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Factors Influencing Nontraditional Age Student Participation in Postsecondary Education:

How Do Student Motivations and Characteristics Relate to

Adult Participation in Credential Programs?

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Abstract

How do student motivations and characteristics relate to participation in credential programs—either in the form of a college or university program, or a program leading to a vocational or technical diploma or certificate? Through multinomial logistic (MNL) regression analysis of data from the 1999 National Household Education Survey Adult Education Interview (AE-NHES:1999), this study finds age, prior educational attainment, and reason for participation to be significant factors for all college/university degree outcomes. Gender, marital status, household income, and household size were significant predictors of participation in Vocational/Technical programs. Having experienced distance education predicted Vocational/Technical and Bachelor degree program participation.

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In recent years, growth in postsecondary education has reflected not only population

growth and an increase in the proportion of high school students who seek to continue their

formal education; in addition, growing numbers of adult learners are returning to college. From a

business perspective, Peter Drucker (1994), has described the rise of new types of workers and

an "emerging knowledge society." In education, Merriam and Caffarella (1999) describe the

connection between adult learning and contemporary society in terms of three dimensions of the

sociocultural context shaping today's world: demographics, the global economy, and technology.

Fueled by structural changes in the national economy, as well as the rapidly changing economics

of information technology, the trend of increasing demand by adult learners for postsecondary

education (Rowley, Lujan, & Dolance, 1998) seems likely to continue. Yet, comparatively little

research has been done to better understand the factors that influence participation in

postsecondary education by nontraditional age students. This paper represents a summary of

literature, analyses, and findings described in more detail in my dissertation addressing the

research question: How do the characteristics and motivations of nontraditional age students

relate to participation in credential programs—either in the form of a college or university

program, or a program leading to a diploma or certificate from a vocational or technical school

or program?

While participation in adult education has grown steadily in recent decades, increasing to

45 percent of all adults and 40 percent of all college students in 1999 (Kim & Creighton, 2000;

Chronicle of Higher Education Almanac, 1999-2000), it has been argued that "our understanding

of the unique factors that predict adult student success has not increased likewise" (Lundberg, 2003, p. 665). Several major forces since the end of the cold war—i.e., economic globalization and increased cultural exchange; personal computers, internet access, and the information explosion—are changing the educational landscape (Duderstadt, Atkins, & VanHouweling, 2002; Twigg, 2002). Changing perceptions of nontraditional age students since the GI Bill, and the interplay between higher education and society (Ashby, 1966; Boyer, 1990; Dey & Hurtado, 2005; Nowotny, Scott, & Gibbons, 2001), help to frame the historical progression of adult education research.

Strictly speaking, the term *adult* may convey an impression of financial independence and responsibility which the phrase *nontraditional age student* may not; however, throughout this work these terms will be used interchangeably with respect to participation in postsecondary education. In contemporary society, working adults must master new types of literacy skills on an ongoing basis. Increasingly, the rising cost of a college education in recent decades—and policy changes related to student financial aid—have provided strong stimulus for students to work while enrolled; however, in depth analyses of college costs and student financial aid are beyond the scope of this research. Because the phrase *adult education* means so many different things to so many groups of people, and the concept changes with changing social norms, the literature on adult education is vast. The following literature review briefly summarizes a longer dissertation version, introducing themes that characterize adult education as well as previous empirical research studies.

Literature Review

The literature relating to nontraditional age student or adult participation in postsecondary education represents the intersection of two research areas embedded within

larger fields of education study: first, a subset of the *higher education* literature describing

nontraditional students, programs, etc. as well as college choice; and, second, a subset of the

adult education literature focusing on adult participation in formal postsecondary programs. As a

social science, the influence of prevailing political, social, and economic trends is also relevant

in education research, particularly as the societal context relates to adult participation. In

contemporary society, adult participation in postsecondary education is important as a policy

issue as well as a research area.

Most conceptual models from the higher education literature focus on factors that

influence *traditional* age students whether to participate in postsecondary education and what

programs to choose. Hossler, Braxton, and Coopersmith (1989) describe this longitudinal and

cumulative process using terms such as *college plans*, *educational goals*, and *the demand for

higher education,* and they define the term *student college choice*: "a complex, multistage

process during which an individual develops aspirations to continue formal education beyond

high school, followed later by a decision to attend a specific college, university or institution of

advanced vocational training" (p. 234). The econometric, sociological, and combined models

reviewed by Hossler et al. focus primarily on the perspective of traditional age students, and

expected college costs are consistently an important factor. Several models of *nontraditional age

student* or *adult* participation have also been proposed in the literature.

Informational and Other Barriers to Participation

For adult students, models of postsecondary participation reflect many of the factors

common to models of traditional age students; however, adult education models often also

include an additional category of variables representing *barriers* to participation (e.g., Cross,

1981; Darkenwald & Merriam, 1982) or *deterrents* (e.g., Henry & Basile, 1994; Valentine &

Darkenwald, 1990). Adults with multiple social roles and many types of responsibilities often

cite *lack of time* as well as cost as barriers to participation; however, for adults, other types of

factors may lie behind these situational factors. In the context of data collection through self-

report surveys of adults, Cross (1981) cites two "methodological problems in understanding the

actual role of dispositional barriers" (p. 106). The first has to do with perceptions of social

desirability: "it is far more acceptable to say that one is too busy to participate in learning

activities or that they cost too much than it is to say that one is not interested in learning, is too

old, or lacks ability… [The second problem is that survey] respondents who said they were not

interested in further education were frequently dropped from further analyses" (pp.106-107).

A theme of information society issues for adult education, including new questions of

access for minorities and other special interest groups, is emerging. At present, this theme

appears infrequently in the literature of higher education, and might be more clearly understood

in terms of *information literacy* (Hancock, 1993). Just as institutional planning perspectives must

expand in order to adapt to a new competitive environment or "postsecondary knowledge

system" (Peterson & Dill, 1997), educators' perspective of literacy in an information society

must also expand. In the same way that contemporary business is now a globally connected

enterprise, postsecondary education is becoming a globally connected postsecondary knowledge

industry. In this new environment, *information* literacy, or the "ability to know when information

is needed" and then having the "skill to identify, locate, evaluate, organize and effectively use

that information" (Rosenberg, 2002, para 5) becomes an essential component of adult literacy.

