SYNTHESIZING UNDERGRADUATE COLLEGE STUDENT PERSISTENCE:
A META-ANALYTIC STRUCTURAL EQUATION MODEL

A dissertation submitted to the
Kent State University College
of Education, Health, and Human Services
in partial fulfillment of the requirements
for the degree of Doctor of Philosophy

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May 2019

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DOLAN, AMANDA A., Ph.D., May 2019   Education, Health &
                                                     Human Services

SYNTHESIZING UNDERGRADUATE COLLEGE STUDENT PERSISTENCE:
A META-ANALYTIC STRUCTURAL EQUATION MODEL (162 pp.)

Director of Dissertation: Jian Li, Ph.D.

Institutions have invested considerably in resources and staff to increase student success
and persistence. However, retention rates have remained fairly steady over time. The
purpose of this study was to synthesize undergraduate student persistence models into a
singular parsimonious model using meta-analytic structural equation modeling to test the
accuracy of the model across diverse studies. The analysis was successful in supporting
many aspects of the major theoretical models proposed about college student persistence
from a wide breadth of research on this subject. It was concluded that academic
integration, social integration, institutional commitment, and organizational factors of the
college/university all significantly contribute to student persistence. Student background
characteristics and student external factors were not significantly related to college
student persistence. The conclusions of this analysis suggest that all types of institutions
invest in programs and services related to academic and social integration, institutional
commitment, and organizational factors of the university environment. Recent statistical
methods published by Cheung in 2015 made it possible to apply structural equation
modeling techniques to meta-analytic research, which allowed for a more robust and
complex analysis. Therefore, the contribution of this work is notable because it applies
rigorous statistical methods and analysis to substantiate and/or question common
theoretical constructs related to college student persistence over a period of 40 years.

ACKNOWLEDGMENTS

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CHAPTER I

INTRODUCTION

Introduction to the Topic

After five decades of research, the volume of knowledge amassed in relation to the study of college student persistence and attrition is vast; in fact, a preliminary search of the literature pertaining to college student persistence returned 10,768 results. A more thorough review of the literature suggested that many undergraduate student persistence models are based on similar constructs and can be traced to one major theorist, Vincent Tinto (1975, 1987, 1993). Moreover, Tinto's work can be derived back to two major theorists, Astin (1965) and Spady (1970). All three theories assume that there is a connection between a student's individual characteristics and the college environment and these relationships influence the student's academic outcome (Astin, 1965; Spady, 1970; Tinto, 1975, 1987, 1993). The work of these theorists formed the foundation for college student persistence models, and many notable theorists expanded upon their work by researching diverse student populations (Bean & Metzner, 1985; Fleming, 1985; Hurtado, 1992, 1994; Nora, Cabrera, Hagedorn, & Pascarella, 1996). Pascarella (1980) is notable for his research into both formal and informal student/faculty interactions, and Kuh (2000) has provided significant contributions in the study of student engagement both socially and academically. The depth and breadth of the body of research on this subject is ideal for a meta-analysis; the synthesis of these theoretical models is a natural progression of research in the study of college student persistence.

Furthermore, recent statistical methods by Cheung (2015a) make it possible to apply structural equation modeling techniques to meta-analytic research, which allows for a more robust and complex analysis. Therefore, the purpose of this study is to synthesize undergraduate student persistence models into a singular parsimonious model using meta-analytic structural equation modeling to test the accuracy of the model across diverse studies.

Background

As previously mentioned, college student persistence/retention and attrition have been researched for decades (Astin, 1965; Kuh, Kinzie, Schuh, & Whitt, 2005; Spady, 1970; Tinto, 1975, 1987, 1993). The first phase of research was in pursuit of a theory that could predict whether a student would continue to enroll at a given institute of higher learning. Knoell (1960) separated studies on student dropout and attrition into four categories: (1) census studies, which recorded the scale of attrition, transfer, and retention rates either within or across institutions; (2) autopsy studies, which pursued students' self-reported reasons for leaving school; (3) case studies, which included long-term follow-ups of students identified as potentially at-risk at the time of admission; and (4) prediction studies, which used a range of admissions variables to generate prediction equations for a variety of college success measures. Marsh (1966) proposed other major categories at this time, including philosophical and theoretical studies as well as descriptive studies.

Within the subsets of prediction and theoretical studies, Astin (1965), Spady (1970), and Tinto (1975) became noteworthy for their contributions to these areas of

research; they introduced the major theoretical elements that are still used in modern persistence models: student background characteristics, institutional commitment, academic integration, and social integration. Student background characteristics may include high school grade point average (GPA), ACT/SAT scores, gender/sex, race/ethnicity, and income or socio-economic status (SES). Initial institutional commitment includes a student's motivation to earn a college degree, plans to continue enrolling at current institution, and/or whether the school was the student's first choice. In some studies, institutional commitment was measured twice: once upon student entry, and subsequently after a period of study, usually at the end of the first semester or the beginning of the second semester. This second institutional commitment measure is related to confidence in making the right college choice, intent to graduate from the institution, and certainty in re-enrolling. Academic integration variables incorporated a student's classroom experiences, including relationships with faculty, as well as intrinsic factors of confidence and self-efficacy, skill, motivation, and goal commitment. Social integration is related to the quality of student peer interactions and support, social expectations, psychological adjustment, and/or satisfaction with college. Persistence is defined as continued reenrollment from first to second semester. Retention is defined as a student's continuous enrollment from first year to second year. These models, described in detail in Chapter II, were instrumental in the development of persistence and attrition models and provided a measureable structure that would allow for more rigorous and sophisticated research in the study of persistence or attrition (Hoffman, 1998).

The next phase of research attempted to determine how higher educational institutions could create and/or mold a more successful student body. Researchers focused on how to employ retention strategies that would increase the likelihood of persistence for different student groups related to ethnicity (Close & Solberg, 2008; Khaneja, 1998; Lichtenstein, 2002; Nora, 1987; Washington, 1996; Williams, 2002), age (Cleveland-Innes, 1994; Gill, 1993; Illanz, 2002; Mooshesian, 2010), socio-economic status, first generation college students (Lin, 2011; Saunders, 2004; Sherlin, 2002), and type of institution (Damon, 1997; Henningsen, 2003; Hoffman, 1998; Nippert, 2000; Stryker, 1997; Tovar, 2013; White, 1998). Additionally, factors of financial aid (Murdock, 1987; 1990) and non-cognitive variables were studied to determine if colleges could create programs to address the needs of students outside of the classroom to increase persistence rates (Lotkowski, Robbins, & Noeth, 2004; Thomas, Kuncel, & Crede, 2007). This second wave of research came in response to trends in state governments moving from an enrollment-based funding system to a performance-based funding system (Dougherty & Natow, 2015; Kuh et al., 2005).

Statement of the Problem

Not only is it the mission of colleges and universities to retain and graduate students, they are increasingly required to demonstrate these measures of student success to their constituents and stakeholders. Traditionally, public colleges and universities were awarded funding from their respective state based on how many students were enrolled at the census date (typically on the 15th day of the semester); however, state funding models over the past decades have changed to what is referred to as

performance-based funding, which includes a combination of student enrollment numbers, student course completion rates, retention, and number of graduates, to determine the amount of state funding a college would receive in a given academic semester. In fiscal year 2012, state government accounted for 21.8% of the total revenues of public higher education institutions (U. S. Department of Education, National Center for Education Statistics [NCES], 2013, Table 333.10). This report included both funding models: total enrollment on the census date funding, and the performance-based funding. In 2014, 38 states had operated performance-based funding programs, although not all have continued. For example, Ohio introduced performance-based funding in 1995, discontinued the practice in 2000, and then re-adopted a revised performance-based funding model in 2009, which is still in effect today (Dougherty & Natow, 2015). The goal of performance-based funding is to hold colleges and universities accountable to stakeholders by demonstrating that their monies are being used effectively to achieve student success outcomes of retention and graduation. This focus on accountability has made it imperative for institutions of higher education (IHEs) to improve student retention and graduation rates. Although private institutions do not receive state funding, the national conversation in the United States recently has questioned the value of a college degree, making it imperative that all IHEs demonstrate positive retention and graduation rates. Yet, despite decades of research and performance funding initiatives, retention and graduation rates have not demonstrably changed (Kuh et al., 2005).

Stagnant retention and graduation rates have effects greater than the financial health of an IHE, as there are broader economic impacts to higher education attainment

that affect both individual citizens and the health of local and state economies. It has long been established that workers with more education typically earn significantly higher wages and have lower unemployment rates than those workers who have no post-secondary education (Rothwell, 2013). The latest figures from the Bureau of Labor Statistics show that workers with only a high school diploma are twice as likely to be unemployed than those who are college educated. On a macroeconomic scale, it should also be noted that those who most directly influence economic growth—inventors and entrepreneurs—also tend to be highly educated. In addition, 92% of high-tech company founders are college educated, especially in STEM (science, technology, engineering, or math) fields. At the local level such as cities and regional domestic areas, bachelor's degree holders contribute on average $278,000 more to local economies than the average high school graduate does over the course of their lifetime. Residents with an associate degree contribute on average $81,000 more than a high school graduate over the course of their lifetime. In addition, 68% of alumni from two-year colleges remain in the location of their college after attending (Rothwell, 2013).

To increase graduation rates, IHEs must improve upon students' early successes such as freshman retention and persistence rates (Kuh et al., 2005; Nippert, 2000). Research suggests that at least half of all students who drop out do so during their first year and the majority do so during the first six to eight weeks of their first semester (Green, 1998). It is also more efficient and straightforward to measure persistence rather than graduation rates. Therefore, much of the research related to student outcomes is focused on first-year persistence or retention rates. Furthermore, the majority of the body

of work related to these topics is a variation of structural equation modeling, specifically

confirmatory factor analysis and path analysis on persistence and retention theories

(Bean, 1981; Berger & Braxton, 1998; Braxton, Milem, & Sullivan, 2000; Carini, Kuh, &

Klein, 2006; Elkins, Braxton, & James, 1998; Fry, 2010; Guerrero, 2010; Liu & Liu,

2000; Pan, 2010; Pascarella, 2001; Kuh et al., 2005; Thomas et al., 2007; Wicker, 2003;

Winteler, 1986).

There is much less research related to evaluating specific retention practices and

programming; reports showing common practices of IHEs with high retention rates are

prevalent but lack the empirical testing of a robust statistical study (Kuh et al., 2005;

Murdock 1987, 1990; Valentine et al., 2011). In addition, the body of research that has

been contributed in the last decade focused on testing whether these theories were

applicable to more diverse groups by studying differences in ethnicity (Close & Solberg,

2008; Khaneja, 1998; Lichtenstein, 2002; Nora, 1987; Washington, 1996; Williams,

2002), age (Cleveland-Innes, 1994; Gill, 1993; Illanz, 2002; Mooshesian, 2010), socio-

economic status, first generation college students, (Lin, 2011; Saunders, 2004; Sherlin,

2002), and type of institution (Damon, 1997; Henningsen, 2003; Hoffman, 1998; Nippert,

2000; Stryker, 1997; Tovar, 2013; White, 1998). There has yet to be a synthesized

analysis of the diverse body of work pertaining to college student persistence and

retention.

