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Community College Pathways:

A Multilevel Examination of Institutional Roles in Student Success

A dissertation submitted in partial satisfaction of the

requirements for the degree of Doctor of Philosophy

in Education

by

Felisha Ann Herrera

2012

ABSTRACT OF THE DISSERTATION

Community College Pathways:

A Multilevel Examination of Institutional Roles in Student Success

by

Felisha Ann Herrera

Doctor of Philosophy in Education

University of California, Los Angeles, 2012

Professor Richard Wagoner, Chair

Set within the context of the current fiscal and political climates, community colleges have received growing attention with their role being articulated as critical to economic recovery. Recent initiatives have heightened the expectations placed on community colleges to improve institutional efficiency and effectiveness in addressing the nation's workforce needs and increasing degree attainment rates. This emphasis on community colleges creates an opportunity for this sector of higher education to better define assessment measures to guide data-driven decisions. To inform these efforts, this study aims to provide a better understanding of the institutional factors that promote persistence, particularly in the areas that may be within the discretion of community college leaders to initiate change.

Community college scholarship has contributed greatly to an understanding of the student experiences that promote successful outcomes, yet these inquiries struggle to provide a more

sophisticated understanding of institutional contexts. The Beginning Postsecondary Students (BPS) Longitudinal Study is utilized to examine a nationally representative sample of 5,410 community college students, following their trajectories from initial enrollment in postsecondary education in 2003-04 through 2009. The study offers a unique perspective in examining students' mobility by accounting for every institution attended in students' 6-year trajectories, which resulted in an institutional sample of 1,584 colleges. After an extensive search of the literature, this study appears to be one of the first in the field of higher education to date to utilize multiple membership random effect modeling (MMREM) in applied research on college students. Advancing the statistical inquiry is particularly critical for community college research, because 2-year students have the highest student mobility rates nationally (National Student Clearinghouse Research Center [NSCRC], 2012b). Furthermore, with the improved accuracy in estimates, researchers seeking to contribute to the national dialogue on community college accountability should be confident in their capacity to publish findings with a high degree of confidence.

In addition to informing research, the results have implications for theory, practice, and policy. Institutional effects were identified in several areas where strategic decisions could be made to implement change, regarding the percentage of part-time faculty, distance learning offerings, and career placement services. Perhaps the most informative results come from the many student-level and college-level findings that point to the critical role of intentional efforts to engage students through academic integration, involvement, and interaction. Paired with these conclusions is the finding that larger investments in academic support expenditures have a strong positive impact on persistence. Higher education decision-makers need to evaluate their prioritizing of funds to determine ways to minimize nonacademic overhead and support costs to

be able to divert more resources to academic support. This research clearly highlights the

importance for a variety of community college stakeholders to better understand the relationship

between institutional efforts and student outcomes.

The dissertation of Felisha Ann Herrera is approved.

Mitchell Chang

Sylvia Hurtado

Jennifer Krull

Richard Wagoner, Committee Chair

University of California, Los Angeles

2012

DEDICATION

Dedicated to my son, in loving memory –

In our short time together, you taught me more than I could ever learn in a lifetime.

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Chapter 1: Introduction

Community colleges have traditionally served as an open access point to higher education for many American students and particularly for low-income, minority, and first-generation college students (Cohen & Brawer, 2003). There are currently 1,173 community colleges enrolling 43% of all undergraduate students in the U.S. (American Association of Community Colleges [AACC], 2010). The American Association of Community Colleges (AACC) noted that the changing economic climate has prompted a surge in community college enrollment overall in the last few years with the largest growth being among full-time students, which increased 21.4% from fall 2007 to fall 2009 (Mullin & Phillippe, 2009). In terms of persistence, only about 50% of students nationally who began at a community college in 2003–04 were still enrolled in at any institution in 2006 (Provasnik & Planty, 2008).

Since 2003 there has been a growing national focus on community college outcomes. The 2009 American Graduation Initiative (AGI), the 2010 Health Care and Education Affordability Reconciliation (HCEAR) Act, and the most recent 2011 Voluntary Framework of Accountability (VFA) have directed attention to the 2-year sector to demonstrate gains in completion rates. All of these initiatives emphasize the use of data and the creation of a culture of evidence among community colleges to inform data-driven decision-making and to measure progress.

Community colleges offer a broad range of programs addressed to a variety of student needs and interests, whether through high school completion (e.g., GED) programs, remedial education, preparation for transfer, or workforce development (Dougherty, Hare, & Natow, 2009). This list demonstrates the broad range of goals that community colleges have to balance. Community colleges need to be able respond to the expectations of a multitude of constituents across the public and private spheres (Levin, 2007). When examining certificate/degree

attainment and 4-year transfer, arguably the two primary objectives that 2-year colleges must prioritize, one can infer the complexities in fulfilling these competing missions. The nation's spotlight on community colleges represents a significant opportunity for the 2-year sector to disentangle these intricacies to establish better data collection methods, measures, and intentional assessments for identifying the institutional efforts that will promote student outcomes.

The open access policies that are a hallmark of community colleges also limit their ability to control institutional characteristics (i.e., selectivity) that have been shown among 4-year institutions to have a positive effect on completion rates. It has been established that, when compared with their 4-year college peers, community college students tend to come from lower income families, arrive with weaker academic skills, and are more likely to work while enrolled, attend part time, and interrupt their studies (Gooden & Matus-Grossman, 2002; Horn & Nevill, 2006). All of these factors have been shown in many studies to be related to lower retention and graduation rates (Adelman, 2006; Berkner & Choy, 2008; Crosta, Calcagno, Bailey, & Jenkins, 2006). As a result, one challenge in improving 2-year student outcomes points to the need to better understand how to better serve and promote achievement among the many types of students that attend community colleges. Rather than giving still more attention to the entering characteristics and barriers of community college students and what the individual can do to be more successful in navigating the postsecondary education pipeline, research can benefit from a more balanced examination of the interactive effects of students and their environments.

Institutional contexts help to shape the experiences and successes that students have while in college. However, these institutional forces are at best under-studied, or at worst ignored in the research examining community college students' matriculation patterns. A more sophisticated understanding of the impact of institutional environments on student outcomes will

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enable community college stakeholders to make better decisions regarding where to focus their efforts and funding. While community college researchers have begun to disentangle the many facets of 2-year colleges, more research is needed to examine how institutional efforts interact with student-level factors, particularly those institutional characteristics for which policymakers and stakeholders have some discretion in initiating change. This study seeks to fill this void by utilizing a multilevel approach to gain a clearer picture of how community college contexts can promote educational attainment through persistence.

National Focus and Initiatives

National efforts focusing on community colleges have been gaining momentum since 2003, beginning with the Lumina Foundation's "Achieving the Dream: Community Colleges Count" initiative, which was the first significant effort to improve student community college completion. The Lumina Foundation and participating partner organizations provided funding support through grants with the expectation that community colleges participating in the initiative would maintain a high degree of access for historically underrepresented groups. Additional goals were to increase the percentage of students who accomplish the following: successfully complete the courses they take, advance from remedial to credit-bearing courses, enroll in and successfully complete gatekeeper courses, enroll from one semester to the next, and earn degrees and/or certificates (Rutschow et al., 2011). This multi-year, national initiative emphasizes the creation of a "culture of evidence" for community college student success, which purports that programs and policies must be based on data about factors that relate to student retention and success.

The onset of the economic recession in 2007 set in motion many challenges for higher education. Over the years that followed, postsecondary institutions faced shifts in enrollment

patterns, uncertainties regarding financial aid practices, and cuts in state support of public institutions (National Student Clearinghouse Research Center [NCSRC], 2012a). At the same time, national discourse centered on community colleges as central in the efforts to ensure a lasting economic recovery and to regain a global competitive edge. Community colleges were placed at the center of the discussion focused on improving student outcomes. In President Obama's (2009) first address to a joint session of congress, he asked every American to commit to at least 1 year of higher education or career training in order to raise the proportion of college graduates to the highest in the world by 2020. Obama also later called on community colleges to increase education attainment levels by 50% over a 10-year period. The 2009 American Graduation Initiative (AGI) further articulated the role of community colleges in responding to the economic crisis with increased goals for college completion rates (Boggs, 2010). This assertion and the $2 billion dollars in allocated funding through the 2010 HCEAR Act heightened the expectations placed on community colleges.

Six national organizations (including the AACC, Association of Community College Trustees, Center for Community College Student Engagement, League for Innovation in the Community College, National Organization for Staff and Organizational Development, and Phi Theta Kappa) responded to this call by signing a statement of commitment to promote the development and implementation of policies, practices, and institutional cultures that will result in increased completion rates (AACC, 2010). Most recently there has been increased attention to accountability measures through the introduction of the VFA. The VFA reflects a considerable effort among community college leaders to collaboratively establish better measures for assessment. The premise behind these efforts is that the current metrics do not fully account for the multiple missions of community colleges in serving an array of constituents. Similarly, non-

traditional student populations enter community colleges with a wide range of objectives, many

of which do not include goals for degree attainment. The economic climate prompted surges in

postsecondary enrollment (NSCRC, 2012a), which has only added to the difficulties in defining

student outcomes with more diverse student populations and more complex enrollment patterns.

Student Mobility

Student mobility is a central concept to this study and is defined as "any academic

mobility, which takes place within a student's program of study in postsecondary education"

(Junor & Usher, 2008, p. 3). The state of the economy triggered unforeseen impacts on student

enrollments and movement across institutions. Many public institutions experienced strains on

capacity simultaneously with budget cuts and many capped enrollments (Ashburn, 2011) such as

those in California, which caused students to seek admission at institutions they might not

otherwise have attended. Many of these students turned to community colleges, while others

concurrently enrolled in multiple institutions to gain access to the courses needed to fulfill their

requirements. As college leaders and practitioners struggle with this multifaceted, ever-changing

phenomenon, researchers have begun to document these student patterns.

Community college pathways are rarely straightforward, particularly in an age of higher

education where students are increasingly mobilizing their education. Movement across

institutions often occurs throughout students' academic trajectory and in recent years individuals

appear more mobile in pursuit of their education, with linear enrollment no longer being the

dominant student pathway (Adelman, 1999; Borden, 2004). Scholars have examined the

increasing mobility seen in the 20th and 21st centuries and identified more than a dozen different

types of multi-institutional attendance that are becoming increasingly common (Adelman, 2004;

McCormick, 2003; Sylvia, Song, & Waters, 2010). "Serial transfers" are those who have one or

more transfers on the way to a final degree (Borden, 2004). These patterns of transfer create

challenges for institutional, statewide, and national efforts to track these students, because of the

lack of reliable tracking mechanisms at and between many colleges (Wassmer, Moore, &

Shulock, 2004). Thus far, the majority of higher education scholarship has largely ignored

student mobility as these trends create dilemmas for researchers interested in examining student

outcomes utilizing large national data. Within this study careful consideration was given as to

how to account for students' attendance at multiple institutions in the analysis and the

interpretation of results.

Purpose of the Study

Considering the national attention to community college outcomes and community

college leaders and stakeholders' efforts to establish better measures for assessment, higher

education researchers must also respond by providing more empirical evidence to inform policy

and practice. The push to increase national workforce initiatives calls for broadening of research

objectives that have primarily focused on transfer-bound students to examining the educational

attainment of students seeking certificates and associates degrees (Goldrick-Rab, 2010). This

study explores persistence among degree-seeking community college students.

In describing the scope and patterning of student persistence trajectories, it is appropriate

to distinguish between the persistence of students at individual institutions (institutional

persistence) and persistence within the wider system (system persistence). These are quite

different not only in character but also in scope and variability among different segments of the

community college student population. For the purpose of this study, the term *persistence* will

only refer to system-wide persistence and be used to describe a student continuing to be enrolled

in the system of higher education after 6 years. Persistence encompasses degree attainment, at

any level (i.e., certificate, associates, baccalaureate) and continued enrollment. More specifically, with regard to outcome measure in the analysis, successful persistence may include students who have attained a degree and are no longer enrolled, who have attained a degree and are still enrolled, and are still enrolled, in comparison to those who are no longer enrolled.

Research questions. To investigate persistence among community college students who entered postsecondary education with the intention of attaining a degree, this study addressed the following research questions:

1. To what extent does student persistence vary between institutions after accounting for all colleges that a student attends in the 6-year study period?

2. Controlling for background characteristics and precollege experiences at college entry, how do student environmental pull factors and student social and academic undergraduate experiences affect persistence within 6 years?

3. Controlling for individual characteristics and experiences, how do institutional predictors such as structural, student peer, and financial characteristics affect student persistence within 6 years?

Scope of Study

Data for the study come from two primary sources obtained from the Beginning Postsecondary Students (BPS) Longitudinal Study, and the National Center for Education Statistics (NCES): the Integrated Postsecondary Education Data System (IPEDS).   The longitudinal data is drawn from the BPS Longitudinal Study 6-year follow-up (BPS:04/09), a national probability sample that is a representative sample of about 4 million undergraduate students beginning college for the first time in 2003-2004 (Berkner & Choy, 2008). Eligible students were initially surveyed at the end of their first academic year (2003-04) and then

received invitations to participate in follow-up surveys 3 years after they had started in postsecondary education (2005-06) and 6 years (2008-09) after entry into postsecondary education. Institutional characteristics from IPEDS data, for all colleges attended by students during the 6-year study period, were merged to supplement the institutional measures included in the BPS: 04/09 dataset. This study examines the student and institutional factors that contribute to persistence for community college students. The sample is limited to degree-seeking students and includes 5,410 students who began postsecondary education at 380 2-year public colleges in 2003-04. The study offers a unique perspective by examining and accounting for students' mobility with information on every institution students attended in their 6-year trajectories, which resulted in the final institutional sample of 1,590 colleges. A multiple membership random effects model (MMREM) was utilized as the most appropriate and sophisticated method to investigate institutional effects while accounting for students who attend multiple institutions in their postsecondary trajectories.

The conceptual model for the study was guided by previous research and integrated constructs from Nora's (2003) Student/Institution Engagement Model and Berger and Milem's (2000) model, which imply the need to consider the relationship between individual, institutional, and environmental variables. The four sets of student-level variables are constructs from Nora's Student/Institution Engagement Model. Two of the three sets of institutional-level constructs—structural characteristics and student peer characteristics—are based on constructs from the Berger-Milem college impact model. The current fiscal climate and prior research indicating the importance of institutional expenditures (Bailey, Calcagno, et al., 2006; Kim, Rhoades, & Woodard, 2003; Ryan, 2005) point to the need to include measures of institutional finance characteristics. Resource dependence theory (Pfeffer & Salancik, 1978) guides the

inquiry of this set of variables. Therefore, the adapted conceptual model in this study allows for an examination of the institutional context over three areas: structural characteristics, student peer characteristics, and institutional finance characteristics.

Significance

The significance of this research is set within the context of the national call for increased accountability and improvement of attainment rates. Growing focus and recent funding for community colleges to boost college completion rates creates an opportunity for this sector of higher education to better define assessment measures to inform data-driven decisions. Similarly, there is a dearth of literature focused on investigating the effects of 2-year institutional contexts. This is perhaps due to the lack of access to adequate national data (Sylvia et al., 2010) or by the research focus in higher education being primarily drawn to examine 4-year students and outcomes (Townsend, Donaldson, & Wilson, 2004). The study's unique methodological approach utilizing a national sample contributes to the emerging community college literature, as this is the first time a sizeable, nationally representative, longitudinal sample of community college students has been available. The sample of 5,410 undergraduates beginning their postsecondary education at 380 community colleges provided a large scope for the examination of persistence. The study offers a unique perspective by examining and accounting for students' mobility with information on every institution students attended in their 6-year trajectories, which resulted in the final institutional sample of 1,590 colleges. In additional to contributing to the community college scholarship, this study contributes to higher education literature overall by introducing this advanced analytical method to the inquiry surrounding student mobility. After an extensive search of the literature, this research project appears to be the first study in the field of higher education to date to utilize MMREM in applied research on college students. This

analytical technique provides new insights into how to appropriately model student mobility and provides the most accurate estimates when high rates of mobility are present.

The research has the potential to inform policy decisions as institutions seek to respond to the call for community colleges to promote student outcomes. The economic climate impacting higher education prompts the need to improve institutional efficiency and effectiveness; therefore, this study aimed to better understand the influence of institutional characteristics that may be within discretion of college leaders. Identifying effective institutional characteristics can guide community college stakeholders in focusing institutional efforts on critical areas that can make the most difference in promoting persistence and completion. Policy and practice must be informed in new ways, with more empirical work, as community colleges strive to better serve the surging enrollments of diverse student populations. Community college research that is truly attuned with the intricacies of the community college pathway provides a key resource in these efforts to redefine 2-year accountability measures.

Chapter 2: Literature Review

Just as the national spotlight has increased a growing interest in community college outcomes, higher education research has now begun to focus more attention to studying community colleges. Although the lack of adequate and comprehensive statewide and national community college data has limited early quantitative research in this area (Sylvia et al., 2010), recent robust empirical studies have attempted to explore student outcomes among larger samples. Community college researchers must sort through the profuse complexities of the diverse student population. Students enter 2-year institutions with a multitude of goals, expectations, and needs, and come from many different backgrounds, levels of academic preparation, and stages in life. Furthermore, community colleges themselves encompass a diverse set of institutions with varying missions and are situated within state and community contexts that place additional expectations and goals for them to fulfill. The efforts of recent scholars to address the intricacies of community college research indicates a promising trend, given the need to understand the unique barriers, as well as successes, of the almost 50% of all beginning college students who start at 2-year institutions (Cohen & Brawer, 2003; Phillippe & Patton, 1999). In summarizing the literature on students within the 2-year sector of postsecondary education, it is first important to discuss the theoretical work that was initially developed to shed light on the college experiences and outcomes of traditional 4-year students and their relevance to community college research.

Theoretical Perspectives

Student persistence and degree attainment has been the focus of higher education research for decades. Theoretical concepts, models, and frameworks relating to student persistence, retention, and attainment have been developed and refined from over 70 years of

research aimed at explaining this phenomenon. Current persistence, attrition, retention, and attainment studies can trace their roots to the work of Astin (1993), Bean and Metzner (1985), Pascarella and Terenzini (1991), Spady (1970), and Tinto (1975, 1993). The concepts of academic and social integration (Spady, Tinto), student interactions (Pascarella and Terenzini), student involvement (Astin), and student satisfaction (Bean) have emerged and been refined over the years to create the conceptual foundations for studying the persistence, retention, development, learning, and achievement of college students. Drawn from student internationalist theoretical underpinnings and Astin's (1984) Theory of Student Involvement, these conceptual developments profoundly influence how student persistence and attainment is investigated in higher education research.

Through the early work of Spady's (1970) sociological approach, Tinto's (1975, 1993) model established the premise that retention is dependent on the student's level of social and academic integration within an institution. Tinto contended that cumulative interaction with peers and faculty over time contributed to both social and academic integration. Tinto's (1975, 1993) model has been extensively tested by researchers studying higher education persistence (for a review, see Braxton, Sullivan, & Johnson, 1997).

Bean and Metzner (1985) offered the next major conceptual development in seeking to understand why students leave college, focusing specifically on non-traditional students. They depart from the models of Spady (1970), Pascarella and Terenzini (1991), and Tinto (1975, 1993), whom they contended relied heavily on socialization to explain attrition, as non-traditional students did not have the opportunity to become socially integrated into the institution. Therefore, a different theoretical link was needed to explain attrition among these students. Bean and Metzner's conceptual model was based on a model originally developed by

Bean (1980) and then modified to its current format. Beginning with Bean, the conceptual explanation of college student attrition begins to shift to include and focus more explicitly on college experiences, consequently implying a responsibility for postsecondary institutions to retain their students.

Nora and Cabrera's (1996) Student Adjustment Model was the precursor to Nora's (2003) Student/Institution Engagement Model. Comparing Tinto's (1975) and Bean's (1980) models, Cabrera, Castaneda, Nora, and Hengstler (1992) noted that both theorists: (a) regard persistence as an interwoven set of interactions, (b) acknowledge the importance of pre-college characteristics, and (c) argue that persistence is influenced by the level of fit between the student and the institution. Nora and Cabrera's Student Adjustment Model was developed based on both Tinto's Student Integration Model and Bean's Model of Student Departure. The model effectively combines the two previous conceptual frameworks and discusses how the experiences of college students are represented by two domains: a social domain, involving experiences with fellow students, and an academic domain, involving experiences with faculty and other academic staff at the institution. These collective experiences have been shown to enhance 4-year students' academic and cognitive development, leading to academic and intellectual development, and increased commitment to both the institution and obtaining a college degree. In examining 2-year students specifically, a meta-analysis of community college research exploring the academic and social domains showed that many studies have found academic integration to exert a stronger impact on student retention in comparison to social integration (Napoli & Wortman, 1996).

Student persistence and retention models have been studied and developed based on the behavior of 4-year college students (Cabrera et al., 1992; Pascarella & Terenzini, 1991). However, acknowledging that these early models were based on "quantitative studies of largely

residential universities and students of majority backgrounds" (Tinto, 2006-2007, p. 3), their relevance to 2-year, non-traditional, and racial minority students has been questioned (Braxton et al., 1997; Braxton & Lien, 2000; Rendon, Jalomo, & Nora, 2000). The unique nature of community colleges in serving students on many academic levels with varying goals calls for more focused research on persistence and attainment specifically among community college students.

Generally, community college research has lacked a theoretical model that reflects the diversity of community colleges, although some of the variables fit the conceptual models used among 4-year students. Just as other studies have sought to operationalize the relevant aspects of 4-year frameworks (Bers & Smith, 1991), this study draws from Nora's (2003) Student/Institution Engagement Model and the Berger and Milem (2000) Organizational Impact on Student Outcomes Model with a resource dependence theoretical lens to inform the conceptual model guiding this investigation of community college student outcomes.

**Nora's (2003) Student/Institution Engagement Model.** Nora's (2003) Student/Institution Engagement Model was developed from Nora and Cabrera's (1996) model and expands upon earlier persistence frameworks as it recognizes influential factors that are more thoroughly descriptive of minority and non-traditional students (Rendon et al. 2000). This unique feature made it particularly useful for this study focused on community college students, given the high proportion of minority and non-traditional students that begin their education at 2-year institutions (Provasnik & Planty, 2008). Nora's framework addresses the pre-college and in-college experiences that affect student persistence to degree completion. Drawing from the existing theories and research, Nora devised a model consisting of six major components: (a) pre-college/pull factors, (b) sense of purpose and institutional allegiance, (d) academic and social

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experiences, (e) cognitive and non-cognitive outcomes, (f) goal determination/institutional commitment, and (g) persistence (see Figure 2.1).

The first component of the model addresses the pre-college preparation and pull factors can deter students from higher education. Students enter postsecondary education with a distinct set of pre-college characteristics reflective of both their home and school environments. Pre-college academic experiences include their collective high school experiences and prior academic achievement. Additionally, the framework expands upon the outside influences or environmental pull factors that may affect persistence among disadvantaged groups (i.e., minority, low-income, and non-traditional populations), such as various family responsibilities, work responsibilities, whether the student receives financial aid, and whether the student commutes to college.

The second component involves students' commitment and decision to remain enrolled in college (Nora & Cabrera, 1996). Entering students bring with them a sense of purpose, often measured by their educational goals and degree aspirations. Students with a clear sense of direction are more likely to engage in activities that will help them to integrate socially and academically into the institution. Furthermore, it has been shown that community college students who are strongly committed to their chosen institution are more likely than their less-committed peers to participate in the types of activities that provide the support they need to meet the challenges faced during the initial year of college and as a result are more likely to persist (Hagedorn, Maxwell, & Hampton, 2002).

Student/Institution Engagement Model Theoretical Framework

Pre-college Factors & Pull-Factors

Initial Commitments

Academic & Social Experiences

Cognitive & Non-cognitive Outcomes

Final Commitments

Persistence

Pre-college Factors & Pull-Factors

Pre-college Ability

Psychosocial Factors
High School
Home Environment

Financial Assist./Need
Tangible
Intangible

Encouragement & Support from Family

Environmental Pull Factors
Family Responsibilities
Work Responsibilities
Commuting to College

Initial Commitments

Educational Aspirations
Commitment to Attending a Specific Institution

Academic & Social Experiences

Formal/Informal Acad. Interactions with Faculty

Involvement in Learning Communities
In-Class Experiences
Outside of Class
Collaborative Learning

Social Experiences
Peer Group Interactions
Involvement in Organizations

Campus Climates
Perceptions of Prejudice/Discrimination
Tolerance versus Acceptance

Validating Experiences
Encouragement & Support from Faculty/Staff

Mentoring Experiences
Faculty
Peers
Counseling/Advising
Staff

Cognitive & Non-cognitive Outcomes

Academic Perf.
Grade Point Average

Academic & Intell. Development
Perceived Cognitive Gains
Actual Gains

Noncognitive Gains
Apprec. of Fine Arts
Valuing Diversity
Acceptance of Others
Member of Global Society
Self-esteem
Self-efficacy

Final Commitments

Educational Goal
Degree Attainment
Graduate/Professional School

Institutional Commitment
Sense of Belonging
Worthwhile Experience

Persistence

Reenrollment in Higher Education Institution

Figure 2.1 Student/Institution Engagement Model Theoretical Framework. From "Access to higher education for Hispanic students: Real or illusory?", by A. Nora, 2003, In J. Castellanos & L. Jones (Eds), The Majority in the Minority: Exapnding the representation of Latino/a faculty, administrators, and students in higher education. Sterling, VA: Stylus Publishing, LLC.

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The third component of the model—academic and social experiences—emphasizes the unique interaction between the student and the institution. This interaction, influenced by a variety of elements, produces a connection (i.e., engagement) between the student and the institution that leads to persistence. Engagement is central to the theory, and Nora (2003) argues that involvement and interaction occur in a number of arenas (e.g., academic and social) over the college years. Students are presented with a multitude of opportunities both in and out of the classroom that create an academic climate that exerts a positive association between the student and the institution. Students' commitment to attaining a degree can be solidified through formal and informal interactions with faculty and fellow students in both academic and non-academic arenas.

The fourth component involves several cognitive and non-cognitive outcomes that can result from academic and social experiences. Cognitive factors reflect academic performance evident through college grade point averages (GPAs) and other performance measures. Non-cognitive gains include critical thinking, appreciation of fine arts, conceptualization skills, etc. The fifth component is related to the gains student experience in their academic and social lives. Student institutional allegiance and sense of belonging is reflected when students come to value and view their college experience as meaningful and worthwhile in the long term. Goal determination relates to the extent students are determined to attain future goals, which may include going to graduate/professional school. Lastly, the five components of Nora's model relate to the final component of persistence. Persistence refers to whether the college is successful in creating a space where the student feels passionate enough about his/her education to reenroll in the institution (Nora, 2003).