Self-directed Nature of Adult Learning

In defining adulthood, Darkenwald and Merriam (1982) emphasize the arbitrariness of

using age alone as a delineator without recognizing the process of maturing and adapting to new

social roles. Throughout their careers as educators, Malcolm Knowles and K. Patricia Cross

sometimes employed different terminology in studying nontraditional age students. However,

much of their work reflects a common interest in designing effective programs for nontraditional

age students based on *why* they participate in postsecondary education—hence, the classification

of such studies as *motivational* or *psychological*. In Knowles (1980) system of *andragogy*, the

first of four original assumptions or stated characteristics of adult learners is: "As a person

matures, his or her self-concept moves from that of a dependent personality toward one of a self-

directing human being" (Knowles, 1980, p. 43).

Trend to "Vocationalism"

Increasingly, governmental policies encourage links between college curricula and

vocational education for adults in order to promote economic development and support

competitiveness in a global knowledge economy. Adult education theory and practice were not

new in America after World War II; however, as more adults became involved in postsecondary

education, the early 20th century focus of adult education on the liberal arts—and social

benefits—began shifting toward what has been described recently as *vocationalism* in higher

education (Grubb & Lazerson, 2005). Now that the 21st century is under way, education for work

performance continues to increase in importance. Like Ben-David (1977/1992) and other

scholars of comparative systems, Brint and Karabel (1989b) contrast the American system of

education with the educational systems of other advanced industrial countries and describe a

unitary pattern of *comprehensive* education (i.e., mixing secondary and postsecondary students

of the liberal arts with students pursuing vocational courses of study) as "the characteristic

American pattern of educational organization" (p. 726). Karabel (1972) and Pincus (1980), for

example, criticize the effectiveness of the community college in achieving the American ideal of

equal opportunity for all students, but they nevertheless acknowledge the unitary pattern ideal

and its purposes in supporting a democratic society. In today's *Information Society*, the changing

societal context is influencing what is meant by *vocational* (Grubb & Lazerson (2005).

Models from Previous Research

Previous empirical research on adult participation in postsecondary education reflects two

general classes of literature: psychological/motivational (later psychosocial interaction) models,

and studies of student characteristics. Psychological models focus on differences in student

motivation (e.g., Morstain & Smart, 1977; Wolfgang & Dowling, 1981). By 1980, higher

education enrollments at some types of institutions had peaked and begun to decline for the first

time (Zammuto, 1986), resulting in competition for students and stimulating institutional interest

in studying the characteristics of students most likely to continue their education beyond high

school. Studies of the characteristics of nontraditional students take several forms (e.g., Aslanian

& Brickell, 1980; Bash, 2003), and include governmental reports based on national surveys (e.g.,

Berker & Horn, 2003; Choy & Premo, 1995; Horn, 1996).

Summary of Previous Research Findings

Previous empirical research on adult participation in postsecondary education has varied

in focus—often including the full range of formal and informal adult education activities, yet has

created a somewhat consistent profile of the adult participant. In the first national study of

participation in adult education, Johnstone and Rivera (1965) at the National Opinion Research

Center found the typical adult participant to be better educated, younger, employed full-time

with a relatively high income, and most likely to be white (Henry & Basile, 1994; Merriam &

Caffarella, 1999). Based upon in-depth interviews of a small sample of adult learners, Houle

(1961) studied the motivations of adult students and constructed a typology of three adult

learning orientations: 1) *goal-oriented*, 2) *activity-oriented*, and 3) *learning-oriented* participants. This typology was extended through the work of other researchers, especially Boshier (1971, 1982) who developed and refined the Education Participation Scale (EPS). Studies of national survey data by the U.S. Department of Education, National Center for Education Statistics (NCES), have also contributed to the literature on reasons for participation—consistently affirming the importance of *job-related reasons* (Berker & Horn, 2003; Kleiner, Carver, Hagedorn, & Chapman, 2005). An earlier national study based on survey data (Aslanian & Brickell, 1980), found that *major life changes in the last year* were an important factor for many participants (Henry & Basile, 1994).

Since both *opportunity* and *motivation* are necessary for adult participation in postsecondary education, psychosocial interaction models have helped to increase understanding of potential barriers to adult participation. Boshier's (1973) Congruence model, Cross' (1981) Chain-of-Response model, Darkenwald and Merriam (1982), Cookson's (1986) ISSTAL model, Rubenson (1989), and Henry and Basile (1994) all incorporate contextual characteristics as well as motivational factors. Cross (1981) identifies prior education level as the best predictor of participation in adult education. In stressing the importance of including both participants and non-participants in the sample, the study by Henry and Basile (1994) remedies one of the methodological problems identified by Cross (1981). In this respect, as well as in its recognition of *sources of information* as a factor for adult participation, the Henry and Basile study has inspired the research design described in the next section of this paper.

<div align="center">Data Source and Method of Analysis</div>

Since 1991, NCES has conducted a series of National Household Education Surveys (NHES)—including an adult education (AE) interview. Data analysis techniques employed in

this study focus on adult participants in postsecondary credential programs, as a proxy for

nontraditional age students in such programs, compared with participants in work-related courses

that did not lead to a credential (i.e., *non*-participants in *credential programs*).

Sample Selection Criteria

I chose the 1999 NHES Adult Education Interview as a source of data for this study for

several reasons. The AE-NHES:1999 survey and dataset structure: (a) combine the full range of

credential programs (i.e., college or university programs as well as programs leading to some

type of vocational or technical diploma or certification) into a common section of the interview,

(b) represent more detailed coverage (i.e., more detailed than later National Household

Education Surveys) of motivational factors for adults, (c) contain a subset of questions related to

the use of new information technology in educational programs, and (d) provide the opportunity

to compare cases of non-participants with participants in postsecondary credential programs.

The AE-NHES:1999 interview was designed to incorporate a broad approach to the

diverse arena of adult education, including "voluntary and required educational activities that are

formal, as defined by the presence of an instructor" (Kim & Creighton, 2000, p. 3). Adult survey

respondents were asked if they had participated in the following *six types* of adult education *in*

the following order: English as a Second Language, Adult Basic Education, Credential

Programs, Apprenticeship Programs, Career- or Job-related (i.e., *work*-related) Courses, and

Personal Interest or Development Courses. For many survey respondents, these were *not*

mutually exclusive categories.