Purpose/Research Questions

The purpose of this research study was to conduct a meta-analysis synthesizing

persistence prediction models when structural equation modeling (SEM) is applied as the

methodology of the primary study. The following paths were evaluated for model fit (see Figure 1):

1. The impact of student characteristics on institutional commitment.

2. The impact of external factors on institutional commitment.

3. The relationship between student characteristics and external factors.

4. The impact of organizational factors on institutional commitment.

5. The impact of institutional commitment on academic integration.

6. The impact of institutional commitment on social integration.

7. The impact of academic integration on a second measure of institutional commitment.

8. The impact of social integration on a second measure of institutional commitment.

9. The relationship between academic integration and social integration.

10. The impact of a second measure of institutional commitment on college student persistence.

Significance and Rationale

In the body of research focused on college student persistence, there are many individual studies that measure student characteristics, institutional commitment, academic and social integration and their relationship with college persistence. There is a growing body of research that includes external student factors such as work/family obligations, support from peers/family to attend college, and financial support. Additionally, current research includes organizational factors such as campus size,

culture, fairness of policies, communication with students, and satisfaction with college

as predictors of college persistence.
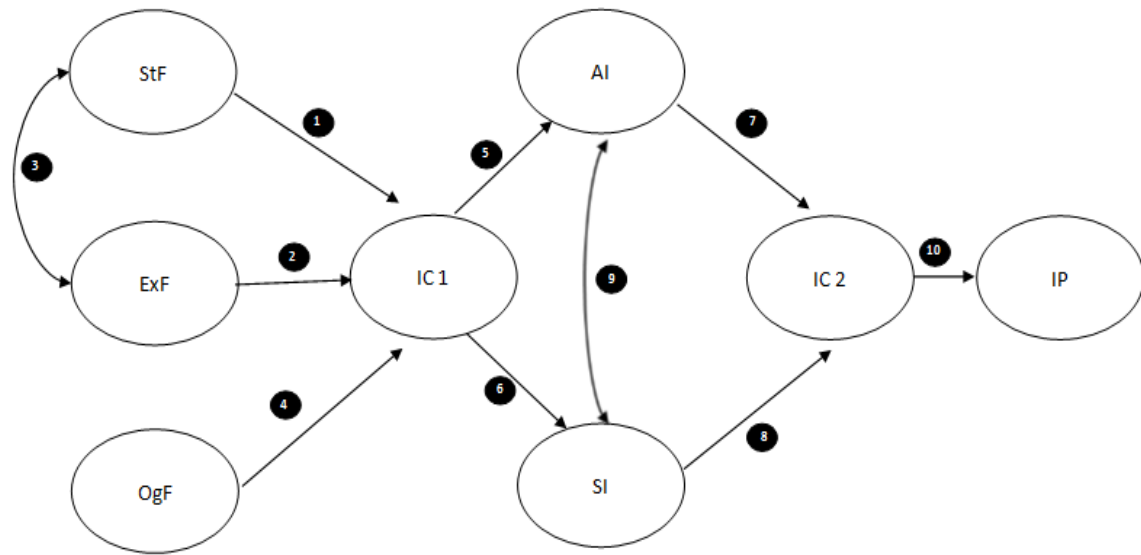
Figure 1. Proposed MASEM model.

StF: Student factors, ExF: External factors, OgF: Organizational factors, IC1: 1st
measure of institutional commitment, SI: social integration, AI: Academic
Integration, IC2: 2nd measure of institutional commitment, IP: Intent to persist

The need for a systematic evaluation of persistence theories is necessary to

conclude whether the model is a good fit across diverse groups. Prior meta-analyses have

been conducted on particular aspects of college student persistence (Napoli & Wortman,

1998; Pan, 2010). Both Napoli and Wortman (1998) and Pan (2010) have conducted

meta-analyses studying only the effects of social and academic integration on the

persistence of first-year students. Pan provided a proposed path model for the

relationships between academic integration, social integration, goal commitment, and

institutional commitment on student persistence as well as the influence of social and academic integration on goal commitment and institutional commitment. However, Napoli and Wortman (1998) only summarized the effects of social and academic integration variables without proposing a model and included only six studies in their analysis. This research study analyzes a complete college student persistence model using meta-analytic structural equation modeling.

Delimitations

Because of the requirements of meta-analytic structural equation modeling, only studies with a full correlation matrix were included; this requirement significantly reduced the number of studies included in the model. In addition, studies were required to have a minimum of three of the seven independent variables: student characteristics, social and academic integration, two measures of institutional commitment, external factors, and organizational factors. To be included in the meta-analysis, studies were required to include a dependent variable measuring student persistence, intent to persist, or retention. Studies were also excluded if they could not be applied and extrapolated into the greater student population (e.g., specific major, learning community, Honors College, special admission).

Missing data can be a threat to the validity and reliability of the meta-analysis. Because some degree of missing data were expected, it was imperative to handle them appropriately. Little and Rubin (1987) categorized missing data into three groups: missing completely at random (MCAR), missing at random (MAR), and missing not at random (MNAR). In meta-analytic context, these three categories are differentiated by

the relationship between the missing effect size estimate and the effect size of interest for which missingness was observed, as well as the other effect sizes for which complete data were available. A correlation may be missing from meta-analyses of correlation matrices for various reasons. One of the most common reasons for missing data in meta-analysis is the "file drawer problem" (Rosenthal, 1979) where the author fails to report an effect because it is statistically non-significant, which results in publication bias. Publication bias is inherent in meta-analysis due to two major types of bias: reporting bias, where researchers are less likely to report non-significant findings, and selective publication bias, where peer-reviewed journals are less likely to publish non-significant results (Card, 2012). Additional model testing is required to determine the effect of publication bias.

A further challenge was that each study reported different variables to measure each path tested in the model; therefore, individual study correlations were averaged into a single factor correlation (e.g., student characteristic correlations of age, sex, high school GPA, ACT/SAT scores, and parents' income were included when available and were combined into a single student characteristic correlation for every ith study). Combining multiple variables into a single variable allowed for clearer interpretability of the results by reducing the number of variables. It also reduced the statistical error or noise by decreasing the number of missing values (Card, 2012).

CHAPTER II

REVIEW OF THE LITERATURE

Theories of Student Persistence and Attrition

The focus of this research study is to synthesize persistence prediction models when structural equation modeling (SEM) is applied as the methodology of the primary study. Through a systematic review of the literature, it was determined that many undergraduate student persistence models are based on similar constructs and can be traced back to one major theorist, Vincent Tinto (1975, 1987, 1993). Furthermore, Tinto's own work can be derived back to two major theorists Astin (1965) and Spady (1970). Each model places different emphases on specific variables and interactions and each theorist places priority on particular constructs, but there is substantial overlap in the constructs. All these theories begin with the basic assumption that there is an interaction between the student's characteristics and the college environment and that these factors influence the student's outcome. There are many notable theorists who expanded upon their work by broadening the scope of the college persistence models to include diverse student populations (Bean & Metzner, 1985; Fleming, 1985; Hurtado, 1992, 1994; Nora et al., 1996). Pascarella (Pascarella & Terenzini, 1980) is notable for his research into both formal and informal student/faculty interactions and Kuh (2000) has provided significant contributions in the study of student engagement both socially and academically.

Astin's Model

  Alexander Astin created his model as a simple way to articulate a parsimonious theory of student development that would bring order to the larger body of research on the subject. He presented his theory to explain most of the empirical knowledge about environmental influences on student development that researchers have gained over the years. He also posited that its breadth allowed it to encompass principles from elements of psychoanalysis and classical learning theories (Astin, 1984). The factors in his model include student inputs, the college environment, and student outputs.

  Astin created the input–environment–output model to explain the interactions between the three factors. Student inputs are the demographic characteristics, family backgrounds, and academic experiences a student brings to college (Pascarella & Terenzini, 2005) as well as "the talents, skills, aspirations and other potentials for growth and learning that the new student brings … to college" (Astin, 1970, p. 225). The college environment represents the "aspects of the college that are capable of affecting the student" (1970, p. 225). The college environment would therefore include institutional culture, administrative policies, interactions with staff, facilities, curriculum, teaching, relationships with faculty, and peer interactions. Virtually any interaction or experience a student has in college is encompassed in the college environment, according to Astin's theory (Astin, 1970; Pascarella & Terenzini, 2005). He defined student outputs as "the measures of the student's achievements, knowledge, skills, values, attitudes, aspirations, interests, and daily activities" as demonstrated after exit from college (Astin, 1970, p. 224).

Astin suggested that the main effects in his model included student inputs, or the relationship between the types of students who enroll and the college environment (A), the relationship between the college environment and student outputs (B), and the relationship between student input and output (C) (See Figure 2). Additionally, there are two interaction effects: the effect of student input on output will vary in different college environments (AC) and the effect of college environment varies for different types of students (AB).
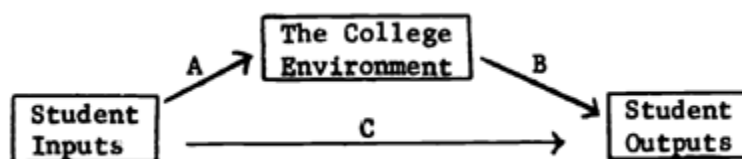
Figure 2. Astin's I-E-O model. From Astin, A. W. (1970), The methodology of research on college impact, part one*, Sociology of Education, 43*(3), p. 225.

The impact of the college environment in Astin's theory of student involvement can be utilized by researchers, college administrators, and faculty to help guide their investigation of student development and create policy and procedures that enhance student-learning environments (Astin, 1984; Pascarella & Terenzini, 2005).

Student involvement remains the most important tenet of Astin's theory; he described student involvement as the amount of physical and psychological energy that the student devotes to the academic experience. Subsequently, a highly involved student is one who expends considerable energy on studying, spends a lot of time on campus, participates actively in student organizations, and interacts frequently with faculty.

Conversely, a typical uninvolved student spends little time on campus, abstains from curricular activities, and has infrequent contact with faculty members or other students.

Astin's concept of involvement closely resembles the Freudian concept of *cathexis*. As described by Astin (1984), Freud believed that people invest psychological energy in objects and persons outside of themselves. In other words, people can cathect on their friends, families, schoolwork, and jobs. The involvement concept also resembles closely what learning theorists have traditionally referred to as *vigilance* or *time on task*. The concept of effort, although much narrower, has much in common with the concept of involvement.

As a greater body of research was applied to the theory, Astin expanded it into the paradigm of student change and development by proposing a theory of involvement that would explain the dynamics of how students learn by becoming involved (Astin, 1987). He proposed five assumptions:

"(1) involvement requires the investment of psychological and physical energy in 'objects' such as tasks, activities, and people; (2) involvement is a continuous concept in that students will invest varying degrees of energy in diverse objects; (3) involvement is both quantitative and qualitative; (4) the amount of learning is directly proportional to the quality and quantity of involvement; and (5) educational effectiveness of any policy or practice is related to its capacity to induce student involvement" (Astin, 1987, pp. 1335-1336).

Astin's theory is a blend of psychological and sociological explanations of student change. The institutional environment is of seminal importance because of the diverse

interactions, both socially and academically, students participate in by exploring new ideas, meeting new people, and broadening their experiences (Pascarella & Terenzini, 2005). His theory also emphasizes the role of the student in the process of learning and change. The quality of the students' efforts to interact with their environments is of pivotal importance to the amount of change that is likely to occur. Therefore, student change is not just the result of the college's impact on a student but also a function of the quality of student effort or involvement within the institution (Astin, 1984). Although Astin's model is focused on student change and outputs such as student achievements, knowledge, skills, and values, it is easily applied to models of student persistence or dropout. In fact, it is the basis of Astin's (1965) theory and has been used as the building blocks of persistence and retention theories ever since.

Spady's Model

Spady (1970) used the same foundation as Astin to explain the student dropout process. He described it as the interaction between a student's family background, academic potential, and the college environment, which is similar to Astin's (1965) model of input –environment–output. Spady's theory elaborated on Astin's focus on involvement by integrating Durkheim's theory of suicide (1951), which suggests that lack of integration into a social system increases the likelihood of suicide. He posited that the social conditions that lead to suicide are equivalent to the social conditions that lead to dropout. Two aspects of Durkheim's work informed Spady's theory: first, when a person shares values with a group, this person is less likely to complete suicide (i.e., drop out of school); second, when a person has friendship support, this person is less likely to

complete suicide (Bean, 1981). Durkheim posited that "suicide varies inversely with the degree of integration of the social groups of which the individual forms a part" (Durkheim, 1951, p. 209).

