (1976). Success and failure in college: A new approach to persistence in undergraduate programs. Columbus: Center for Human Resource Research, College of Administrative Sciences, Ohio State University.

- Lautz, R., MacLean, D., Vaughan, A. T., & Oliver, T. (1970). Characteristics of successful students readmitted following academic suspension. College and University, 45(2), 192-202.
- Lee, V., Mackie, C., and Marlis, H. (1992). Persistence to the baccalaureate degree for students who transfer from community college. Paper presented at the annual meeting of the American Educational Research Association.
- Lenning, O. T., Beal, P. E., & Sauer, K. (1980). Retention and attrition: Evidence for action and research. Boulder, CO: National Center for Higher Education Management Systems.
- Malette, B., & Cabrera, A. (1990). Determinants of withdrawal behavior: An exploratory study. Paper presented at the annual meeting of the American educational Research Association.
- Messick, S. (1990). Validity. In R. L. Linn (Ed.), Educational Measurement (3rd ed.). New York: MacMillan.
- Murdock, T. A. (1987). It isn't just money: The effects of financial aid on student persistence. The Review of Higher Education, 11, 75-101.
- Newlon, L. L., & Gaither, G. H. (1980). Factors contributing to attrition: An analysis of program impact on persistence patterns. College and University, 55, 227-251.
- Noel, L. (Ed.) (1978). Reducing the dropout rate. New Directions for Student Service #3. San Francisco, CA: Jossey-Bass Publishers.
- Noel, L., Levitz, R., & Saluri, D. (1987). Increasing student retention, (pp. 78-182). San Francisco, CA: Jossey-Bass Publishers.
- Ott, M. D. (1988). An analysis of predictors of early academic dismissal. Research in Higher Education, 28, 34-48.
- Panos, R. J., & Astin, A. W. (1968). Attrition among college students. American Educational Research Journal, 5(1), 57-72.
- Pantages, T. J., & Creedon, C. F. (1978). Studies of college attrition: 1950-1975. Review of Educational Research, 48, 49-101.

- Pascarella, E. T. (Ed.) (1982). Study student attrition. New Directions for Institutional Research. San Francisco, CA: Jossey-Bass Publishers.
- Pascarella, E. T. (1985). Racial differences in factors associated with bachelor's degree completion: A nine year follow-up. Research in Higher Education, 23(4), 351-373.
- Pascarella, E. T., Doby, T. B., Miller, V. A., & Rasher, S. P. (1981). Pre-enrollment variables and academic performance as predictors of freshman year persistence, early withdrawal, and stopout behavior in an urban, non-residential university. Research in Higher Education, 15(4), 329-349.
- Pascarella, E. T., & Terenzini, P. T. (1977). Patterns of student-faculty informal interaction beyond the classroom and voluntary freshman attrition. Journal of Higher Education, 48, 540-552.
- Pascarella, E. T., & Terenzini, P. T. (1978). Student-faculty informal relationships and freshman year educational outcomes. Journal of Educational Research, 71, 183-185.
- Pascarella, E. T., & Terenzini, P. T. (1980). Predicting freshman persistence and voluntary dropout decisions from a theoretical model. Journal of Higher Education, 51, 60-75.
- Pascarella, E. T., & Terenzini, P. T. (1991). How college affects students: Findings and insights from twenty years of research. San Francisco, CA: Jossey-Bass Publishers.
- Pedrini, B., & Pedrini, D. (1978). Evaluating experimental and control programs for attrition and persistence. Journal of Educational Research, 71, 234-37.
- Planisek, R. J., Arnold, G. B., & Ferraca, S. L. (1968). The success of the readmitted college student: A multivariate study. (ERIC Document Reproduction Service No. ED 038932).
- Press, S. J., & Wilson, S. (1978). Choosing between logistic regression and discriminant analysis. Journal of the American Statistical Associates. 73, 699-705.
- Ramist, L. (1981). College student attrition and retention. (College Board Report No. 81-1). New York: College Entrance Examination Board.

- SAS Institute, Inc. (1989). SAS/STAT user's guide (4th ed.), Vol. 2. Cary, NC: SAS Institute, Inc.
- Schuster, D. H. (1971). An analysis of flunked-out and readmitted students. Journal of Educational Measurement, 8(3), 171-175.
- Spady, W. G., Jr. (1971). Dropouts from higher education: Toward an empirical model. Interchange, 2, 38-62.
- Summerskill, J. (1962). Dropouts from college. In N. Sanford (Ed.), The American College (pp. 627-657). New York: John Wiley & Sons, Inc.
- Terenzini, P. T. (1980). An evaluation of three basic designs for studying attrition. Journal of Student Personnel, 21, 257-263.
- Terenzini, P. T., Lorang, W. G., & Pascarella, E. T. (1981). Predicting freshman persistence and voluntary dropout decisions: A replication. Research in Higher Education, 15, 109-127.
- Terenzini, P. T., & Pascarella, E. T. (1977). Voluntary freshman attrition and patterns of social and academic integration in a university: A test of a conceptual model. Research in Higher Education, 6, 25-43.
- Tinto, V. (1975). Drop out from higher education: A theoretical synthesis of recent research. Review of Educational Research, 45, 89-125.
- Tinto, V. (1982). Limits of theory and practice in student attrition. Journal of Higher Education, 53, 687-700.
- Tinto, V. (1987). Leaving college: Rethinking the causes and cures of student attrition. Chicago: University of Chicago Press.
- Tinto, V. (1988). Stages of student departure: Reflections on the longitudinal character of student leaving. Journal of Higher Education, 59, 438-455.
- Titely, R. W., & Titely, B. S. (1980). Initial choice of college major: Are only the 'undecided' undecided? Journal of College Student Personnel, 21, 293-298.
- Webb, M. W. (1990). Development and testing of a theoretical model for predicting student degree persistence at four-year commuter colleges. Paper presented at the annual meeting of the American Education Research Association.