Of the six types of adult education activities defined for the NHES, only participants in

either a Credential Program or a Work-related Course, *or both*, are included in the effective

sample. Estimated percentages of adults participating in adult education activities related to

English as a Second Language, Adult Basic Education, or Apprenticeship Programs are small,

and these groups are beyond the scope of this study. Similarly, due to the potential for extreme

variability of content and quality associated with Personal Interest and/or Personal Development

Courses, these courses are also beyond the scope of this study and are excluded from the

effective sample. The total number of adults in the United States at the time of the survey (1st

quarter, 1999) is estimated to be a *population* of 194.625 million (Kim & Creighton, 2000).

Although the NHES:1999 survey screening process was designed to include household members

ages 16 and older in the resulting AE-NHES:1999 dataset, it is important to note that those

individuals *only participating full-time in a college or university credential program* are

considered 'traditional' students here and, as such, *are excluded by design* from the 'adult

education' survey and, accordingly, from the AE-NHES:1999 dataset of 6,697 cases overall.

Proportional comparisons between major conceptual categories of the adult education

sample (representing all six types of adult education activities mentioned earlier) are blurred by

the fact that respondents representing an estimated 12% of adults participated in more that one

type of adult education activity during the survey period. Table 1 summarizes the logic employed

in identifying cases for the effective sample, based on the variables that identify participants in

either type of credential program (i.e., College/University or Vocational/Technical) or in a work-

related course (i.e., credential program *non*-participants). The observations of primary interest

for this study are the 1,437 participants in either type or both types of credential programs;

however, an additional 1,545 participants only in work-related courses that did not lead to a

credential is also of interest for comparison purposes and is included as a control group in the

effective sample of 2,982 observations.

Table 1
Selection of Effective Sample: Postsecondary Participation by Type of Activity

Logical combination possibility	Participation in either type of credential program during past yr?		Work-related course participant in past year?	Number of observations (*n*)
	College or university participant?	Vocational or technical participant?		
1	*Yes*	*Yes*	*Yes*	57
2	*Yes*	*Yes*	No	112
3	*Yes*	No	*Yes*	270
4	*Yes*	No	No	664
5	No	*Yes*	*Yes*	71
6	No	*Yes*	No	263
Subtotal credential program participants				**1,437**
Comparison: Work-related courses only	No	No	*Yes*	1,545
Total number of observations in effective sample[a]				**2,982**

[a]Of 6,697 total AE-NHES:1999 interview respondents, the remaining 3,715 participated in AE activities other than credential programs or work-related courses during the 12-month period preceding the survey.

Data Analysis Techniques and Complex Sample Design Effects

Given the categorical nature of the dependent variables and *complex design* of the overall NHES sample, I conducted logistic regression analyses using the survey commands in Stata. The survey literature (Heeringa & Liu, 1997) describes samples incorporating special design features such as stratification, clustering, and weighted estimation as 'complex designs.' Stata 9 includes capabilities for analyzing complex sample design survey data, with some known limitations. For example, many post-estimation tests have not yet been fully adapted for complex sample design survey data (Long & Freese, 2006). Wherever necessary, I conducted sensitivity analyses by comparing logistic regression results obtained using survey commands to those obtained under assumptions of simple random sampling (with pweights) to determine the importance of complex sample design effects for these data. I took the relative magnitude of design effects into account

in determining whether simple (non-survey data) test commands could be employed without risk of misinterpretation of results or unreasonable loss of precision.

Multinomial Logistic Regression

Initially, I estimated a multinomial logistic (MNL) regression model, regressing participants' highest credential program pursued (HIGHCRED) on a number of independent variables conceptualized to be related to one's choice of credential program (see Table 2 for dependent variable descriptions and frequencies). The initial MNL regression phase of the study compares outcomes representing participation in each of six categories of credential program to a *base category* of credential program non-participants, then tests whether underlying assumptions for that model are violated for these data. MNL regression analysis requires that the decision makers can be assumed to view each alternative outcome possibility *independently*. This analysis technique is most appropriate when the alternatives are quite different from one another. In the case of the dependent variable highest credential pursued, one might think about the *independence of irrelevant alternatives* (IIA) property constraint in terms of the question: Would the probability of pursuing an Associate Degree, for example, change if the Vocational/Technical Diploma were no longer an alternative?

Tests of the IIA Assumption

Two tests of the IIA assumption (i.e., to determine that the relative risk of obtaining any outcome does not depend on the availability of other outcomes) have been implemented in Stata for use after the MNL regression is estimated: the Hausman test and the Small-Hsiao test. When designing this research, I planned to execute both tests to determine if the MNL is an appropriate model specification for these data. If tests of the IIA assumption failed, I then planned to estimate a binary logistic regression model, exploring the appropriateness of nested binary

models representing two decisions: first, to enroll in a postsecondary program or not; then, to

choose either a college/university or some type of vocational/technical school or program. For

the final phase of this research, I constructed a binary logistic regression analysis with the same

effective sample as in the first phase and a dependent variable (CRDIPART) representing

participation (or not) in any form of postsecondary credential program. In order to further

explore the relationship between the decisions involved in (a) returning to school (or not), and

(b) choosing a course of study or type of program, I compared a binary logistic regression model

including the same independent variables used in the MNL regression analysis to a second binary

model including institutional type of instruction provider as an additional independent variable.

Dependent Variables

The primary dependent variable for this study is highest credential program pursued

(HIGHCRED), including both the possibility of a college or university program and the

possibility of a program leading to a diploma or certificate from a vocational or technical school

or program. This variable is considered the *primary* dependent variable for this research in two

ways: first, it represents the full range of outcomes (see Table 2) addressed by the research

question being explored, and, second, it serves as the dependent variable in the initial MNL

regression. Table 2 summarizes the initial frequencies (*f*) of each category of highest credential

program pursued and recoding to define the categories for an initial MNL regression analysis.