Family background was categorized into two main clusters: cosmopolitanism, which includes father's educational background, socioeconomic status, urbanization, religion, and ethnicity; and family relationships, including parental marital stability, satisfaction with home life, and the student's psychological independence from the parents (Hoffman, 1998). Academic potential includes a combination of the student's SAT scores, high school class rank, and high school quality. Spady proposed that a student's background interacted with his/her academic potential and "normative congruence," which is described as "having attitudes, interests, and personality dispositions that are basically compatible with the attitudes and influences of the environment" (Spady, 1970, p. 77). These three factors impact grade performance (extrinsic reward), intellectual development (intrinsic reward), and friendship support (collective affiliation) to influence the level of social integration into the college environment. Social integration is established through normative congruence and the development of close relationships with others in the system, which Spady identified as "friendship support" (1970, p. 14).

These factors are directly related to Durkheim's theory, which posits that when two aspects of social integration—insufficient moral consciousness (normative congruence), and insufficient collective affiliation—are severed, individuals are more likely to complete suicide. The parallel can be extended further to assume that one's

success (grade performance) and inadequate identification with the norms of the group

(intellectual development) are critical aspects of the integration process. It should be

noted that Spady believed that dropout decisions were the result of a longitudinal process

whereby personal characteristics interact with social integration, which then influences

satisfaction and institutional commitment, which in turn influence the student's dropout

decision (Bean, 1981) (see Figure 3).
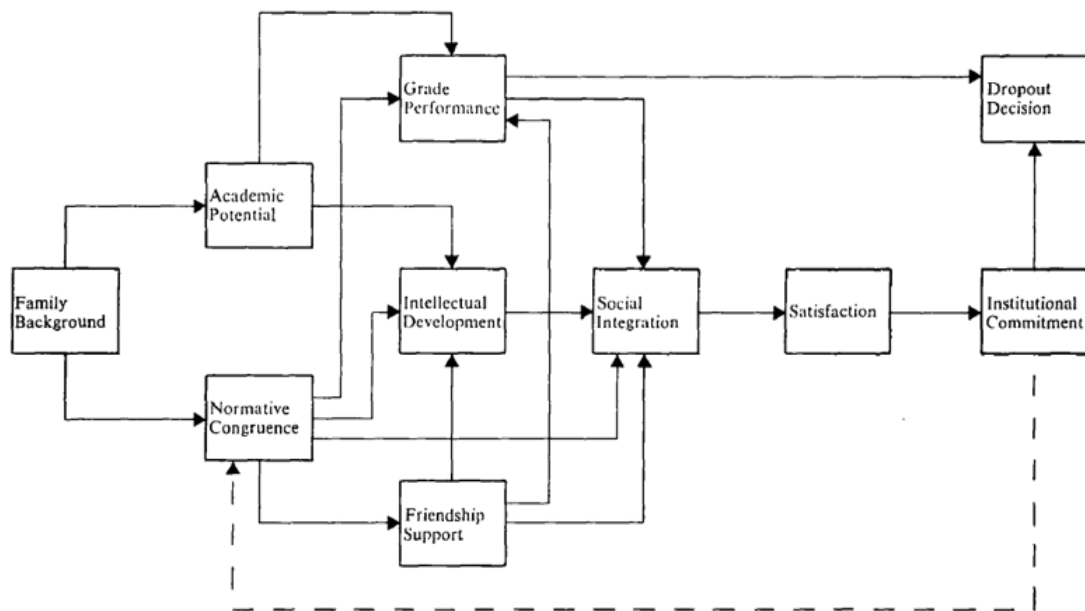
Figure 3. Spady's sociological model of the dropout process. From Spady, W. G. (1970),
        Dropouts from higher education: An interdisciplinary review and synthesis,
        Interchange, 1(1), p. 79.

Bean (1981) notes that Spady omitted a second critical aspect of Durkheim's

theory of suicide, which could influence the student attrition process: the degree of

regulation of the society in which a person lives, in this case represented by the college

environment/culture. Durkheim hypothesized that when regulation in a society is high,

the importance of the individual and the sense of isolation increase, possibly leading to suicide. On the other side of the pendulum, when regulation is quite low discipline breaks down, and the student feels abandoned by the institution; he/she may become disenchanted and withdraw from the system. The student may also think that when regulation is low, the institution does not care about him/her as an individual, identifying them only as a number, and drop out (Bean, 1981). The second interpretation of Durkheim's theory of suicide may also cast some light on the student attrition process in relation to organizational factors within the college that affect institutional commitment. Durkheim's idea that shared group values and friendship support are expected to reduce suicide, and by analogy, dropout, formed the foundation for both Spady and Tinto's models. These models emphasized social and academic integration, which correspond to friendship support and shared group values, both of which strongly influence the decision to drop out (Bean, 1981).

The complexity of the interrelationships of the variables he identified is demonstrated by Spady's (1971) study of University of Chicago dropouts. One of the most important findings from this study is that satisfaction is not directly related to dropout, but only indirectly related to dropout through institutional commitment. Secondly, background characteristics did not have direct effects on dropout, and only a direct effect on institutional commitment for men, but not for women. Their removal from the model would not influence the predictive power of the model as far as dropout is concerned. They are needed primarily to lend clarity to the process and to eliminate spurious conclusions (Bean, 1981).

Tinto's Model

Vincent Tinto is one of the most-cited authors of student persistence and attrition theory (Bean, 1981; Henningsen, 2003; Hoffman, 1998). His theory is also one of the most widely applied and tested models (Aitken, 1982; Bean, 1981; Cleveland-Innes, 1994; Fox, 1986; Getzlaf, Sedlacek, Kearney, & Blackwell, 1984; Pascarella & Chapman, 1983; Pascarella, Duby, & Iverson, 1983; Pascarella, Smart, & Ethington, 1986; Pascarella & Terenzini, 1978, 1979, 1980; Terenzini, 1983; Terenzini, Lorang, & Pascarella, 1981; Terenzini & Pascarella, 1978; Voorhees, 1986; Webb, 1989). He drafted three models in 1975, 1987, and 1993, although they are widely considered to be iterations of the same model (Bean, 1981).

Tinto also borrowed from Durkheim's (1966) theory of suicide and included elements of Dutch anthropologist Arnold Van Gennep's early 20th-century work in developmental theory, which conceptualizes how people move from one stage of life to the next. The adjustment between stages of life involve three periods: separation, transition, and incorporation. This suggests that an individual must separate from the former environment, adjust to the new environment, and finally, be incorporated into the new environment. This incorporation is defined by a feeling of complete integration and acceptance of the new environment (Hoffman, 1998). Astin's influence can be seen in the inclusion of pre-college factors of prior schooling, individual history, and family background that affect the college environment. The differences in these pre-matriculation characteristics affect initial levels of commitment to obtaining a college degree and the institution being attended. These initial commitment levels interact with

various structural and normative qualities of the specific college or university, leading to varying levels of integration into the academic and social systems of the institution (Terenzini, 1983). The inclusion of academic and social integration are carried over from Spady, but Tinto differentiated between formal and informal interactions.

In his 1975 interactionist theory of student departure, Tinto included institutional commitment as well as goal commitment as longitudinal variables which are affected by both the student's pre-college factors and the level of social and academic integration while in college, which all impact a student's dropout decision. Institutional commitment was hypothesized to produce peer group and faculty interaction, which lead to social integration, which in a cyclical way increases institutional commitment. Goal commitment leads to higher grade performance and intellectual development, which lead to academic integration, which leads to even greater goal commitment (Bean, 1981). Because of the cyclical nature of these two variables, they are measured twice in the model: the first is the product of pre-matriculation characteristics and the second is the product of either social or academic integration, which is a result of the student interacting with the institution (see Figure 4).

Tinto was very careful in defining dropout, as he had been critical of attrition research where studies combined permanent and temporary withdrawal, voluntary withdrawal, and academic failure into a single category. Failure to adequately define various dropout behaviors is problematic; therefore, he developed a theoretical model that accounts for different forms of dropout behavior (Hoffman, 1998). The model revealed a longitudinal process of interactions between the student and the academic and social

systems of the institution. These interactions constantly influenced goal and institutional

commitments. Ultimately, the process leads to a persistence or dropout decision.
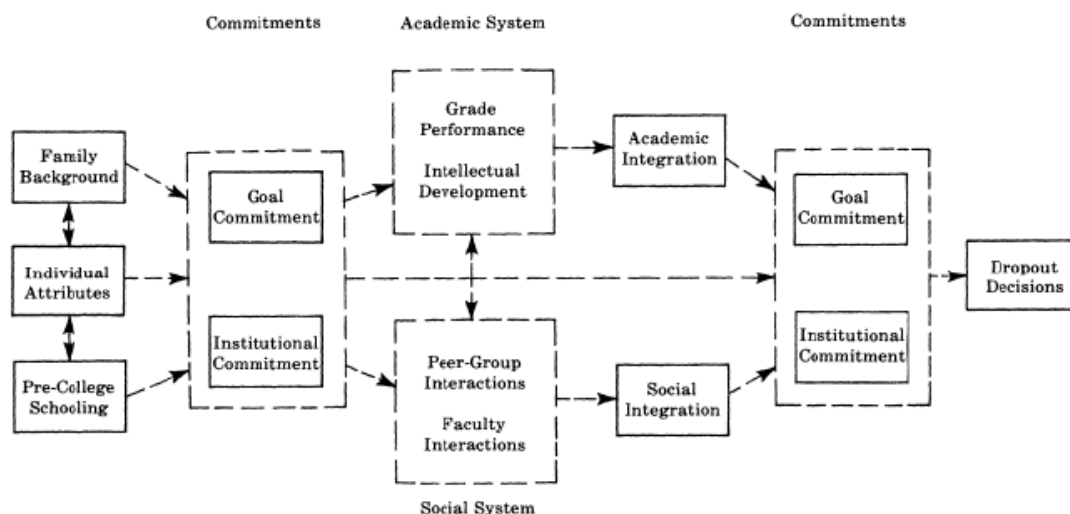
Figure 4. Tinto's 1975 conceptual model for college dropout. From Tinto, V.
(1975), Dropout from higher education: A theoretical synthesis of recent
research, *Review of Educational Research, 45*(1), p. 95.