This study drew from Nora's (2003) Student/Institution Engagement Model to inform the student-level conceptual model that guided the selection of variables and review of literature on student-level predictors of persistence. For simplicity's sake, this study adapted an abbreviated version of Nora's model with five categories: (a) demographic characteristics, (b) precollege experiences, (c) environmental pull factors, (d) undergraduate experiences, and (e) successful student outcomes. Demographic and precollege experiences can be mapped onto Nora's conceptualized precollege factors. Environmental pull factors are distinguished as a set of components to more fully explore the unique environmental factors that are relevant for community college students. Undergraduate experiences include both academic and social experiences, as well as student cognitive and non-cognitive outcomes. Finally, the last component is reflective of persistence. Specifically, Nora defined persistence as reenrollment at the same institution. This study defines persistence as attaining a degree or continued enrollment after 6 years.

Berger and Milem's (2000) Organizational Impact on Student Outcomes Model. According to Berger (2000), research focusing on the impact of college on students generally ignores the link between organizational behavior and student retention, degree attainment, and other student outcomes. Given the dearth of community college literature focused on institutional influences (Calcagno, Bailey, Jenkins, Kienzl, & Leinbach, 2008), it can be inferred that this research focus is even more scant in 2-year studies. Berger and Milem (2000) combined sociological and organizational theory to develop a conceptual model describing the relationship between organizational behavior and student outcomes, explicitly identifying organizational behavior as a source of influence.

While focusing on the relationship between organizational behavior and student outcomes, the Berger and Milem Organizational Impact Model (2000) draws most heavily from student departure theory and organizational theory. Specifically, the model draws strongly from works of Astin (1993), Bean (1980), and Tinto (1975, 1993), and contributes to the field by providing an organizational viewpoint. Berger and Milem (2000) modified and extended the typology of Bolman and Deal (2003), which looked at organizational life through four different "frames" of reference—the structural, human resource, political and organizational culture and symbols—that provide often-referenced categories of analysis, intentionally addressing both public and private organizations. Similarly, the Berger and Milem model includes five dimensions or categories for analysis: (a) systemic, (b) bureaucratic/structural, (c) collegial, (d) political, and (e) symbolic. Although this study uses the concept of behavioral impact, these measures are less tangible and difficult to measure using existing data. Therefore, doing so is beyond the scope of this study on persistence. However, the Berger-Milem model offers a useful framework for examining the influence of institutional characteristics, as it identifies other aspects of the institutional context in addition to organizational behavior that are associated with student outcomes.

The Berger-Milem (2000) model includes student outcomes and four areas of independent variables, including: organizational characteristics (structural characteristics), student entry characteristics, peer group climate, and student experiences (see Figure 2.2). Berger and Milem identify structural organizational characteristics such as size, selectivity, public or private, location, degree offerings, and other structural elements. Berger and Milem posit that student entry characteristics (e.g., race/ethnicity, socioeconomic status), when aggregated, shape

the peer characteristics of an institution; therefore, these college-level measures of student

characteristics were included in this study's conceptual model.

**Figure 2.2 Organizational Impact on Student Outcomes Model**
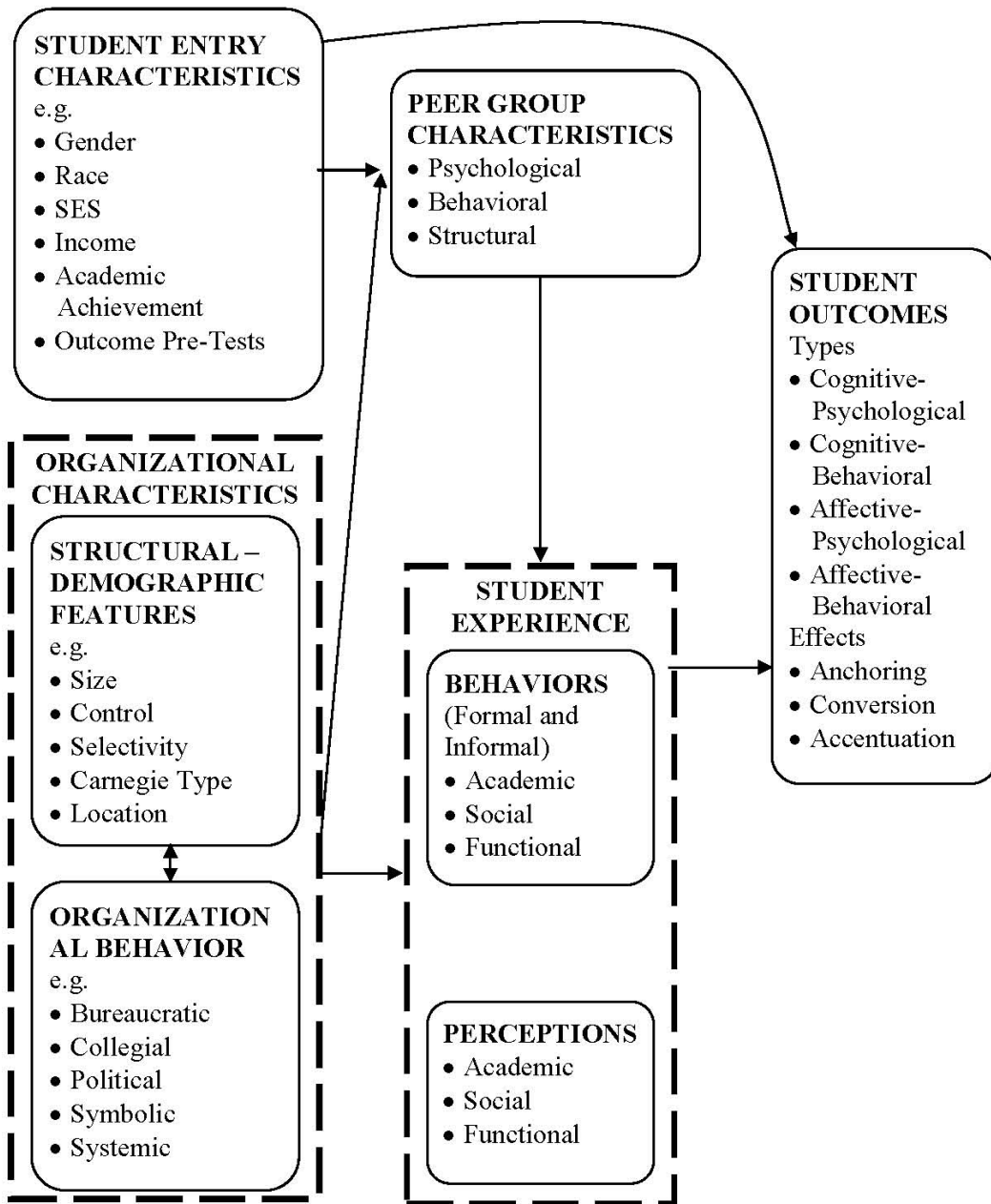
Figure 2.2. Organizational Impact on Student Outcomes Model. From "Conceptual Model for Researching Organizational Impact on Student Outcomes", by J.B. Berger and J. F. Milem, In J.C. Smart (Ed), Higher Education: Handbook of Theory and Research. New York: Agathon.

The Berger-Milem (2000) model provides two measures of institutional context that are utilized in this study: (a) structural characteristics and (b) structural-demographic characteristics. However, it is lacking in one critical area of institutional context, specifically institutional finance characteristics. Higher education institutions, society, and researchers have devoted relatively little attention to the role and effect of institutional expenditures on college students. Student-level conceptual frameworks of persistence have devoted even less attention to this subject. A critical review of important conceptual frameworks developed by Bean (1980), Spady (1970), and Tinto (1975) reveals that institutional expenditures are not identified as an integral component in any of these models. For example, Astin (1993) devotes less than two pages to the issue of institutional expenditures. He suggests that the percentage of expenditures devoted to student services has a positive effect on student perceptions and attitudes, while the percentage of instructional expenditures has a similar, albeit more modest and indirect, effect. Given the recent financial climate, the focus on community college accountability and prior research indicating the importance of institutional expenditures (Bailey, Calcagno, et al., 2006; Gansemer-Topf, 2004; Kim et al., 2003; Ryan, 2005; Thomas & Bean, 1998; Wyman, 1997), this study drew from a resource dependence perspective to explore institutional finance characteristics.

Resource dependence theory. Although Berger and Milem (2000) draw from open-systems theories (Birnbaum, 1988), to explore the systemic dimension of organizational behavior from several perspectives, including resource dependence, they do not explicitly explore how organizational finance might impact student outcomes. Resource dependence theory (Pfeffer & Salancik, 1978), a major strand of open systems theory that focuses on the nature of environmental influence on organizations, postulates that an organization's ability to achieve an

outcome is determined by the environment in which it must operate. From this perspective, the environment impacts postsecondary institutions because of the dependency on ecological constituents and entities for resources (Bess & Dee, 2007). The conditions of this environment are shaped by external entities (i.e., local, state, and federal government; educational and community organizations), postsecondary institutions, and the inter-organizational relationships that exist between them (Pfeffer & Salancik, 2003). In other words, colleges are not just reactionary respondents, but rather are proactive players that must manage conflicts and demands.

This study utilized resource dependence theory positing that institutions not only are dependent on external resources and contingencies in the environment (Pfeffer & Salancik 1978), but also employ strategies to negotiate the financial context. Resource dependence theory suggests that colleges must take strategic actions to adapt internally in order to survive in ever-changing fiscal environments. It is important to consider the context within which organizational decisions are made. Thus, this inquiry acknowledged the broader political and financial environments that impact postsecondary education. Specifically, the study focused on two current ecological conditions: (a) the economic downturn, which impacted the scarcity of higher education resources; and (b) the heightened focus on community colleges to improve educational outcomes and contribute to workforce initiatives. College's internal adjustment to changes in the availability of external resources is evident by the institutional choices to prioritize specific functions (i.e., instruction, academic support, student services, administrative), as demonstrated by larger investments and expenditures in these areas. These strategic actions to allocate funds to specific areas and institutional goals have been hypothesized to affect organizational behavior (Leslie & Slaughter, 1997). Therefore, this inquiry sought to understand how these financial

decisions effect organizational behavior and go beyond simply recognizing the role of financial contexts by linking to the central focus of Berger and Milem's (2000) model to explore how this dimension of organizational behavior impacts student persistence.

Drawing from both the Berger and Milem (2000) model and resource dependence theory (Pfeffer & Salancik, 1978), the conceptual model in this study investigated institutional context over three areas: structural characteristics, student-peer characteristics, and institutional finance characteristics.

Summary of Theoretical Framework

This study drew from relevant aspects of two persistence frameworks—Nora's (2003) Student/Institution Engagement Model and the Berger and Milem (2000) Organizational Impact Model—in addition to resource dependence theory (Pfeffer & Salancik, 1978) to inform the conceptual model, guiding a multilevel examination of persistence among degree-seeking community college students. At the student level, Nora's Student/Institution Engagement Model provides an insightful framework for examining the influence of students' experiences in four areas: (a) demographic characteristics, (b) precollege experiences, (c) environmental pull factors, and (d) undergraduate experiences. This model was particularly useful to this study focused on community college students as it recognizes influential factors that provide insights into understanding the experiences of minority and non-traditional students (Rendon et al., 2000). At the institutional level, the Berger-Milem model informs key measures of the institutional context with respect to two components: structural characteristics and student-peer characteristics. Considering the recent calls for accountability measures linked to funding and current fiscal climate described earlier (see Chapter 1), this study expanded on the Berger-Milem model through a resource dependence perspective (Pfeffer & Salancik, 1978) to include institutional

finance characteristics. Taken together, these three theoretical perspectives, along with findings from empirical research, informed a comprehensive conceptual model to guide the multilevel investigation.

Prior Empirical Research on Persistence

This study relied heavily on the previously explained theoretical concepts to investigate the student and institution-level influences on community college students' persistence. This section will first give an overview of relevant national community college studies. Then, empirical findings related to community college persistence will be outlined, building off the identified relevant components of Nora's (2003) Student Engagement Model, the Berger-Milem (2000) model, and resource dependence theory (Pfeffer & Salancik, 1978). Empirical findings will be followed by a discussion of limitations and gaps, which will aid in setting the research context for this study's goal of investigating persistence and attainment.

Generally, community college research is restricted, as researchers have been lacking access to good national and statewide data, often resulting in 2-year studies that are less robust with sample sizes that limit the analytical techniques that can be employed. Cofer and Somers (2000) analyzed data from the 1996 National Postsecondary Student Aid Study (NPSAS:96) to understand the persistence patters of 7,510 students enrolled in 2-year colleges. Logistic regression was used to predict within-year persistence from student background characteristics, aspirations, college experiences, and college costs and subsidy. Cofer and Somers compared their findings to two earlier studies using NPSAS:87 data to examine within-year persistence. Both of these previous studies focused on the effects of tuition and aid on persistence among distinct samples; Hippensteel, St. John, and Starkey's (1996) sample consisted only of adult students and St. John and Starkey's (1994) sample was focused on traditionally-aged students.

Cofer and Somers' analyses included all students and revealed different results than the two previous studies. Race and income were not significant predictors in Cofer and Somers' research. In this more recent study, students older than 30 years of age were more likely to persist than student aged 22-30, as were dependent students. Students who completed a GED were significantly less likely to persist than those with a high school diploma. Students with a goal of pursuing a college degree or an advanced degree had a higher likelihood of persisting compared to those who did not desire a degree. These results contradicted St. John and Starkey's findings, as students seeking advanced degrees were less likely to persist. Full-time students also had a higher likelihood of persistence than part-time students. Students with low first year GPAs were less likely to persist than those with higher GPAs. Students attending public institutions and those who had higher amount of grants and loans were all more likely to persist. In contrast, both Hippensteel and associates and St. John and Starkey found higher grant amounts to be a negative predictor of persistence. Lastly, students attending institutions with higher tuition had a lower likelihood of persistence.

Although it was helpful to see the comparisons that Cofer and Somers (2003) made with earlier research, their research had several limitations. The 1 year time frame of the of the NPSAS data points restricts the usefulness of the study's results. Within-year persistence is an important outcome, but the NPSAS survey does not provide information on students' experiences during that critical first year. Therefore, one learns very little from the work of Cofer and Somers, Hippensteel and associates (1996), and St. John and Starkey (1994) about college experiences that can facilitate or hinder persistence. Similarly, these analyses include a few institutional factors (i.e., public vs. private), yet not one of these studies utilized multilevel

techniques to better assess the institutional affects of these factors and account for the clustered nature of this national dataset.

The most up to date, robust, single-level study is Bailey, Jenkins, and Leinbach's (2006) research examining community college persistence using national data from the Beginning Postsecondary Student Survey 1996-2001 (BPS:96/01). Utilizing a sample of 1,080 students who began college at a 2-year institution, the study used logistic regression to predict attainment of a degree/certificate or transfer to a baccalaureate institution within 6 years, measured as a dichotomous successful student outcome. Bailey and associates explored student characteristics, student intentions, and college experiences as predictors. In terms of background and precollege characteristics, the researchers found that African American students were significantly less likely to attain or transfer than their White peers. There were no other significant effects based on racial identification as Latino, Asian, or selecting "other" as a racial/ethnic category. Age was also a negative predictor, as students who entered college at age 23 or older were significantly less likely to attain a degree or transfer in comparison to younger students.

Parental education also mattered, as findings revealed that parental education of a bachelor's degree or higher is a significant positive predictor of attainment or transfer. Students with intentions to transfer, in comparison to those who sought to gain job skills, were more likely to attain or transfer. A second identical model added a control for degree aspirations in place of reasons for enrolling (i.e., gain job skills, transfer) and found that both bachelor's and post bachelor's degree aspirations in comparison to no degree aspirations were significant predictors of success. Other background and precollege characteristics that were examined, but not found to have a significant effect, included gender, income, disability, receiving financial aid, and having received a GED in lieu of a high school degree (Bailey, Jenkins, et al., 2006).

Whereas Bailey, Jenkins, and associates' (2006) investigation was limited in the college experiences explored, there were a few significant findings. Students who were enrolled full-time had a higher likelihood of attainment or transfer than those who enrolled part-time. Additionally, students who enrolled in remedial courses were less likely to attain or transfer than those who did not utilize remedial education. Initial enrollment in a certificate program was also included in the model but was not found to be significant. Overall, Bailey, Jenkins, and associates' research reflects a concerted effort to explore attainment and transfer among a large nationally representative study. However, the study was restricted primarily to an exploration of background and precollege characteristics; therefore, the findings provide little information about the influence of college experiences and the educational interventions that make a difference among the diverse students who enter college via the 2-year sector. The study employed single-level techniques and did not account for the between-institution differences or the salient institutional characteristics that can impact student-level outcomes.

Another stream of literature has looked specifically at community college students' baccalaureate attainment. Although it is known that many community college students have no intention of attaining a bachelor's degree (Alfonso, Bailey, & Scott, 2005), the transfer function leading to baccalaureate attainment is an important and relevant outcome. A common way that researchers have explored this has been simply to assess bachelor's degree completion among samples that include students who begin postsecondary education at both 2 and 4-year institutions. Researchers compare general community college entrants with bachelor's degree aspirations to similar students who begin their postsecondary education at a 4-year institution. Thus, they remove community college students who aspire to less than the baccalaureate degree from the sample. Accordingly, they are comparing students who aspire to a 4-year degree, but

vary in where they choose to begin their postsecondary education. Researchers employing this strategy are disadvantaged because of different characteristics found among community college students that are often unaccounted for, yet can have a significant impact on degree attainment.

Alfonso (2006) adds statistical rigor in comparison to previous research by examining a sample of 8,890 students obtained from the National Education Longitudinal Study (NELS) to determine how initially attending a community college, rather than a 4-year institution, affects the probability of baccalaureate attainment. NELS followed a nationally representative cohort of 1988 eighth graders for a period of 12 years, with follow-ups in 1990, 1992, 1994, and 2000. In addition to controlling for traditional predictors (e.g., race, gender, social class, parent education level, college major, prior academic achievement), the study also controlled for students' degree aspirations, attendance pathways (i.e., full-time, part-time, interrupted, and delayed enrollment), and students' self-selection to attend either a community college or a 4-year institution. Alfonso determined that community college students were 29.3% less likely to earn a bachelor's degree than those who began their education at a 4-year institution, even after controlling for traditional predictors, educational expectations, and attendance pathways. When adding controls for self-selection, the diminished likelihood of attaining a bachelor's degree grew larger (-33.2%) for those who initiated their education at a community college. In terms of descriptive differences, Alfonso found that community college students who aspired to a bachelor's degree or higher were more likely to delay enrollment (14.5% vs. 4.5%), to enroll part-time (75.3% vs. 61.9%), to enroll in remedial education (51.4% vs. 22.4%), to experience interrupted enrollment patterns (41.9% vs. 27.9%), and to come from a lower social class than those who matriculated to 4-year institutions. All of these factors were related to a lower likelihood of community college students attaining a bachelor's degree. Alfonso's research uses advanced methods to further the literature;

however, the sample was not representative of all students enrolled in community colleges as the data were cohort-based.

Empirical Findings to Theoretical Concepts

This section will outline empirical findings related to community college persistence while mapping them to the relevant components of Nora's (2003) Student Engagement Model, the Berger-Milem (2000) model, and resource dependence theory (Pfeffer & Salancik, 1978).

Student background characteristics. Several background characteristics including age, gender, race, parental education, and income have been investigated in the community college literature. While much of higher education research is primarily concerned with the impact of college experiences, it is important to control for salient background characteristics in order to disentangle and reveal the effects of college. Therefore, the literature is examined to identify the key student background predictors that influence persistence.

Age. Students' age has been considered a major factor influencing student outcomes in numerous community college studies. However, these studies show contradicting results. Both Bailey, Jenkins, et al. (2006) and Cofer and Somers (2000) found a negative relationship between age and community college persistence. Several other studies have confirmed these results (Hagedorn et al., 2002; Lanni, 1997), demonstrating that as student age increased, persistence rates reduced significantly. Therefore, younger students were more likely to persist than older students. In contrast, Zhai and Monzon (2004) found that students 24 years of age or younger were less likely to persist; however, this study employed basic descriptive statistics to make this claim. Hippensteel et al. (1996) demonstrated the same negative association with students younger than 20 years of age in a logistic regression using a nationally representative sample of adult students. Lastly, Feldman (1993) revealed a curvilinear relationship between age

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and community college persistence among a sample of 1,140 community college students. According to her logistic regression analysis, students in the age range of 20-24 were 1.77 times more likely to drop out than students aged 19 or younger.

These contradictory results can be explained using several reasons. Research has consistently found that older students have more competing demands for time compared to younger students. Older students are more likely to have acquired several different roles, such as being an employee, a spouse/life partner, or a parent, and have to navigate a collegiate system structured to accommodate younger students (Hagedorn, 2005). Students may be less able to focus on the role of a student when they have acquired more competing roles that must be fulfilled (Jacobs & Berkowitz King, 2002). In contrast, several researchers indicated potential advantages older students may have. For example, Kinser and Deitchman (2007) suggested that older students tend to be more vocationally oriented and see the benefits of schooling. Thus, clearer goals may lead to better work habits, consequently leading to higher retention rates. Similarly, older students may have greater financial resources, thus providing support for tuition that allows them to continue their education.

Gender. Gender is another control often used in community college persistence studies. While neither Bailey, Jenkins, et al. (2006) and Cofer and Somers (2000) found significant affects related to gender, several other studies found some association between gender and persistence (Chen & Thomas, 2001; Lanni, 1997; Nippert, 2000-2001; Zhai & Monzon, 2004) and transfer (Lee & Frank, 1990). Nippert (2000-2001) examined a longitudinal sample of 262 students who began their freshman year in college at a 2-year institution in 1986. Utilizing the Cooperative Institutional Research Program (CIRP) surveys, which follow up with these students in their fourth year of college (1990), the study employed multiple regression to investigate the

educational degree attainment of 2-year college students. Women were significantly more likely to reach higher levels of degree attainment than men. Chen and Thomas (2001) found similar results among 1,243 vocational technical college freshmen. Using registrar and administrative data to examine freshman-year to sophomore-year persistence, the logistic analyses discovered that women had a significantly higher probability of persistence than men. Higher persistence rates in women can perhaps be attributed to findings revealing that female community college students achieve significantly higher grades than male students (Grimes, 1997).

In examining transfer, Surette (2001) examined a sample of 2,413 women and 2,349 men using the National Longitudinal Survey of Youth (NLSY). This study demonstrated that women are less likely than men to transfer and tested several plausible explanations for the transfer rate difference. Their results suggest that marital status, the presence of children, and gender differences in occupational preferences do not fully explain women's lower transfer rates. Despite controlling for these and other factors, women remain less likely than men to transfer from a 2-year to a 4-year college.

Race/ethnicity. Community college studies demonstrating significant effects of race/ethnicity are limited and those that do exist show conflicting results. In predicting transfer, several studies found race to be negatively associated with transfer (Dougherty & Kienzl, 2006; Wang, 2010) and others found no direct effects (Allen, Robbins, Casillas, & Oh, 2008). Bailey, Jenkins, et al. (2006) and Cofer and Somers' (2000) national persistence studies found no significant effects related to race/gender. However, several single institution studies did find race/ethnicity to be associated with persistence. Feldman (1993) found that white students had higher retention rates than African American students. Similarly, two studies done at the same predominantly Black community college (77% of the student population was African American)

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found a positive association with persistence and racial identification as a minority. Zhao (1999) used logistic regression to investigate persistence among 1,249 degree-seeking first-time students. The analyses revealed that minority students were significantly more likely to persist than White students. Similarly, Hawley and Harris (2005) examined 133 freshmen at the same institution and also demonstrated that African American and Latino were strong predictors of retention, while being a Mexican-American student was a significant predictor of dropout. The mixed results regarding race/ethnicity demonstrate the need for more studies utilizing advanced statistical techniques among nationally representative samples. It is difficult to compare and assess results among single-institution or small sample studies, as the unique composition of these sample limits their generalizability.

Pre-college experiences. Prior literature has identified several precollege experiences that are important to consider in assessing community college outcomes. These include socioeconomic status, academic preparation, and delayed enrollment.

Socioeconomic status. Another background characteristics often controlled for in persistence studies is socioeconomic status (SES). Researchers often operationalize SES as a combined measure of both of parental education and income (either parental income, student income, or a combination). However, many studies may also include only a single measure of parental education or income as a proxy for SES. Additionally, single measures of mother or father's education have been used in place of a combined parental education measure or as a proxy for SES (e.g., the use of mother's education as a proxy for SES). Persistence studies on community college students often find no significant effect of SES (or its proxy) after controlling for other characteristics and experiences (i.e., Cofer & Somers, 2000; Nippert, 2000-2001). In contrast, SES is often found as a significant predictor of transfer (i.e., Allen et al., 2008;

Dougherty & Kienzl, 2006; Wang, 2010). Allen and associates (2008) compared two structural equation models, the first predicting within-institution retention vs. drop out and a second model predicting transfer vs. drop out. The effect of SES on transfer vs. drop out was stronger than its effect on retention.

Garardi (1996) found both father's education and income to be significant positive predictors of graduation among a sample of 307 entering freshmen at a technical college who were tracked for eight semesters. Pascarella, Smart, and Ethington (1986) examined a sample of 825 (418 men and 407 women) community college students who responded to the 1971-1980 CIRP surveys. In fitting a structural equation model exploring degree completion for both men and women, findings for the sample of women revealed a positive direct effect of SES on degree persistence. In terms of parental education, Bailey, Jenkins, et al. (2006) indicated that parental education of a bachelor's degree or higher is a significant positive predictor of attainment. Crisp and Nora (2010) also found higher parental education to be positively related to second and third year persistence among a sample of 570 Hispanic community college students. Community college students are much more likely to come from households in the lower SES quartiles, which has been shown to be related to lower retention and graduation (Bailey, Alfonso, Scott, & Leinbach, 2004). Therefore, SES is an important control to include in persistence studies among 2-year students.

Academic preparation. Not surprisingly, studies consistently demonstrate that students' prior academic achievement is the most powerful predictor of postsecondary persistence and attainment. Measuring prior academic achievement among community college students can be a challenge given that a larger percentage of them (in comparison to 4-year students) do not complete a regular high school degree, having entered postsecondary education by receiving a

GED or through an alternative route (Provasnik & Planty, 2008). Thus, community college researchers have used measures such as: high school type, in addition to high school GPA; number of years (or highest level completed) of high school Math and English; and high school Math and English assessment scores.