Table 2
Description of Primary Dependent Variable, Original and Recoded Values

Original values of primary dependent variable: Highest credential pursued, HIGHCRED				Recoding of primary dependent variable	
Description	Freq. *(f)*	% of **Total Adults**	% of **Cred. Prog.**	Description	Freq. *(f)*
				Other[a]	*159*
1 Voc/Tech diploma	228	3.4	15.8	Voc/Tech diploma	228
2 Associate degree	250	3.7	17.4	Associate degree	250
3 Bachelor degree	473	7.1	32.9	Bachelor degree	473
4 Master degree	205	3.1	14.3	Master degree	205
5 Doctorate	47	0.7	3.3	Doctorate/Professional	122
6 Professional degree	75	1.1	5.2		0
91 *Other*[a]	*159*	2.4	11.1		0
Subtotal credential program participants	**1,437**	21.5	100.0	**Subtotal credential program participants**	**1,437**
Other AE activities	3,715	55.5		(Non-credential)	
Work-related courses only	1,545	23.0		Work-related courses	1,545
Total adult education No. of observations (*N*)	**6,697**	100.0		**Effective sample (*n*)**	**2,982**

[a]Preliminary review of supplemental restricted use data associated with 'Other' responses suggested possible combination of this category with the 'Voc/Tech Diploma' category.

For analytical convenience and without substantial loss of clarity for purposes of this study, I recoded the original values of the primary dependent variable to combine the two categories 'Doctorate' and 'Professional Degree.' The 159 responses labeled 'Other' represent only 2.4 % of total adult education cases, but slightly over 11% of credential program participants. According to additional information available in the NHES supplemental restricted use file, the 'Other' category includes many vocation-related credential program descriptions; based on this preliminary information, the 'Other' category has been re-ordered to appear next to the 'Voc/Tech Diploma' category but not combined with that category.

A second dependent variable (CRDIPART) representing participation in either type of credential program (a college or university program or a program leading to a diploma or

certificate from a vocational or technical school or program), as opposed to non-participation in a credential program, is employed in the binary logistic regression models of this study.

Independent Variables

Reflecting the literature, and theoretical influence from sociology as well as psychology, I selected contextual factors as well as variables representing student motivational factors from the AE-NHES:1999 dataset. Variables representing the contextual perspective include student demographics such as age, gender, marital status, and race/ethnicity; and household characteristics such as household income, total number of persons in the household, whether the respondent owns or rents the home, whether the household is located in an urban or rural area, and region of the country in which the household is located. Additional contextual elements include background characteristics such as prior educational attainment (i.e., prior to current postsecondary participation), and information-literacy-related elements such as library use during the past month and year. Study variables also include self-reported number of hours worked weekly, and whether or not the employer provided any support for education activities (including providing instruction) or required continuing education.

In the AE-NHES:1999 dataset, variables representing the motivational perspective are somewhat limited—based primarily on the survey question that asks the main reason the respondent participated during the past 12 months in the program being discussed at the time with the interviewer. Choices suggested to the respondent include: (a) improve, advance or keep up to date on current job; (b) train for a new job or career; (c) improve basic reading, writing, or math skills; (d) meet a requirement for a diploma, degree, or certificate; (e) personal, family, or social reason; or (f) some other reason. For purposes of this study, the (c) and (e) categories (i.e., basic skills and personal reason) were combined with (f) 'some other reason' and reported as

'Other Reasons.' In recognition that nontraditional age students are often time-limited adults

with family or work responsibilities, or both, the variable representing postsecondary

participation via some type of distance education was studied as an additional proxy for

nontraditional age student motivation to return to school.

Given the diverse range of adult education activities represented in the overall dataset of

6,697 observations, and the variety of definitional perspectives of adult education in the

literature, the usefulness of a single summary statistic for the age variable is limited. Table 3

illustrates how the mean age of respondents varies for different groups within the effective

sample. Adult survey respondents who had participated in credential programs during the

previous 12-month period ($n = 1,437$) ranged in age from 17 to 87 years; among *all* adult

education respondents ($N = 6,697$), the age range was 16 to 95 years (mean 44.7).

Table 3
Summary Age Statistics for Selected Adult Credential Program Participants

Group (see notes)	(n)	*Mean ($df = 6,695$)* Age in 1998	Linearized Std. Error	95% Confidence Interval		*deff*
I-A[a]	2,982	37.1	.29	36.52	37.65	1.14
I-B[b]	2,823	36.9	.30	36.35	37.52	1.14
II-A[c]	1,437	31.8	.41	30.97	32.58	1.23
II-B[d]	1,278	30.7	.42	29.87	31.54	1.23

[a]I-A: Full range of credential participant observations (College/University and Voc/Tech), *including* 159 with 'Other' as a highest credential pursued, *plus additional work-related control group.*

[b]I-B: Full range of credential participant observations (College/University and Voc/Tech), *excluding* 159 with 'Other' as a highest credential pursued, *plus additional work-related control group.*

[c]II-A: Full range of credential participant observations (College/University and Voc/Tech), *including* 159 with 'Other' as a highest credential pursued.

[d]II-B: Full range of credential participant observations (College/University and Voc/Tech), *excluding* 159 with 'Other' as a highest credential pursued.

Nontraditional age students are defined here as those who are 25 or older. Age ranges selected

for this study are based on age classifications from the most recent United Nations Educational,

Scientific, and Cultural Organization (UNESCO) study of participation in adult education

(Valentine, 1997), reprinted with permission in Merriam and Caffarella (1999, p. 50).

Findings

This section presents a summary of results, according to three sequential stages of the

analysis: multinomial logistic regression (MNL) regression, post-estimation tests, and binary

logistic regression. Overall MNL results across seven outcome categories are summarized in

Table 4. Results of the two binary logistic regressions are summarized in Table 5.

MNL Regression Results

Based on relative risk ratios (RRR) and Wald statistics calculated, age is a significant

demographic predictor across college/university outcomes, but not a significant predictor for the

Vocational/Technical and 'Other' categories. For Associate, Bachelor, and Master program

outcomes, nontraditional age adults were found to be less likely (indicated by RRRs less than

1.0) than traditional age adults to participate in credential programs rather than work-related

courses. For the Doctorate or Professional Degree outcome, only the age 35-44 and age 55-87

categories were significant; both of these relative risk ratios (.153 and .090, respectively) indicate

a much smaller 'relative risk' that adults in these age ranges would be participants in this type of

credential program, as compared to the non-participant base category outcome (work-related

course participation only).