In 1987, Tinto added external factors and influences to the model, and in 1993,

keeping all prior variables from the first two models, he added the overarching social

system of external community to the model. These were the result of research Tinto

conducted on the characteristics of community college students, and were added to

expand the model to include this population of students. Tinto hypothesized that external

events (e.g., hours worked on/off-campus, family responsibilities, financial constraints)

influenced student intentions, commitments, and persistence, especially for students in

commuter institutions. To account for this larger external community, Tinto nested the

college environment within the larger overarching social system of external community,

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which accounts for the possibility that external commitments also shape what transpires

within the college (Henningsen, 2003) (see Figure 5).
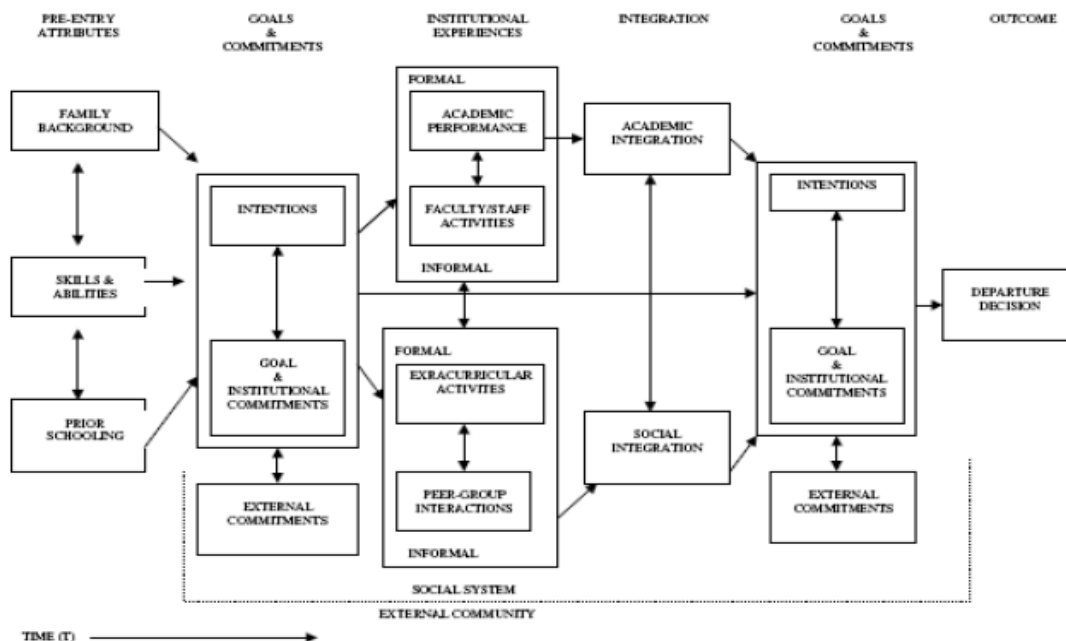
Figure 5. Tinto's 1993 longitudinal model of institutional departure. From Tinto, V.
     (1993), *Leaving college: Rethinking the causes and cures of student attrition*
     (2nd ed.), p. 114.

Pascarella's Model

Pascarella (1980) believed that the previous models were too broad and that more

specificity with single variables was required in working with attrition models; therefore,

he developed a longitudinal model of college attrition based on the impact of informal

contact between students and faculty (Hoffman, 1998). The structure of Pascarella's

model drew heavily from the work of Astin (1970), Spady (1970) and Tinto (1975).

Pascarella's (1980) model discovered that students' non-classroom contact with faculty

had a distinct impact on persistence in college. Within this model, student background

characteristics and institutional factors, combined with college experiences in and out of the classroom, including informal contact with faculty, have an impact on students' successful educational outcomes. Persistence and withdrawal decisions are informed by the educational outcomes of students (Hoffman, 1998).

Bean and Metzner's Model

Bean and Metzner's (1985) causal model was markedly different from previous persistence models in two distinct ways. First, it was based on research related to turnover in work organizations, and second, it was the first theory to provide a framework for the attrition of nontraditional college students. Their model revealed that students exit college for reasons similar to those that cause employees to leave work organizations. Price's (1977) research regarding turnover in employment informed Bean and Metzner's (1985) model (Hoffman, 1998). The importance of intention in determining a certain behavior was influenced by Ajzen and Fishbein (1972), who suggested that a behavior, as well as intentions about performing that behavior, influenced the actual behavior. Consequently, intent to leave college positively influenced the decision to drop out. Bean (1982) stated,

> The primary value of intent as a variable is for prediction of attrition...and not in the explanation of the factors that cause attrition. When attrition is highly correlated with intentions, the problem for the researcher is to explain intentions. (p. 25)

Bean and Metzner's (1985) causal model had four categories of variables. The dependent variable was dropout/retention. The independent categories of variables

included satisfaction, institutional commitment, organizational determinants, and

background variables. The causal model suggested that organizational determinants

affected satisfaction, which affected the intent to persist or drop out (Hoffman, 1998).

Again, Bean and Metzner's model was the first major model to address the

nontraditional student (Hoffman, 1998). Prior models from Astin (1965), Spady (1970)

and Tinto (1975) focused their research on traditional college students at four-year

institutions. Their models were tested on residential students who were under age 25,

with full-time enrollment. Therefore, their models emphasized the importance of social

integration and interaction with the college environment. Bean and Metzner (1985)

defined the nontraditional student as follows:

> A non-traditional student is older than 24, or does not live in a campus residence
>
> (e.g., is a commuter), or is a part-time student, or some combination of these three
>
> factors; is not greatly influenced by the social environment of the institution; and
>
> is chiefly concerned with the institution's academic offerings (especially courses,
>
> certification, and degrees). (p. 489)

This definition of a non-traditional student is still currently used by higher

education professionals. One defining characteristic of nontraditional students was the

lack of concern that they exhibited toward social integration into the institution and the

increased concern with academic offerings (Hoffman, 1998). Because of this, Bean and

Metzner (1985) intentionally used theories from other paradigms unrelated to

socialization to draft the variables in their causal model of student attrition. In fact, their

nontraditional student attrition model noted that the most important variable that affected the dropout decision was institutional commitment, which is consistent with the models of Spady (1970) and Tinto (1975). Also noteworthy is that the determinants based on the causal model of turnover in work organizations: "routinization, opportunity, and pay (measures of development, university GPA, practical value, and institutional quality)" were a significant portion of Bean and Metzner's (1985) model of student attrition (Hoffman, 1998, p. 25).

After the first major test of their theory involving 624 part-time freshman students at an urban commuter university in the Midwest, Metzner and Bean (1987) revised the causal model. The revised model discovered that the dropout decision for nontraditional students involved four categories of variables: (1) students with strong academic performances and a history of strong past academic performances (high school), tended to have higher GPA's, and were more likely to stay in college; (2) intent to leave, the most critical factor in dropout, was influenced by background, academic and environmental variables, and psychological outcomes; (3) background variables, such as age, hours enrolled, educational goals, high school performance, ethnicity, and gender affected the dropout decision of the student; and (4) environmental or external variables, such as finances, hours of employment, outside encouragement, family responsibilities, and opportunity to transfer have an influence on the student's decision to drop out (Hoffman, 1998).

Kuh's Model

George Kuh (2000) differs from his predecessors in theorizing that what a student does in college is more important than the individual factors he/she may bring to college; Kuh's theory therefore is centered on student engagement. He asserts that student engagement is the most impactful factor for predicting student success, and developed the National Survey of Student Engagement (NSSE) to measure the "level of academic challenge, active and collaborative learning, student interaction with faculty members, enriching educational experiences, and supportive campus environments" (Kuh et al., 2005, p. 10). His theory posits two key elements that contribute to student success. First is the amount of time and effort students dedicate to their studies or other activities related to student success. Second is the ways in which the IHE allocates resources to high-impact educational practices (Hu, Kuh, & Li, 2008; Kuh et al., 2005). Kuh et al. (2005) identified high-impact educational practices as those involving level of academic challenge, active and collaborative learning, student interactions with faculty, enriching educational experiences, and a supportive campus environment.

Multicultural Retention Models

A new wave of research beginning in the late 1980s focused on the persistence and retention of minority students (Fleming, 1985; Hurtado, 1992, 1994; Nora et al., 1996; Tinto, 1987). Tinto (1987) began to analyze minority groups in the second iteration of his theory, suggesting that differences in African-American student persistence rates could be attributed to their academic preparedness rather than differences in their socioeconomic backgrounds. Tinto hypothesized that differences in

ability arise from prior educational experiences at elementary and secondary school. He further proposed that K-12 education tends to prioritize non-minority student achievement over minority student achievement; therefore, it would be logical to assume that the prior educational experiences of minority versus non-minority students would lead to differences in their persistence in college (Nora et al., 1996; Tinto, 1987).

Further research on the differences in withdrawal behavior between minorities and non-minorities led to the proposition that exposure to a climate of prejudice and discrimination in the classroom and on campus would diminish the satisfaction of college experiences of minority students and decrease rates of persistence (Fleming, 1985; Hurtado, 1992, 1994; Nora et al., 1996). Fleming (1985) fervently contended that adjustment problems with the curriculum, lack of support services, and financial difficulties, as well as the nature of interpersonal relationships with faculty, peers and academic staff are some of the experiences that negatively influence minority students attending predominantly white institutions (Nora et al., 1996).

The role of perceived discriminatory behavior on the interaction of minority students with the college environment has been examined through two paradigms; the first approach relies on Student-Institution Fit models (Bean, 1981; Spady, 1970; Tinto, 1993) and views prejudice and discrimination as a factor interfering with a student's integration into his or her social and academic environments. A second, more recent approach uses transactional models of stress and coping behaviors as their theoretical basis (Munoz, 1987; Smedley, Myers, & Harrell, 1993). Other researchers hypothesize these trends could be attributed to changes in the structure of federal financial aid packets

and patterns of financing higher education exhibited by minority students (John, Andrieu, Oescher, & Starkey; 1994; Mortenson & Wu, 1990; Olivas, 1985).

Student Change and Development Theory

There is another domain of research related to college student success focused on student change and development theories and how college affects students. This body of research is outside the scope of this study because the dependent variables were related to student academic achievement and intellectual growth, rather than student persistence. However, it merits mention because of its prominence as another cluster of research related to college student success. These theories can be sorted into categories of psychosocial development, cognitive structural, typological, and identity development (Bean, 1981; Cabrera, Nora, & Casteneda, 1993; Eimers & Pike, 1997; Griffin, 2010; Pascarella & Terenzini, 2005).

Measurement Instruments

Operationalizing the latent variables in persistence models can be challenging and create inconsistencies between studies. Liu & Liu (2000) proposed that Tinto's model was not intended for rigorous statistical analysis such as path analysis or structural equation modeling and could not be tested through those analytic procedures until Pascarella and Terenzini (1976, 1980), and Cabrera, Castañeda, Nora, and Hengstler (1992) operationalized his original factors. Several surveys have been developed to measure the factors most prevalent in college student persistence models, although many authors choose to create their own unique measures based on their specific research questions (Angulo-Riuz & Pergelova, 2013; Bean, 1979; Bragg, 1994a, 1994b; Cabrera,

1990; Cleveland-Innes, 1994; Fry, 2010; Jumpeter, 2005; Liu & Liu, 2000; McGuigan, 1993; Nadler, 2013; Nakajima, 2008; Neuville et al., 2007; Nora, 1987; Pascarella & Terenzini, 1980; Pessa Huff, 2009; Woosley, Slabaugh, Sadler, & Mason, 2005; Yonai, 1991). Aside from surveys created by the authors, the most common surveys used in the research studies included in this meta-analysis were the Early Collegiate Experiences Survey, the First Year Survey, and the Student Information Form.

The Early Collegiate Experiences Survey (ECES) was developed to measure a wide range of student perceptions and behaviors. Items on the ECES measure faculty teaching skills and behaviors including organization and preparation, and instructional clarity and skill. It also measures student involvement and integration such as peer group interaction and out-of-class interactions with faculty, perceptions of the campus environment and climate, reaction to stress, and satisfaction (Berger & Braxton, 1998). Additionally, it is used to assess active learning behaviors such as the quality of classroom discussions led by the instructor, and the amount of collaborative or group work (Braxton, Bray, & Berger, 2000; Braxton, J. M. et al., 2000).

Many of the items in The First Year Survey (FYS) were developed directly from instruments in previous studies of Tinto's model (Berger & Braxton, 1998). Higher-order thinking activities such as the depth of debate related to course concepts, ability to argue for or against a particular point of view and defend the argument were used to measure academic integration. Social integration was assessed by outcomes of positive intellectual and personal growth and development of close personal relationships with another student. Out-of-class informal interaction with faculty included developing close

relationships, faculty having a positive influence on intellectual growth, as well as personal and career growth. Subsequent institutional commitment and departure decisions were measured by factors related to the importance of graduating from the IHE, confidence of decision to enroll and the likelihood to re-enroll (Braxton, Milem, & Sullivan, 2000).