After controlling for both high school GPA and high school type, Cofer and Somers (2000) did not confirm a significant effect for GPA, but revealed a negative effect of completing a GED vs. a high school diploma. Crisp and Nora (2010) included both high school GPA and the highest level of high school math completed and found high school GPA to be non-significant, while higher levels of math were positively associated with persistence among Hispanic students. Feldman (1993) found high school GPA to be the strongest predictor of retention. Similarly, Pascarella and his colleagues' (1986) findings for male community college students demonstrated high school GPA as having a positive direct effect on degree completion. Nippert (2000-2001) used a two-item scale consisting of respondents' high school GPAs and their high school rank to measure high school academic record, which was a positive predictor of degree attainment. Chen and Thomas (2001) measured prior academic achievement with entrance exams, which were reported to be positively associated with persistence in their research on vocational technical students. Still other studies used reading and writing assessment scores to reflect prior academic achieve and found a positive association between these scores and retention (Lanni, 1997) attainment (Garardi, 1996) or transfer (Wang, 2010). Regardless of how community college researchers have operationalized college preparation, it has subsequently been demonstrated to strongly relate to persistence, retention, and degree completion.

Academic preparation. An additional precollege experience is the length of time an individual delays college enrollment. Delaying enrollment into postsecondary education after high school is associated with an increased risk of departure (Horn, 2009) and decreased likelihood of persisting to graduation (Adelman, 1999, 2006; Provasnik & Planty, 2008). Crisp and Nora (2010) confirm these findings, reporting that delaying enrollment in college decreased the odds that a student would persist, transfer, or earn an associate's degree in 2 years. Similarly, Hawley and Harris (2005) found that longer periods of time between the end of high school and college entry was a significant negative predictor of within-year persistence. Still other community college studies did not include a measure for delayed enrollment, but utilized age as a proxy. Specifically accounting for the number of years a student delays college may contribute more insight to the literature.

Environmental pull factors. As conceptualized in Nora's (2003) framework, environmental pull factors can exert a *pulling away* or a *drawing in* of students. Environmental pull factors include student's family and financial responsibilities, such as the need for full-time employment, financial independence, supporting dependents (i.e., children), and whether or not a student receives financial aid to alleviate these burdens. Community colleges serve many older students who face additional challenges to educational success because they are more likely to work full-time and may have families to support—characteristics that have been shown to be significant barriers to educational success (Gooden & Matus-Grossman, 2002). Findings by Schmid and Abell (2003) suggest that community college students who have children at home, are single parents, and are financially independent are less likely to remain enrolled in college. Cofer and Somers' (2000) results demonstrate that financially independent 2-year students were less likely to persist compared to those who depended on others financially.

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Employment has also been negatively associated with student retention. Gabriel (2001)

conducted research at Northern Virginia Community College to investigate reasons for non-

persistence. Results from telephone interviews showed that work and financial issues were

reasons students gave for not returning to college. Dougherty and Kienzl (2006) reported that

students who worked less than 40 hours per week had a higher likelihood of transfer than those

who worked more than 40 hours per week. Crisp and Nora (2010) reported that more hours

worked per week resulted in a decreased likelihood of third year persistence for Hispanic

community college students. Additionally, higher amounts of financial aid increased students'

odds of persistence. Considering that low SES has significant influence on 2-year student

persistence (Cofer & Somers, 2000; Garardi, 1996; Nippert, 2000-2001), extra funds in the form

of financial aid may help students in need and relieve the stress of employment, thereby

promoting persistence. Results from several community college studies confirmed that students

who received financial aid were more likely to persist than students who did not receive financial

aid (Cofer & Somers, 2000; Lanni, 1997; Makuakane-Drechsel & Hagedorn, 2000). Clearly, the

need to consider finances is important within the 2-year sector, as Hawley and Harris' (2005)

analyses revealed that even the expectation that a student will have trouble financing college is

negatively associated with persistence.

Undergraduate experiences. Although the previous empirical findings offer important

insights into how students' background characteristics may influence persistence, as higher

education researchers are often more interested in how college experiences can promote

successful student outcomes. This is particularly important in the 2-year sector where the

mission of providing open access to postsecondary education provides for a much more diverse

student body that often possess characteristics that have been shown to put students at risk for

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attrition. The following sections highlight some of the more salient activities in which community college students engage during college that may promote persistence and degree attainment. These undergraduate experiences include students' academic goals, enrollment intensity (full-time vs. part-time), whether or not a student is required to take remediation courses, first year college GPA, and academic and social integration.

   Educational goals. A discussion of students' entering educational goals is important because attendance itself may increase community college students' ambitions for further learning and enhance educational expectations (Alexander, Bozick, & Entwisle, 2008). Some scholarly work contends that students may come in with high expectations or unrealistic attainment goals and the college experience can lead to a decrease in students' original education goals (e.g., Rosenbaum, 2001). Alternatively, Alexander and associates' (2008) analyses suggest that 2-year college attendance is associated more with increased educational goals than with decreased goals.

   In relating degree aspirations to persistence, Bailey, Jenkins, et al. (2006) results among a nationally representative sample are telling. Students with intentions to transfer in comparison to those who sought to gain job skills were more likely to attain or transfer. Similarly, Hawley and Harris' (2005) analyses of students attending a predominately Black community college concluded that those with initial plans to transfer were significantly more likely to persist than those without initial plans to transfer. Bers and Smith (1991) found that students with the objective of completing a degree or transferring were also more likely to persist. Bailey and associates also ran a second identical model that controlled for degree aspirations in place of reasons for enrolling (i.e., gain job skills, transfer), indicating that both bachelor's and post-bachelor's degree aspirations in comparison to no degree aspirations are significant predictors of

success. Several other studies support these results, concluding that higher educational goals positively predict community college persistence (Hagedorn et al.; 2002; Perin, 2006). Further, Voorhees and Zhou (2000) found that community college students who reported greater goal orientation (i.e., declaring a major early in their academic pathways) were more likely to persist.

Given the highlighted community college studies suggesting that higher educational goals (i.e., degree aspirations) and a commitment to fulfilling those goals is important to persistence, more research is need to further explore these effects. Researchers need to be mindful of accounting for these goals when examining persistence, particularly within the 2-year sector, as students enter with a variety of goals. Therefore, analyzing in aggregate baccalaureate aspirants and students who aim at less than a baccalaureate degree may produce results that lead to unjustified criticism of community colleges for hindering students' educational attainment.

Enrollment intensity. Numerous researchers have indicated that students' enrollment status relates to their persistence (Bailey, Jenkins, et al., 2006; Cofer & Somers, 2000; Crisp & Nora, 2010; Feldman, 1993; Hagedorn, 2005; Hagedorn et al., 2002; Makuakane-Drechsel & Hagedorn, 2000; Mohammadi, 1994). The consistent conclusion among all these community college studies is that students who attend college on a full-time basis are more likely to have higher retention rates compared to students who attend on a part-time basis. Large-scale national research (i.e., Cofer & Somers, 2000; Bailey, Jenkins, et al., 2006) supports this conclusion, as well as single institution studies (i.e., Feldman, 1993) and research on specific populations (i.e., Crisp & Nora, 2010; Hagedorn et al., 2002; Makuakane-Drechsel & Hagedorn, 2000). Feldman found that part-time students are 2.23 times more likely to drop out compared to full-time students. Crisp and Nora (2010), Hagedorn et al. (2002), and Makuakane-Drechsel and Hagedorn (2000) all examined unique student populations, specifically Hispanic students, Hawaiian

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students, African-American males, respectively, and found identical results to these other community college studies. Enrollment intensity may influence student persistence because full-time enrollment enhances academic integration of community college students (Makuakane-Drechsel & Hagedorn, 2000). Furthermore, full-time enrollment may contribute to 2-year students' overall college involvement, which may increase their likelihood of persistence and attainment.

Remedial education. Over 50% of all new college entrants take remedial courses, many in multiple subjects (Attewell, Lavin, Domina, & Levey, 2006), and 60% of first-time community college students take at least one remedial course (Calcagno, Crosta, Bailey, & Jenkins, 2007). A considerable amount of empirical evidence has indicated that remedial interventions do not appear to influence persistence and degree completion (Bettinger & Long, 2005; Jepsen, 2006; Pascarella & Terenzini, 2005). However, some other studies have suggested the opposite: that enrolling in remedial courses has a negative effect on graduation and degree attainment (Adelman, 1999; Bailey & Alfonso, 2005). Community college research, such as Bailey, Jenkins, et al. (2006) recent national analysis and Zhao's (1999) single institution study, support the conclusion of remedial education as a negative predictor of persistence. Perhaps these findings imply that the need for remedial coursework is linked to prior academic achievement, arguably one of the strongest predictors of persistence and attainment. Hawley and Harris (2005) claimed that rather than the score itself, the amount of developmental coursework students are required to complete due to the test scores were the highest predictors of student dropout. They proposed that the more developmental coursework a student is required to take, the less likely the student will persist with his/her college education.

Academic performance. Academic performance has been shown to be the single strongest predictor of degree attainment (Adelman, 1999; Pascarella & Terenzini, 1991, 2005) and transfer (Allen et al., 2008). Students' first year GPA is the most frequent measure used to reflect academic performance in community college persistence studies. Voluminous studies have demonstrated the association between college GPA and 2-year student persistence (Chen & Thomas, 2001; Cofer & Somers, 2000; Grimes, 1997; Hawley & Harris, 2005; Makuakane-Drechsel & Hagedorn, 2000; Mohammadi, 1994; Zhai & Monzon, 2004; Zhao, 1999). First-year GPA serves as an early gauge of college success, as grades can be likened to a reward system for students. The more rewarding their academic accomplishments are for them, the more likely the students are to persist (Bean & Metzner, 2005).

Student academic and social integration. Much research has suggested that student involvement and integration on campus are key to persistence to degree attainment (e.g., Bean, 1990; Tinto, 1993). Academic and social integration are core concepts in several persistence models (i.e., Spady, 1970; Nora, 2003; Tinto, 1993). Involvement and interaction with faculty, staff, and student peers occur in a number of arenas throughout college. Napoli and Wortman (1996) conducted a meta-analysis to assess the magnitude of the effect of academic and social integration among community college students and showed that academic and social integration indeed influence attainment. Prior research observed academic integration to be more significant than social integration for community college students, with traditional forms of social integration found to be unrelated to persistence (Braxton, Hirschy, & McClendon, 2004; Halpin, 1990; Mutter, 1992; Pascarella & Chapman, 1983). Several qualitative studies examining the concepts of academic and social integration and persistence demonstrate that intellectual and social contact with faculty, staff, and other students outside of class is particularly salient (Deil-

Amen, 2011; Deil-Amen & Rosenbaum, 2003; Karp, 2011; Rosenbaum, Deil-Amen, & Person, 2006).

A few studies also explore single elements of academic integration, particularly faculty-student interactions. Schmid and Abell (2003) specifically investigated faculty-student interaction and its influence on student persistence among community college students. Their results indicate that regular faculty-student contact is one of the most important discriminating variables between returning and non-returning students. Hagedorn and colleagues' (2002) research conducted at a 2-year college focused more on the personal and social forms of faculty-student interaction as opposed to purely academic interaction. They discovered that student interaction with faculty outside of class was minimal. Approximately 80% of students indicated that they had neither discussed career matters nor socialized informally with a faculty member more than once a semester. The institutional contexts of 2-year colleges are qualitatively different from those of 4-year institutions, thus leading to the discrepancies in research attempting to map 4-year concepts to the community college setting. More research and theoretical developments are needed to fully understand what types of interaction promote persistence and what intentional efforts 2-year colleges can pursue to promote successful outcomes (Karp, 2011).

Institutional contexts. This study focused on examining the influence of 2-year institutional contexts on successful community college outcomes. Although there is a larger research base on institutional determinants of educational outcomes for 4-year institutions, few studies have been conducted specifically on community college student outcomes (Townsend et al., 2004). In identifying the 2-year institutional characteristics that promote students' academic endeavors by achieving institutional goals for retention, persistence, and completion, many

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studies have focused on the effectiveness of single institutions or systems. These limitations in

community colleges are possibly due to the prior lack of availability and access to sufficient

national data (Bailey & Alfonso, 2005). Although the literature on community college contexts is

limited, there have been recent attempts to further this research agenda as more adequate national

community college data becomes obtainable. This section will first highlight these recent large-

scale quantitative studies and then elaborate on more specific findings across several study

results.

A recent study using national data by Bailey, Calcagno, Jenkins, Leinbach, and Kienzl

(2006) indicated a negative relationship between institution size and completion rates.

Additionally, they demonstrated the importance of considering student body composition by

identifying institutions with higher proportions of racial minority, women, and part-time students

as having lower graduation rates. However, the study was limited by the use of the IPEDS,

which does not include student background characteristics (i.e., pre-college academic

preparedness) that are key indicators of persistence and completion (Borglum & Kubala, 2000;

Kirby & Sharpe, 2001). Hence, there is a need to examine both institutional characteristics and

student characteristics in assessing student outcomes.

Calcagno et al. (2008) expanded upon the work of previous research with a multilevel

examination of the institutional characteristics influencing student outcomes for those attending

community colleges. The study utilized National Education Longitudinal Study of 1988

(NELS:88) data, which followed a nationally representative sample of eighth graders for 12

years. This community college study is significant as it is one of the first attempts to utilize a

multilevel logistic regression to measure the probability that a community college student will

persist, controlling for both individual characteristics and institutional characteristics. Although

the study controls for individual characteristics (gender, race/ethnicity, SES, high school preparation, and declared major), it does not report these results or specific coefficients for student-level variables, as it concentrates solely on the effects of institutional factors across four areas—general institutional, compositional, financial, and fixed location. The variables that the researchers claimed could be controlled by the institutions directly included: institutional size, proportion of part-time to full-time faculty, and number of associate degrees and certificates conferred per year. Student composition factors considered in this study were measures of overall household income, and percentage of part-time, female, and minority students.

Analysis suggests that larger institutions and higher percentages of racial minority and part-time students are institutional characteristics that serve as negative predictors of student outcomes. A second finding from the study was the negative relationship between a high percentage of part-time faculty and successful 2-year outcomes. Financial variables taken into consideration for the study included average federal aid per full-time equivalent (FTE), average undergraduate in-state tuition, average expenditures per FTE in instruction, academic support, student services, and administration. Results showed that students that attended institutions where a greater proportion of funding was allocated for academic support were more likely to be successful. Therefore, the researchers identified key institutional characteristics that are within the institution's control (e.g., size, part-time faculty, expenditures) that contribute to the likelihood of students persisting (Calcagno et al., 2008).

With its multilevel approach and institutional focus, Calcagno et al.'s (2008) study greatly contributes to the literature on institutional effects. However, there are still some limitations. Given the broad scope of the national dataset, the study was limited in the institutional variables that could be controlled for and did not account for pedagogical strategies,

academic and student support services, or other important organizational characteristics. Perhaps the greatest limitation is the student sample, which is drawn from a high school cohort of entering college students and does not reflect the typical community college population with diverse student characteristics. Thus, their findings reflect more traditional students and are not generalizable among the broader 2-year student population.

These two seminal pieces draw attention to the need for a more sophisticated understanding of community college contexts and inform future research in this area. Although these recent national analyses contribute many new insights, several of their key findings are also supported by other studies. First, both Bailey, Calcagno et al. (2006) and Calcagno et al. (2008) indicate that a greater percentage of minority students is associated with a decreased likelihood of students persisting, or attaining, as argued by Pascarella and Terenzini (1991, 2005). Wassmer et al.'s (2004) study of first time freshman students from California community colleges who started their undergraduate education in 1996 and 1997 support this finding, as they also report that the race/ethnic composition of the student body had an impact on transfer rates.

Another finding from Calcagno and associates' (2008) study was the negative relationship between a high percentage of part-time faculty and student outcomes. Different types of institutions utilize contingent faculty in different ways. Studies focused on 4-year colleges show lower graduation or retention rates when the schools have a greater percentage of part-time faculty (Ehrenberg & Zhang, 2004). Most community college research also suggests that increased exposure to part-time faculty has similar negative effects on student outcomes at community colleges (Eagan & Jaeger, 2009; Jaeger & Eagan, 2009; Jacoby, 2006). However, Bailey, Calcagno, et al. (2006) found no effect of part-time faculty on institutional graduation rates among 2-year colleges.

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When examining the utilization of part-time faculty, one must consider how these faculty members are situated within the community college's context. Levin's (2007) description of community colleges and their newly established role in the globalized economy provides an insightful discussion for understanding these dynamics. The multiple functions and missions of community colleges set them apart from 4-year institutions. The need to respond the expectations of a multitude of constituents requires 2-year institutions to be much more agile within the public and private spheres. Part-time faculty members are not only used as a cost-saving strategy, but also allow community colleges to be able to adapt to the changing needs of society (Levin, 2007). This is evident from the disaggregated evidence showing that part-time faculty in particular fields are more central to the principal missions of the institution, and therefore, more valuable (Levin, Kater, & Wagoner, 2006; Wagoner, 2007). Levin (2007) further argues that efficiency and workforce development are the primary goals of community colleges in the new globalized economy. Part-time faculty are a critical component of meeting these objectives; therefore, the "condition of [the] workforce is identified by institutional context" (p. 16), suggesting that addressing the complexities part-time faculty requires a redirection of goals.

Lastly, several financial variables were considered in the Bailey, Calcagno, et al. (2006) and Calcagno et al. (2008) studies. The financial variables taken into consideration in these studies were the average federal aid per FTE, average undergraduate in-state tuition, and average expenditures per FTE in instruction, academic support, student services, and administration. The average federal aid per FTE was analyzed as a proxy for financial need among the institution's students and was not found to be significant in either study. The cost of tuition was reported as non-significant in both studies, even though significant effects have been noted in other community college research. Using NPSAS data, St. John and Starkey (1994) found a negative

relationship between tuition prices and within-year persistence for traditional-age college students. Each $100 increase in price decreased the probability of persistence by 1.4 percentage points. Using the same data, Hippensteel et al. (1996) found a similar effect for adult community college students; the probability of persistence decreased by 1.8 percentage points for each $100 increase in tuition.

In terms of expenditures, Bailey, Calcagno, et al. (2006) found no significant effect for any of these financial characteristics, whereas Calcagno et al. (2008) found that institutions with greater expenditures for academic support saw results, as students attending these colleges were more likely to succeed. This finding supports the 4-year literature that posits that institutional expenditures matter and have an influence on student outcomes (Kim et al., 2003; Ryan, 2004, 2005). Taken together, these studies demonstrate just a small body of literature exploring institutional expenditures. This lack of attention within higher education research, particularly community college research, stands in stark contrast to the large amount of attention given to funding and expenditures for education by the media, the public, policymakers, and higher education leaders. The recurring nature of budgetary and fiscal challenges requires efforts to enhance the use of financial resources, which is critical as institutions attempt to respond to increased pressure for accountability and performance (Dougherty et al., 2009). More community college research focused on funding allocations is needed to provide empirical links between where financial resources are used and the achievement of institutional and student goals, such as persistence and degree attainment, to inform community college leaders and policymakers.

Summary

The purpose of this literature review was to illuminate empirical findings from community college research on persistence and attainment. Special consideration was taken to focus on literature based on a community college perspective. Often, community college outcomes are examined in comparison to 4-year students and outcomes (Townsend et al., 2004), thus inevitably imposing 4-year concepts that impact the research design and interpretations that may not be the most fitting for 2-year colleges. This study sought to reposition the focus on a community college contexts drawing only from the relevant components of 4-year perspectives, rather than attempting to situate the study within a 4-year lens. Attention is given as to how each element of the research design reflects the reality and complexities of 2-year institutions with a broad range of missions and student populations.

The significance of this research is set within the context of the national call for increased accountability and improvement of attainment rates at community colleges. Increased focus and recent funding for community colleges to boost college completion creates an opportunity for this sector of higher education to define better assessment measures to inform data-driven decisions. Similarly, there is a dearth of literature focused on investigating the effects of 2-year institutional contexts. This is perhaps due to the lack of access to adequate national data (Sylvia et al., 2010) or by the research focus in higher education being primarily drawn to examine 4-year students and outcomes (Townsend et al., 2004). The study's unique methodological approach used a national sample and contributes to the emerging community college literature that seeks to disentangle the processes that are operating at the student and institutional levels in influencing student persistence and attainment.

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The research has the potential to inform policy decisions as institutions seek to respond to the call for community colleges to improve student outcomes. The economic climate impacting higher education prompts the need to improve institutional efficiency and effectiveness. Therefore, this study aimed to better understand the influence of the institutional characteristics that may be within the institution's control. Identifying the institutional characteristics that are effective can guide community college stakeholders in focusing institutional efforts on the critical areas that can make the most difference in promoting persistence and completion. Policy and practice must be informed in new ways, with more empirical work, as community colleges strive to better serve the surging enrollments of diverse student populations. Community college research that is truly attuned with the intricacies of the community college pathway provides a key resource in these efforts to redefine 2-year accountability measures.

Chapter 3: Methodology

Introduction

As discussed in Chapter 1, and illustrated in Chapter 2, postsecondary researchers have much to explore when considering the undergraduate experiences that contribute to persistence and completion for students who began college at 2-year institutions. Scholars have given substantial attention to the individual factors that predict successful outcomes for community college students, yet few have focused on the institutional environments that can play an important role in community college pathways. Additionally, studies accounting for the mobility of community college students are non-existent in the current literature base.

This chapter presents specific hypotheses for the effects of various college experiences and aspects of institutional contexts on community college persistence while accounting for key student characteristics. The dependent variable, which will be described in further detail, reflects persistence among degree-seeking community college students.

Research Questions

To investigate persistence among degree-seeking community college students, this inquiry addressed the following research questions:

1. To what extent does student persistence vary between institutions after accounting for all colleges that a student attends in the 6-year study period?

2. Controlling for background characteristics and precollege experiences at college entry, how do student environmental pull factors and student social and academic undergraduate experiences affect persistence within 6 years?

3. Controlling for individual characteristics and experiences, how do institutional predictors such as structural, student peer, and financial characteristics affect student persistence within 6 years?

Hypotheses

Guided by these questions, the study investigated the following hypotheses. In this section, each hypothesis, corresponding to one of the aforementioned research questions, is substantiated with a statement of rationale. Given that the relevant theory and literature were previously discussed in depth Chapter 2, the rationale for each hypothesis will be limited to a concise statement.

Hypothesis I – Variation between institutions in 6-year persistence. Hypothesis I addressed research question one, which asked, "To what extent does student persistence vary between institutions after accounting for all colleges that a student attends in the 6-year study period?" It was hypothesized that the analyses would reveal that this common phenomenon of student movement between institutions would be an important consideration in assessing the variation between institutions in students' average probability of persistence. This hypothesis was based on the national data indicating that student mobility is increasing across all sectors, but the diverse student populations who start postsecondary education at community colleges have a much higher rate of attending multiple institutions during their educational trajectories (NSCRC, 2012b). Furthermore, the diversity among the many colleges in the institutional sample, with varying missions and purposes, led to the hypothesis that students' average likelihood to persist within 6 years of college entry would vary significantly across institutions.

The within-institution variation is found when many students attending the same institution are seeking a degree, yet many of them do not attain a degree within 6 years of

enrollment. The vast persistence and attainment literature has documented the differences in students' likelihood of success, particularly among community college students. Students attending 2-year institutions vary in their likelihood to persist or attain, often because of their background characteristics and college preparation (Berkner & Choy, 2008). Recent studies have highlighted differences in students' likelihood of persistence and attainment that can be observed across differing institutional contexts, such as those focused on supported students academically or smaller institutions that can offer more individualized attention (Bailey, Calcagno, et al., 2006; Calcagno et al., 2008). The BPS: 04/09 sample contains a large diversity of institutions with many different characteristics and missions; therefore, it was expected that variation across institutions would emerge in the analyses.

  Hypothesis II – Student-level predictors of 6-year persistence/attainment. Research question two corresponded to Hypothesis II and asked, "Controlling for background characteristics and precollege experiences at college entry, how do student environmental pull factors and student social and academic undergraduate experiences affect persistence within 6 years?" Given the literature on the influence of pre-college and college experiences and the theoretical underpinnings of Nora's (2003) Student/Institution Engagement Model, it was hypothesized that student experiences over the college years matter. Specifically, it was expected that student-level predictors, including both on-campus experiences and outside influences (environmental pull factors), would have significant effects on persistence after controlling for student demographics and pre-college experiences. Outside influences include considerations like family responsibility and financial burden. Although many studies have identified background characteristics and precollege experiences as some of the strongest predictors of persistence, it was expected that academic experiences such as interactions with faculty, staff and

peers, student's first year GPA, whether or not a student requires remediation, and a student's full-time enrollment status would also have an influence on persistence above and beyond background characteristics.

Prior research has consistently found first year academic performance to be positively related to persistence among community college students (Cofer & Somers, 2001; Hawley & Harris, 2005; Makuakane-Drechsel & Hagedorn, 2000). In terms of remediation, much empirical research has indicated that remedial interventions appear to promote persistence and degree completion (Pascarella & Terenzini, 2005). However, other studies have suggested the opposite: that enrolling in remedial courses has a negative effect on completing a degree (Adelman, 1999; Bailey & Alfonso, 2005). Also, full-time status, specifically when a student enrolls in 12 credit hours in a given semester, has repeatedly been shown to have a positive impact on community college persistence (Cofer & Somers, 2000, 2001; Feldman, 1993; Hippensteel et al., 1996; Kirby & Sharpe, 2001; Lanni, 1997; Nora & Crisp, 2010, Schmid & Abell, 2003). While there is some contention on the role of social integration, academic integration has been well established as important to promoting community college outcomes (Napoli & Wortman, 1996).

In addition to the experiences students have within college, Nora's (2003) Student/Institution Engagement Model posits that environmental factors can pull students away from their academic pathways. These environmental pull factors are often operationalized in studies as measures of financial or family responsibilities and are generally found to be significant negative predictors of persistence (Cofer & Somers, 2000; Gooden & Matus-Grossman, 2002; Nora & Crisp, 2010; Schmid & Abell, 2003). This hypothesis proposed that students employed full-time and students who are financially independent would be significantly less likely to persist.

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Hypothesis III - Effect of institutional context on 6-year persistence/attainment.

Hypothesis III specifically focused on the impact of institutional context and linked to research question three, which asked: "Controlling for individual characteristics and experiences, how do institutional predictors such as structural, student peer, and financial characteristics affect student persistence within 6 years?" Given prior research on the association between institutional characteristics and students' likelihood of persistence, it was hypothesized that institutional characteristics would be influential on persistence across three areas: (a) structural characteristics, (b) student peer characteristics, and (c) institutional finance characteristics. In terms of structural characteristics, it was expected that institutional level, size, and location, would be predictive of persistence. Similarly, higher utilization of part-time faculty has been identified as a negative predictor for both community college persistence (Calcagno et al., 2008) and transfer (Eagan & Jaeger, 2009).