For the Vocational/Technical outcome, variables representing both separated-widowed-

or-divorced marital status and married marital status were significant. Results indicate that

separated, widowed, or divorced adults (RRR of .331) and married adults (RRR of .242) have a

lower relative risk than single adults of being participants in a Vocational/Technical program

rather than in a work-related course. Married marital status was also found to be a significant

predictor of participation in an Associate, Bachelor, and Doctorate/Professional degree program, but not in a Master degree program. For example, married students had a relative risk of being in a Bachelor degree program (rather than a work-related course) that was only .416 that of their single counterparts.

Gender was found to be a significant predictor of participation by adults in Vocational/Technical, Associate, and Bachelor programs but not in Masters and Doctorate/Professional programs. For the three significant credential program outcomes (at least $p < .05$), females had a relative risk of being participants in credential programs rather than work-related courses that was approximately half the RRR of males.

For most types of credential programs, race/ethnicity was not found to be a significant predictor of credential program participation. However, in this regard, the 'Other' outcome category was an exception. For the 'Other' credential programs outcome, Black non-Hispanic adults were found to have a significant RRR 2.026 times higher than that of White adults of non-Hispanic origin; adults of Hispanic origin an RRR 2.281 times that of White adults of non-Hispanic origin; and, adults of other races or ethnicities an RRR 3.684 times that of White adults of non-Hispanic origin.

Educational Background Prior to the Survey Period

The literature describing previous empirical studies of adult participation notes educational background to be an important predictor of participation in postsecondary education and results of this study concur. In most result categories, adults with some level of additional education after high school were more likely than those with a background of high school or less to be participants in credential programs than in work-related courses. As an exception to this pattern, adults with a prior educational background of postgraduate work or a bachelor degree

were found to be only half as likely (RRR of about .5) as those with a high school background or

less to be in a Vocational/Training program outcome rather than a work-related course.

Household Characteristics

In general, variables representing household income and the number of persons in the

household were not found to be significant predictors of participation in college or university

degree programs, but were significant predictors of participation in vocational or technical

programs. For households with incomes above $30,000 per year, higher household income levels

were found to be associated with lower relative risks of participation in a Vocational/Technical

program. Regarding number of persons in the household, in comparison to single-person

households, larger households were found to be associated with higher relative risk ratios for

Vocational/Technical program participation. Other variables associated with household own/rent

status and household location within an urban or rural area, as well as geographic location of the

household within a regional quadrant of the country, were not found to be significant predictors

at the $p < .05$ level.

Motivation

Wald test results found variables representing reasons for participation significant even at

the $p < .001$ level for all outcome categories. Adults who said they participated in postsecondary

education to earn a credential were found to have RRRs from 2.104 (Voc/Tech) and 2.493

(Master) to 7.647 (Bachelor) and 7.605 (Doct/Prof) times that of those who said they participated

to advance in their current job or career. Results for adults who said they participated in

postsecondary education for other reasons or in order to train for a new job generally indicated

even higher RRRs for credential program participation, as compared to work-related course

participation, even for the outcome category of 'Other' unspecified credential programs. Results

for the variable associated with distance education experience were also found to be significant for the 'Other,' Vocational/Technical, and Bachelor program outcomes, suggesting that the availability of distance education as an optional mode of participation may possibly have influenced the postsecondary participation decision of participants in these types of programs.

   Other Independent Variables

   Although approximately 86% of adults in the effective sample reported being employed, no overall pattern of association between credential program participation and the (self-reported) number of hours worked on a regular weekly basis was clearly indicated. In all result categories where number of weekly hours worked was significant, the RRRs are less than one—indicating a relatively lower risk of credential program (rather than work-related course) participation among working adults than among those who reported working zero hours per week or were not in the labor force. The influence of *no* employer support was found to be significantly associated with participation in credential programs. However, this seemingly counterintuitive association may reflect the fact that credential program participants who did not work during the survey period (more than 20% of credential program participants) were coded as having no employer support. And, several forms of employer support, including requirements for continuing education and provision of instruction, were defined in the survey as components of 'any support.'

   Very few of the variables included in the study to explore possible influences of having information or access to information were found to be significant (p < .05 level). Having heard of the Lifetime Learning tax credit was a significant predictor for 'Other' and for Masters program outcomes. Some results related to use of a *public* library in the past month or year were found to be significant; however, interpretation of these results could be misleading if survey respondents distinguished between *public* and *school* libraries when responding to the survey.

Table 4

Multinomial Logit Results: Chi2 Variable Significance and Relative Risk Ratios (RRR), by Outcome Category (*n* = 2,982)

Independent Variables	Other Credential	Vocational /Technical	Associate Degree	Bachelor Degree	Master Degree	Doctorate/ Professional
Student Characteristics						
Age Chi2 =	1.96 (.7427)	4.02 (.4036)	19.26 (.0007)	58.53 (.0000)	15.89 .0032)	23.70 (.0001)
[Age 17-24]						
Age 25-34	.903	1.305	.452 *	.277 ***	.413 *	.550
Age 35-44	1.212	.763	.247 ***	.146 ***	.242 **	.153 ***
Age 45-54	1.443	.863	.180 ***	.047 ***	.156 ***	.617
Age 55-87	1.537	1.130	.134 **	.035 ***	.106 **	.090 **
Marital Status [Sing]	2.83 (.2431)	22.56 (.0000)	7.70 (.0213)	11.01 (.0041)	3.33 (.1892)	10.06 (.0065)
Sep., Wid., Div.	.510	.331 **	.617	.593	.545	.440
Married	.712	.242 ***	.418 **	.416 **	.634	.338 **
Gender	2.23 (.1354)	11.27 (.0008)	11.93 (.0006)	8.87 (.0029)	2.83 (.0926)	1.48 (.2231)
Female	.711	.494 **	.456 ***	.523 ***	.660	.676
Race/Ethnicity	11.17 (.0108)	2.05 (.5611)	4.23 (.2379)	8.16 (.0428)	4.29 (.2318)	5.06 (.1678)
[W, non-Hispanic]						
Black, n-Hispanic	2.027 *	1.053	1.593	1.359	.784	.957
Hispanic	2.281	1.229	1.370	1.680	2.165	.753
Other Race/Ethn.	3.684 *	2.136	2.024	3.051 *	.882	3.142 *
Country of Origin	4.88 (.0272)	.00 (.9612)	.56 (.4546)	.01 (.9049)	2.35 (.1257)	.66 (.4174)
Not born in US	.277 *	.979	.730	.960	.544	.691
Prior Education [HS]	7.50 (.1862)	18.27 (.0026)	89.15 (.0000)	108.44 (.0000)	2895.5(.000)	43.89 (.0000)
Vocational/Tech	.764	1.638	1.166	1.130	.000 ***	1.121
Some college	1.327	1.539	5.743 ***	14.025 ***	7.433 **	2.776
Assoc. Degree	2.144 *	1.072	4.499 ***	12.561 ***	4.536	1.471