The Student Information Form (SIF) measures student background characteristics of parental income, high school GPA, gender, race, parental educational level, and composite SAT score; as well as initial institutional commitment (Braxton, J. M. et al., 2000). Many studies included this survey in addition to another survey such as the ECES, FYS, or other similar instrument.

The National Survey of Student Engagement (NSSE) developed by Kuh (2000) "assesses the extent to which students engage in educational practices associated with high levels of learning and development. The questionnaire collects information in five categories: (1) participation in dozens of educationally purposeful activities, (2) institutional requirements and the challenging nature of coursework, (3) perceptions of the college environment, (4) estimates of educational and personal growth since starting college, and (5) background and demographic information" (NSSE Survey Instruments; n.d. Retrieved from http://nsse.indiana.edu/html/survey_instruments.cfm).

The measure is widely used by IHEs to set benchmarks for student engagement.

Summary

In this meta-analysis, the researcher attempted to synthesize the models illustrated above into a parsimonious model reflecting the common elements of each model. The researcher considered Astin's (1965) student inputs as comparable to Spady's (1970) family background and Tinto's (1993) family, skills and abilities, prior schooling, and Pascarella's (1980) student background characteristics. Further comparisons can be drawn between Astin's (1965) college environment, Spady's (1970) normative congruence, and Bean and Metzner (1985) and Fleming's (1985) satisfaction variable. All these major models include a variation of an institutional commitment factor, as well as social and academic integration. Subsequently, because of these similarities, the synthesis of these models was a natural progression of research on student persistence. Recent statistical methods developed by Cheung (2015a) allowed for the application of structural equation modeling to meta-analytic research, which provides a more robust and complex analysis of these models.

CHAPTER III

METHODOLOGY

The focus of this research study was to synthesize undergraduate student persistence models using meta-analytic structural equation modeling techniques. Based on the analysis of the studies included, the following variables were included in the model: Student characteristics of age, sex, ethnicity, SES, and prior educational performance as evidenced by high school GPA, and/or ACT/SAT scores. Relationships with the college environment included organizational factors such as culture, satisfaction, or sense of belonging. It is proposed that the preceding two factors, student characteristics and organizational factors, as well as a student's external factors of family/friend support and/or work obligations, have a moderating effect on institutional commitment. These factors influence students' academic and social integration, and all these relationships influence college student persistence.

Review of Studies included in the Meta-Analysis

Forty-six studies were included in the meta-analysis. One study contained two separate correlation matrices; therefore, 47 correlation matrices were included in the analysis. To be included in the meta-analysis, studies were required to include a dependent variable measuring student persistence, intent to persist, retention, drop out, attrition or graduation. Persistence in college was defined as a student's continued enrollment from first semester to second or more semester(s). Retention was measured as a student's continued enrollment from first year to second year in college.

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Studies were included if they contained a minimum of three of the seven independent variables: student background characteristics, social and academic integration, initial institutional commitment, and subsequent commitment, external factors, and organizational factors. A detailed list of definitions for each variable can be found in Appendix A.

Sample

The total sample size represented in the 46 studies was 129, 011 undergraduate college students pursuing both two year and four year degrees, with an average sample size of 1918 students in each study. The individual sample size range was between 45 and 58,294. The sample was representative of diverse ethnicities. Caucasians represent 51% of the student sample; African-American/Black students represent 16%, Hispanic/Latino(a) students represent 14%, Asian students represent 13%, and other/multi-ethnic students represent 6% of the student sample; 38% of the studies did not report ethnicity. Three studies grouped all minorities into one category, reporting only minority and non-minority groups. Of those studies, 27% are minority students and 73% are non-minority students. One study by Bean (1979) was entirely Caucasian, and Jumpeter (2005) described his sample as "basically Caucasian" (p. 154). Research by William (2002) focused on the integration of African-American, Hispanic, and Asian students, and did not include any data on Caucasian students.

The majority of the studies sampled traditional-aged students under 24 years old. About a quarter (27.7%) of the studies reported the individual ages of the student sample, which showed that 89.9% of the sample was comprised of students under 24 years of age.

Nine studies, or 19.14% of the total, reported the average age of the sample. The composite average age of those studies was 20.73 years of age. Fifty-three percent of the studies included did not report age. However, all the studies with the exception of Ling (2006), who studied transfer students, sampled college freshmen and/or sophomores. Therefore, it is assumed that the majority of students in these studies were younger than twenty-four. The average number of females studied was 57.11%. The average percent of males in the study was 42.89%. Gender was not reported for 29.79% of the studies.

Type of Institution

For this meta-analysis, the researcher intentionally sampled community colleges, two-year public and private colleges, and four-year public and private colleges to determine if persistence models held across diverse institutions. Community colleges represented 17% of the sample, two-year public and private institutions represented 9% of the sample, and four-year private colleges represented 15% of the sample. Public four-year colleges/universities represented 48%, the largest group in the sample. Eleven percent of the sample came from studies available through the NCES. The colleges represented varied geographic regions of the United States, Canada (Angulo-Ruiz & Pergelova, 2013; Wintre & Bowers, 2007) and Belgium (Neuville et al., 2007).

Data Collection

The majority of studies only surveyed students once. Surveys were distributed to students in their first semester of college, with varying degrees of follow-up throughout their academic careers. The most common follow-up survey schedule was at the end of the first semester (Berger & Braxton, 1998; Braxton, J. et al., 2000; Braxton, J. M. et al.,

2000; McGuigan, 1993; Napoli & Wortman, 1998; Ogrosky, 1992) or at the end of the first year (Saunders, 2004). The most common surveys used in the research studies included in this meta-analysis were the Early Collegiate Experiences Survey, the First Year Survey, and the Student Information Form. However, the majority of the authors created their own survey.

Analysis

The studies included in the analysis were required to contain a full correlation matrix. Therefore, the majority of studies used a latent variable structural equation model (Angulo-Ruiz & Pergelova, 2013; Bean, 1979; Cabrera, 1990; Cordell-McNulty, 2009; Gill, 1993; Hoffman, 1998; McGuigan, 1993; Nadler, 2013; Napoli & Wortman, 1998; Neuville et al., 2007; Okun & Finch, 1998; Pan, 2010; Pascarella et al., 1986; Pessa Huff, 2009; Saunders, 2004; Stryker, 1997; Tovar, 2013), or path analysis (Berger & Braxton, 1998; Bragg, 1994a, 1994b; Braxton, J. M. et al., 2000; Damon, 1997; Elkins et al., 1998; Fry, 2010; Nakajima, 2008; Sherlin, 2002). Additional studies included in the analysis employed multiple regression or multivariate models (Braxton, J. et al., 2000; Green, 1998; Ikegulu & Barham, 1997; Jumpeter, 2005; Lin, 2011; Ling, 2006; Morales, 1998; Nippert, 2000; Ogrosky, 1992; White, 1998; Yonai, 1991). Some studies applied logistic regression (Szafran, 2001; Wintre & Bowers, 2007), longitudinal models (Henningsen, 2003; Pearl, 1993; Wicker, 2003), or correlation studies (Cleveland-Innes, 1994; Woosley et al., 2005). One study utilized a mixed-models approach (Jordan, 2003).

Results of the Included Studies

This section provides a comprehensive summary of the relationships found between factors reported in the correlation matrices and descriptive statistics of each study in the meta-analysis. The results from the 47 correlation matrices are organized by the factors included in the model. This allows for a comprehensive understanding of any consistencies and inconsistencies in the relationships between factors in each model. Additionally, it provides context for how the aforementioned theories in Chapter II are operationalized and measured in the model.

Student background characteristics. Student background characteristics were included in 40 (or 85%), of included studies. A large number of unique variables were measured in student background characteristics; therefore, only the following categories of student characteristics were included in the analysis: high school GPA, standardized test scores, gender/sex, race/ethnicity, age, and income/SES. These variables were chosen because *high school GPA* and *gender* were reported in 49% of the studies included, *race/ethnicity* in 45%, *income/SES* in 36%, *standardized test scores* in 32%, and *age* in 21%. Variables included in less than 10% of the studies were excluded from further analysis. The student background characteristic *parents' educational background* was considered for inclusion, as it was included in 11% of the studies. However, upon further investigation, parents' educational background was not significantly correlated with persistence in any of the studies in which it was included (Braxton, J. M. et al., 2000; Damon, 1997; Elkins et al., 1998; Fry, 2010; Helland, Stallings, & Braxton, 2002). Furthermore, in the studies where both income and parents' educational background were

measured, there was a moderate to strong correlation between the variables in every study

analyzed (Elkins et al., 1998; Helland et al., 2002), and in Damon's (1997) study parents'

educational background was used as a measure of SES; therefore, it was redundant to

include both income variables and parents' educational background. The results of each

student background characteristic are described in detail in the following sections.

    Age. The results of the direct and/or indirect effects of age on college student

retention were mixed in the studies presented in this analysis. Thirteen studies reported

age as a student background factor, and only four studies in the analysis showed a

significant correlation between age and persistence (Cleveland-Innes, 1994; Morales,

1998; Nakajima, 2008; Napoli & Wortman, 1998). These studies were sampled from

community colleges (Nakajima, 2008; Napoli & Wortman, 1998), or predominantly

commuter campuses (Cleveland-Innes, 1994; Morales, 1998). Although community

colleges tend to have a higher population of non-traditional or adult students, that

generalization cannot be applied to these samples. Of the 1,011 community college

students sampled by Napoli and Wortman (1998), 92% were 22 years old or younger.

The studies conducted by Cleveland-Innes (1994), and Morales (1998) did not report age

statistics. The only study confirming the assumption that more adult students attend

community colleges was the study authored by Nakajima (2008) with an average age of

24.64. The Cleveland-Innes (1994) study focused specifically on whether there were

differences in student dropout rates based on age. Traditional-aged students were

identified as students who were 22 years of age or younger. It was determined that there

was a significant difference in dropout patterns of non-traditional students and

traditional-aged students ($r = .09$, $p < .05$); suggesting that older students are more likely to drop out of college.

Overall, the studies included in the analysis did not suggest a significant direct effect of age on persistence; however, there are several indirect effects on persistence to explore. Age was significantly correlated with other student background statistics of gender (Pearl, 1993), ethnicity (Nakajima, 2008; Nippert, 2000; Sherlin, 2002), SES (Nippert, 2000), high school GPA (Ikegulu & Barham, 1997; Morales, 1998), and test scores (Morales, 1998; Stryker, 1997). The majority, or 69%, of studies that measured age as a student background characteristic suggested a significant relationship between age and academic integration (Cleveland-Innes, 1994; Gill, 1993; Hoffman, 1998; Ikegulu & Barham, 1997; Morales, 1998; Nakajima, 2008; Pearl, 1993; Stryker, 1997; White, 1998). Older students tended to have higher academic integration (Cleveland-Innes, 1994; Hoffman, 1998; Morales, 1998; Napoli & Wortman, 1998; Pearl, 1993; Stryker, 1997; Woosley et al., 2005). In addition, institutional commitment and social integration also show significant relationships with age (Gill, 1993; Nakajima, 2008; Nippert, 2000; Pearl, 1993; Stryker, 1997; White, 1998). Older students tended to exhibit higher institutional commitment than younger students (Stryker, 1997; White, 1998) and lower levels of social integration (Cleveland-Innes, 1994; Napoli & Wortman, 1998; Pascarella et al., 1986; Pearl, 1993). However, Gill (1993) and Stryker (1997) suggested the opposite: that older students have higher levels of social integration.