Furthermore, it was hypothesized that student peer characteristics would have a significant influence on a student's likelihood to persist. It was expected that higher proportions of minority students would be negatively associated with persistence, as past research utilizing a national dataset supports these hypotheses (Bailey, Calcagno, et al., 2006; Calcagno et al., 2008). Another indicator of student-peer characteristics is the proportion of students receiving federal aid as a proxy for the overall financial needs of the institution's student population, which is hypothesized to negatively influence persistence. This hypothesis was informed by national data suggesting that financial burdens are more common characteristics of 2-year students (Berkner & Choy, 2008), and theoretical guidance from Nora's (2003) concept of environmental pull measures and Berger and Milem's (2000) assertion that the peer climate matters. Finally, the financial context of institution was hypothesized to have a significant effect on the persistence of

community college students. It was expected that higher amounts of institutional funding committed to instruction and academic support would positively predict community college persistence as prior research indicates (Bailey, Calcagno, et al., 2006).

Conceptual Model

This study drew from Nora's (2003) Student/Institution Engagement Model, the Berger-Milem (2000) college impact model, and resource dependence theory (Pfeffer & Salancik, 1978), as well as from prior empirical research, to develop and test a multilevel conceptual model for examining the influence of community college student characteristics and undergraduate experiences, and uniquely focus on the impact of institutional contexts on student persistence. The dependent variable was defined as continuing to be enrolled or completing degree/certificate 6 years after first enrolling in postsecondary education vs. no longer being enrolled after 6 years.

As shown in Figure 3.1, both student-level and institutional-level variables were used in this study. The four categories of student-level variables were constructs from Nora's (2003) Student/Institution Engagement Model. Two of the three sets of institutional-level constructs, structural characteristics, and student-peer characteristics were based on concepts from the Berger-Milem (2000) college impact model. Resource dependence theory (Pfeffer & Salancik, 1978) informed the consideration of the environment, specifically the national political and fiscal ecological conditions that influence internal decisions within colleges to prioritize expenditure areas. Aligned with the small body of literature indicating the importance of institutional expenditures (Bailey, Calcagno, et al., 2006; Kim et al., 2003; Ryan, 2005), the conceptual model included measures of institutional finance characteristics with four expenditure areas—instruction, student support, academic support, and administrative. Therefore, the conceptual

model in this study allowed for an examination of the institutional context over three areas—structural characteristics, student-peer characteristics, and institutional finance characteristics.

Figure 3.1 Conceptual Model to Examine Persistence
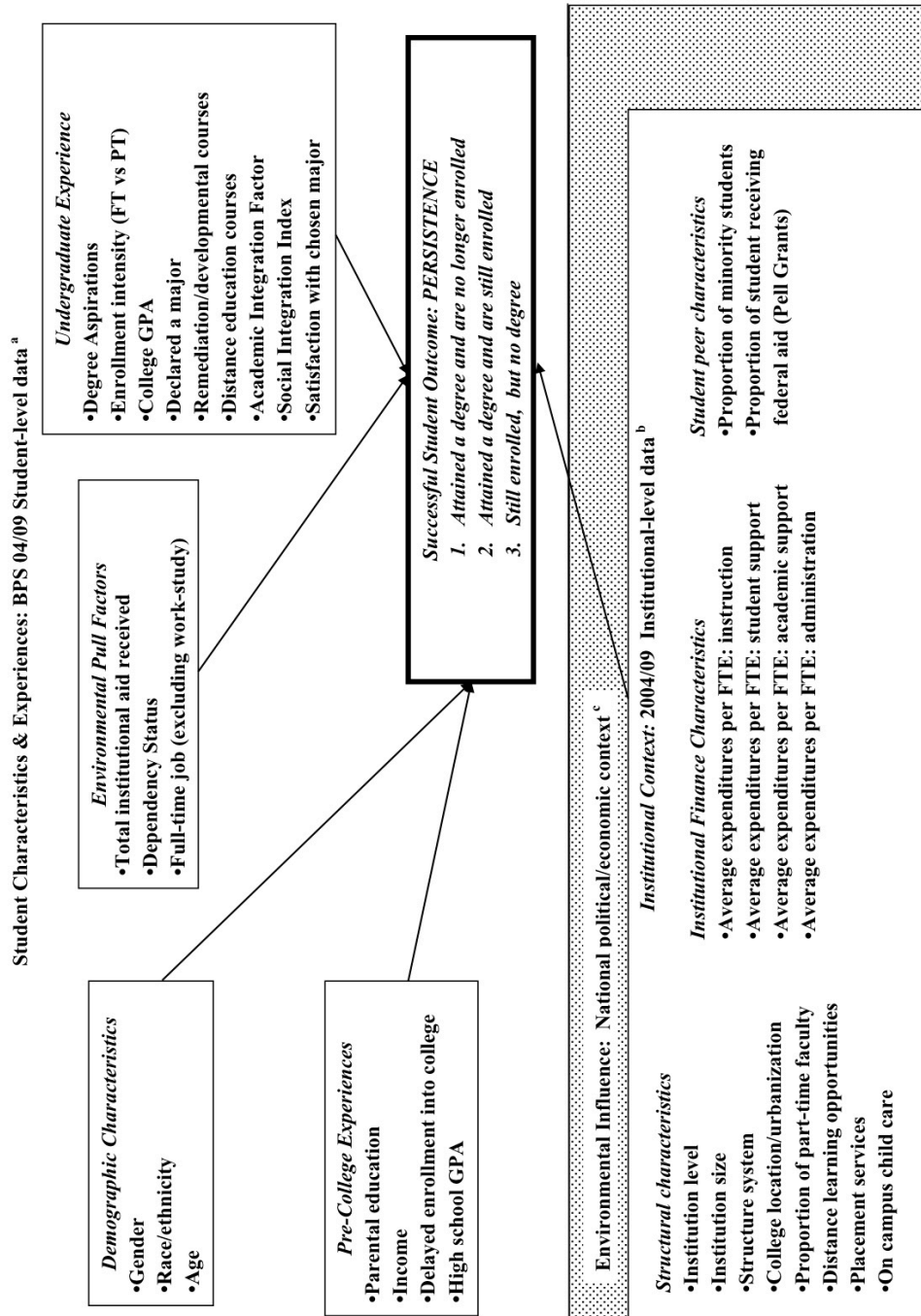
Figure 3.1. [a] Student-level adapted from "Access to higher education for Hispanic students: Real or illusory?" by A. Nora, 2003, In J. Castellanos & L. Jones (Eds.), *The Majority in the Minority: Expanding the representation of Latina/o faculty, administrators and students in higher education*. Sterling, VA: Stylus Publishing, LLC. [b] Institutional-level adapted from "Organizational behavior in higher education and student outcomes." by J.B. Berger and J.F. Milem, 2009, In *Higher Education: Handbook of Theory and Research*, J.C. Smart (Ed.), Vol. XV: p. 268-338. New York: Agathon. [c] Environment adapted from "The external control of organizations: A resource dependence perspective. J. Pfeffer and G. Salancik, 1978, New York: Harper & Row.

Data Source

To clarify the research design, this section provides details on the longitudinal data set and sampling techniques before specifying the analytical sample used in the reported analyses. This study used national data from two databases that were sponsored by the U.S. Department of Education Institute of Education Sciences' (IES) National Center for Education Statistics (NCES): the 2004-2009 Beginning Postsecondary Students (BPS:04/09) Longitudinal Study and the Integrated Postsecondary Education Data System (IPEDS) Enrollment Survey (Wine, Janson, & Wheeless, 2011).

Institutional data were drawn from IPEDS, which is a program run by the NCES within the U.S. Department of Education. IPEDS data are collected from all postsecondary education providers. Data reporting is mandated for any postsecondary education institution receiving federal funding in the U.S. and all outlying U.S. territories. Additional variables providing information on institutional expenditures, faculty composition, and other institutional characteristics were merged to supplement the institutional measures included in the BPS:04/09 dataset. The vast majority of institutional measures used were taken from the 2003-04 academic year in IPEDS to be consistent with the institutional data that are included the BPS:04/09 dataset. When 2003-04 college variables were missing, this information was taken from the next available year in IPEDS.

The BPS:04/09 is a national probability sample of American undergraduate students beginning higher education for the first time in 2003-2004 (Berkner & Choy, 2008). The BPS:04/09 study provides data on first-time beginners (FTBs) and the issues students encounter in "enrollment, persistence, progress, and attainment in postsecondary education and in consequent early rates of return to society" (Cominole, Wheeless, Dudley, Franklin, & Wine,

2007, p. iii). There are unique advantages to utilizing the BPS Longitudinal Study data to examine community college students as the FTB cohort is tracked regardless of when they completed high school or how many colleges they attend, providing a more representative sample of the diverse student populations (including non-traditional students) that are typically found at 2-year institutions.

Sample. Data for the BPS:04/09 were collected using a sampling frame derived from the 2003-04 National Postsecondary Student Aid Study (NPSAS:04). According to the NCES, the NPSAS:04 sample is representative of an estimated 19 million students attending U.S. colleges and universities in 2003-2004. The NPSAS:04 consists of a sample of 90,000 undergraduate, graduate, and professional students in about 1,600 postsecondary institutions that are eligible for federal financial aid (Radford, Berkner, Wheeless, & Shepherd, 2010). A subset of the 23,090 undergraduate students classified as FTBs during the base-year NPSAS:04 survey comprised the sample for the BPS:04/09 cohort. FTBs are defined as students who first enrolled in college during the 2003-2004 academic year. Of the 23,090 sample members, approximately 18,540 (81%) were determined to be eligible for inclusion in the BPS:04 cohort (Cominole et al., 2007). The longitudinal data drawn from the BPS:04/09 study are a representative sample of about 4 million undergraduate students beginning American higher education for the first time in 2003-2004 (Berkner & Choy, 2008). Eligible sample members were initially surveyed at the end of their first academic year (2003-04) and then received invitations to participate in follow-up surveys 3 years after they had started in postsecondary education (2005-06) and 6 years (2008-09) after entry into postsecondary education. Approximately 16,500 of the 18,540 eligible students in the BPS:04/09 sample had sufficient data from either the NPSAS:04, BPS:04/06,

BPS:04/09 interviews or other sources to be considered panel respondents. Un-weighted and weighted response rates were 87% and 86%, respectively (Radford et al., 2010).

Data collection. Data sources included in the BPS:04/09were derived from student interviews/survey responses, institutional records, federal financial aid applications, federal student loan and Pell Grant records, enrollment records from the National Student Clearinghouse, information from college admissions test agencies, and college transcript data. Data collection from student interviews for the BPS:04/09 study was conducted in three phases: (a) early phase, (b) production phase, and (c) nonresponse phase. First, questionnaires were either self-administered via web or telephone interviews were performed during the initial 4 weeks providing participants with an incentive of $30. Next, interviewers using computer-assisted telephone interviewing (CATI) offered participants $20 to complete a telephone interview. Finally, assigned field interviewers employed computer-assisted personal interviewing (CAPI), and offered an incentive of $30 to convert non-respondents who refused participation in the study but were geographically located within a selection of 48 clusters. The questionnaire contained six sections of questions developed to gather information on students' eligibility, enrollment history and characteristics, post-enrollment employment, background, and location (Cominole et al., 2007).

Analytical sample

The overall final analytical sample included 5,410 students and is detailed in Table 3.1. The sample was limited to those who first enrolled at a 2-year public community college in 2003-2004 (approximately 43% of the BPS:04/09 panel respondents). To fairly assess persistent and attainment, the sample was also limited to respondents with intentions of attaining a degree or certificate. Finally, there was no institutional data available for 90 institutions, resulting in a

further reduction of the student and institutional samples. Thus, the 5,410 students included in

the sample began postsecondary education at 380 community colleges. After accounting for all

institutions attended by students over the 6-year study period, the institutional sample grew to

1,590 colleges. In this study, the number of students per institution ranged from 1 to 101 and the

average number of students per institution was 13.

Table 3.1
Roadmap to the Final Analytical Sample

Survey	Description	Sample
NPSAS: 04	NPSAS:04 sample members	
		23,090
BPS: 04/09	NPSAS:04 sample members eligible for inclusion in the BPS:04 cohort	
		18,540
BPS: 04/09	BPS:04/09 eligible students that had sufficient data to be considered panel respondents	
		16,500
BPS: 04/09	BPS:04/09 panel respondents who's first institution of attendance was a public 2-year college	6,900
	BPS:04/09—Analytical Sample after deleting non-degree seeking students and students attending institutions for which institutional data was missing	5, 410

Note: Student n's are rounded per NCES reporting guidelines.

Variables

Given the hierarchical design of this study, with students clustered within institutions, the

independent variables were included from both the student level (level 1) and the institutional

level (level 2). Drawing from Nora's (2003) Student/Institution Engagement framework, the

Berger and Milem (2000) models, resource dependence theory (Pfeffer & Salancik, 1978), and

findings from past empirical research, independent variables were selected from the data

available in the BPS:04/09 and IPEDS. Student-level variables examine demographic

characteristics, pre-college experiences, environmental pull factors, and undergraduate

experiences. Institution-level variables examine college characteristics, including institutional

structures, institutional finance characteristics, and student composition measures. The following subsections provide more detailed information on the dependent variable and the specific independent variables that comprised each of these variable categories.

Dependent variable. The dependent variable being examined reflected 6-year persistence and/or attainment and was measured in 2009 with the second BPS follow-up. This measure indicated whether the student had attained any certificates or degrees and/or was still enrolled at any postsecondary institution as of June 2009. The dependent variable was then structured as a binary outcome measure with 0 equaling students who did not attain a degree and were no longer enrolled after 6 years and 1 equaling students who: attained a degree and were still enrolled, attained a degree and were no longer enrolled, or did not attain a degree and were still enrolled after 6 years. Given the study's focus on overall persistence, system persistence (at any institution) was examined rather than within-institution persistence (at the same institution).

Demographic characteristics. Student demographic characteristics included gender, race/ethnicity, age, income, and parental education. Overall, compared with 4-year students, community college students have more non-traditional characteristics, being more likely to be minority, older, low-income, and first generation students (Berkner & Choy, 2008). Women are more likely than men to reflect non-traditional characteristics (Aud et al., 2011). In fact, women have been shown to make up over 60% of students in the lowest 25% income percentile of students over age 40, and of students with children or dependents (Peter & Horn, 2005). Similarly, age has been identified as an important factor in examining successful community college outcomes, with several studies finding that older students are more likely to drop out than younger students (e.g., Cofer & Somers, 2000; Bailey, Jenkins, et al., 2006; Hagedorn et al.,

2002; Lanni, 1997). Students 25 and older are primarily concentrated in 2-year institutions

(Berkner & Choy, 2008); therefore, age was included in the analyses as a control.

In terms of race and ethnic identification, students with minority ethnic status (African

American, American Indian, and Latino) are more likely to begin college at 2-year institutions

(Berkner & Choy, 2008). Community college research examining the association between race

and persistence has produce mixed results (Cofer & Somers, 2000; Bailey, Calcagno, et al.,

2006; Feldman, 1993; Hawley & Harris, 2005; Lanni, 1997; Zhao, 1999). In this study,

racial/ethnic minority status was measured by variables indicating a student's self-identification

as African American, American Indian, Asian or Pacific Islander, Latino, Multiracial, and Other

(all categories measured: 1=yes, 0=no). The BPS:04/09 does not distinguish between these

groups from those who are international students (i.e., Asian and Asian American, White and

Whites who are not U.S. citizens). White was the reference group (see Table 3.2 for a complete

description of variables and coding procedures used in this study).

Table 3.2
Variables and Coding

Variables	Coding Description
Dependent Variables	
Persistence/attainment vs. not enrolled	0=no 1=yes
Demographic Characteristics	
Gender: Female	1=male 2=female
Race: White (reference group)	0=no 1=yes
Race: African American	0=no 1=yes
Race: Latino	0=no 1=yes
Race: Asian American & Pacific Islander	0=no 1=yes
Race: American Indian	0=no 1=yes
Race: Other	0=no 1=yes
Race: Multiracial	0=no 1=yes
Age 25 or older	0=no 1=yes
Precollege Experiences	
Mother's highest education level	1=less than HS, 10=Doctorate/equivalent
Middle income or higher	1=no 2=yes
Delayed enrollment	0=no 1=yes

| High school GPA | 1=D- to D, 7=A-to A+ |

Environmental pull Factors

Total institutional aid received 2003-04	Continuous
Worked full-time 2003-04 (exclude work-study)	0=no 1=yes
Dependency status 2003-04	1=dependent, 2=independent

Undergraduate Experiences

Certificate of Associate's degree aspirations (reference group)	0=no 1=yes
Bachelor's degree aspirations	0=no 1=yes
Master's or above degree aspirations	0=no 1=yes
Enrollment intensity: full-time 2003-04	1=no 2=yes
College GPA 2003-04	Range: 0.00 to 4.00
Declared a major 2003-04	0=no 1=yes
Remedial course: any taken in 2003-04	0=no 1=yes
Distance ed. course: any taken in 2003-04	0=no 1=yes
Satisfaction with undergraduate education	0=no 1=yes
Academic integration 2004/2006	Factor of four items: frequency of faculty informal meeting (0.63), faculty talk outside of class (0.73), meet academic advisor (0.75), study groups (0.63) Cronbach's Alpha: 0.74
Social integration index 2004/2006	Range: 0 to 200 Composite variable derived from attended fine arts activities, participated in sports, participated in school clubs

Institutional Characteristics

Structural characteristics	
Institution level	1=less than 2 year; 2=2year; 4year
Size: Total FTE undergraduates	Range: 17 to 74,535
College part of a system	1=no 2=yes
College location: degree of urbanization	1=large city 7=rural
Proportion of FTE faculty	(in 10 point increments) Range: 0% to 100%
Distance learning opportunities	1=no 2=yes
Placement services for completers	1=no 2=yes
On-campus day care for student's children	1=no 2=yes
Student peer characteristics	(in 10 point increments)
Proportion of minority (African American, American Indian, Latino) undergraduates	Range: 0% to 100%
Proportion of undergraduates receiving Federal aid (Pell Grants)	Range: 0% to 100%
Institutional finance characteristics	(in $1000s)
Instruction expenses per FTE	Continuous
Academic support expenses per FTE	Continuous
Student services expenses per FTE	Continuous
Administrative expenses per FTE	Continuous

Precollege experiences.   Results of empirical research suggest that higher levels of SES (Garardi, 1996; Pascarella et al., 1986) or parental education (Bailey, Calcagno, et al., 2006; Crisp & Nora, 2010) are associated with an increased chance of college persistence and attainment. According to the NCES, 39% of all first-time community college students are independent students (not relying on parental income to support them through college) compared to 15% of those who begin at 4-year institutions (Berkner & Choy, 2008). Therefore, for this study, income and parental education were not combined in a composite measure of SES as is common in higher education research focused on 4-year students. The BPS:04/09 included a measure of students' income as percent of poverty level 2003-04. This measure was calculated from the 2002 calendar year income that was used determine federal financial aid eligibility for the 2003-2004 academic year, which is based on family size, total income, and dependency. This income measure was then used to create a variable identifying low-income students, as defined by household earnings at or below 185% of the 2003 national poverty level. Mother's education was included as a separate variable as it would not have as high of a correlation with income as in examining traditional-aged college students.

Precollege learning opportunities include high school GPA, and whether or not a student delayed college enrollment. Community college research has shown that high school achievement measures are associated with a higher chance of college persistence (Cofer & Somers, 2000; Crisp & Nora, 2010; Feldman, 1993; Lanni, 1997; Garardi, 1996; Nippert, 2000-2001; Pascarella et al., 1986). Related to high school preparation, students who delay postsecondary enrollment after high school are less likely to persist, transfer, or attain (Crisp & Nora, 2010); therefore, a variable indicating whether or not a student delayed enrollment after high school was included in the analyses.

Environmental pull factors. Community colleges serve many older students who face additional challenges because they are more likely to have financial responsibilities and the need to work full-time—characteristics that have been found to be significant barriers to educational success (Gooden & Matus-Grossman, 2002). Nora's (2003) Student/Institution Engagement Model identifies a set of environmental factors exert a "pulling away" or a "drawing in" of students. This set of predictor variables centered on environmental pull factors, including dependency status, the total amount of institutional aid that a student receives, and whether or not a student worked full-time outside of work-study employment. Dependency status based on federal financial aid eligibility criteria indicated whether a student was a dependent or independent. Student financial variables were also included because prior research indicates that 2-year students who worked full-time were more likely to drop out of college when compared to those who worked part-time or not at all (Cofer & Somers, 2000; Lanni, 1997; Makuakane-Drechsel & Hagedorn, 2000; Schmid & Abell, 2003).

Undergraduate experiences. Undergraduate experiences are measured through educational goals, declaration of major, college first-year GPA, enrollment intensity (full-time vs. part-time), participation in distance education, academic and social integration, whether or not a student required remediation courses, and student's reported satisfaction with his/her undergraduate major. Overall, compared with students at baccalaureate institutions, community college students have more characteristics that might compromise their ability to complete a degree in a timely manner. Specifically, they are far more likely to delay enrollment in college after high school, attend part time, have no major field, and require some remediation (American Association of Community Colleges, 2010; Chen, 2007), which have been shown in many studies to be related to lower retention and graduation rates (Bailey, Jenkins, et al., 2004).

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There is a wealth of literature suggesting that students' degree aspirations are strongly and positively associated with eventual educational attainment (Bailey, Jenkins, et al., 2006; Bers & Smith, 1991; Hagedorn et al., 2002; Perin, 2006). Among community college students, Hagedorn and associates (2002) reported that students with high educational goals were likely to persist. Degree aspirations are accounted for with three measures indicating student aspirations toward a (a) certificate or associate's degree, (b) bachelor's degree, or (c) Masters degree or above. Students demonstrate commitment to their education goals through their progress in navigating the community college pathway. Voorhees and Zhou (2000) found that community college students who reported greater goal orientations (i.e., declaring a major early in their academic pathways) were more likely to persist; therefore, a dichotomous variable indicating whether or a not a student declared a major in their first year of college was included in the analyses.

Academic performance among first-year community college students is positively related to persistence (Chen & Thomas, 2001; Cofer & Somers, 2000; Grimes, 1997; Hawley & Harris, 2005; Makuakane-Drechsel & Hagedorn, 2000; Mohammadi, 1994; Zhai & Monzon, 2004; Zhao, 1999). Although less examined in the literature, recent studies have sought to incorporate distance learning into Nora's (2003) model (Sutton & Nora, 2008) and with the current trend to explore instructional technology it has been seen as an important factor to examine. Thus, this study's model included a measure indicating whether or not a student took one or more distance education courses in his/her first year. Similarly, whether or not a student took one or more remedial courses in 2003-04 was included because of the mixed results surrounding remedial interventions (e.g., Bailey & Alfonso, 2005; Bettinger & Long, 2005; Jepsen, 2006). Enrollment status and whether or not a student was enrolled part-time or full-time was included as numerous

studies have found an association between full-time enrollment and successful community

college outcomes (Bailey, Jenkins, et al., 2006; Cofer & Somers, 2000; Crisp & Nora, 2010;

Feldman, 1993; Hagedorn, 2005; Hagedorn et al., 2002; Makuakane-Drechsel & Hagedorn,

2000; Mohammadi, 1994). Scholars suggest that full-time students are likely more involved on

campus as they are physically present and may not have the distractions of full-time employment

and family responsibilities that are common among part-time students (Napoli & Wortman,

1996).

Lastly, institutions have more control over the conditions and experiences of students

while on campus (in comparison to background and out of college experiences), which can

contribute to successful community college outcomes. A meta-analysis of past community

college research exploring these concepts revealed that many studies have found academic

integration to have a stronger impact on student retention in comparison to social integration

(Napoli & Wortman, 1996). Several qualitative studies have demonstrated that both formal and

informal interaction with students, faculty, and staff are salient experiences promoting

persistence (Deil-Amen, 2011; Deil-Amen & Rosenbaum, 2003; Karp, 2011; Rosenbaum et al.,

2006). Therefore, both academic and social integration measures were included in the study.

These measures were collected in 2004 and in 2006. Therefore, a mean score was calculated

from the values for each measure from both time points and then used to create a factor

representing academic integration and a composite variable measuring social integration, which

will be described in subsequent sections. An academic integration factor was identified using

items related to students' frequency of: meeting with faculty informally, talking with faculty

outside of class, meeting with academic advisors, and participating in study groups. This

measure was identified through confirmatory factor analysis and resulted in an alpha reliability

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coefficient of 0.74. Additionally, a measure of social integration was also included with a

composite variable derived from students' frequency of: attending fine arts activities,

participating in sports, and participating in school clubs.

      Institutional characteristics.   As previously shown in Figure 3.1, this study explored

the following three areas of institutional characteristics: (a) structural characteristics, (b) student

peer characteristics, and (c) institutional finance characteristics. Community college institutional

structural characteristics and student peer experiences have been shown to be important

predictors of both institutional graduation rates (Bailey, Calcagno, et al., 2006) and student

persistence (Calcagno et al., 2008). This study accounted for structural characteristics, such as

enrollment (size), institutional level, the location or level of urbanization, and whether or not a

college was part of a structured system. Additionally, the percentage of full-time employees at

an institution was measured, as the utilization of part-time faculty has been negatively associated

with community college persistence (e.g., Calcagno et al., 2008). Student peer characteristics are

measured with the proportion of minority, female, and part-time students at each institution. The

proportion of full-time faculty, minority students, and undergraduates receiving federal aid were

all measured in 10-point increments. Additionally, the model included the proportion of students

receiving federal aid (Pell Grants) as a proxy for the extent of financial need among a college's

students. Though less examined in the literature, three variables were introduced at the college

level: distance education, placements services, and on-campus childcare. A measure of whether

or not a college offers distance learning opportunities was part of the model as there has been a

national trend with more colleges moving toward these course delivery options given the current

budgetary constraints and availability of new technologies (Allen & Seaman, 2010). Similarly,

the availability of placement services was accounted for given the growing importance of

workforce initiatives (Boggs, 2010). Lastly the availability of on-campus childcare was examined considering that nearly 30% of students at community colleges and 13% at 4-year institutions are parents (Miller, 2010), along with the theoretical importance of environmental pull factors.

The role of the financial context of an educational institution has been understudied in higher education research (Ryan, 2004). The majority of research examining the role of the financial context among 4-year institutions (Kim et al., 2003; Ryan, 2004, 2005) suggests that allocating expenditures for instruction and academic support significantly predicted graduation and retention rates. Among community colleges, Bailey, Jenkins, et al. (2006) found that allocating expenditures for instruction significantly predicted community college graduation rates. The following institutional financial characteristics were included in this study's analytical model: average in-state tuition and expenses per FTE in administrative, student support, academic support, and instructional expenses. For these expenditure measures and the institutional size variable, log transformations were employed to account for the fact that the distributions are not normal. Lastly, it should be noted that these measures of the institution's financial context are an expansion of the Berger-Milem (2000) model guiding the institutional level framework, as informed by resource dependence theory (Pfeffer & Salancik 1978).