Independent Variables	Other Credential	Vocational /Technical	Associate Degree	Bachelor Degree	Master Degree	Doctorate/ Professional
Prior Ed. (continued)						
Bach. Degree	1.380	.512 *	.214 **	3.462 **	37.839 ***	4.720 **
Grad school +	.747	.473 *	.291	.674	91.123 ***	19.783 ***
HH Characteristics						
HH Income [< $10K]	8.86 (.1819)	18.77 (.0046)	9.20 (.1625)	12.62 (.0495)	4.61 (.5942)	7.93 (.2430)
$10,001-20,000	.840	.455	.990	1.078	.468	1.534
$20,001-30,000	.351	.480	.509	.430	.701	.745
$30,001-40,000	.657	.392	.810	.741	1.130	1.148
$40,001-50,000	.382	.388	.701	.395	.621	.388
$50,001-75,000	.542	.259 *	.516	.499	.809	.868
$75,001 or more	.340	.149 ***	.360	.375 *	.727	.550
No. in Household [1]	8.63 (.1246)	11.71 (.0390)	3.97 (.5537)	4.62 (.4636)	13.05 (.023)	8.59 (.1264)
2 persons	.950	2.287 *	1.416	1.411	1.333	1.849
3 persons	1.906	2.374 *	.979	1.465	1.424	.818
4 persons	.911	3.089 **	.937	1.096	.635	1.670
5 persons	1.742	4.082 **	1.049	1.193	3.297 *	3.829
6 or more	1.112	4.609 **	.714	.793	1.032	2.018
Own/Rent [Owned]	.34 (.8427)	3.69 (.1577)	1.38 (.5024)	.65 (.7213)	2.80 (.2466)	3.76 (.1523)
Home is rented	1.104	.609	.728	.814	1.653	1.961
Other arrangement	.864	.809	.913	.868	1.266	1.729
Urban/Rural [Urban]	3.44 (.1793)	.69 (.7070)	1.94 (.3790)	2.07 (.3548)	.88 (.6424)	2.19 (.3344)
Urban, outside	1.318	.815	1.313	1.600	1.114	.343
Rural area	1.666	1.130	1.445	1.035	1.365	.749
Census Region [NE]	5.03 (.1695)	2.49 (.4767)	1.96 (.5802)	1.42 (.7007)	2.93 (.4033)	5.17 (.1600)
South	.905	.735	.677	.934	.969	1.375
Midwest	1.725	.635	.856	1.218	.920	1.160
West	1.488	.650	.868	1.154	.646	.561

Independent Variables	Other Credential		Vocational /Technical		Associate Degree		Bachelor Degree		Master Degree		Doctorate/ Professional	
Labor Force Status												
Weekly Hrs Worked [Zero per week]	8.48 (.2923)		6.33 (.5021)		4.87 (.6760)		25.94 (.0005)		10.49 (.163)		20.18 (.0052)	
1- 10 hrs per wk	1.447		.273		1.737		1.371		1.156		.148	
11-20 hrs per wk	.154	*	.342		.970		.583		.662		.287	*
21-30 hrs per wk	.580		.678		1.227		.275	**	.620		.231	**
31-40 hrs per wk	.775		.791		1.160		.326	**	.650		.223	**
41-50 hrs per wk	.596		.787		.727		.443	*	.599		.166	**
51-60 hrs per wk	.617		.793		.631		.240	**	.246	*	.177	**
61-99 hrs per wk	1.079		1.462		.848		.162	**	.278		.303	
Employer Support?	14.58 (.0001)		41.89 (.0000)		22.16 (.0000)		8.52 (.0035)		12.46 (.0004)		6.32 (.0119)	
No Employer Support	2.704	***	4.795	***	3.338	***	2.039	**	2.688	***	2.165	*
Employer Required Continuing Educ	.87 (.6470)		3.76 (.1524)		1.35 (.5092)		3.75 (.1537)		4.35 (.1137)		6.24 (.0441)	
Not applicable	.557		.618		.765		.510		.721		.236	*
CE not required	1.009		1.334		1.218		1.217		1.514		.724	
Motivation												
Reason [Current Job]	43.50 (.0000)		57.37 (.0000)		95.67 (.0000)		121.16 (.0000)		57.96 (.000)		60.63 (.0000)	
Earn credential	.942		2.104	*	4.421	***	7.647	***	2.493	**	7.605	***
Train for new job	4.980	***	5.471	***	13.105	***	14.764	***	7.594	***	13.150	***
Other Reasons	5.260	***	6.125	***	11.552	***	12.525	***	4.233	***	10.701	***
Distance Education	8.56 (.0034)		6.22 (.0126)		1.32 (.2499)		7.79 (.0053)		3.22 (.0728)		2.24 (.1347)	
Distance Educ.	2.597	**	2.110	*	1.487		2.551	**	1.727		2.061	
Information Literacy												
Heard of tax credit?	5.46 (.0195)		2.10 (.1468)		.00 (.9534)		.05 (.8158)		10.68 (.001)		3.12 (.0773)	
Lifetime learning	2.647	*	1.560		.980		.936		.425	**	.509	