Gender/Sex. Twenty-two studies in the analysis included gender/sex as an independent variable. A third of the studies that included gender/sex as a student

background characteristic showed significant direct effects of gender on persistence (Braxton, J. M. et al., 2000; Elkins et al., 1998; Fry, 2010; Gill, 1993; Napoli & Wortman, 1998; Saunders, 2004; Stryker, 1997). Gender was also found to have an indirect effect on persistence in the models, demonstrating relationships with all the other variables, with the exception of organizational factors. Three of the studies included did not show any significant relationships, either direct or indirect, with gender and any of the variables in the model (Braxton, J. M. et al., 2000; Jordan, 2003; Woosley et al., 2005).

The studies included suggested that gender was significantly correlated with three other student background characteristics: high school GPA, test scores, and ethnicity/race. Of the five studies that measured gender and high school GPA, four of them suggested that female students had significantly higher GPAs than male students (Braxton, J. M. et al., 2000; Cleveland-Innes, 1994; Szafran, 2001; Wicker, 2003; Yonai, 1991), and one suggested that male students had significantly higher GPAs than female students (Bean, 1979). The results in the correlation between gender and test scores were mixed. Male students had significantly higher test scores than female students in two studies (Saunders, 2004; Yonai, 1991). Stryker (1997) found that male students scored higher on the SAT math test, and females scored higher on the SAT reading test; and finally, Szafran (2001) suggested that female students scored higher on the SAT. There was a moderately strong relationship between gender and African-American ethnicity, suggesting that African-American students were more likely to be female as compared to other groups (Stryker, 1997; Yonai, 1991).

Female students were significantly impacted by external factors related to family, and number of children (Gill, 1993; Pearl, 1993; Wicker, 2003). A significant relationship between gender and institutional commitment was consistently found in the studies included in the analysis. All studies with the exception of Braxton, Milem, and Sullivan (2000) suggested that female students had significantly higher institutional commitment than male students exhibited (Berger & Braxton, 1998; Helland et al., 2002; Stryker, 1997; White, 1998).

Research indicates a consistent relationship between gender and academic achievement. Eighty percent of the studies that included gender ($N = 22$) showed statistically significant relationships between gender and academic integration; however, the results were mixed. Some suggested a significant positive relationship between female students and academic integration (Braxton J. M. et al., 2000; Cleveland-Innes, 1994; Napoli & Wortman, 1998; Stryker, 1997; Szafran, 2001; Tovar, 2013),while others suggested a significant positive relationship between male students and academic integration (Braxton, J. et al., 2000; Cordell-McNulty, 2009; Ogrosky, 1992; Pearl, 1993). Gender and institutional commitment were also found to have a significant relationship (Bean, 1979; Braxton, J. M. et al., 2000; Gill, 1993; McGuigan, 1993; Ogrosky, 1992; Pearl, 1993; Stryker, 1997; White, 1998; Wicker, 2003).

Social integration and gender demonstrated a significant relationship most consistently throughout the studies. Thirty-two percent of the studies that included gender ($N = 7$) suggested a significant relationship between gender and social integration (Bean, 1979; Braxton, J. M. et al., 2000; Cleveland-Innes, 1994; Gill, 1993; Helland et

al., 2002; Pearl, 1993; Yonai, 1991). All these studies suggested a positive correlation between female students and social integration.

Ethnicity. Twenty-two of the 46 studies reported ethnicity as an independent variable. Only six (or 27%), of the studies found a significant direct correlation between ethnicity and student persistence (Berger & Braxton, 1998; Elkins et al., 1998; Fry, 2010; Jordan, 2003; Stryker, 1997; Tovar, 2013). Three studies did not find significant correlations between ethnicity and any of the other variables in the model (Braxton, J. et al., 2000; Ogrosky, 1992; Woosley et al., 2005).

Eleven (or 50%), of the studies measuring ethnicity showed a significant relationship between ethnicity and academic integration. Minority students' GPA in the first semester of college tended to be lower than non-minority students' GPA (Cordell-McNulty, 2009; Nakajima, 2008; Sherlin, 2002; Stryker, 1997; Tovar, 2013; Yonai, 1991). The data suggest that Caucasian students report higher self-efficacy than minority students report and engage in academic support services and advising/counseling at lower rates (Lin, 2011; Tovar, 2013). There were mixed results between African-American student populations and Asian student populations about the quality of relationships with faculty (Berger, & Braxton, 1998; Stryker, 1997; Tovar, 2013). Saunders's (2004) suggested that students of color have higher degree aspirations than Caucasian students.

Four studies showed a significant correlation between institutional commitment and ethnicity, three of which were the same studies that found significant correlations between ethnicity and academic integration (Braxton, J. et al., 2000; Stryker, 1997; Tovar, 2013). The results suggested a difference between ethnic minority groups and

measures of institutional commitment. For example, Braxton, Bray, and Berger (2000) suggested that non-white students report lower institutional commitment than white students report. However, Helland, Stallings, and Braxton (2002) suggested the opposite: that white students report lower institutional commitment than non-white students report. Stryker's (1997) and Tovar's (2013) research suggested that Asian students had the lowest institutional commitment. This discrepancy would suggest that non-white student groups report varying levels of institutional commitment. There appear to be differences in the levels of institutional commitment of Asian, Latino (a), and African-American/ Black students; future models should report each ethnic group separately to further examine differences between groups.

Three studies demonstrated a significant relationship between ethnicity/race and social integration. Lin (2011) suggested that friend support and mentoring was important for all students. Further results of the study showed all groups reported that cultural congruity was important to them. The other two studies suggested that Caucasian students had the highest levels of social integration. However, African-American and Latino (a) students also reported high social integration, as well as family and friend support, and sense of belonging (Saunders, 2004; Tovar, 2013). Asian students reported the lowest sense of belonging as compared to all other groups (Tovar, 2013).

The student background variable of test scores was the most consistently correlated with ethnicity. All five studies suggested that Caucasian students tended to have higher SAT scores. Asian students often scored higher in math, and African-American students generally scored the lowest (Saunders, 2004; Sherlin, 2002; Stryker,

1997; Szafran, 2001; Yonai, 1991). It should be noted that Nakajima (2008) warned against reading too much into high correlations between minority students and test scores because ethnicity and SES tended to be highly correlated and some of the effects of ethnicity can be attributed to factors related to SES.

Four studies in the analysis showed statistically significant correlations between ethnicity and SES, all suggesting that minority students have lower socio-economic status than non-minority students do. African-American and Latino/a students reported the lowest socio-economic status (Braxton, J. et al., 2000; Hoffman, 1998; Saunders, 2004; White, 1998). Nakajima's (2008) study suggested that the external factor of working more hours was correlated to ethnicity, which could also be related to SES. Ethnicity and gender were significantly correlated in two studies (Hoffman, 1998; Yonai, 1991). Both studies suggested that African-American students who enroll in college are more likely to be female; African-American men enroll at much lower rates as compared to other ethnicities.

Socio-economic status (SES). None of the studies that included SES ($N = 13$) found a significant direct correlation between SES and persistence. However, there were significant correlations between SES and all other student background characteristics, except gender. The relationship between SES and ethnicity was previously demonstrated and implies that minority students tended to have lower SES than non-minority students. The research conducted by J. Braxton et al. (2000) and Cleveland-Innes (1994) showed a significant relationship between high school GPA and SES. The studies demonstrated that students with lower SES tended to have lower high school GPAs. Three studies

showed a significant correlation between age and SES, suggesting that younger students had lower socio-economic status (Cleveland-Innes, 1994; Sherlin, 2002; White, 1998). Similarly, three studies found that higher SAT scores were significantly correlated with higher SES (Braxton, J. et al., 2000; Sherlin, 2002; Wicker, 2003). Institutional commitment was found to be lower in students who were more economically disadvantaged (Cleveland-Innes, 1994; Damon, 1997; White, 1998).

The relationship between social integration and SES suggests that students with higher SES demonstrate higher social integration (Cleveland-Innes, 1994; Wicker, 2003). Academic integration and SES showed a similar relationship. Research by White (1998) suggested that students with lower SES had less frequent interactions with faculty and lower academic and intellectual development. In relation to external factors in the model, Damon (1997) and Wicker (2003) suggested that students with higher SES were more likely to be encouraged to complete their educational goals. White (1998) suggested that employment was correlated with higher income. Three of the studies included found no significant correlations between SES and any of the variables included in the model (Elkins et al., 1998; Nadler, 2013).

High school grade point average (GPA). High school GPA was the most consistent student background characteristic to demonstrate a direct correlation with persistence. Forty-eight percent of the 23 studies that included high school GPA as a student background characteristic found a direct correlation between high school GPA and college-student persistence (Bragg, 1994a, 1994b; Braxton, J. et al., 2000; Braxton J. M. et al., 2000; Cleveland-Innes, 1994; Damon, 1997; Ikegulu & Barham, 1997; Nippert,

2000; Saunders, 2004; Sherlin, 2002; Wintre & Bowers, 2007; Woosley et al., 2005). All studies suggested that the lower a student's high school GPA, the more likely they are to drop out of college. High school GPA was also significantly correlated with all other student background characteristics of age (Cleveland-Innes, 1994; Nakajima, 2008), gender (Cleveland-Innes, 1994; Nakajima, 2008; Sherlin, 2002; Szafran, 2001), ethnicity (Nakajima, 2008; Sherlin, 2002), SES (Braxton, J. et al., 2000; Cleveland-Innes, 1994), and test scores (Bragg, 1994a, 1994b; Morales, 1998; Sherlin, 2002; Wicker, 2003; Yonai, 1991). The results indicate that older students have lower high school GPAs, as do minority students and students who are economically disadvantaged. Finally, lower test scores on standardized measures were correlated with lower high school GPA (Bragg, 1994a, 1994b; Morales, 1998; Sherlin, 2002; Wicker, 2003; Yonai, 1991).

A significant relationship between high school GPA and academic integration was found in 8 (or 35%), of the 23 studies including these factors (Bragg, 1994a; Cleveland-Innes, 1994; Ikegulu & Barham, 1997; Nippert, 2000; Szafran, 2001; Wicker, 2003; Wintre & Bowers, 2007; Yonai, 1991). All the studies included indicated that high school GPA is positively correlated with college GPA and/or measures of academic integration variables. Social integration showed the same positive correlations with high school GPA (Braxton, J. M. et al., 2000; Cleveland-Innes, 1994; Helland et al., 2002; Ikegulu & Barham, 1997; Yonai, 1991). This pattern is also repeated in the findings of studies that included measures of institutional commitment (Braxton, J. et al., 2000; Damon, 1997; Wicker, 2003).

Six studies found a significant relationship between external factors and high school GPA. Two studies demonstrated a positive relationship between high school GPA and more family encouragement (Damon, 1997; Ikegulu & Barham, 1997), while the other studies showed that students with lower high school GPAs worked more hours (Nippert, 2000; Szafran, 2001; Wicker, 2003). Green (1998) suggested that students with higher high school GPAs found work to be more of a distraction than those with lower high school GPAs. Two studies concluded no significant relationships between high school GPA and any of the variables included in the model (Elkins et al., 1998; Fry, 2010).