AnalysesSeveral analytical techniques were utilized to answer the research questions examining persistence among community college students 6 years after entering postsecondary education. First, appropriate weighting techniques were applied to address both subsampling and nonresponse bias within the survey. Next, appropriate methods for handle cases with missing data were identified. A series of descriptive and preliminary analyses, including descriptive statistics and factor analyses, were run to clarify the relationships among key variables. These

descriptive analyses provided statistics describing the characteristics of students and institutions in the study's analytical sample. Multilevel modeling statistical techniques were the primary form of analysis conducted. The following subsections provide more detail regarding each segment of the analytic process.

Analytic weights.   Due to the complexity of both NPSAS:04 and BPS:04/09, weighting measures were utilized to adjust for "unequal probability of selection of institutions and students in the NPSAS.04 sample…[and] multiplicity at the institution and student levels, unknown student eligibility, nonresponse, and poststratification" (Cominole et al., 2007, p. 67). The longitudinal weights provided by NCES for students who responded to all three rounds of the survey were selected to adjust for subsampling and nonresponse of students who did not respond to NPSAS: 04 or BPS: 04/09 (Cominole et al., 2007). These weights were selected because the outcome variable and a significant number of independent variables were constructed from data across all three rounds of data collection (for more information on the weighting procedures, see Cominole et al., 2007).

Missing data.   A preliminary inspection of the dataset examined the extent to which missing data occurred at the student level. It was important to address missing data before proceeding with analysis, as results could otherwise be distorted. In the examination of missing data patterns, some assumptions had to be made about the missing data with respect to the distribution of the missing values. Considering that it is empirically impossible to accurately determine that data are missing completely at random (MCAR), researchers can only infer this pattern of missingness (Allison, 2002). The less rigorous assumption is missing at random (MAR), in which the pattern of missingness could depend on the values of some (but not all) of the other variables. Most research using missing data procedures relies on this assumption.

Overall, there was little missing data, with the exception of high school GPA, for which 28.4% of the sample was missing data. While this variable surpassed the acceptable range for missing data (Allison, 2002; Little & Rubin, 2002), there is theoretical importance in accounting for prior academic achievement in the model. To preserve the full dataset and include critical variables in the model, imputation methods were applied. Given the limitations of all imputation methods (Little & Rubin, 2002), multiple imputation (MI) was determined to be the most appropriate approach as it is currently seen as one of the best methods for handling missing data in studies with multivariate statistics (Allison, 2000).

Descriptive and preliminary analyses.   Several descriptive and preliminary analyses were utilized as a first step toward addressing the research question. The descriptive analyses provided statistics describing the characteristics of students and institutions in the study's analytical sample. Factor analyses were conducted to explore the constructs previously presented in Table 3.2. In an effort to determine if the set of variables underlie only one construct, promax rotation was utilized. After identifying items that seemed to explain a common construct, reliability analysis was used to examine how consistent the items composing a construct were in measuring the composite factor. Constructs with a Cronbach's alpha of 0.60 or higher were considered to be a reliable indicator (Nunnally, 1978) along with individual factor loadings of 0.40 or higher (Brown, 2006).

The next stage of preliminary analyses investigated Pearson's correlations to get a sense of how independent variables related to one another as well as to the outcome measure, persistence. To effectively narrow down the initial list of independent variables, significant and substantial correlations between the dependent variable and the independent variables were

identified. Additionally, identifying significant and substantial correlations among independent variables assisted in attaining parsimony in the analyses.

Multilevel modeling. This study utilized multilevel modeling statistical techniques to examine student characteristics, perceptions, experiences, and institutional structures that may uniquely contribute to persistence. A series of random effects regression models were conducted using MLwiN software (version 2.24, 2011) employing the Markov Chain Monte Carlo (MCMC) estimation procedures. Two different unconditional multilevel models were fit to investigate the variation in average persistence probabilities across institutions. First, a fully unconditional hierarchical generalized linear model (HGLM) was fit to ensure the use of multilevel modeling was warranted. After determining significant variation between institutions, a fully unconditional MMREM was run to accurately represent the data structure observed in the longitudinal data set. The results from these two models were then compared to determine the better fitting model. Confirming MMREM as the most appropriate, the unconditional model served as the baseline model. The conditional MMREM included student and institutional predictors that help explain variability at each level.

Fully unconditional HGLM. First, to ensure the use of multilevel model was warranted, the researcher began by constructing a purely hierarchical unconditional model to assess whether students' average probabilities of persistence after 6 years varied across the sample institutions. This model has no predictor variables at either level. The most appropriate multilevel analysis for the binary outcome measure—whether or not a student persists—was that of a random effects logistic regression model, or an HGLM, using a binomial sampling model and logit link function (Raudenbush & Bryk, 2002). Specifically, this study utilized a Bernoulli distribution, which accounted for the bounded sampling distributions, bounded distributions that are confined to lie

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between two determined values, 0 and 1 in this case (Van Hauwermeiren & Vose, 2009). The logit link that transforms the level 1 predicted values to ensure that the predictions are constrained to lie within the interval [0, 1], as shown in equation 1 below (Raudenbush & Bryk, 2002).

The Bernoulli sampling model and a logit link function require the following level 1 model:

$$\eta_{ij} = \text{Log} \left[\frac{\pi_{ij}}{1 - \pi_{ij}} \right] = \beta_{0j} \qquad (1)$$

where η_{ij} represents the log-odds of persistence for student i in school j and π_{ij} represents the odds, the probability of persistence vs. no longer being enrolled based on the institutional average on the outcome β_{0j}. The level 1 error term is absent from the equation because in a binomial error distribution the error variance is a function of the mean and cannot be estimated separately. This model predicted the outcome, persistence, within each level 1 unit with just one level 2 parameter, the intercept β_{0j}.

The level 2 model is specified thusly:

$$\beta_{0j} = \gamma_{00} + u_{0j} \qquad\qquad u_{0j} = N(0, \tau_{00}) \qquad (2)$$

In this equation, the institutional average on the outcome measure (persistence) β_{0j} is a function of the average log-odds of persistence across all institutions, γ_{00} and a random effect u_{0j} that is unique to each institution. The random effect u_{0j} is assumed to be normally distributed with a mean of 0 and a constant variance τ_{00}, which is the variance between institutions in log-odds of persistence.

The between-institution variance significantly ($p<.001$) varied across institutions. The between-institution variance component was then used to calculate the Intra-Class Correlation

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(ICC), the proportion of variance between groups, which is given by the following formula

(Raudenbush & Bryk 2002):   (3)

$$ICC_{logit} = \rho = \frac{\tau_{00}}{\left(\tau_{00} + \frac{\pi^2}{3}\right)}$$

The ICC was calculated by dividing the between-institution variance (level 2 variance) for the

outcome variable by the total variance (level 2 variance + level 1 variance), where τ_{00} is the

level 2 error variance and the level 1 can be estimated as $\frac{\pi^2}{3}$ (or 3.29). A latent variable approach

was taken and the level 1 error variance was assumed to be $\frac{\pi^2}{3}$, which is the assumption made in

the traditional logit model (Grilli & Rampichini, 2007) and is one alternative when the level 1

error variance is heteroscedastic. Rho (ρ) ranged from 0 (no between-group variation) to 1 (no

within-group variation). Higher estimates of ρ suggest a substantial amount of clustering in the

data. However, the ICC in HGLM is less informative and not directly comparable to the ICC in a

hierarchical linear model because of the assumed level 1 error variance. MLWIN allows for

hypothesis tests of the random (and fixed) components in a multilevel model (Rasbash, Steele,

Browne & Prosser, 2009). A statistically significant level 2 error variance is an indicator that

clustering is present in the data, and the use of single level techniques is inappropriate even if the

ICC value is below the standard threshold of 0.05.

The ICC results showed that 3% of the variability in students' average probabilities of

persistence is between group variability. Therefore, most of the variance existed within groups.

While this is not an extremely large ICC, ignoring an ICC of this size by performing single-level

analyses with multilevel data is likely to be problematic. This is of particular concern with larger

sample sizes as it has been shown that in large samples an ICC of any size can increase the

probability of making a Type-I statistical error (Barcikowski, 1981; de Leeuw & Meijer, 2008).

Hence, appropriately modeling the dependency among level 2 units (among institutions) becomes very important in the ability to accurately interpret these results.

    Multiple membership data structure. The conventional HGLM models the dependency resulting from clustered data (i.e., student nested within colleges) and assumes that each level 1 unit is a member of only one level 2 unit, as depicted in Figure 3.2.

Figure 3.2. Purely Hierarchical Data Structure

Within the U.S. higher education context, the vast majority of students do not attend a single institution, but instead attend several colleges in their postsecondary educational trajectory (NSCRC, 2012b). A more realistic perspective is that students are nested within more than one institution as increased patterns of postsecondary student's mobility have been observed (Adelman, 2004; McCormick, 2003; Sylvia et al., 2010), particularly among community college students (Townsend, 2001). This was reflected in the analytical sample with 50% of students who changed institutions at least one time over the 6-year study period. The total possible number of colleges attended over the 6-year study period was five institutions. A multiple-membership data structure was evident when students were nested within *more than one school* (e.g., transferred), as shown in Figure 3.3.

Figure 3.3. Multiple Membership Data Structure
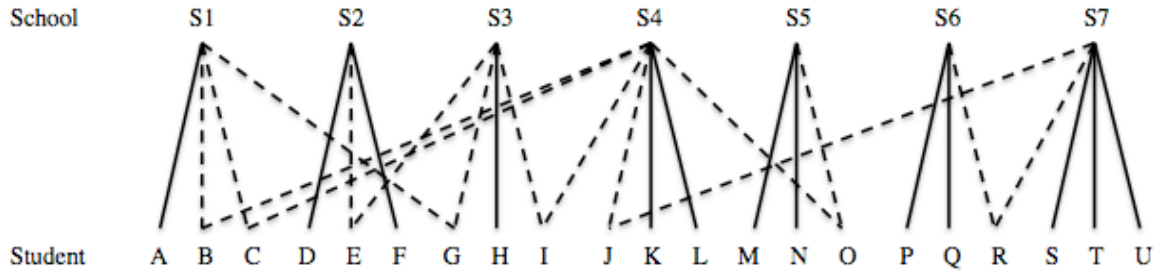
Clearly, the analytical sample denotes a non-hierarchical data structure with the large proportion of mobile students; therefore, it was not appropriate to model a purely hierarchical data structure assuming each student was nested solely in one institution (Fielding & Goldstein, 2006).[11] Use of the conventional HGLM required that each level 1 unit be associated with only one level 2 unit and thus could not handle the multiple membership data structures that resulted from this student mobility. The MMREM is designed specifically for use with multiple membership data. Thus, the fully unconditional MMREM should produce a more appropriate modeling of the data structure, likely resulting in a better fitting model.

Fully unconditional MMREM. The MMREM is used to handle multiple membership data. In the context of this study it represents the most appropriate method to model the effects of the multiple institutions attended by some students while modeling the dependence of students within colleges. The parameterization of the unconditional model (Beretvas, 2010; Goldstein, 2010; Rasbash & Browne, 2001) will be discussed in this section. The Bernoulli sampling model and a logit link function requires the following level 1 model:

$$\eta_{i\{j\}} = \text{Log} \left[\frac{\pi_{i\{j\}}}{1 - \pi_{i\{j\}}} \right] = \beta_{0\{j\}} \tag{4}$$

where $\eta_{i\{j\}}$ represent the log-odds of persistence where student i might attend a set of multiple level 2 units (here, colleges). The set of colleges for student i is represented using $\{j\}$. Thus, $\pi_{i\{j\}}$

represents the odds, the probability of persistence vs. no longer being enrolled, controlling for

the weighted average persistence of the set of colleges $\beta_{0\{j\}}$. The level 1 error term is absent

from the equation because in a binomial error distribution the error variance is a function of the

mean and cannot be estimated separately. The level 2 model is specified thusly:

$$\beta_{0\{j\}} = \gamma_{00} + \sum_{h\in\{j\}} w_{ih} u_{0h} \qquad\qquad u_{0h} = N(0, \tau_{00}) \qquad\qquad (5)$$

where γ_{00} is the average log-odds of persistence, w_{ih} is the weight associated with the level 1

unit's (student's) association with unit h of set $\{j\}$. u_{0h} is the level 2 residual for level 2 unit h,

which was assumed to be normally distributed with a mean of 0 and a constant variance τ_{00}. As

with a pure hierarchical modeling approach such as HGLM, a latent variable approach can be

used to calculate the ICC (see Equation 3) to assess the proportion of variability in the outcome

variable that lies between colleges.

Weights in MMREM. . Weights had to be assigned for each student for each level 2 unit

(college), j, included in the dataset. A number of algorithms can be used to assign the weights for

each set $\{j\}$ with the restriction that the weights must sum to one, i.e., $\sum_{h\in\{j\}} w_{ih} = 1$ (Goldstein,

2010). Equal or unequal weights can be assigned. If equal weights were assigned, each college is

assumed to have an equal contribution to persistence. Based on the national trends and empirical

research in student mobility, it was hypothesized that a college's contribution to student

persistence should reflect the relative length of time that students attended each college during

the 6-year study period. Therefore, the weights in Equation 5 represent the proportion of time a

student was enrolled at each institution. The data set included a measure indicating the number of

months a student was enrolled at a particular college. The proportional weight assigned to each

college was calculated by taking number of months enrolled at a particular institution and

dividing it by the total number of months enrolled at any college. Thus, a student's total months

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enrolled in postsecondary education is equal to one, i.e., the proportional time enrolled at each college summing to one.

Although research has indicated that the decision to use unequal or equals weights does not greatly impact parameter estimates (Wolff Smith & Beretvas, 2012), it is particularly important for answering the research question concerning the effects of institutional contexts. Weights were also applied to the institution-level predictors, which will be discussed in the explanation of Equation 9 after the conditional MMREM model is presented. Students who have attended multiple colleges might have been exposed to the effects of more than one institution; therefore, accurate estimation of colleges' effects is crucial.

Comparison of the unconditional HGLM and unconditional MMREM. While exploration of the data clearly indicates a multiple membership data structure, the best fitting model can be determined by comparing the fit index values of the unconditional HGLM and unconditional MMREM. The deviance statistic can be thought of as a measure of how well the model fits the data. The deviance statistic specifically reported in MLwiN software utilizing MCMC estimation is the Deviance Information Criterion (DIC). The DIC is a fit index used in Bayesian model selection and is calculated as follows:

$$\text{DIC} = \overline{D} + \rho_D, \tag{6}$$

where $\overline{D}$ is the mean of deviance across iterations and ρ_D is the effective number of parameters. The DIC penalizes model complexity through the term ρ_D as small DIC values indicate better model fit (Spiegelhalter, Best, Carlin, & van der Linde, 2002). The DIC can be used to compare the relative fit of unconditional HGLM and unconditional MMREM. This measure along with the random effect variance component and the calculated ICC justify the use of MMREM vs. a conventional HGLM.

Table 3.3 presents a comparison of the two unconditional models. Applying purely hierarchical multilevel models to multiple membership data structures typically results in an underestimation of the higher level variance and a worse fitting model (Chandola, Clarke, Wiggins & Bartley, 2005; Goldstein, Burgess, & McConnell, 2007; Grady & Beretvas, 2010). The HGLM yielded lower estimates of between-institution variance than obtained from the MMREM. Results showed that an estimated 7% of the variability in students' average probabilities of persistence was between group variability, which is nearly double the ICC of 3% that was calculated for the HGLM. Compared with the HGLM, the unconditional MMREM resulted in a reduction of the DIC statistic from 7340 to 7200, indicating that the latter is a better fit. Researchers deem a value larger than 10 to be a substantial difference to support the model with the smaller value (Leckie, 2008). Confirming that the MMREM was the most appropriate modeling technique for the analytical sample, the conditional MMREM was constructed by adding level 1 and level 2 predictors. The unconditional MMREM served as the baseline model for comparing the improvement of fit for the proceeding conditional MMREM.

Table 3.3
Comparing the Unconditional HGLM and Unconditional MMREM (n=5,410)

	DIC [a]	τ_{00} Level 2 variance	ICC [b]
Unconditional HGLM	7340	0.098	3%
Unconditional MMREM	7200	0.242	7%

Note: Student n's are rounded per NCES reporting guidelines.
[a] DIC = Deviance Information Criterion; [b] ICC = Intra-Class Correlation

Conditional MMREM. The level 1, or within-institution, model with a Bernoulli sampling model is:

$$\text{Log}\left[\frac{\pi_{i\{j\}}}{1-\pi_{i\{j\}}}\right] = \beta_{0\{j\}} + \beta_{1\{j\}}(\text{Demographic Characteristic})_{i\{j\}} +$$

$$\beta_{2\{j\}}(\text{Precollege Experiences})_{i\{j\}} + \beta_{3\{j\}}(\text{Environmental Pull factors})_{i\{j\}} +$$

$$\beta_{4\{j\}}(\text{Undergraduate Experiences})_{i\{j\}} \tag{7}$$

where student i might attend a set of multiple colleges represented using $\{j\}$ and $\beta_{1\{j\}}$ can be

interpreted as the change in a student's probability of persistence when the level 1 predictor

(i.e., $X_{i\{j\}}$) changes by one unit, holding all else constant. Equation 7 is simplified, presenting the

general form of the level 1 equation rather than giving the specific equations for each of the five

variable blocks. The intercept for Equation 7 varies between institutions. However, the

coefficients for each of the student-level independent variables are restricted to the same values

for all institutions. Students' weighted average likelihood of persistence is thought to be

different depending on the institutional context. The effects of individual experiences are

assumed to be the same regardless of where the student attended college.

The level 2 model can be expressed thusly:

$$\beta_{0\{j\}} = \gamma_{00} + \gamma_{01} \sum_{h \in \{j\}} w_{ih}(\text{Institutional Characteristics})_h + \sum_{h \in \{j\}} w_{ih}u_{0h} \tag{8}$$

where γ_{00} is the average log-odds of persistence when the level 1 predictors and the weighted

average of the level 2 predictors are zero; γ_{01} can be interpreted as the change in $\beta_{0\{j\}}$ for a one

unit change in the level 2 predictor (i.e., $\sum_{h \in \{j\}} w_{ih}Z_h$), holding all else constant. Similar to the

level 1 equation (7), Equation 8 is simplified, with the vector "institutional characteristics"

referring to that variable block rather than giving the specific equation.

Note that the level 2 predictor (i.e., $\sum_{h \in \{j\}} w_{ih}Z_h$) in MMREM is a weighted average of

level 2 predictor's values across the set of colleges attended by the mobile student. Within the

analytical sample the total possible number of colleges attended in this sample is five

institutions. If, for example, student A attended five colleges, the level 2 predictor values would

be calculated as follows:

$$Z_{A\{1,2,3,4,5\}} = \left(w_{j_1} * Z_{j_1}\right) + \left(w_{j_2} * Z_{j_2}\right) + \left(w_{j_3} * Z_{j_3}\right) + \left(w_{j_4} * Z_{j_4}\right) + \left(w_{j_5} * Z_{j_5}\right) \quad (9)$$

As previously mentioned, the weighting scheme adopted for this study was based on a student

proportional enrollment time (in months) at each institution attended, which provided for a more

accurate estimation of institutional effects.

Additional modeling considerations. In terms of centering considerations for the

multilevel mode1, this study used grand-mean centering for all variables except for the

dichotomous variables. Dichotomous variables were not centered in this study; therefore, the

parameter associated with dichotomous variables represented how that particular value compared

to the reference group in terms of the probability of the outcome (persistence). All other

continuous variables centered around the grand mean. Grand-mean centering subtracts the mean

value of a variable for the entire sample from that variable's value for each individual

observation (Porter & Umbach, 2001), which facilitates the interpretation of the intercept in the

model (Raudenbush & Bryk, 2002). The grand-mean centering technique adjusts for between-

institution differences in student-level variables. The intercept can be translated as the weighted

average likelihood of persistence for students *with the average characteristics of the sample*.

The study's results were interpreted in terms of the delta-P statistic, or the expected

change in probability of persistence resulting from a one-unit change in a given independent

predictor, i.e., X_j (Peng, So, Stage, & St. John, 2002):

$$\Delta P = P(Y = 1 \mid L_1) - P(Y = 1 \mid L_0)$$

$$= P(Y = 1 \mid L_0 + \beta_i) - P(Y = 1 \mid L_1) \quad (7)$$

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where L_1 represents the logit after a one-unit change in X_j and L_0 represents the logit prior to a one-unit change in X_j. According to Peng et al. (2002), "the magnitude of delta-p is not a constant but rather a variable for the entire range of X_j" (p. 269), making it appropriate when interpreting continuous variables. When interpreting dummy variables, the delta-P statistic indicates an independent predictor's percent impact on the outcome. Following the recommendation of Cabrera (1994), the delta-Ps are presented only for statistically significant parameters.

Limitations

There are several limitations of this study that should be considered. The study is limited to availability of variables in the BPS:04/09 and the IPEDS data. The BPS:04/09 survey was designed to assess a broad range of experiences over the college years. Thus, the BPS: 04/09 data set is limited in variables that provide more specific information about students' undergraduate experiences that could further explain a student's probability to persist. Additionally, the dataset has a limited selection of variables capturing students' perceptions and viewpoints regarding their college experiences. Furthermore, it must also be recognized that a large amount of the survey drew on student self-assessed survey data, which introduces a number of additional limitations (Porter, 2009) and research has shown that self-reported data are not as reliable as administrative data (Adelman, 1999). However, there are a number of measures that can only be obtained from self-reports, thus making the findings important for higher education research.

Similarly, IPEDS has a limited selection of variables providing information about the contextual effects of institutions. The IPEDS data also limits the results of the institutional effects, because the vast majority of institutional measures were taken from the 2003-04 academic year in IPEDS (subsequent years were utilized when 2003-04 was not available) to be

consistent with the institutional data that are included the BPS:04/09 dataset. Considering that the institutional variables are not likely to be constant over the six-year study period, a more accurate measure would have been to take an institutional measure for each student based on the first year of attendance at that specific institution.

Unlike IPEDS, which is mandated for all postsecondary institutions that receive federal aid, the BPS survey was administered under financial and resource constraints, making it impossible for BPS researchers to survey the entire population of students and institutions. It was therefore necessary to use a sampling approach for estimation of trends and patterns across the data. To ensure appropriate representation of the population, researchers oversampled selected subgroups of students and institutions. This resulted in a distortion of the overall representation that required adjustment through the application of weights. In addition, the longitudinal response rate for the BPS:04/09 may inappropriately bias the data. Although normalized weights were applied to compensate, the results may still have some form of bias. Therefore, generalization of the findings from this study beyond the study's population should be done with great caution.

In addition, the analysis is limited by missing data. Missing data are problematic at the student level, particularly with 28.4% missing data for high school GPA. Although the most up-to-date, sophisticated method for handling missing data was used, this is still problematic and a substantial limitation as the percentage of missing data exceeds the recommended threshold. However, the theoretical importance of controlling for prior academic achievement warranted the inclusion of the high school GPA measure in the MMREM model.

In investigating degree attainment, the BPS:04/09 dataset is limited in its duration. The BPS survey provides a 6-year window to analyze degree attainment. Six years should be an

adequate amount of time to complete a degree, a degree with a theoretical duration of 2-4 years, if the student follows a traditional pathway of enrollment. Many community college students delay enrollment, attend part-time, and interrupt enrollment; thus, 6 years might not be a long enough period of time to complete a degree. This is particularly true for those seeking a bachelor's degree as many of these students may transfer without first attaining an associate's degree or may lose credits when they transfer.

Lastly, this study utilized the number of months that a student was enrolled at a college as the basis for creating the weights that were utilized for modeling membership in the random effects model and for the proportions used in creating the institutional variables. While the option existed to use unequal or equal weights, it has been noted that the choice of weights' values does not greatly impact parameter estimates (Wolff Smith & Beretvas, 2012). The decision to utilize weights based on the number of months enrolled may not be the most accurate measure for calculating the proportional institution-level variables. The numbers of months enrolled does not accurately reflect the proportional amount of engagement a student had with one institution vs. another. Perhaps a better measure would be the number of credits attempted at an institution. For example, two students may attend the same institution for equal amounts of time, but one student may have been enrolled full-time (e.g., four courses) and the other may have been enrolled part-time (e.g., two course). One might argue that an institutional effect (e.g., institution size) would be different for each of these students even though they were enrolled for the same amount of time, as one student was twice as engaged in that institution as the other student. A measure indicating a student's attempted credits was not available at the time of the analysis, but future research should consider the use of the more recently available transcript data for these additional measures.

The following chapter will present the results for the MMREM model predicting persistence among degree-seeking community college students. The final chapter will conclude with a discussion of findings and implications.

Chapter 4: Results

This study utilized multilevel modeling techniques to examine the extent to which institutional characteristics influence student persistence after accounting for the characteristics and college experiences of students within institutions. Persistence is defined as attaining a degree or continued enrollment in postsecondary education at any institution after 6 years. This inquiry drew from Nora's (2003) Student/Institution Engagement Model in examining the influence of community college student characteristics and the Berger-Milem (2000) college impact model informed by resource dependence theory (Pfeffer & Salancik 1978) in focusing on the influence of institutional contexts on student persistence. Guided by these analytical frameworks and prior empirical scholarship, the following three research questions are sequentially addressed:

1. To what extent does student persistence vary between institutions after accounting for all colleges that a student attends in the 6-year study period?

2. Controlling for background characteristics and precollege experiences at college entry, how do student environmental pull factors and student social and academic undergraduate experiences affect persistence within 6 years?

3. Controlling for individual characteristics and experiences, how do institutional predictors such as structural, student peer, and financial characteristics affect student persistence within 6 years?

This chapter highlights the study results, beginning with information on the analytical sample using descriptive statistics for both student-level and institution-level variables. Next, the findings of the multilevel statistical analysis present estimates of the variation in average

persistence probabilities across institutions, in addition to the student and institutional predictors that influence persistence.

Descriptive Statistics Results

This section presents the un-weighted descriptive statistics, including the minimum and maximum values, mean, and standard deviations, separately for the student and institutional samples.

Student-level descriptive statistics. Table 4.1 shows the descriptive statistics for the dependent and independent variables included in the MMREM analyses. Among the 5,410 community college student surveyed, 57% persisted after 6 years of enrollment in postsecondary education. The persistence outcome explored in this study included students who attained a degree and students who did not attain a degree but were still enrolled vs. students who did not attain a degree and were no longer enrolled. As shown in Figure 4.1, 38% of community college students attained a certificate or degree and 18.5% had not attained, but were still enrolled.