Independent Variables	Other Credential	Vocational /Technical	Associate Degree	Bachelor Degree	Master Degree	Doctorate/ Professional
Heard of tax credit? Hope scholarship	.01 (.9202) 1.034	.00 (.9925) .997	.83 (.3619) 1.286	3.38 (.0661) .660	.79 (.3753) .808	.68 (.4087) .730
Public Library use Y-in past month	.20 (.6523) .880	6.46 (.0110) 1.914 *	.04 (.8379) 1.050	.03 (.8583) 1.041	.00 (.9832) 1.006	1.34 (.2470) 1.541
Public Library use Y-in past year	.41 (.5239) 1.208	.72 (.3960) .809	10.54 (.0012) .397 **	13.00 (.0003) .361 ***	7.74 (.0054) .411 **	1.01 (.3159) .660
Read any Books? Y-in past 6 mths	.19 (.6626) 1.121	.67 (.4138) .822	.74 (.3906) .801	6.04 (.0140) .506 *	6.83 (.0090) .391 **	.51 (.4767) .688
No. of Magazines Read regularly	2.54 (.1110) .942	1.39 (.2387) .952	3.83 (.0504) .919	5.38 (.0204) .926 *	1.22 (.2703) .959	1.69 (.1929) 1.033
Read Newspaper? [Hardly Ever]	4.88 (.1806)	13.09 (.0044)	4.49 (.2128)	.97 (.8088)	3.34 (.3423)	6.35 (.0960)
Almost every day	.858	.479 *	.563	.925	1.051	1.612
At least 1 per wk	1.219	.392 **	.606	.974	.958	1.945
At least 1 per mo	2.128	1.265	1.016	1.482	.259	4.739 *

Reference Category: Credential Program *non*-participants (i.e., Work-related Course participation only)

Log Pseudolikelihood -2840.667; Pseudo R^2 .356; Prob > chi2 less than .001

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

Post-estimation Tests, IIA Assumption, and Complex Sample Design Effects

After estimating the initial MNL regression, I ran several post-estimation tests to help determine the most parsimonious and appropriate model specification for these data. By their nature, MNL results are more complicated than the results of linear or binary logistic regression analyses. Accordingly, I had hoped that statistical results would justify combining two or more of the original six credential program outcome categories. As noted in Table 2, preliminary information suggested the possibility of combining the 'Other' category with the 'Voc/Tech Diploma' category; however, further analysis has indicated that the 'Other' category represents a diverse range of participant characteristics. Results of statistical testing of the effect of all possible combinations of two outcomes did not justify any such combinations.

Regarding tests of the IIA assumption, additional research experience with the post-estimation tests available in Stata has led to a different recommendation regarding their use in the interval since my research design was proposed. As similarly reported by other researchers over the past year, my experience with the Hausman and Small-Hsiao tests of IIA contributes to a pattern of conflicting results in which one test supports the null hypothesis that the assumption is upheld while the other test rejects the same null hypothesis for the same data. In response to such reports, Cheng and Long (2005) "ran Monte Carlo experiments to examine the properties of these tests," and concluded "these tests are not useful for assessing violations of the IIA property" (Long & Freese, 2006, p. 243). Although not necessarily definitive for determining model misspecification, results of these tests for the MNL regression model I constructed might still be informative. After running the survey data MNL regression command *and* the non-survey data command with the appropriate pweight and cluster() variables, as suggested by Long and Freese (2006, p.85), I determined that relative risk ratios (RRRs) calculated by the two command

versions were exactly the same and standard errors the same to four or five decimal places. I then

ran both tests of the IIA: the Hausman test supported the null hypothesis of independence among

outcome categories and the Small-Hsiao did not. In other words, the Small-Hsiao test did not

confirm the null hypothesis that eliminating any outcome category has no significant effect on

comparisons between other categories, suggesting that the IIA assumption does not hold for this

study's effective sample.

Binary Logistic Regression

To further explore the relationship between the independent variables and participation in

a credential program, I ran two binary logistic regressions: first, with the same independent

variables as used in the MNL model, then adding institutional type of instruction provider as an

independent variable to the model. In order to compare variables representing type of instruction

provider for credential program participants with type of instruction provider for those adults

who only participated in work-related courses (i.e., the MNL base category of credential program

non-participants), it was necessary to analyze and recode several variables. In the survey

questionnaire, credential program participants had been asked to indicate the type of provider for

the *highest* credential program they had pursued. However, participants in work-related courses

were asked to indicate provider types for *all* courses they had participated in during the survey

period. Thus, data regarding institutional provider type for work-related course participants

included observations with *multiple* types of providers. Results of the two binary logistic

regression estimations, *excluding 210 cases* with multiple institutional instruction type providers

are compared in Table 5.

In the comparative binary logistic regression analysis, the model including type of

institutional instruction provider yielded a Pseudo R^2 of .47, as compared to a Pseudo R^2 of .36

for the model without provider type. In the final binary model (see right hand side of Table 5),

the odds of participation in a credential program were found to be significantly higher when the

instruction provider was a school or college than when the instruction was provided by a

business or industry association. For example, when the instruction provider was a vocational or

technical school or program the odds of participation in a credential program were 3.7 times

higher than when a private business provided the instruction. As discussed in connection with the

MNL model, the counterintuitive finding that *no* employer support significantly predicts

participation in a credential program may be explained by the fact that this indicator is only

applicable for adults who worked during the survey period. As in the MNL model, age, marital

status, gender, prior educational attainment, household income, household size, and motivation

were also found to be significant predictors of participation in a credential program in the binary

logistic regression models.

Table 5
Binary Logit Odds Ratios (OR) and Significance Levels, by Model

Independent Variables	Binary Logit Model with MNL Predictors ($n = 2772$; Pseudo $R^2 = .36$) Odds Ratio (OR)		Binary Logit Model plus Institutional Provider Type ($n = 2772$; Pseudo $R^2 = .47$) Odds Ratio (OR)	
Student Characteristics				
Age [17-24]				
Age 25-34	.566	*	.789	
Age 35-44	.371	***	.526	*
Age 45-54	.334	***	.430	**
Age 55-87	.260	***	.402	*
Marital Status [Single]				
Sep., Wid., Div.	.422	***	.437	**
Married	.403	***	.387	***
Female Gender	.645	**	.586	**
Race/Ethnicity [White, non-Hispanic]				