Test scores. Three studies found a direct correlation between standardized test scores, most commonly the SAT, and student persistence (Fry, 2010; Saunders, 2004; Sherlin, 2002; Wicker, 2003). Test scores were shown to have an indirect effect on persistence through several of the other factors included in the models. The relationship between ethnicity and test scores has already been established and suggests that Caucasian students tended to have higher scores on standardized tests (Saunders, 2004; Sherlin, 2002; Stryker, 1997; Szafran, 2001; Yonai, 1991). Age was correlated with test scores in two studies, both concluding that older students had higher scores (Morales, 1998; Stryker, 1997). However, the research by Morales (1998) did not include descriptive statistics on age, and Stryker (1997) reported an average age of 23.31. Men tended to have higher scores than women (Sherlin, 2002; Stryker, 1997; Szafran, 2001), and students with a lower SES had lower standardized test scores (Braxton, J. et al., 2000; Sherlin, 2002; Wicker, 2003). It was previously established that lower test scores

are correlated with lower high school GPA (Bragg, 1994a, 1994b; Morales, 1998; Sherlin, 2002; Wicker, 2003; Yonai, 1991). Seven studies suggested a positive correlation between test scores and academic integration (Bragg, 1994a, 1994b; Morales, 1998; Saunders, 2004; Stryker 1997; Szafran, 2001; Wicker, 2003; Yonai, 1991). None of the studies included demonstrated a significant relationship between test scores and social integration. Two studies suggested that lower scores are correlated with lower institutional commitment (Braxton, J. M. et al., 2000; Helland et al., 2002). Wicker (2003) suggested that greater work and family commitments are correlated with lower test scores. Of the studies that included test scores as a student background characteristic, only two did not establish any significant relationships between test scores and any other variables in the model (Bragg, 1994a, 1994b; Braxton, Milem, & Sullivan, 2000).

In summary, the studies included suggested that student background characteristics are directly and indirectly related to college student persistence. The direct relationship with persistence is most often found with a student's high school GPA. Indirect relationships can be found between student background characteristics and all other variables in the model. The strongest indirect relationship with persistence was the effect of student background characteristics on academic integration, particularly the effects of ethnicity, SES, and high school GPA.

External factors. External factors were included in 21 (or 45%), of the studies included in this analysis. The studies included in this analysis measured six different constructs that could be categorized as external factors: a general measure of external commitments, family/parental support and involvement, support from peers, financial

concerns including financial need/support and ability to pay for college, work obligations or number of hours spent working, and family obligations related to marriage and childcare. Eight of the studies suggested a significant direct correlation between external factors and student persistence (Fry, 2010; Gill, 1993; Green, 1998; Ikegulu & Barham, 1997; Nakajima, 2008; Nippert, 2000; Sherlin, 2002; Wicker, 2003; Wintre & Bowers, 2007). Only two studies did not indicate a significant relationship between external factors and any of the variables included in the model (Bean, 1979; Fry, 2010).

The external factor most frequently measured was student work obligations or number of hours spent working; this variable was included in 57% of the studies measuring an external factor (Bean, 1979; Fry, 2010; Gill, 1993; Green, 1998; Morales, 1998; Nakajima, 2008; Nippert, 2000; Sherlin, 2002; Szafran, 2001; White, 1998; Wicker, 2003). Only five of the studies showed a direct significant relationship with persistence (Gill, 1993; Morales, 1998; Nakajima, 2008; Nippert, 2000; Sherlin, 2002). Overall, students with more work obligations and/or worked more hours were less likely to persist in college.

The majority of the studies that investigated external factors also indicated a significant indirect relationship with other factors in the model and persistence. Nippert (2000) found that women and economically disadvantaged students worked more hours than men did. Older students were also found to work more hours than younger students did (Morales, 1998; Nakajima, 2008; White, 1998). The lower a student's high school GPA, the more hours they worked while attending college (Nippert, 2000; Sherlin, 2002; Szafran, 2001). One study by Wicker (2003) found that students who worked more hours

had lower SAT scores. A negative relationship between number of hours worked and academic integration was also established (Gill, 1993; Green, 1998; Morales, 1998; Nakajima, 2008). The same was true of the relationship between social integration and working more hours (Nippert, 2000). One study by White (1998) suggested that employment was related to higher institutional commitment.

Students with higher financial need were significantly less likely to persist in college in two studies (Gill, 1993; Morales, 1998). The research also suggested that students who had financial concerns regarding the ability to pay for college showed lower academic satisfaction and integration (Cabrera, 1990; Gill, 1993), as well as social integration (Green, 1998; Pascarella et al., 1986). In Cabrera's (1990) study, high financial concern correlated with lower SES and minority student status, as well as marital status (Pascarella et al., 1986).

The study conducted by Fry (2010) showed a significant direct negative relationship between family obligations and persistence. Students with more dependents tended to have less income, more financial concerns, and lower academic and social integration and institutional commitment (Nakajima, 2008; Nippert, 2000; Pearl, 1993; Wicker, 2003). Students who got married while in college tended to be female students with lower SES who worked more hours (Nippert, 2000). Pascarella (1986) found that married students tended to be older and worked more hours.

Family support was measured in five of the 21 studies that included an external factor variable. Three studies included in the analysis that measured the effect of a student's family support found that students with higher family support were more likely

to persist in college (Gill, 1993; Ikegulu & Barham, 1997; Wintre & Bowers, 2007). Additionally, these students also tended to have higher academic and social integration, and GPA (Elkins et al., 1998; Gill, 1993; Green, 1998; Wintre & Bowers, 2007). Peer support was positively correlated with persistence in two studies (Green, 1998; Wicker, 2003). Henningsen (2003) suggested that a general measure of external commitments was correlated with higher institutional commitment and goal commitment. Nakajima (2008) found similar results; however, goal commitment decreased as the number of student dependents increased.

Overall, external factors showed a significant direct and indirect effect on student persistence. The studies suggested that older students with lower SES, and in some cases women, worked more hours and had greater work obligations while attending college. Married students as well as students with low SES and minority students were more likely to demonstrate greater financial need. Both financial need, family obligations, and greater work hours led to lower levels of academic and social integration. Family and peer support both showed positive effects on academic and social integration, as well as persistence.

Organizational factors. Twelve studies evaluated organizational factors related to the college/university as an organization. Variables such as campus size, culture/environment, sense of belonging, fairness of policies, communication with students, and satisfaction with college were included as organizational factors. Campus size was not found to have a significant relationship with persistence or any other factors in the model (Napoli & Wortman, 1998). Research conducted by Berger and Braxton

(1998) suggests a positive relationship between organizational factors of fairness in policies, and institutional communication with student persistence and institutional commitment. Institutional communication had a greater effect on female students, and Caucasian students were more likely to report feeling included in the decision-making process.

Sense of belonging demonstrated significant relationships with parental support, institutional commitment, and social integration. It was not found to be statistically significant with persistence (Cordell-McNulty, 2009). Lin (2011) found that minority students reported lower levels of cultural congruence and University fit or perceived belonging, and this experience decreased the likelihood of college persistence. Similarly, perceived University environment was correlated with academic and social integration (Morales, 1998). Research conducted by Tovar (2013) reaffirmed the relationship between sense of belonging and college persistence.

Institutional effectiveness as reported by Angulo-Ruiz and Pergelova (2013) was significantly correlated with academic and social integration, goal commitment, and persistence. Satisfaction with the University was significantly correlated with academic and social integration, encouragement from family/friends, and persistence (Gill, 1993). The research conducted by White (1998) demonstrated relationships between University fit and academic and social integration, institutional commitment, and persistence. Bean (1979) demonstrated similar correlations with academic and social integration and persistence using measures of justice, institutional quality, and satisfaction. Jordan (2003) found correlations between satisfaction and academic integration and persistence.

Fry (2010) found significant relationships between sense of belonging and persistence, as well as academic integration and support from family and friends. Although several different measures were used to evaluate organizational factors, almost all of them showed significant relationships with academic and social integration, institutional commitment, and persistence (Angulo-Ruiz & Pergelova, 2013; Bean, 1979; Berger & Braxton, 1998; Fry, 2010; Gill, 1993; Jordan, 2003; Lin, 2011; Napoli & Wortman, 1998; Tovar, 2013; White, 1998).

Institutional commitment. Institutional commitment was included in 31, or 66%, of the studies included in the analysis. Initial institutional commitment included initial motivation to earn a college degree, plans to continue enrolling at current college, or whether the school was the student's first choice. In 11 studies, institutional commitment was measured twice: once upon student entry, and again after a period of study, usually at the end of the first semester or the beginning of the second semester. This subsequent institutional commitment measure was related to confidence in making the right college choice, intent to graduate from the institution, and certainty in re-enrolling. Eleven studies also measured a student's goal commitment, meaning how confident they were in their major and/or career choice, and how committed they were to achieve their educational goals. Three studies measured goal commitment twice: once at the beginning of the semester, and a second measure either at the end of the first semester, or at the beginning of the second semester.

Thirty-one studies measured institutional commitment, and 23 (or 72%), of the studies, implied a positive direct correlation between institutional commitment and

student persistence (Angulo-Ruiz & Pergelova , 2013; Bean, 1979; Berger & Braxton, 1998; Braxton, J. M. et al., 2000; Braxton, Milem, & Sullivan, 2000; Cabrera, 1990; Cleveland-Innes, 1994; Damon, 1997; Helland et al., 2002; Henningsen, 2003; Hoffman, 1998; Ling, 2006; McGuigan, 1993; Napoli & Wortman, 1998; Neuville et al., 2007; Okun & Finch, 1998; Pan, 2010; Pessa Huff, 2009; Stryker, 1997; Wicker, 2003; White, 1998; Woosley et al., 2005; Yonai, 1991). Student background characteristics of age, gender, ethnicity, SES, high school GPA and test scores all affected student levels of institutional commitment. Older students tended to exhibit higher institutional commitment (Stryker, 1997; White, 1998). All studies except Braxton, Milem, and Sullivan (2000) suggested that female students had significantly higher institutional commitment (Berger & Braxton, 1998; Braxton, J. M. et al., 2000; Braxton, Milem, & Sullivan, 2000; Helland et al., 2002; Stryker, 1997; White, 1998). Caucasian students tended to have higher institutional commitment (Berger & Braxton, 1998; Braxton, J. M. et al., 2000; Stryker, 1997). Two studies reported the opposite, where minority students reported higher levels of institutional commitment (Braxton, J. M. et al., 2000; Helland et al., 2002). Economically disadvantaged students reported lower levels of institutional commitment (Cleveland-Innes, 1994; White, 1998). Students with lower SAT scores had lower institutional commitment (Braxton, J. M. et al., 2000; Braxton, Milem, & Sullivan, 2000; Helland et al., 2002; Yonai, 1991) as well as lower high school achievement (Pascarella et al., 1986; Woosley et al., 2005). Several studies showed a significant correlation between institutional commitment and organizational factors of satisfaction, fairness, communication of information, and quality (Bean, 1979; Berger & Braxton,

1998; Fry, 2010; Napoli & Wortman, 1998; White, 1998). External factors of parental support and external commitments were also shown to have a positive effect on institutional commitment (Cordell-McNulty, 2009; Henningsen, 2003).

Institutional commitment had a strong positive relationship with both academic and social integration. Twenty-one studies found significant correlations between these variables, suggesting a clear relationship between a student's commitment to the institution and academic and social integration (Angulo-Ruiz & Pergelova, 2013; Bean, 1979; Berger & Braxton, 1998; Cabrera, 1990; Cleveland-Innes, 1994; Cordell-McNulty, 2009; Damon, 1997; Fry, 2010; Henningsen, 2003; Hoffman, 1998; Ling, 2006; McGuigan, 1993; Napoli & Wortman, 1998; Neuville et al., 2007; Okun & Finch, 1998; Pan, 2010; Pascarella et al., 1986; Pessa Huff, 2009; Stryker, 1997; White, 1998; Wicker, 2003; Yonai, 1991). Academic integration was defined as faculty caring about students, faculty interactions, motivation, self-efficacy, academic development and college GPA. Social integration included peer interactions, social activities/ organizations, social bonds, and general measures of social integration and satisfaction. A student's commitment to an institution affects his/her academic and social integration, which both directly and indirectly influences a student's persistence. It is also possible that there is a reciprocal relationship between integration and institutional commitment.