Table 4.1
Descriptive Statistics (n=5410 community college students, 1,590 institutions)

	Min.	Max.	Mean	SD
Dependent Variables				
Persistence/attainment vs. not enrolled	0.00	1.00	0.57	0.49
Demographic Characteristics				
Gender: Female	1.00	2.00	1.58	0.49
Race: White (reference group)	0.00	1.00	0.62	0.48
Race: African American	0.00	1.00	0.15	0.36
Race: Latino	0.00	1.00	0.13	0.34
Race: Asian American & Pacific Islander	0.00	1.00	0.04	0.20
Race: American Indian	0.00	1.00	0.01	0.09
Race: Other	0.00	1.00	0.01	0.12
Race: Multiracial	0.00	1.00	0.03	0.16
Age 25 or older	0.00	1.00	0.20	0.40
Mother's highest education level	1.00	10.00	3.51	2.31
Middle income or higher	1.00	2.00	1.39	0.49

(table continues)

	Min.	Max.	Mean	SD
Precollege Experiences				
Delayed enrollment	0.00	1.00	0.40	0.49
High school GPA	1.00	7.00	5.43	1.05
Environmental Pull Factors				
Total institutional aid received 2003-04	0.00	20842.00	271.43	1368.30
Worked full-time 2003-04 (exclude work-study)	1.00	2.00	1.31	0.46
Dependency status 2003-04	0.00	1.00	0.27	0.44
Undergraduate Experiences				
Certificate of Associate's degree aspirations (reference group)	0.00	1.00	0.18	0.39
Bachelor's degree aspirations	0.00	1.00	0.37	0.48
Master's or above degree aspirations	0.00	1.00	0.45	0.50
Enrollment intensity: full-time 2003-04	1.00	2.00	1.58	0.49
College GPA 2003-04	0.00	4.00	2.87	0.85
Declared a major 2003-04	0.00	1.00	0.66	0.47
Remedial course: any taken in 2003-04	0.00	1.00	0.32	0.47
Distance ed. course: any taken in 2003-04	0.00	1.00	0.12	0.33
Satisfaction with choice of major	0.00	1.00	0.86	0.35
Academic integration 2004/2006	-1.81	2.48	-0.38	0.83
Social integration index 2004/2006	0.00	200.00	22.34	31.55
Institutional Characteristics				
Structural characteristics				
Institution level (4 year keyed higher)	1.06	2.98	2.16	0.28
Size: Total FTE undergraduates	17.00	74535.67	10858.26	8783.05
College part of a system	1.00	2.00	1.39	0.45
College location: degree of urbanization	1.00	7.00	2.97	1.69
Proportion of FTE faculty (in 10-point increments)	3.19	100.00	41.48	18.48
Distance learning opportunities	1.00	2.00	1.93	0.21
Placement services for completers	1.00	2.00	1.92	0.23
On-campus day care for student's children	1.00	2.00	1.67	0.42
Student peer characteristics (in 10-point increments)				
Proportion of minority undergraduates	0.00	100.00	25.08	19.23
Proportion of undergraduates receiving Federal aid (Pell Grants)	0.00	100.00	36.23	16.06
Institutional finance characteristics (in $1000s)				
Instruction expenses per FTE	70.00	138637.00	4297.51	3782.37
Academic support expenses per FTE	0.00	76630.55	1453.06	3557.89
Student services expenses per FTE	0.00	58443.00	1378.15	2612.02
Administrative expenses per FTE	0.00	45963.87	1639.16	2016.33

Note: Student n's are rounded per NCES reporting guidelines

Figure 4.1
Proportion of students perstisting/attaining after six years
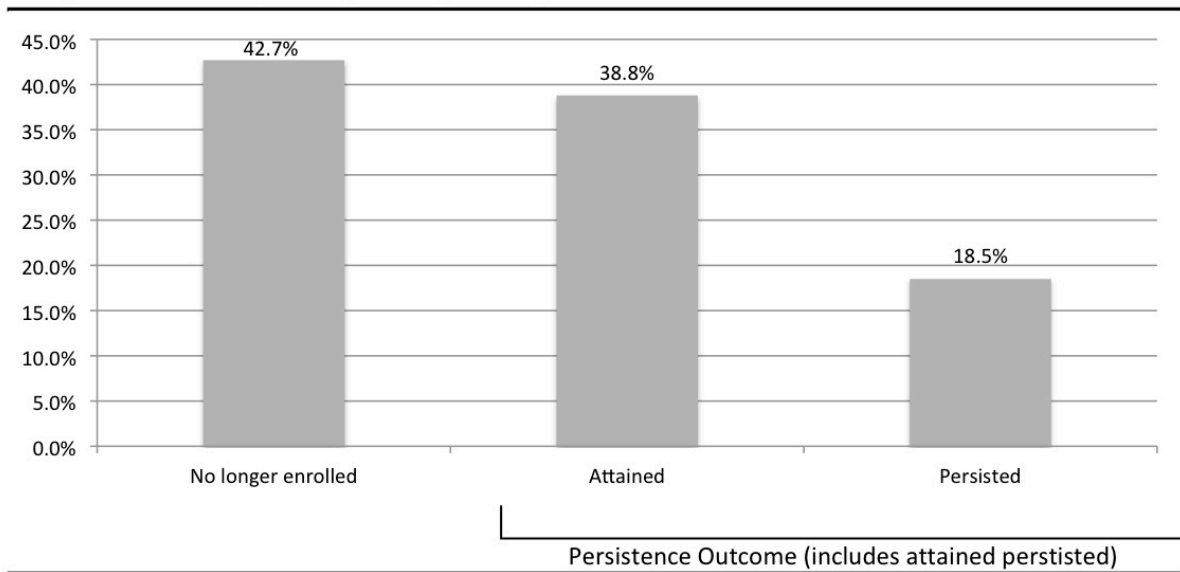
White students characterized 62% of the sample, along with African Americans and

Latinos representing 15% and 13%, respectively. The remaining racial categories had smaller

proportions (<10%), with 4% Asian American, 1% American Indian, 1% Other, and 3%

Multiracial. In terms of other demographic characteristics, 58% are female, 20% were 25 years

or older when first enrolled, and 61% were low-income with household earnings at or below

185% of the national poverty level in 2003. Additionally, a mean of 3.51 for mother's highest

education indicates that, on average, students' mothers had achieved some college or vocational

training, but no degree. Considering students' precollege experiences, 20% had delayed

enrollment after high school at least 1 year. The mean of 5.43 on a 7-point scale for high school

GPA indicates that, on average, students entered college with a high school that GPA fell

between a B- and an A-. To gain a sense of students' average financial situations upon entering

college, it was discovered that 27% were independent, 31% worked full-time (outside of work-

study), and the average institutional aid per year received in 2003 was roughly $271.00.

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In terms of postsecondary expectations, the majority of community college students have high degree goals with only 18% aspiring to a certificate or AA, while 37% were interested in attaining a baccalaureate, and 45% aspired to a Master's degree or beyond. Similar to their entering high school GPAs, students' average 2003-04 college GPA was 2.88 (on a 4.00 point scale), which is within a C range. Students first-year experiences were also characterized by 58% enrolled full-time, 66% officially declared a major, 32% took at least one remedial course, and 12% took one or more distance education courses. When last surveyed, 86% of students were satisfied with their choice of major.

The descriptive statistics for institutional characteristics in Table 4.1 represent the weighted institutional variables that were calculated based on a student's proportional time enrolled at a college as described in Chapter 3 (see Equation 9, p. 80). Thus, to provide a more informative picture of the college sample, institution-level descriptive statistics will be presented separately.

Institution-level descriptive statistics. Table 4.2 provides the descriptive findings for the institutional sample of 1,590 colleges. The average undergraduate FTE enrollment for colleges included in the study was 6,753. Among the institutions sampled, 33% were part of a structured system, 76% offered distance education, 88% provided placement services for completers, and 46% offered on campus childcare. The student body in the average institution was composed of 24% minority students (African American, American Indian, Latino). The average college had 39% of students receiving federal Pell Grants. The average institution spent $5,622 on instruction, $4,705 on academic support, $3,855 on student services, and $3,634 on administrative expenses per FTE student.

Table 4.2
Institutional Sample Descriptive Statistics (n=1,590)

	Min.	Max.	Mean	SD
Institutional Characteristics				
Structural characteristics				
Institution level	1.00	3.00	2.41	0.60
Size: Total FTE undergraduates	11.00	83933.00	6753.13	7734.67
College part of a system	1.00	2.00	1.33	0.47
College location: degree of urbanization	1.00	7.00	3.01	1.85
Proportion of FTE faculty	0.00	100.00	51.06	25.92
Distance learning opportunities	1.00	2.00	1.76	0.43
Placement services for completers	1.00	2.00	1.88	0.32
On-campus day care for student's children	1.00	2.00	1.46	0.50
Student peer characteristics				
Proportion of minority undergraduates	0.00	100.00	24.22	21.95
Proportion of undergraduates receiving Federal aid (Pell Grants)	0.00	100.00	39.42	19.81
Institutional finance characteristics				
Instruction expenses per FTE	0.00	729541.00	5622.06	19415.14
Academic support expenses per FTE	0.00	281053.00	4705.35	15521.40
Student services expenses per FTE	0.00	214476.00	3855.77	11524.76
Administrative expenses per FTE	0.00	145611.00	3634.11	8215.83

For descriptive purposes, these variables are reported in their original formats and not in format in which they were entered in the MMREM. For example, institution size and expenses per FTE categories (e.g., instruction, academic support, student services, administrative) are reported here in actual terms, but for the purposes of the multilevel models, these variables have been transformed using a log transformation to account for the fact that the distributions are not normal. When interpreting the exploratory measures presented in Table 4.2, it is important to also keep in mind that the college sample represented in the descriptive statistics is across all postsecondary sectors, and therefore does not fully describe the differences across institutional level or control for each of the variables. More specifics on the institution sectors and student mobility across sectors will be provided in the next section.

Exploration of student mobility. To be more specific in describing student movement across sectors, Table 4.3 presents the proportions of students who attended multiple colleges, along with the sector breakdown for destination institutions. Over the 6-year study period, 50%

of the students sampled transferred at least one time, 11% attended two or more colleges, 2%attended three institutions, and less than 1% changed colleges five times. A clear trend of upward mobility is evident as 4-year institutions (public, private, and for-profit combined) were the destination for 60% of the community college students who attended at least 2 institutions (n=2,710). Lateral transfer was also common as 32% of students who changed schools at least one time choose another public 2-year institution as their destination college. These two trends continue to hold true in examining the sub-samples of students who transfer three, four, and five times. Table 4.3 also confirms the multiple membership data structures as is evident by the proportions of students in the sample who attended multiple institutions. The next major section discusses the results of the MMREM analyses, which accounts for the student mobility seen in the sample.

Table 4.3
Institution Sector Among Students Who Attended More Than One College

	2 Colleges	3 Colleges	4 Colleges	5 Colleges
Proportion of student sample (n=5,410)	50%	11%	2%	<1%
	(n=2710)	(n=620)	(n=110)	(n=20)
Public 4-year	42%	44%	44%	17%
Private not-for-profit 4-year	13%	10%	8%	28%
Private for-profit 4-year	5%	6%	8%	22%
Public 2-year	32%	34%	39%	28%
Private not-for-profit 2-year	1%			
Private for-profit 2-year	3%	3%		
Public less-than-2-year	1%	1%		6%
Private not-for-profit less-than-2-year				
Private for-profit less-than-2-year	3%	1%	1%	

Note: Student n's are rounded per NCES reporting guidelines

Multilevel Modeling Results.

The modeling process occurred in several stages, based on the research questions. As described in Chapter 3, all of the multilevel analyses were conducted in MLwiN (version 2.24, 2011) using the Markov Chain Monte Carlo (MCMC) estimation procedure. Two fully

unconditional models were compared to determine the best fitting model and confirmed the need for MMREM statistical approach. In this section, the results of the fully unconditional MMREM will be detailed to attend to the first research question and working hypothesis. Then, conditional MMREMs are presented to address the final two research questions and hypotheses.

      Unconditional MMREM results. The MMREM explore persistence referring to students who have attained a degree and are no longer enrolled, who have attained a degree and are still enrolled, and are still enrolled, in comparison to those who are no longer enrolled. The fully unconditional model results addressed research question one, which asked, "Does student persistence and degree attainment vary within and between institutions?" This model contained no predictor variables, but allowed the level 2 intercept to vary. As hypothesized, the unconditional model revealed between-institution difference as indicated by the level 2 variance component (0.24), which is significant at the p<0.001 level. The assumption made in the traditional logit model is that the level 1 error variance can be estimated as $\frac{\pi^2}{3}$, (Grilli & Rampichini, 2007), which was utilized to calculate the proportion of the total variance that is between institutions or the intra-class correlation (ICC). These results demonstrate that the majority of variance is attributable to differences within institutions as the ICC for between-institution variance was 0.069 or 7% of the total variance.   As reported in Chapter 3, the between-institution variance in students' average probability of persistence was underestimated (3% vs. 7%) using the traditional HGLM, thus confirming that MMREM was the most appropriate method. The Deviance Information Criterion (DIC), which is a measure of a model's overall fit, is reported as 7200.29. This deviance statistic and the level 2 variance component obtained from the unconditional MMREM provide a baseline for comparing

conditioned models as a reduction of these estimates indicates an improvement in the relative fit of the model.

      Conditional MMREM Results. Before detailing the results of the conditional MMREM, the model building process must be further explained. In addition, clarifying points must be made regarding the interpretation of results. There are five models in total (four level 1 categories and one level 2 category) that correspond to the conceptual model presented in Chapter 3. The following categories of predictors were entered in five temporally aligned blocks of variables: (a) demographic characteristics, (b) pre-college experiences, (c) environmental pull factors, (d) undergraduate experiences, and (e) institutional characteristics. This method of blocking allowed for assessment of model fit at each stage to gain a better understanding of the influence each cluster of predictors exerts on 6-year persistence. To simplify and facilitate the presentation of results, the models will be presented in three stages. Model 1 includes predictors from the demographic characteristic and precollege experience categories. Model 2 adds the independent variables related to environmental pull factors and undergraduate experiences. Model 3 reflects the final model, which includes institutional factors. Thus, the results in table format (Table 4.4) displays the three models side by side; however, the discussion will present the results in terms of the five categories of predictors related to the analytical framework.

      The final model (Model 3) addresses the second and third research questions, which asked: "Controlling for background characteristics and precollege experiences at college entry, how do student environmental pull factors and student social and academic undergraduate experiences affect persistence within 6 years?" and "Controlling for individual characteristics and experiences, how do institutional predictors such as structural, student peer, and financial characteristics affect student persistence within 6 years?"

Table 4.4

MMREM Results Predicting Persistence Among Community College Students (N=5,410 Students, 1,590 Institutions)

	Model 1			Model 2			Model 3		
	Coef.	S.E. (sig)	Delta-p	Coef.	S.E. (sig)	Delta-p	Coef.	S.E. (sig)	Delta-p
Demographic Characteristics									
Gender: Female	0.17	0.06***	4.13%	0.14	0.06**	3.39%	0.17	0.06**	4.03%
Race: Black (White referent)	-0.13	0.09		-0.13	0.09		-0.04	0.09	
Race: Latino	-0.25	0.09***	-6.28%	-0.18	0.09		-0.04	0.10	
Race: Asian American & Pacific Islander	0.14	0.15		0.07	0.15		0.00	0.17	
Race: American Indian	0.14	0.33		0.08	0.34		0.23	0.35	
Race: Other	-0.03	0.23		-0.01	0.24		0.11	0.25	
Race: Multiracial	-0.37	0.17*	-9.18%	-0.36	0.18*	-8.83%	-0.32	0.18	
Age 25 or older	-0.24	0.09**	-6.03%	-0.21	0.11		-0.10	0.11	
Precollege Experiences									
Mother's highest education level	0.04	0.01***	1.07%	0.03	0.01**	0.73%	0.01	0.01	
Middle income or higher	0.00	0.06		-0.01	0.07		0.04	0.07	
Delayed enrollment	-0.39	0.07***	-9.68%	-0.27	0.08***	-6.70%	-0.14	0.08	
High school GPA	0.17	0.03***	4.01%	0.09	0.03***	2.21%	0.06	0.03*	1.57%
Environmental-Pull Factors									
Total institutional aid received 2003-04				0.00	0.00		0.00	0.00	
Worked full-time 2003-04 (exclude work study)				-0.23	0.07***	-5.68%	-0.18	0.07**	-4.56%
Dependency status 2003-04				-0.18	0.10		-0.19	0.10	
Undergraduate Experiences									
Bachelor's degree aspirations (Cert/AA aspirations referent)				-0.11	0.09		-0.24	0.09**	-5.84%
Master's or above degree aspirations				0.18	0.09*	4.30%	-0.07	0.09	
Enrollment intensity: full-time 2003-04				0.14	0.07*	3.42%	0.07	0.06	
College GPA 2003-04				0.30	0.00***	7.35%	0.20	0.00***	5.95%
Declared a major 2003-04				0.11	0.06		0.09	0.06	
Remedial course: any taken in 2003-04				-0.09	0.06		0.01	0.06	
Distance ed. course: any taken in 2003-04				0.06	0.09		0.06	0.09	
Satisfaction with choice of major				0.72	0.08***	16.18%	0.76	0.09***	16.84%
Academic integration 2004/2006				0.27	0.04***	6.34%	0.21	0.04***	5.01%
Social integration index 2004/2006				0.00	0.00		0.00	0.00	

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	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	%
Institutional Characteristics							
Structural characteristics							
Institution level (4 year keyed higher)					1.88	0.16***	32.69%
Size: Undergraduates FTE (Log)					0.12	0.04***	2.89%
College part of a system					0.10	0.06	
College location: degree of urbanization					0.07	0.02***	1.80%
Proportion of FTE faculty (in 10-point increments)					0.11	0.02***	2.70%
Distance learning opportunities					-0.65	0.21***	-16.11%
Placement services for completers					0.43	0.15***	9.97%
On-campus day care for student's children					-0.02	0.08	
Student peer characteristics (in 10-point increments)							
Proportion of minority undergraduates					-0.01	0.02	
Proportion of undergraduates receiving Federal Pell Grants					0.03	0.02	
Institutional finance characteristics (Log)							
Instruction expenses per FTE					0.07	0.06	
Academic support expenses per FTE					0.20	0.04***	4.72%
Student services expenses per FTE					-0.09	0.04	
Administrative expenses per FTE					0.12	0.06	
Intercept	0.325	0.11***	-0.33	0.18	-7.89	0.74***	
Model Statistics							
Level 2 variance	0.034		0.003		0.001		
Explained variance at level	0.86		0.99		0.99		
DIC	7187.3		6954.73		6564.67		

Note: Student n's are rounded per NCES reporting guidelines
*p<0.05 **p<0.01 ***p<0.001

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Table 4.4 provides the log-odds coefficient (Coef.), standard error (S.E.), level of significance (sig), and the calculated delta-p statistic for all three models. The delta-p statistic represents the change in probability of persistence that is associated with a one-unit change in each independent variable. This explanation is appropriate for continuous variables, while the values can be interpreted for dichotomous variables as the difference in probability of persistence compared to students who do not have that characteristic or experience. The delta-p statistic is only given for statistically significant predictors.

Demographic characteristics. Considering student demographics, relatively few variables significantly predicted persistence after controlling for undergraduate experiences and institutional factors. In comparing the three models presented in Table 4.4, gender was the only demographic characteristic that retained its predictive power after all variables had been entered into the model. Women were significantly more likely succeed in comparison to their male peers with a 4.03% higher probability of persisting after 6 years of college. Perhaps this mirrors the national trends indicating larger proportions of women (vs. men) enrolling in 2-year colleges (Goan & Cunningham, 2007) and across all sectors (Horn & Nevill, 2006). This finding is also noted in the descriptive statistics of the analytical sample, which was nearly 60% female. Although women are more likely to exhibit non-traditional characteristics (Aud et al., 2011), prior research examining community college women suggests that they are more committed to the degree program in comparison to their male counterparts. This commitment is measured by the higher proportions of women enrolling full-time as well as the higher proportion of women noting the purposes of earning a credential and/or transferring as their reason for enrollment (Horn & Nevill, 2006), which may both contribute to their higher likelihood of persistence. Latino and multiracial students appeared to have a lower probability of persistence than their

White peers; however, these effects disappeared for Latino students after accounting for undergraduate experiences. Identification as multiracial became non-significant after controlling for institutional characteristics. Similarly, accounting for students' college experiences erased the significant negative effect on persistence of enrolling in college at age 25 or older observed in Model 1.

Precollege experiences. Among the pre-college characteristics analyzed, high school GPA had a significant positive effect on persistence. A grade-unit increase from the mean of the college GPA variable (i.e., moving from the B- to B range to the B to A- range) translated to a 1.57% increased students' probability of persistence in the final model. Students whose mothers had attained higher education levels were more likely to persist, but this effect was diminished after controlling for institution-level variables in Model 3. Delaying postsecondary enrollment for 1 year or more after completing high school significantly and negatively influenced persistence, yet this relationship became non-significant once institutional characteristics entered the model.

Environmental pull factors. Student finances during college also play role in student persistence. Respondents who reported working full-time, excluding work-study positions, had significantly lower probabilities of persistence in comparison to those who were not employed full-time. This finding highlights the utility of Nora's (2003) Student/Institution Engagement Model positing that environmental factors can exert a "pulling away" of students from institutional engagement, which may have a detrimental impact on their success.

Undergraduate experiences. In addition to student demographics and pre-college experiences, a number of undergraduate experiences significantly predicted students' likelihood of persistence. Post-baccalaureate aspirations appeared to have a significant positive impact on

persistence, yet the predictive power of these effects did not remain after accounting for institutional characteristics. Students entering college with graduate school aspirations tend to be better prepared (Hagedorn et al. 2002); therefore, this positive association was expected. Having initial aspirations for a bachelor's degree corresponded to a nearly 6% lower likelihood of persistence in comparison to those who entered with certificate or associate degree aspirations. A wealth of literature suggests that higher degree aspirations positively influence persistence among community college students (Bailey, Jenkins, et al., 2006; Bers & Smith, 1991; Hagedorn et al., 2002; Perin, 2006). To interpret the negative effects of baccalaureate aspirations observed here it is important to acknowledge the reference group in relation to the outcome. Students who aspire to a certificate or associates degree may be more likely to attain or persist because of the shorter degree requirements or due to the need to move between institutions to gain a bachelor's degree. Unfortunately, many community college students face challenges in the transfer process (Dougherty & Kienzl, 2006) and because many transfer before earning an associates degree they would not be counted as persisters in this study if they discontinued enrollment after transfer.

Academic experiences seem to be most salient for student persistence. Although social integration (including measures of participation in intramural or varsity sports, attendance of fine arts activities, participation in school clubs) has been noted as an important factor related to successful student outcomes among 4-year students (Napoli & Wortman, 1996), it was not a significant predictor in this community college model. However, for students who were more academically involved (including measures of participation in study groups, contact with faculty, meeting with academic advisor, talking with faculty about academic matters) the probability of persistence increased 5.01% for a one standard deviation change from 0 (on a standardized scale) in the academic integration measure. Not surprisingly, first-year academic performance had a

positive impact, as a 5.95% higher probability of 6-year persistence was observed for every one-unit increase from the mean in students' college GPA (i.e., moving from a 3.0 to a 4.0). Furthermore, full-time enrollment during the first year of college increased students' likelihood of persistence, yet this effect diminished once institutional variables were accounted for in Model 3. Clearly academic experiences make a difference in students' success; however, taking remedial classes in one's first year of college did not significantly impact persistence in Model 2 or 3. Perhaps this effect was non-significant because the model controlled for both high school and college GPA. While officially declaring a major in the first year did not significantly predict persistence, students who were satisfied with their chosen major had a 16.84% greater probability of persisting, which underscores the importance of assisting students to clarify their degree fields early.

Institutional level results. Examining the results related to students' college environments, Model 3 addresses the last research question related to institutional effects. A note for interpreting the results presented in this chapter is that the institutional effects described are not the effect of a single institution measure but the institutional effect of the measure after accounting for the weighted average of the set of colleges attended. To interpret the findings related to institutional level, we must note that accounting for the weighted average of the set of colleges attended results in students who transferred sooner to higher level institutions (i.e. 4-year colleges) have higher scores on this measure. Therefore, students who transferred to a 4-year college earlier in their educational trajectories had significantly higher probabilities (delta-p=32.69%, p<0.001) of persistence. Institutional size also mattered as a one standard deviation increase (from 0 on a standardized scale) in the logged undergraduate FTE corresponded to a 2.89% increase in students' average probability of persistence. Attending a college located in a less urban location corresponded to a nearly 2% higher likelihood of 6-year persistence. The

inputs in the student peer characteristics variable block were not found to be influential, as the proportions of minority students and undergraduates receiving federal aid were statistically non-significant.

Although structural characteristics are important and must be taken into account, of greater interest are the institutional factors that may be partially or fully within institutions' control. Respondents who enrolled at institutions where distance learning was available were 16.11% less likely to persist than students attending colleges that did not provide this type of instructional offerings. Finally, attending an institution that provides placement opportunities corresponded to a nearly 10% higher probability of persistence. For a 10-point increase (from 0) in the proportion of full-time faculty at an institution, the average likelihood of student persistence increased by 2.70%. This finding is in line with the community college research demonstrating the detrimental effects to student and institutional outcomes from relying too heavily on part-time faculty instruction (Eagan & Jaeger, 2008, 2009; Jacoby, 2006; Jaeger & Eagan, 2009), suggesting that having a higher proportion of full-time faculty may correspond to a more engaged, scholarly faculty, which can impact student outcomes. The financial context of an institution is also shown to have an effect on student outcomes. Students who enrolled at colleges with higher investments in academic support per FTE undergraduate had a 4.72% higher average probability of persistence with a standard deviation increase (from 0 on a standardized scale) in expenditures. This finding supports Calcagno et al.'s (2008) work suggesting that institutions with greater expenditures for academic support saw results promoting student outcomes.

Overall adequacy of the MMREM. The model statistics are reiterated in Table 4.5 for each model run in building the final MMREM. The unconditional MMREM serves as the

baseline for comparing these models. Model 1 accounted for 86% of the level 2 variance.

Models 2 and 3 added environment pull factors, college experience, and institutional variables,

which explained an additional 13% of the between-institution variance in students' average

probability of persistence. Overall, approximately 99% of the between-school variance was

explained by predictors in the model. Utilizing the DIC to assess model fit, researchers consider

a difference larger than 10 in the DIC statistic a substantial change to support the model with the

smaller value (Leckie, 2008). The DIC decreases as significant effects (both random and fixed)

are added to the model; hence, each model demonstrates an improvement in the fit index and a

considerable reduction supporting the final model.

Table 4.5
Model Statistics

	Unconditional Model	Model 1	Model 2	Model 3
Level 2 variance	0.242	0.034	0.003	0.001
Explained variance at level 2		0.86	0.99	0.99
DIC	7200.29	7187.3	6954.73	6564.67

Note. DIC= Deviance Information Criterion

Summary of Results This study involved numerous stages of analysis to determine the student and institutional influences on college student persistence. The chapter began with a summary of descriptive statistics that were presented separately for the student and institutional samples. Additionally, student mobility was explored and a high rate of mobility was found among students included in the study, with 50% of students transferring at least once in the 6-year study period. These patterns reveal the majority of student mobility to be upward transfer to 4-year institutions (public, private, and for-profit). Lateral transfer to another public 2-year college represented the next most common type of movement. Preliminary analyses confirmed the multiple membership data structure warranting the use of MMREM.