Independent Variables	Binary Logit Model with MNL Predictors ($n = 2772$; Pseudo R^2 = .36) Odds Ratio (OR)		Binary Logit Model plus Institutional Provider Type ($n = 2772$; Pseudo R^2 = .47) Odds Ratio (OR)	
Black, non-Hispanic	1.216		1.176	
Hispanic	1.625		1.264	
Other Race/Ethnicity	2.258	*	2.109	
Not Born in USA	.624		.619	
Prior Education [HS or less]				
Voc/Tech after HS	1.261		1.213	
Some college	3.026	***	1.711	*
Associate Degree	2.542	***	2.044	**
Bachelor Degree	1.495		.903	
Some grad school +	2.101	**	.842	
Household Characteristics				
Household Income [less than $10K]				
$10,001-20,000	1.026		.681	
$20,001-30,000	.522		.363	*
$30,001-40,000	.750		.605	
$40,001-50,000	.477		.291	**
$50,001-75,000	.558		.373	*
$75,001 or more	.380	**	.313	**
No. in Household [1 person]				
2 persons	1.537	*	1.371	
3 persons	1.706	*	1.630	*
4 persons	1.300		1.365	
5 persons	2.151	*	2.183	*
6 or more	1.493		1.249	
Own/Rent Status [Owned]				
Home is rented	.916		.712	
Other arrangement	.930		.605	
Urban/Rural Status [Urban]				
Urban, outside	1.132		1.108	
Rural area	1.226		1.074	
Census Region [Northeast]				
South	.849		.714	
Midwest	.935		.838	
West	.811		.872	

Independent Variables	Binary Logit Model with MNL Predictors ($n = 2772$; Pseudo $R^2 = .36$) Odds Ratio (OR)		Binary Logit Model plus Institutional Provider Type ($n = 2772$; Pseudo $R^2 = .47$) Odds Ratio (OR)	
Labor Force Status				
Weekly Hrs Worked [0]				
1-10 hrs per week	.948		.592	
11-20 hrs per week	.566		.594	
21-30 hrs per week	.522		.647	
31-40 hrs per week	.571	*	.682	
41-50 hrs per week	.512	*	.646	
51-60 hrs per week	.408	**	.533	
61-99 hrs per week	.576		1.026	
No Employer Support	2.838	***	2.427	***
Employer Req'd Cont. Ed.				
Not applicable	.480		.644	
Cont. Ed. not required	1.136		1.052	
Motivation				
Reason [Current Job]				
Earn credential	3.209	***	2.166	**
Train for a new job	7.890	***	6.407	***
Other Reasons	7.655	***	5.896	***
Distance Education	2.290	***	2.358	**
Information Literacy				
Lifetime Learning Credit	.834		1.138	
Hope Scholarship Credit	.869		.880	
Public Library use/past mth	1.142		1.221	
Public Library use/past year	.655	*	.782	
Institutional Instruction Provider[Business/Industry]				
2yr Voc/Tech or less	n.a.		3.728	***
2yr Comm./Jr. College	n.a.		10.941	***
4yr College/University	n.a.		18.629	***
Government	n.a.		1.420	
Community/Relig/Other	n.a.		1.467	

Log pseudolikelihood -1233.88   Log pseudolikelihood -1013.83
Prob > LR less than .001   Prob > LR less than .001

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

Discussion

In the workplace of the 21st century, credentials remain an important signal system to employers (Bowen, 1977/1997). And, work-related goals are clearly important to nontraditional age postsecondary credential program participants. Implications of study findings for policy, practice, and research derive from the nature of nontraditional age students in credential programs as self-directed and *goal-oriented* learners with multiple social roles and responsibilities. Here, adults who had participated via distance education technology were more than twice as likely as their counterparts who had not taken a distance education course to be in some type of credential program. Results of this study also underscore the importance of prior education as a factor influencing adult participation in postsecondary credential programs. In particular, although cases reflecting prior vocational or technical education were few, this background was found to be significantly associated with later participation in a Master's degree program. A prior background of "some college" was found to be a significant predictor of all college/university outcomes except 'Doctorate/Professional,' suggesting that appropriate re-enrollment incentives for students who "stop out" of college might successfully promote ultimate attainment of a college degree for those students.

Findings also highlight the importance of household income and size as factors influencing the career decisions of adults, and females were found to be about half as likely to be credential program participants as males. Although differences by race were not found to be significant, this study suggests a different profile of nontraditional age students than described in the earliest study of adult participation in postsecondary education (and much of the later adult education literature) where the focus had been on participation by comparatively higher income

adults in hobby or recreational activities. Instead, relative to the effective sample's credential program non-participants, this study has found larger proportions of credential program participants in low-to-moderate categories of household income. All of these findings have important institutional implications, especially for community colleges and possibly for four-year institutions with distance education programs.

For institutional researchers, this study highlights the importance of questioning whether assumptions about studies of and programs recommended for nontraditional age students may be based on outdated data, or on research that includes too broad a range of formal and informal adult education activities. Part-time or full-time status was not studied here due to ambiguity regarding cases indicating both types of participation status and a larger percentage of missing data for this variable. However, additional research on part-time/full-time status (possibly a more difficult distinction for busy adults to relate to, as compared to perceptions of traditional age students), on how best to provide convenient access to application/enrollment information, and on the role of employer support for working adults could also help institutional researchers better understand potential barriers to time-limited adults with multiple social roles and responsibilities.

In discussing credentials, Bowen (1977/1997) concludes that education is "strongly and positively associated with adaptability" (p. 142). However, he also argues that "a case can be made for critical skepticism toward new products, new jobs, new ideas, and new ways of life" (p. 142). In the United States, much of the strength of the educational system has been its broad range of alternatives and institutional diversity. Particularly for adults from lower income households of more than one person in this study, unknown barriers to college/university degree programs may have prevented greater participation in such programs. The challenge of

improving broad access to higher and postsecondary education is even more important when

adults need ongoing education in order to function in a rapidly changing society.

In contemporary society, information literacy issues can create new barriers to access and

limit the success of nontraditional students. Although the debate about multiple missions for

community colleges continues, the role community colleges play in serving large numbers of

nontraditional age students gives them unique potential (Bailey, 2002). Coincidentally, a recent

issue of *Newsweek* (Green, May 1, 2006) includes a contributed essay from the chief executive

officer of an American consulting firm. The essay was prompted by the State of the Union

Address earlier this year, in which President Bush challenged Americans to find ways to improve

American competitiveness in the world. The CEO took the time to contribute a personal account

of his own career-changing experience and argues that, in seeking to increase American

competitiveness, "many still overlook our system of community and junior colleges" (p. 22).

However, lack of mobility among types of institutions and credential programs based on

narrowly defined vocational training preclude the integration of theory with practice necessary to

encourage labor force adaptability. For today's postsecondary students of all ages, greater access

represents greater long-term opportunity only when it represents greater access to something

more than job-specific vocational training at a local community college.

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