The process for constructing the MMREM occurred in several phases with results from three progressive models being presented. The final model indicated that numerous student and institutional variables significantly predicted the variance in student persistence between institutions. There are several significant findings that can inform practices and policy related to community college student outcomes. In terms of student characteristics, women were more likely to persist than men. Findings also confirm prior research on the importance of academic preparation and performance, as both high school GPA and first year college GPA were significant positive predictors of persistence. Environmental pull factors are salient for community college students as working full-time had a significant negative impact on persistence. Degree aspirations produced interesting findings, showing students aspiring to bachelor's degree were less likely to persist in comparison to students seeking to obtain a certificate or AA degree. A higher likelihood of persistence was associated with students' satisfaction with their chosen major. Students' engagement in academically-focused activities (i.e., participation in study groups, contact with faculty, meeting with academic advisor, talking

with faculty about academic matter) was a strong predictor of persistence. Institutional efforts to promote students' academic integration through participation in these academic activities may be an advantageous strategy for institutions to employ.

As hypothesized, institutional variables impacted students' probability of persistence, with several structural characteristics identified as significant predictors including size, level, and location. Of greater interest are the institutional factors that may be completely or partially in control of the institution. Faculty composition mattered, as students attending colleges with larger proportions of full-time faculty were more likely to persist. Students also had a higher likelihood of persistence when attending institutions that provide placement services for completers, suggesting that the link between colleges and the workforce is important to students. The negative findings related to distance learning opportunities point to the need to better understand this emerging trend in course delivery. Lastly, of critical importance is the need to inform colleges of the best strategies for investing the limited funds that are available in the current fiscal environment.   Findings reveal that larger institutional investments in academic support significantly and positively impact students' likelihood to persist and suggest an opportunity for institutions to reprioritize their financial efforts on academic support services. In Chapter 5, these finding will be discussed in depth and situated with current postsecondary context to offer recommendations for future research before outlining the major theoretical, practical, and policy implications of this study.

Chapter 5: Discussion and Implications

Introduction

Community colleges have traditionally served as an open access point to higher education for many American students and particularly for low-income, minority, and first-generation college students (Cohen & Brawer, 2003). The national emphasis on college completion has shifted away from a predominantly access-oriented agenda to one that encompasses what is now termed *access and success*. Recent initiatives have called on community colleges, placing them at the forefront of addressing the nation's workforce needs and increasing degree attainment rates. Although efforts to improve student outcomes have long concentrated on transfer-bound students and bachelor's degree completion, recent years have fostered much discussion about the need to broaden definitions of success (Goldrick-Rab, 2010). Within the context of the past decade's economic downturn and the emphasized role of community colleges in advancing workforce initiatives, success must also be redefined to include overall persistence and certificate/associates degree attainment. Considering the national attention to 2-year outcomes and community college leaders and stakeholders' efforts to establish better measures for assessment, higher education researchers must also respond by providing more empirical evidence to inform policy and practice.

This inquiry sought answers to the crucial questions surrounding 6-year persistence among community college students. The impact of student characteristics and college environments on persistence were examined among a national sample of degree-seeking community college students. Emphasis was placed on different postsecondary environments that facilitate persistence. Prior research and theoretical perspectives suggested that the exploration of student background, precollege experiences, environmental pull factors, undergraduate

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experiences, and particularly institutional contexts are important to providing a more complete understanding of persistence. Much of the empirical evidence pointing to the importance of institutional context has been examined at the university level with a focus on the general 4-year student population (Astin, 1991; Pascarella & Terenzini, 2005; Titus, 2004). Although much research has centered on 4-year institutions, less emphasis has been given to 2-year colleges as a whole. This study informs and adds to emerging research exploring 2-year institutional contexts (e.g., Calcagno et al., 2008) and uniquely contributes to the literature by increasing understanding of student mobility with an intentional interest in accounting for all colleges attended in a student's educational trajectory.

These themes were examined within the larger political and economic context facing 2-year colleges. State and federal agencies have heightened expectations with widely articulated goals for degree completion in this sector, while providing these institutions with substantially fewer financial resources (Mullin, 2010). Given these realities, institutions find themselves in a position of trying to abide by their democratic missions while also attempting to meet economic and societal demands for a well-educated workforce (Gutmann, 1999). Community colleges are influenced and constrained by the environments within which they operate and by the often competing expectations of their numerous constituents. The study's findings seek to inform programmatic and policy decisions to enhance the educational experiences of students and improve outcomes.

In conclusion of this manuscript, it is important to comprehensively review the study, place it within the relevant national context, and discuss the findings and implications. This chapter provides a brief overview of the study including details on the guiding literature and theoretical perspectives, research design, and the methodological approach. The findings, related

to each research question, are summarized in this culminating section. Lastly, the implications

for research, theory, practice, and policy are explored.

Overview of the Study

This section provides a broad overview of the study. First, the significance of the study

and contributions to the literature are highlighted before placing the study within the national

political and economic context to better understand the unique position of this inquiry. Then the

guiding perspectives and research design are outlined. The following section will elaborate on

the study's findings.

The study's contributions to community college persistence research. Despite over

70 years of sustained empirical inquiry relating to student persistence, quantitative research

focused specifically on community college students is limited and further challenged by the lack

of reliable national data and longitudinal analysis, and has heavily relied on single-level

analytical techniques. Nonetheless, the findings that have emerged from a growing body of work

on community college outcomes have contributed greatly to researchers' understanding of

student experiences within specific colleges and statewide systems. Yet these contributions have

struggled to provide a more sophisticated understanding of institutional context and their

potential impact on student-level outcomes. The recent acquiring of national community college

data makes the rigor and depth of this analysis possible, as this is the first time a large nationally

representative longitudinal sample of community college students has been available. The

sample of 5,410 undergraduates beginning their postsecondary education at 380 community

colleges provided a large scope for the examination of persistence. This study offered a unique

perspective by examining and accounting for students' mobility with information on every

institution students attended in their 6-year trajectories, which resulted in the final institutional

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sample of 1,590 colleges. In additional to contributing to the community college scholarship, this study adds to higher education literature overall by introducing an advanced analytical method to the inquiry surrounding student mobility. This is the first study in the field of higher education to date to utilize MMREM in applied research on college students, providing new insights into how to appropriately model student mobility and offering the most accurate estimates when high rates of mobility are present.

Drawing from Nora's (2003) Student/Institution Engagement Model, the Berger and Milem Organizational Impact Model (2000), and resource dependence theory (Pfeffer & Salancik, 1978), this study bridges these perspectives to employ a multilevel conceptual model, thereby providing theoretical implications (discussed later in this chapter) and contributing to the scholarship seeking to better conceptualize contextual influences. This multi-theoretical approach informed the examination and salient findings surrounding financial contexts and introduced understudied measures that are particularly relevant in the current national context. Situating the inquiry within the political and economic contexts that impacted higher education during the study period, and that remain pertinent, informs policy decisions and practice as institutions respond to the heightened expectations of various constituents. Findings offer new and important insights into the paramount role of college experiences and environments in the postsecondary educational trajectories of degree-seeking community college students.

Contextualizing community college persistence. There are currently 1,173 community colleges enrolling 43% of all undergraduate students in the U.S. (AACC, 2010). Since 2003, the national priority has shifted from simply access to a focus on promoting successful community college outcomes. Endeavors such as the Lumina Achieving the Dream: Community Colleges Count initiative propelled efforts to create a *culture of evidence* for evaluating community

college outcomes. The national spotlight on community colleges heightened as the 2007 recession triggered shifts in enrollment patterns, uncertainties regarding financial aid practices, and cuts in state support of public institutions, among other challenges for higher education. The economic recession prompted a surge in postsecondary enrollment overall (NSCRC, 2012a). However, the most dramatic impact was on community college enrollment, which had the largest enrollment increases across all sectors (Mullin & Phillippe, 2009), while at the same time this sector also bore the brunt of budget cuts to higher education (Mullin, 2010). Many public institutions experienced strains on capacity simultaneously with budget cuts and many capped enrollments (Ashburn, 2011), such as those in California, which caused students to seek admission at institutions they might not otherwise have attended. Other students concurrently enrolled in multiple institutions to gain access to the courses needed to fulfill their requirements. Thus, the economic downturn also affected postsecondary education by contributing to the already increasingly complex student mobility patterns among both non-traditional and traditional students (NSCRC, 2012a).

In the face of rapidly increasing student enrollment and substantially fewer financial resources, heightened expectations to increase college completion transpired as the 2009 American Graduation Initiative (AGI) articulated the role of community colleges in responding to the economic crisis (Boggs, 2010). Community college persistence rates have remained the lowest across all sectors of postsecondary education, with only about 50% of students nationally who began at a community college in 2003-04 continuing to be enrolled at any college by 2006 (Provasnik & Planty, 2008). Recently, 2-year college leaders have worked collaboratively to redefine accountability measures through the introduction of the VFA, to include a more thorough understanding of community college outcomes beyond degree completion.

Considering the national attention to community college outcomes and community college leaders and stakeholders' efforts to establish better measures for assessment, higher education researchers must also respond by providing more empirical evidence to inform policy and practice.

Guiding perspectives. Several perspectives informed the study's inquiry of the role of institutions in community college persistence, set within the current political and economic climates. Theoretical concepts relating to student persistence and retention have been developed and refined from over 70 years of research in this area. Although these models have been studied and developed and are well supported among 4-year college students (Cabrera et al., 1992; Pascarella & Terenzini, 1991), community college research has generally lacked a theoretical model that reflects the diversity of community colleges. Thus, this study drew from relevant aspects of two 4-year frameworks to inform a conceptual model that fully explores the student experiences and college contexts that impact persistence.

First, Nora's (2003) Student/Institution Engagement Model provided an insightful framework that expands upon earlier persistence models (i.e., Tinto's [1975] Theory of Departure) by recognizing the influential factors that are more thoroughly descriptive of minority and non-traditional students (Rendon et al., 2000). The acknowledgement of outside influences or environmental pull factors affecting persistence among disadvantaged groups (i.e., minority, low-income and non-traditional populations), such as work responsibilities and whether the student receives financial aid, were key components utilized in this study to better understand community college students' experiences. Engagement is central to the theory, and Nora argues that involvement and interaction occurs in a number of arenas (academic and social) over the

college years. The conceptual framework acknowledges that academic and social interactions can provide positive reinforcement or can detract from educational goals.

Berger and Milem's (2000) model also draws heavily from student departure theory, but expands upon it by adding an organizational viewpoint that identifies structural organizational characteristics and provides several measures of institutional context, including the areas of structural characteristics and structural-demographic characteristics, which inform this study. Although Berger and Milem draw from open-systems theories (Birnbaum, 1988) to explore the systemic dimension of organizational behavior from several perspectives, including resource dependence, they do not explicitly identify the institution's internal adjustment to changes in the availability of external resources (i.e., organizational finance; Titus, 2006b). Therefore, this inquiry utilized resource dependence theory positing that institutions not only depend on external resources (Pfeffer & Salancik, 1978) and the contingencies in the external environment (Tolbert, 1985), but also employ strategies to negotiate the conditions of the broader political and financial postsecondary environments. The tenets inherent in these two theories acknowledge that organizational behavior may be affected by the institutional choices (Leslie & Slaughter, 1997) to prioritize specific functions (i.e., instruction, academic support, student services, administrative), as demonstrated by a larger investments in these expenditure categories. Aligning this perspective with the central focus of the Berger and Milem model allowed this study to go beyond simply recognizing the role of financial contexts in organizational behavior and explicitly examine how this dimension of organizational behavior impacts student persistence.

Several studies examined the influence of student characteristics and experiences on persistence (Alfonso, 2006; Bailey, Calcagno, et al., 2006; Cofer & Somers, 2000), and others

that have looked specifically the impact of institutional characteristics on institutional outcomes (Bailey, Jenkins, et al., 2006). However, there is a dearth of literature focused on investigating the effects of 2-year institutional contexts on student outcomes, and no studies to date have accounted for student mobility across institutions. This is perhaps due to the lack of access to adequate national community college data (Sylvia et al., 2010) or the research focus in higher education being primarily drawn to examine 4-year students and outcomes (Townsend et al., 2004). This inquiry comprehensively examined both student-level and college-level predictors while accounting for students with multi-institutional attendance. The study's unique methodological approach, utilizing a national sample, fills a broader literature gap and contributes to the emerging community college literature (Calcagno et al., 2008) that seeks to disentangle the processes operating at the student and institutional levels to influence student persistence and attainment.

Research design. With literature on community college outcomes, as well as the theoretical frameworks just discussed, serving as a basis for further inquiry, this study explored the relationship between 6-year persistence and students' background characteristics, pre-college experiences, environmental pull factors, and college experiences and environment. The guiding research questions, with a focus on between-institution differences and the binary nature of persistence (yes/no), required the use of a random effects logistic regression model. Furthermore, examination of student mobility among the 5,410 respondents sampled revealed that 50% of students attended more than one college during their postsecondary trajectories. The 5,410 students began at 380 community colleges and after accounting for student mobility the institutional sample represented 1,590 colleges. It was encouraging to find that upward mobility was the most common trend as 4-year institutions (public, private, and for-profit combined) were

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the destination for 60% of the community college students who attended at least 2 institutions (n=2,710). Lateral transfer was the next common trend with students transferring to another public 2-year institution as their destination college. Considering the complexity of the data structure and the high rate of student mobility, the application of MMREM modeling was the most appropriate method to account for student mobility and accurately estimate institutional effects. The MMREM analysis included individual and institutional level variables, corresponding with the study's conceptual model in the following areas: (a) demographic characteristics, (b) pre-college experiences, (c) environmental pull factors, (d) undergraduate experiences, and (e) institutional characteristics.

Discussion of Findings

In Chapter 4, results were summarized and interpreted, primarily through the discussion of individual delta-P values, to determine the odds of persistence for each measure. This section presents a synthesis of the findings, as guided by the study's guiding theoretical perspectives, to address the research questions posed in Chapter 3.

Research question 1—Variation between institutions. The first question posed in Chapter 3 read: "To what extent does student persistence vary between institutions after accounting for all colleges that a student attends in the 6-year study period?" With the institutional sample representing 1,590 colleges with many different characteristics and missions, it was hypothesized (Hypothesis III) that variation across institutions would emerge in the analyses. The unconditional model revealed between-institution variation as indicated by the significance level (p<0.001) of the institution-level variance component. A latent variable approach was taken to calculate the intra-class correlation (ICC), where the level 1 error variance is assumed to be $\frac{\pi^2}{3}$, which is the assumption made in the traditional logit model (Grilli &

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Rampichini, 2007). The ICC indicated that 7% of the variance in the probability of persistence can be attributed to differences between colleges after controlling for the weighted average persistence of the set of colleges. The ICC value underscores the importance of examining the effects of institutional contexts on student persistence, as institutional characteristics account for a significant proportion of the variance in students' probability of persistence. Prior research (e.g., Cofer & Somers, 2003; Hippensteel et al., 1994; & St. John & Starkey, 1996) largely has ignored these institutional effects, which may have overlooked significant influences on community college outcomes. Although others have observed differences in students' likelihood of success across differing institutional contexts (Bailey, Calcagno, et al., 2006; Calcagno et al., 2008), these studies accounted only for the first college attended and did not account for student mobility. As reported in Chapter 3, the between-institution variance in students' average probability of persistence was underestimated (3% vs. 7%) using the traditional HGLM, which accounted only for the first institution of attendance. Thus, it is meaningful to account for the multiple college contexts that a student encounters in his/her educational trajectory as it may distort the analyses with inflated or deflated parameter estimates and associated test statistics (Goldstein, 2003; Rasbash & Browne, 2001). Additionally, a student who has transferred might have been exposed to the effects of more than one college environment. With increasing pressure on colleges to improve student outcomes, researchers who are focused on the institutional influences should heed the call to better account for student mobility to ensure accurate estimates of institutional effects (Grady & Beretvas, 2010).

Research question 2—Student-level predictors of persistence. The second research question guiding this study (coinciding with Hypothesis II) was: "Controlling for background characteristics and precollege experiences at college entry, how do student environmental pull

factors and student social and academic undergraduate experiences affect persistence within 6 years?" It was hypothesized that prior research indicating that background characteristics and precollege experiences are some of the strongest predictors of persistence would be confirmed. Furthermore, it was hypothesized that college experiences, including both on-campus experiences and outside influences (environmental pull factors), would have significant effects on persistence after controlling for student demographics and pre-college experiences. The results related to student-level predictors are presented in Table 4.4 in Chapter 4.

Background characteristics and precollege experiences. Drawing mainly from Nora's (2003) Student/Institution Engagement Model, which acknowledges the importance of pre-college characteristics and environments (both home and educational), the impact of student-level variables on persistence was assessed. Student demographic variables included gender, age, and racial identification. In Model 1, students who were 25 or older when first enrolling in college appeared to have a lower probability of persistence even after controlling for their precollege academic achievement. This study found that age was not a predictor of persistence after college experiences were taken into account. This initial negative effect of age is consistent with the findings of with several studies that older students are more likely to drop out than younger students (e.g., Cofer & Somers, 2000; Bailey, Jenkins, et al., 2006; Hagedorn et al., 2002; Lanni, 1997). It is particularly important within the community college setting to realize that older students are more likely to have acquired several different roles, such as being an employee, a spouse/life partner, or a parent and have to navigate a collegiate system structured to accommodate younger students (Hagedorn, 2005). Model 2 demonstrates that after controlling for environmental pull factors (e.g., full-time employment) and college experiences, the effect of age disappears. Although the non-significant effect of age found in this study is contrary to prior

findings, these studies employed single-level analytical techniques and may have overestimated the effects of age on student outcomes.

Latino and multiracial students also appeared to have a lower probability of persistence in comparison to their White peers. These effects disappeared for Latino students after accounting for undergraduate experiences and for multiracial students after controlling for institutional characteristics. While several single institution studies examining community college persistence found Latino students (Hawley & Harris, 2005) and minority students (Feldman, 1993; Zhao, 1999) to have lower persistence rates, the non-significant findings are more consistent with national persistence studies indicating no effect of race (Bailey, Jenkins, et al., 2006; Cofer & Somers, 2000). It is encouraging that undergraduate experiences and college contexts appear to explain away the effects of race as it implies that colleges can and do have a role to play in encouraging and assisting students of all races to persist.

Gender is the only demographic characteristic that remains a significant predictor of persistence after accounting for college experiences and institutional contexts. Previous national studies found no significant effects related to gender (Cofer & Somers, 2000; Bailey, Jenkins, et al., 2006); however, the study results are consistent with other empirical evidence indicating that females have a significantly higher probability of persistence than males (Chen & Thomas, 2001; Lanni, 1997; Nippert, 2000-2001; Zhai & Monzon, 2004). Women are more likely to exhibit non-traditional characteristics (Aud et al., 2011), which have been shown to have a negative association with student outcomes (Berkner & Choy, 2008). Higher persistence rates in women can perhaps be explained by the research suggesting that female community college students achieve significantly higher grades (Grimes, 1997) and may be more committed to their degree program than male students (Horn & Nevill, 2006). Considering that males are less likely to

persist and researchers called for special initiatives to be implemented to address the particular needs of males with additional attention to males of color (Wood, 2011).

Community college students are much more likely to come from households in the lower income quartiles, which has been shown to be related to lower retention and graduation (Bailey et al., 2004), thus, it was an important control to include in the study. 4-year studies have found that students in the bottom two quartiles were less likely to complete college (Titus, 2006a). The analysis accounted for low-income students (i.e., those with household incomes of <185% of the poverty level), but it was not a significant predictor of persistence even before college experiences and institutional factors were entered into the model. This finding is consistent with previous community college research on persistence (e.g., Cofer & Somers, 2000; Nippert, 2000-2001). Similarly, mother's education, which often serves as an indicator of SES, was a significant predictor of persistence even after accounting for environmental pull factors and college experiences, yet became non-significant after controlling for institutional factors. While prior community college scholarship has noted parental education to impact persistence (Bailey, Jenkins, et al., 2006; Crisp & Nora, 2010), the significant findings came from studies that did not account for institutional differences; therefore, highlighting the need to better understand the role of colleges in promoting persistence among first-generation college students.

Community college research has shown that high school achievement measures are associated with a higher chance of college persistence (Cofer & Somers, 2000; Crisp & Nora, 2010; Feldman, 1993; Lanni, 1997; Garardi, 1996; Nippert, 2000-2001; Pascarella et al., 1986). In examining high school GPA specifically, some scholars (e.g., Cofer & Somers, 2000; Crisp & Nora, 2010) found high school GPA to be non-significant after controlling for college GPA as students' academic performance in college can be linked to their pre-college academic

preparation. Considering that high school GPA remains a significant negative predictor of persistence even after controlling for college academic performance, undergraduate experiences, and college contexts has several implications for open access institutions, which include strengthening K-12 partnerships as will be discussed in the implications section. Related to high school preparation, studies have noted the negative effects of delaying postsecondary enrollment after high school (Crisp & Nora, 2010), which appeared to be an important predictor of persistence in this study. However, once accounting for institutional factors delayed enrollment became non-significant, again pointing to the role of institutional contexts prefaced by Nora's (2003) model in arguing that the level of fit, between the student and the institution, influences persistence.

   Environmental pull factors and undergraduate experiences.   The findings related to environmental pull factors further validate the usefulness of Nora's (2003) conceptual framework. In examining the environmental factors that exert a ''pulling away'' from students' education, this study looked at students' financial situations and specifically at their employment status in the first year. Confirming prior community college scholarship (e.g., Crisp & Nora, 2010; Dougherty & Kienzl, 2006; Makuakane-Drechsel & Hagedorn, 2000; Schmid & Abell, 2003) student's who worked full-time were less likely to persist. The measure utilized in the analysis excluded work-study hours, because prior research has argued that working on campus helps to promote students' involvement in the community college (Astin, 1993). Inversely, working full-time means that students have less time to spend on campus, possibly coming solely for class and not taking advantage of the other engagement opportunities that are posited as highly important within Nora's (2003) framework. Students who work full-time may also have unmet financial need and might be an indicator of students' financial burdens and

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responsibilities, which are not fully addressed through financial aid and other resources. Both explanations have implications for institutions, which will be further discussed later in the chapter.

Nora's (2003) framework proposes that student's commitment to reenrollment is influenced by the extent to which they enter with a sense of purpose, often measured by their educational goals and degree aspirations. Students with a clear sense of direction are more likely to engage in activities that will help them to integrate socially and academically into the institution. There is a wealth of literature suggesting that students' degree aspirations are strongly and positively associated with eventual educational attainment (Bailey, Jenkins, et al., 2006; Bers & Smith, 1991; Hagedorn et al.; 2002; Perin, 2006). Model 2 supports these notions as aspiring to a Master's degree has a significant positive effect on persistence, yet when institutional factors are accounted for in Model 3 these effects become non-significant. Contrary to expectations based on the prior research, student's who aspired to a bachelor's degree were less likely to persist in comparison to students who aspired to an associate's degree. Students who aspire to a certificate or associates degree may be more likely to attain or persist, because of the shorter degree requirements. Furthermore, many students arrive at community college indicating intentions to complete a bachelor's degree (Bailey, Jenkins, et al., 2006). However, evidence has suggested that this intention may not be very concrete among community college students as some may in effect be "sampling" college (Adelman, 2005; Bailey, Jenkins, et al., 2006), given the relatively low cost and open access admission. More specifically, it has been noted that over half of the high school students who enter postsecondary education with baccalaureate aspirations, non-academic majors or failed to disclose a major during the first year (Alfonso, 2006), demonstrating little commitment to these goals. Similarly, many community college

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students demonstrate "misaligned ambitions" by indicating bachelor degree aspirations, yet build career plans that are highly inconsistent with these goals (Schneider & Stevenson, 1999). Clearly more research is needed to understand and better promote the baccalaureate-aspiring individuals who began postsecondary education community colleges (Wang, 2012).

Another critical component to Nora's (2003) model is the cognitive outcomes that can result from academic and social experiences. College academic performance is a cognitive factor that has proven to be the single strongest predictor for degree attainment (Adelman, 1999; Pascarella & Terenzini, 1991) and is consistently cited as having a positive association with persistence among community college students (Chen & Thomas, 2001; Cofer & Somers, 2001; Hawley & Harris, 2005; Makuakane-Drechsel & Hagedorn, 2000; Zhai & Monzon, 2004). Focusing on first year academic performance, the findings confirms the wealth of literature pointing to college GPA as a strong positive predictor of persistence. While we know that college GPA impacts student success, we need to better understand how grades serve as motivators and rewards for students (Bean & Metzner, 2005) and conversely, how students' academic struggles can discourage them. It is clear that there is a link between college performance and pre-college academic preparation (Astin, 1993; Pascarella & Terenzini, 2005). Furthermore, it is also well established that students receive unequal precollege preparation (Attewell et al., 2006; Bahr, 2010) and differential access to advanced learning opportunities (Solarzano & Ornelas, 2004). Given their democratic and open access missions and the many students that enroll from diverse backgrounds, community colleges must look more closely at the early interventions that can strengthen academic skills before students leave college as we see the highest drop out rates in the first year (NSCRC, 2012a).

Engagement is central to Nora's (2003) theory and this involvement is argued to occur in a number of arenas (academic and social), which can create an academic climate that exerts a positive association between the student and the institution. Students' commitment to attaining a degree can be solidified through the formal and informal interactions with faculty and fellow students in both the academic and non-academic settings. The findings from this study echo prior research that observed academic integration to be more significant than social integration for community college students, with traditional forms of social integration unrelated to persistence (Braxton et al., 2004; Halpin, 1990; Mutter, 1992; Napoli & Wortman, 1996). The academic integration construct measuring students' frequency of meeting with faculty informally, talking with faculty outside of class, meeting with academic advisors, and participating in study groups was a significant positive predictor of persistence.

Academic advisement can improve student outcomes (Bahr, 2008) and help solidify students major and career selections (Grubb, 2006). Community college advising is often underfunded, and students report dissatisfaction (Grubb, 2006; O'Gara, Karp, & Hughes, 2009). Peer interaction in community colleges has been cited as important to student engagement (Maxwell, 2000) and influential on persistence (Fike & Fike, 2008). Specifically, structured opportunities are salient, such as cohort models and learning communities, which promote study teams (Sandoval-Lucero, Maes & Chopra, 2011). These intentional efforts make a difference because there are fewer opportunities for peer interaction outside of class for commuting, part-time, and other non-traditional students (Hagedorn et al., 2010). Student-faculty interaction has been shown to be one of the most important discriminating variables between returning and non-returning community college students (Schmid & Abell, 2003). Unfortunately, the types of informal interactions with faculty that were measured in the study (i.e., meeting with faculty

informally, talking with faculty outside of class) have been noted as all too rare on 2-year campuses (Chang, 2005; Hagedorn et al., 2002). Paired with the negative findings on heavy reliance on part-time faculty, which will be discussed later in this section, this finding has implications for how 2-year colleges promote personal and social forms of faculty-student support.

While it was not explicitly tested, Nora's (2003) framework infers that student engagement and interactions solidify students' commitment to their institution, which influences persistence. As suggested by Astin (1993) students who are satisfied with institutional structures, opportunities, and their experiences within them have an increased chance of persistence. This study explored satisfaction with major specifically and found that students who were pleased with their chosen major had a significant higher probability of persisting. Satisfaction is related to academic integration and the critical role of advisors and faculty in early involvement. While the survey does not allow examination of the ways in which students are satisfied, this finding underscores the importance of assisting students to clarify their degree fields early.

Research question 3— College-level predictors of persistence. The third research question under investigation (coinciding with Hypothesis II) focused explicitly on institutional effects and asked "Controlling for individual characteristics and experiences, how do institutional predictors such as structural, student peer, and financial characteristics affect student persistence within 6 years?" While the institutional analyses were guided primarily by the Berger and Milem (2000) model with an intentional resource dependence theoretical lens, Nora (2003) also argued that the level of fit between the student and the institution influences persistence, thus pointing to the role of institutions. After controlling for the student-level

predictors identified in Nora's framework, the research findings show that several of the institutional variables, identified by Berger and Milem and through a resource dependence perspective, help to explain differences in the average likelihood of persistence. It is important to remember when interpreting these findings that the institutional effects account for the entire set of colleges that a student attended over the study period; therefore, the significant effects of an institutional variable indicated the predictive power after accounting for the weighted average across all institutions in the set. To be specific, persistence is related to college structural and financial characteristics, but was not significantly associated with the student peer characteristics included in the study.

      Structural characteristics.   The results from this study support the hypothesis, guided by Berger and Milem (2000) and prior research (Bailey, Calcagno, et al., 2006; Calcagno et al., 2008), positing that institutional structural characteristics would be strong predictors of community college outcomes. The analysis included several structural characteristics, variables in the model were considered for two reasons: (a) a set of variables served primarily as controls (i.e., institution level, urbanization), and (b) as other research has proposed, this inquiry focused on institutional factors that colleges might have more control and discretion over (i.e., part-time faculty, finances, learning opportunities, services). Institution level was controlled for in the analysis to determine if the institutional factors that colleges have discretion over are significant predictors of persistence above and beyond the effect of institutional level. The results demonstrate that students who transferred to a 4-year college earlier in their educational pathways had significantly higher probabilities of persistence after controlling for the weighted average of the set of college's attended. Thus, confirming what we know in terms of persistence

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rates across sectors—public 2-year colleges lag behind both public and private 4-years in persistence and completion rates (NSCRC, 2012a)

Another structural organizational characteristic identified by Berger and Milem (2000) and controlled for in the analyses is location or the degree of urbanization. Findings revealed that students attending colleges in less urbanized locations were more likely to persist. Previous research has pointed to higher retention rates at suburban community colleges in comparison to rural colleges (Goble, Rosenbaum, & Stephan, 2008) and town colleges (Waller & Tietjen-Smith, 2009). An emerging body of literature is exploring the differential proportions of part-time students (Copeland, Tietjen-Smith, Waller, & Waller, 2008), financial aid, revenues, and faculty among community colleges disaggregated by degree of urbanization (Katsinas & Hardy, 2012). More research is need to disentangle the variation within the 2-year sector, because there are unique institutional and community settings that each community college operates within.

Contrary to expectations, students attending larger institutions had a higher likelihood of persistence. This finding contradicts recent national examinations of community college institutional context indicating a negative relationship between size and completion rates (Bailey, Calcagno, et al., 2006; Goble et al., 2008) and persistence to complete a credential/degree and/or transfer (Calcagno et al., 2008). However, it does support statewide studies indicating that students attending colleges with larger enrollments were found to have greater levels of student success (Wassmer et al., 2004; Windham & Hackett, 1997). The increased likelihood of persistence may indicate that somewhat larger institutions offer a better variety and higher level of certain academic and support services that enhance student persistence and degree attainment. Expenditures for such services may offset the potential negative effects noted in the literature of student isolation and a lack of integration, engagement, or involvement that may be more

common at larger institutions. As more national level community college data becomes available, more research is needed to confirm these results and better understand mixed effects noted in the prior studies.

In line with prior research identifying the negative effects on student and institutional outcomes from relying too heavily on part-time faculty instruction (Bailey, Calcagno, et al., 2006; Calcagno et al., 2007; Eagan & Jaeger, 2008, 2009; Goble et. al., 2008; Jacoby, 2006; Jaeger & Eagan, 2009), this study found that increased numbers of full-time faculty significantly increase students' likelihood to persist. Drawing from the theoretical frames of resource dependence theory and prior scholarship, it must be acknowledged that the utilization of part-time faculty is established within the context of a globalized economy (Levin, 2007) with colleges making strategic decisions to manage the expectations of a multitude of constituents. Although postsecondary institutions must operate within the economic environments that have led to the dependency on current workforce practices, the ever-burgeoning scholarship pointing to the negative effect of the overreliance on part-time faculty cannot be ignored, particularly when paired with findings pointing to the important role of faculty interaction (Chang, 2005; Schmid & Abell, 2003). Different types of institutions utilize contingent faculty in different ways, but some community college scholarship has found no significant effects of part-time faculty (Bailey, Calcagno, et al., 2006). Furthermore, disaggregation of faculty data shows important differences to consider across particular fields and disciplines (Levin et al., 2006; Wagoner, 2007); thus, future research should following this vein of inquiry to further disentangle these effects.

Calcagno and associates (2008) proposed several variables (e.g., size, part-time faculty, expenditures) that are partially or fully within the control of higher education institutions. This

study included additional variables that are at the discretion of colleges, and two of these factors—career placement and distance education offerings—were found to be significant predictors of persistence. These measure were informed by consideration of the economic downturn occurring within the study period and by resource dependence theory. Economic conditions and the resulting tight employment market led colleges to ramp up their career services (Lipka, 2008), resulting in colleges strengthening or forging new relationships within the job market to manage the shifting demands (Pfeffer & Salancik, 2003). Many colleges sought out cost saving and revenue generating strategies (Bess & Dee, 2007), of which distance education became a viable option for many as noted in the 2008-09 academic year, with a 22% growth in enrollment in distance learning over the previous year (Allen & Seaman, 2010). Thus, the theoretical perspective provides for a better understanding of how colleges are influenced by changes in the external environment and how these organizations manage their dependence on the environment with a combination of tactics.

First, placement services for completers has received relatively little attention in higher education scholarship. In this study, students who attended colleges that provide career placement opportunities had a higher likelihood of persistence. Most campuses provide some type of career services (88% of the institution sample); thus, this finding suggests that there is something within the campuses that offer this service above and beyond the other institutional characteristics. In fact, career centers often do much more than help students find their first job. Career offices can assist students by helping them identify potential career paths, providing information regarding future careers to facilitate academic and professional development, and provide guidance in selecting academic programs that are most closely aligned with career goals, in addition to offering other programming and services (National Association of Colleges and

Employers, 2010). Hence, career centers can also serve as retention tools, by improving the flow not only between postsecondary education and the labor market, but also between levels of higher education (McGrath, 2002).

Distance learning opportunities are the second significant institutional factor added to this study, expanding the work of Calcagno and associates (2008) in examining school-level variables that are within the college's discretion. Just over 75% of the institutions sampled provide some type of distance learning, which reflects the current trend toward distance and online offerings (Allen & Seaman, 2010). Distance education may provide more flexible learning opportunities, but undoubtedly alters students' experiences with a campus (or lack thereof). The negative findings related to distance learning opportunities point to the need to better understand this emerging trend in course delivery.

Student peer characteristics. Berger and Milem (2000) posit that student entry characteristics (e.g., race/ethnicity, SES), shape the peer characteristics of an institution. Two measures were hypothesized to significantly impact persistence—percentage of minority students and percentage of student receiving federal aid (as a proxy for the extent of financial need among a college's students). Neither of these variables characterized as student peer characteristics emerged as predictive of persistence above and beyond the rest of the measures included in the model. This was a surprising result, as extant literature suggests that colleges with higher percentages of students of color tend to have lower success rates (e.g., persistence, attainment, transfer) than those with lower percentages of minority students (Bailey, Calcagno, et al., 2005; Calcagno et al., 2007; Goble et al., 2008). One explanation is that the proportion of minority students often serves as a proxy for less resourced colleges; therefore, accounting for

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the variety of college level variables, including financial indicators, may have resulted in the non-significant results.

Institutional finance characteristics. Berger and Milem (2000) draw from open-systems theories (Birnbaum, 1988) to explore the systemic dimension of organizational behavior, positing that colleges interact with and depend on the environment in order to survive. Resource dependence theory has traditionally described institutions as proactive players seeking opportunities and not merely as reactionary respondents (Pfeffer & Salancik, 1978). Colleges have to navigate competing conflicts and demands (Bess & Dee, 2007). Within the constraints of the larger financial context, internal strategies to prioritize expenditures in specific areas is one way that institutions meet the needs of various constituents and fulfill their missions. An institution's ability to make substantive decisions about how and what type of academic services will be provided to its students is influenced by funding sources, the degree to which an organization is constrained by its environment, and adequacy of leaders' knowledge about the relationship between their expenditures and educational outcomes.

The role of financial contexts within institutions has been understudied in higher education across all sectors (Ryan, 2004) and most research in this area has focused on 4-year colleges and universities (Kim et al., 2003; Ryan, 2004, 2005; Titus, 2006a, 2006b). With the exception of a few studies (Bailey, Calcagno, et al., 2006; Calcagno et al., 2008), little research has specifically examined financial indicators among community colleges. Based on findings from these previous studies, it was expected that higher amounts of institutional funding committed to instruction and academic support would positively predict community college persistence. In contrast to previous conclusions highlighting the positive influence of higher investments in instruction (Bailey, Calcagno, et al., 2006), this study did not find a significant

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effect for this expenditure category. Larger investments in academic support expenditures—which include academic administration and curriculum development, libraries, audio/visual services, and technology support for instruction—were found to have a positive impact on persistence. This positive and significant effect of academic support stands in contrast to the insignificant effect of institutional support, suggesting that all administrative and support expenditures may not be of equal importance to students. Academic support expenditures may provide more support for student integration, involvement, engagement, and meaningful experiences that promote persistence. Together these findings suggest that more research is needed confirming academic support as an important expenditure area, which should prompt higher education decision-makers to reevaluate and minimize nonacademic overhead and support costs to divert more funds to academic support.

Summary. Findings from this study help to solidify a better understanding of the student characteristics and institutional contexts that influence community college students' persistence. Specifically, the study concluded that student background and precollege experiences matter, as gender and precollege academic achievement are related to successfully persistence. As proposed by Nora (2003), environmental pull factors, specifically full-time employment, can have detrimental effects on community college persistence. During college, students' academic experiences influenced their probability to persist, with degree aspirations, GPA, academic involvement, and satisfaction with major all being significant predictors. Lastly, several institutional factors were important to community college students' persistence. Several structural characteristics, including institutional level and urbanization were important control variables. In examining the institutional features that may be discretionary, in that strategic decisions can be made to change them, the study highlights several informative results, with size,

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the percentage of full-time faculty, distance learning offerings, career placement services, and academic support expenditures identified as impacting persistence. Together, these findings highlight the need to reevaluate the role of the institution in supporting students from diverse backgrounds and levels of preparation to enhance persistence.

Discussion of Implications

Given the heightened expectations for community colleges to create a *culture of evidence*, the study's findings have implications for higher education policy, assessment, and practice. This section will highlight implications for future research, in addition to outlining the implications for theory, practice, and policy. Much of this discussion will apply to all sectors of postsecondary institutions, thereby implicating system-wide dialogue, yet emphasis will be placed on the public 2-year sector.

Limitations and implications for future research. It is important to acknowledge this study's limitations, which can point to future research that may be useful in advancing researchers' understanding of persistence. First the analyses are limited by the data and availability of measures that might best predict persistence. The BPS is designed first and foremost as a policy tool, which results in a major focus on financial variables, with a minor focus on persistence. A number of important variables related to persistence are absent from the database (i.e. more information on college experiences and programs), narrowing the areas that could be explored in this inquiry. Although a number of institutional variables were merged from IPEDS, it was also limited in the availability of information and measures of institutional context.

Within the constraints of the data, there was accurate information identifying each of the colleges a student attended over the 6-year period, thereby providing the ability to account for

student mobility. This study heeded the calls of methodologists (e.g., Grady & Beretvas, 2010) urging for applied research to better account for student mobility through the utilization of MMERM statistical techniques. Future researchers should also heed these considerations, particularly those interested in the institutional impact and community colleges, as student mobility is the highest among this sector. The study findings demonstrated that the institutional variance was underestimated by over 50% when the multiple institutions of attendance were not accounted for through this technique. Assigning institutional effects to only the first institution, a strategy employed in most studies, may unfairly assign impact or blame to a college when a student may have been influenced by the effects of several different institutions throughout his/her educational trajectory. Inquiries focused specifically on the influence of college contexts will need to use MMREM to obtain accurate estimates of institutional effects. With the recent widespread focus on accountability measures, researchers seeking to make policy and practical recommendations should be concerned with their ability to publish findings with a high degree of confidence.

The study provided intriguing results regarding the level of mobility among community college students. With newly available national data, more research should advance this opportunity to better understand student enrollment patterns. Transcript data are becoming more readily available, providing new prospects for disentangling the patterns of movement among today's college students. Again, this is particularly salient for community college research given the high rates of mobility, the inherent need to transfer, and multiple missions and open access policies that ease movement across colleges. Future studies should tease out those who change institutions through upward mobility and those who had a misalignment with the institution in

which they initially chose to enroll, which might provide more insight into how student mobility affects student outcomes.

In discussing the findings, there were several instances where more research would further the understanding of community college persistence, but were perhaps outside of the scope of this study. First, this study sought to redefine successful outcomes by examining persistence. With national efforts to identify appropriate outcomes among community colleges, future research should consider following in this vein to provide more informative scholarship that reflects the multiple missions of these institutions and the varying goals of their students. Second, this study examined financial variables, adding to the small body of literature exploring this area among community colleges. This lack of attention within higher education research, particularly community college research, stands in stark contrast to the large amount of attention given to funding and expenditures for education by the media, the public, policymakers, and higher education leaders. With the increased pressure for accountability and performance among community colleges (Dougherty et al., 2009), more research focused on funding allocation is needed to provide an empirical link between where financial resources are used and the achievement of institutional and student goals to inform community college leaders and policymakers. More research is needed in this area to confirm these results and tease out the differences across the 2-year sector (rural/urban, small/large colleges). Third, the findings related to distance education offerings need further exploration as the nation's colleges move toward increased online coursework.

Although results of the analyses provide some initial answers, they also generate new questions. The most puzzling finding was the negative impact of bachelor's degree aspirations on persistence. This finding contradicts a wealth of literature (e.g., Bailey, Jenkins, et al., 2006; Bers

& Smith, 1991; Hagedorn et al.; 2002; Perin, 2006) pointing to the positive influence of educational goals. Future research could seek to refine this inquiry by focusing only on baccalaureate-seeking students to better understand what hinders or supports this group. Lastly, although these research recommendations have highlighted concerns related to enhancing the rigor of future quantitative inquiry, there are still limitations within this methodological stream that could be more adequately investigated through qualitative or mixed methods research.

  Implications for theory. This study drew from relevant aspects of two theoretical frameworks—Nora's (2003) Student/Institution Engagement Model and the Berger and Milem Organizational Impact Model (2000) to inform the conceptual model guiding a multilevel examination of 6-year persistence among degree-seeking community college students. The model utilized was based on a modified version of Nora's framework, which explored applicability of the retention model on system-wide persistence rather than re-enrollment at a specific college. Seeking to operationalize the constructs of the Berger and Milem model, this inquiry modeled previous scholarship (e.g., Titus, 2006a, 2006b) to employ the dimensions of structural characteristics and structural-demographic characteristics within the analyses. A concerted effort was made to merge these two conceptual models into a cohesive multilevel model, yet the unsuccessful search for a multilevel framework to inform the study points to a critical gap in student retention frameworks.

  From the earliest conceptions of student retention models the role of the institution has been alluded to, as Tinto (1993) discussed, the "complex interplay of individual and institutional forces which shape the extent and patterning of student departures from higher education" (p. 33). This study found significant variation in persistence between institutions, pointing to the need to conceptualize persistence behaviors by using both student-level and institution-level

models to achieve a fuller understanding of community college student outcomes. Despite calls

for a stronger and better theory of persistence and completion, and a particular need for

community college frameworks (Braxton et al., 1997), higher education scholarship has not

advanced persistence models that explicitly inform multilevel examinations.

Implicating the need for a multilevel framework to inform within and between institution

differences, it is important to now discuss the ways that the study findings indicate areas of need

for this type of expanded conceptual work. First, at the student level, the exhaustive conceptual

work in student development and persistence should be built upon to advance a framework that

is more reflective of community colleges. Although early retention models may serve as a basis

to begin examining community college outcomes, their relevance to 2-year, non-traditional, and

racial minority students has been questioned (Braxton, et al., 1997; Braxton & Lien, 2000;

Rendon et al., 2000). The unique nature of community college students must be considered in

developing such a model and requires a shift in thinking away from the traditional notions of 4-

year college students. For example, many community college students embody multiple roles

(i.e., employee, spouse, parent) that create competing responsibilities (Hagedorn, 2005). A

significant shift conceptual thinking would be to acknowledge these non-traditional attributes as

the norm within the community college context. One of the key reasons for this study's focus on

persistence, rather than bachelor's degree attainment or completion in general, was to recognize

other forms of student success, while also considering that 6 years may not be enough time for a

part-time community college student to complete a degree. Given the larger national efforts to

redefine community college outcomes, conceptual perspectives should consider the many critical

outcomes that have been identified through the collaborative efforts of community college

leaders and stakeholders to meet the VFA recommendations. A 2-year framework should seek a deeper understanding of both community college student experiences and outcomes.

Although synthesizing the work of Nora (2003) and Berger and Milem (2000) helped to inform the study, there were other theoretical perspectives, namely resource dependence, that were drawn on the construct the institutional-level model. This inquiry was set within the context of the 2007 recession, and the consequences that impacted higher education have continued to trickle down over the years. Pulling from resource dependence, the study introduced financial and other under-examined variables that were important to elucidating the changing fiscal climate affecting postsecondary education. Thus, the results have theoretical implications pointing to the need to further examine financial context when conceptualizing the institutional environment. Furthermore, resource dependence theory was used in this study because it implies that organizational behavior is dependent on and influenced by the political and economic contexts within which colleges operate (Bess & Dee, 2007). In developing a multilevel model, accounting for multiple contexts will allow for a theoretical frame that moves toward understanding how environments impact organizational behavior and how organizational behavior impacts student outcomes. Lastly, further adding to this complexity is student mobility, which this study found to be highly relevant for community college students. A multilevel conceptual model focusing on community college students, who have high rates of student mobility nationally (NSCRC, 2012b), would need to also consider the multiple institutional contexts that impact students' success at different points in their postsecondary trajectories.

Implications for practice and policy. Practitioners and policymakers can be informed by this study's findings in numerous ways. The are several current initiatives being pursued and developed in national policy circles that are line with this inquiry and could be informed by the

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study's findings. First, the VFA initiative has been working to define community college

measures that are more reflective of the multiple missions within the 2-year sector. The

dependent variable examined in this study aligns with these efforts as it seeks to acknowledge

persistence as a successful measure outside of or in addition to degree attainment and transfer.

The primary goal of the national data reform effort is to commonly define outcome measures and

to improve student tracking to solidify data (College Board, 2012). Until the program gains

traction with more colleges participating the data gathering, large-scale research will be limited

to nationally available data sets. With the rigor and breadth of the national sample, this study

demonstrates how these more appropriate outcomes can be utilized to inform policy discussions

until more relevant data are collected through the VFA and other venues.

The study findings demonstrate that both student and college-level variables influence

persistence. With the VFA making a concerted effort to be intentional and thoughtful in

determining outcomes that accurately reflect community college goals, these efforts will fall

short of their objectives if outcome measures continue to be reported and examined as raw

aggregates and descriptive statistics. Holding community colleges accountable to these rates

without acknowledging the complex set of student and institutional factors that impact student

outcomes does not provide an accurate picture of institutional effectiveness. These data

collection endeavors could be enhanced by employing this national collaborative of community

college leaders to also identify and collect measure reflective of the salient community college

experiences that might explain what matters most for improving persistence and other outcomes.

As noted in the limitations of this study, the national data available are limited in the explanatory

variables, and the measures included are not community college specific. With all of the

national attention on data, it would be worthwhile to invest in further expanding these efforts to obtain national data that can adequately inform change.

Although a number of recommendations surface in reviewing the results of this study, one of the most salient implications relates to the importance of academic integration and institutional efforts to promote academic experiences. Overall, findings points to the notion that the more academically engaged students are, the more likely they are to persist. This academic involvement includes a student's frequency of meeting with faculty informally, talking with faculty outside of class, meeting with academic advisors, and participating in study groups. It is a most compelling and encouraging finding that colleges can directly impact persistence and promote this engagement by investing more expenditure dollars in academic support. This finding is supported by prior empirical community college conclusions (Calcagno et al., 2008), thus adding to the emerging literature that postsecondary leaders should take into consideration. Considering the current fiscal climate within higher education and unlikelihood of obtaining new funding, the obvious implication would be for institutions to reallocate resources to support academic services in order to enhance persistence. Academic expenditures cover a wide range of categories and the IPEDs data used in this study do not permit further investigation of which of these subcategories of expenditures are the ones that matter.

Academic involvement is important not just because it promotes persistence among students overall, but also because it can serve as an intervention for specific student groups who have lower persistence rates. The study findings revealed that men, students who enter college less academically prepared, and students who work full-time are less likely to persist. Considering that males are less likely to persist, researchers have called for special initiatives to be implemented to address the particular needs of males, with additional attention to men of

color (Wood, 2011). Institutional programming should include early opportunities for academic interactions with faculty and advisors as these have been found to be critical first year experiences for males of color (Flowers, 2006).

Opportunities to participate in academically focused activities at the onset of college would likely have a positive impact on students who enter community colleges less academically prepared. Given the nature of 2-year institutions, opportunities for academic integration are limited (Hagedorn et al., 2010); thus, making academic support an integral part of every student's experience may help to ensure that services are utilized. Some intentional efforts to provide structured activities that have been proven successful are cohort models and learning communities that promote peer interaction (Sandoval-Lucero, Maes, & Chopra, 2011), events and programing requiring faculty into engage with students outside of class (Jacoby, 2006), and group advisement initiatives (Levin, Cox, Cerven, & Haberler, 2010). Beyond these early interventions, intentional efforts to promote academic involvement need to start well before students' first year. Given the link between college GPA and precollege academic performance, student engagement should be forged early with strengthened K-12 partnerships. Connections between community colleges and K-12 education have historically been strong, as early junior colleges grew as appendages of K-12 systems (Cohen & Brawer, 2003). Recouping these ties through dual enrollment, precollege summer programs, and other partnerships can promote a student's sense of commitment to educational aspirations.

For students working full-time, the structured within-class engagement tools just discussed might be influential in promoting academic integration among this population that has little time to be involved on campus. For some students, full-time employment is reflective of a career that students are choosing to maintain while taking advantage of the flexibility of

community colleges as a viable option for pursing education alongside career pathways. Other students may have financial burdens that require a full-time income. For students with unmet financial need, there are practical implications. Considering that community college students are less likely to utilize financial aid (Adelman, 1999), more can be done to make financial aid information more widely available, in addition to providing more thorough financial aid counseling. Better informing students will provide them with the tools needed to take advantage of available aid.

An important aspect of academic integration is faculty-student interaction, which has been noted to be lacking within community colleges (Chang, 2005; Hagedorn et al., 2002). Prior research has pointed to the overreliance on contingent faculty as one factor contributing to this lack of interaction, while having overall negative effects on persistence (Eagan & Jaeger, 2008, 2009; Jacoby, 2006; Jaeger & Eagan, 2009). The study findings confirm the wealth of literature documenting these effects, suggesting that colleges could benefit from more full-time faculty. Relying more heavily on adjunct instructors may make it more difficult to engage in sustained quality improvement and development of coherent instructional programs (Jenkins, 2011). Given the current budgetary state of postsecondary education, hiring more full-time faculty may not be a viable option for many colleges. Institutions may need to find ways to use their current labor force more effectively by examining the utilization of faculty across departments and through further initiatives to support adjunct instructors and promote collaboration with full-time faculty and staff.

Another finding with not so obvious connections to academic integration is that colleges providing placement services for students saw gains in student persistence. One link to academic involvement is that career centers can supplement advisement in identifying potential career

paths, and students may also gain information on the academic programs that closely align with their future careers. Furthermore, career services often provide a substantial amount of programing that could be paired with academic advisement, thus playing a role in developing students academically and professionally. Institutions should look outside of the common advisement strategies to collaborate across departments and more effectively serve students. This may be a difficult task given the silos that often exist, with departments working toward the same goals often independent of each other (Bess & Dee, 2007). However, collaboration in a time of scarce resources might prove to be a more efficient strategy.

Lastly, practitioners should closely evaluate the use of distance education on their campus as it was found to negatively impact persistence. Without further national empirical findings to reference, this study alone cannot serve as a strong justification for eliminating distance education. Contrarily, utilizing distance education only continues to grow as more colleges, including elite universities (Allen & Seaman, 2010), explore these learning opportunities. Given the overarching theme in this study pointing to interaction as integral to successful persistence, close consideration should be paid to the ways that distance education students are engaged with college personnel, faculty, and fellow students.

Conclusion

The analyses yielded an important set of findings and confirmations for the research questions and hypotheses under investigation. The results show that: (a) student mobility must be accounted for among community college samples utilizing appropriate statistical techniques, (b) it is important to examine both student-level and college-level characteristics, and (c) institutional context matters. Perhaps the most informative results come from the institutional findings, suggesting that academic integration is critical and institutions can impact persistence

by investing in academic support efforts. A number of student-level and institution-level findings refer back to the need to advance intentional efforts to engage students academically. The strength of this culminating discussion is the situating of the findings and implications within the current political and economic contexts that continue to impact postsecondary education even as the economy swings toward recovery. As community colleges' enrollment surge with diverse individuals from varying backgrounds and educational goals, and expectations heighten from numerous constituents, expanded knowledge of student mobility and influence of college experiences and institutional contexts on student outcomes will prove vital to the success of the 2-year sector.

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