The vast majority of studies that included multiple measures of goal commitment or institutional commitment showed strong positive correlations between subsequent measures (Angulo-Ruiz & Pergelova, 2013; Bean, 1979; Berger & Braxton, 1998; Braxton, J. M. et al., 2000; Braxton, Milem, & Sullivan, 2000; Damon, 1997; Fry, 2010;

Helland et al., 2002; Henningsen, 2003; Napoli & Wortman, 1998; Okun & Finch, 1998; Sadler & Mason, 2005; Wicker, 2003; Woosley et al., 2005). Only three studies measuring institutional commitment did not find any significant correlations between variables (Elkins et al., 1998; Green, 1998; Pearl, 1993).

Ten studies included a second measure of institutional commitment collected either at the end of the first semester or the beginning of the second semester. Ninety percent of the studies including a subsequent measure of institutional commitment found a positive direct correlation with student persistence (Berger & Braxton, 1998; Braxton, J. M. et al., 2000; Braxton, Milem, & Sullivan, 2000; Helland et al., 2002; Henningsen, 2003; Jumpeter, 2005; Okun & Finch, 1998; Pascarella et al., 1986; Pearl, 1993). The results mirrored initial institutional commitment samples taken at the beginning of the semester, with a few notable differences. High school GPA had a much greater effect on subsequent measures of institutional commitment than initial measures. A positive relationship between high school GPA and institutional commitment was established by five studies in the analysis (Berger & Braxton, 1998; Braxton, J. M. et al., 2000; Braxton, Milem, & Sullivan, 2000; Helland et al., 2002; Pascarella et al., 1986). Like initial results, female students had higher institutional commitment (Pearl, 1993). Older students and students with higher SES had higher levels of institutional commitment (Pascarella et al., 1986; Pearl, 1993). Interestingly, the results for different ethnicities was split, with half of the studies showing that Caucasian students had higher subsequent institutional commitment than minority students (Berger & Braxton, 1998; Pascarella et

al., 1986), and the other half indicating that minority students demonstrated higher levels of commitment (Helland et al., 2002; Pearl, 1993).

Two studies included measures of external student factors and subsequent institutional commitment. External factors of support from family or friends, general measure of external commitments, and work expectations were correlated with a second measure of institutional commitment (Henningsen, 2003; Napoli & Wortman, 1998). Berger and Braxton (1998) found a positive correlation between organizational factors of fairness in policies, and participation in decision-making and institutional communication.

Similar results were found in the correlations between initial measures of institutional commitment and academic and social integration and successive measures of institutional commitment. All the studies that included a measure for academic integration also included measures of social integration. In each study, a positive significant correlation was found between both variables and a second measure of institutional commitment (Berger & Braxton, 1998; Braxton, J. M. et al., 2000; Braxton, Milem, & Sullivan, 2000; Helland et al., 2002; Henningsen, 2003; Jumpeter, 2005; Okun & Finch, 1998; Pascarella et al., 1986).

Seven of the 11 studies that measured goal commitment, or 64%, found a significant positive relationship with student persistence (Angulo-Ruiz & Pergelova, 2013; Bean, 1979; Gill, 1993; Napoli & Wortman, 1998; Woosley et al., 2005). The student background characteristic of age suggested that older students had higher goal commitment (Gill, 1993), and females showed stronger commitment to educational goals

(Gill, 1993; Pascarella et al., 1986). Greater high school achievement was correlated with stronger goal commitment (Nippert, 2000; Pearl; 1993). Minority students, as well as economically disadvantaged students, demonstrated weaker goal commitment than non-minority students (Napoli & Wortman, 1998; Pearl, 1993). Gill (1993) found that external factors of employment/work hours and financial concerns negatively affected students' goal commitment. However, outside encouragement had a positive effect on goal commitment. Results between goal commitment and academic and social integration were equivalent to institutional commitment. A positive correlation between goal commitment and academic and social integration was significant in 55% of studies representing these factors (Angulo-Ruiz & Pergelova, 2013; Gill, 1993; Napoli & Wortman, 1998; Nippert, 2000; Pearl, 1993; Wicker, 2003).

A second measure of goal commitment was included in four studies, all of which demonstrated a positive direct correlation between the second measure of goal commitment and student persistence (Gill, 1993; Jumpeter, 2005; Napoli & Wortman, 1998; Pearl, 1993). Napoli and Wortman (1998) found that females had higher goal commitment, as did students with a higher GPA and students with greater external social support. Pearl (1993) also found that females had higher goal commitment than males. In addition, a positive relationship was established with academic and social integration. Results from Gill (1993) suggested that older students had higher goal commitment. A positive correlation was also found between satisfaction, external encouragement, and social integration. Jumpeter (2005) demonstrated relationships between secondary measures of goal commitment and financial concerns, as well as academic and social

integration. All four studies demonstrated correlations between a second measure of goal commitment and the initial measure of goal commitment, as well as an initial and/or subsequent measure of institutional commitment.

In conclusion, institutional commitment and goal commitment demonstrated a strong positive relationship with student persistence. In addition, commitment was strongly correlated with academic and social integration. Various student background variables of age, gender, ethnicity, and high school GPA demonstrated influences on students' institutional and goal commitment. External influences of support and work obligations also affect commitment to college goals. Organizational factors of satisfaction, fairness, communication of information, and quality of institution were also correlated with institutional and goal commitment.

Academic integration. Every study included in the analysis, except one, reported a variable measuring academic integration. It was most commonly reported as a global construct of academic integration and academic adjustment (Cabrera, 1990; Cleveland-Innes, 1994; Damon, 1997; Green, 1998; Henningsen, 2003; Napoli & Wortman, 1998; Neuville et al., 2007; Ogrosky, 1992; Pascarella 1986; Saunders, 2004). Aspects of this global academic integration included relationships and interactions with faculty both in and out of the classroom (Berger & Braxton, 1998; Ling, 2006; McGuigan, 1993), quality of instruction (Braxton J. M. et al., 2000; Braxton, Milem, & Sullivan, 2000; Morales, 1998), faculty expressing concern (Nakajima, 2008; White, 1998), and characteristics of the classroom experience (Pearl, 1993). Other studies focused on the student's intrinsic characteristics such as academic self-concept (Green,

1998), academic self-efficacy (Cordell-McNulty, 2009; Lin, 2011; Ling, 2006; Nadler, 2013), expectations of college (Helland et al., 2002), academic aptitude/skills (Ikegulu & Barham, 1997) and confidence in choice of major and commitment to educational goals (Angulo-Ruiz & Pergelova, 2013; Woosley et al., 2005; Yonai, 1991). GPA was often used as a measure of academic integration and achievement (Bean, 1979; Bragg, 1994a; Jordan, 2003; Pessa Huff, 2009; Stryker, 1997; Szafran, 2001; Tovar, 2013; Wintre & Bowers, 2007). Some researchers focused on academic behaviors, involvement, and activities (Gill, 1993; Jumpeter, 2005; Ling, 2006; Mooshegian, 2010; Nippert, 2000; Sherlin, 2002; Yonai, 1991), and a few researchers included elements of academic satisfaction in relation to the quality of the faculty, curriculum, and academic advising/support services (Bean, 1979; Morales, 1998; Mooshegian, 2010; Nippert, 2000).

The variables included in the studies reflect the influence of Tinto's (1993) model, which includes academic performance and faculty/staff activities, both informal and formal. They also show influences from Pascarella's (1980) model, which combines college experiences in and out of the classroom. The addition of student behaviors and satisfaction shows the influence of Bean and Metzner's (1985) model in the studies included in the analysis. Results demonstrated a significant positive effect of academic integration on college student persistence in 83% of the studies included in the analysis. Eight measures of academic integration were found to have a significant effect on student persistence: global constructs of academic integration and academic adjustment, relationships and interactions with faculty both in and out of the classroom, quality of

instruction, intrinsic characteristics such as academic self-concept and self-efficacy, and GPA and academic satisfaction (Angulo-Ruiz & Pergelova, 2013; Bean, 1979; Berger & Braxton, 1998; Bragg, 1994a, 1994b; Braxton, J. et al., 2000; Braxton, J. M. et al., 2000; Cabrera, 1990; Cleveland-Innes, 1994; Cordell-McNulty, 2009; Damon, 1997; Elkins et al., 1998; Fry, 2010; Gill, 1993; Green, 1998; Helland et al., 2002; Henningsen, 2003; Jordan, 2003; Jumpeter, 2005; Ling, 2006; Morales, 1998; Ikegulu & Barham, 1997; Nadler, 2013; Napoli & Wortman, 1998; Neuville et al., 2007; Nippert, 2000; Pan, 2010; Pascarella et al., 1986; Pearl, 1993; Saunders, 2004; Sherlin, 2002; Stryker, 1997; Szafran, 2001; Tovar, 2013; Wicker, 2003; Wintre & Bowers, 2007; Woosley et al., 2005; Yonai, 1991). It should also be noted that there were significant correlations between measures of academic integration when multiple measures were included in the analysis.

Student characteristics of age, gender, ethnicity, SES, high school GPA, and test scores showed differences in level of academic integration. Older students tended to have higher academic integration (Cleveland-Innes, 1994; Hoffman, 1998; Morales, 1998; Napoli & Wortman, 1998; Pearl, 1993; Stryker, 1997; Woosley et al., 2005). Correlations between gender and academic integration were mixed. More than half of the studies included in the analysis suggested a significant positive relationship between female students and academic integration (Cleveland-Innes, 1994; Braxton, J. et al., 2000; Napoli & Wortman, 1998; Stryker, 1997; Szafran, 2001; Tovar, 2013), while the remaining 45% of the studies suggested a significant positive relationship between male

students and academic integration (Braxton, J. M. et al., 2000; Cordell-McNulty, 2009; Ogrosky, 1992; Pearl, 1993).

Student ethnicity and academic integration showed similar mixed results. Sixty percent of the studies measuring ethnicity and academic integration suggested that Caucasian students demonstrate higher academic integration (Pascarella et al., 1986; Stryker, 1997; Szafran, 2001; White, 1998). However, slightly less than half of the studies suggested that minority students demonstrate higher academic integration (Lin, 2011; Yonai, 1991). Pascarella (1986) demonstrated a relationship between higher SES and higher levels of academic integration.

All studies incorporating measures of high school GPA and prior academic achievement showed a significant positive relationship with academic integration (Bragg, 1994a, 1994b; Braxton, J. M. et al., 2000; Cleveland-Innes, 1994; Helland et al., 2002; Henningsen, 2003; Napoli & Wortman, 1998; Nippert, 2000; Pascarella et al., 1986; Szafran, 2001; Wintre & Bowers, 2007). The same results were found between test scores and academic integration (Bragg, 1994a, 1994b; Morales, 1998; Stryker, 1997; Szafran, 2001; Wicker, 2003; Yonai, 1991).

External factors of financial concerns, hours worked, and marital status negatively affected academic integration (Gill, 1993; Green, 1998; Morales, 1998; Nakajima, 2008; Nippert, 2000; Pascarella et al., 1986). Support and encouragement from family showed a positive effect on academic integration (Cordell-McNulty, 2009; Fry, 2010; Green, 1998; Wintre & Bowers, 2007). Organizational factors of communication, fairness in policies, participation in decision-making, and satisfaction with the college/university

positively influenced academic integration (Bean, 1979; Berger & Braxton, 1998; Bragg, 1994b; Gill, 1993; Lin, 2011; Nadler, 2013; Napoli & Wortman, 1998).

All 24 studies incorporating measures of institutional commitment and academic integration established a significant positive relationship between institutional commitment and goal commitment and academic integration (Angulo-Ruiz & Pergelova, 2013; Bean, 1979; Berger & Braxton, 1998; Braxton, J. M. et al., 2000; Cabrera, 1990; Cleveland-Innes, 1994; Cordell-McNulty, 2009; Damon, 1997; Elkins et al., 1998; Helland et al., 2002; Henningsen, 2003; Hoffman, 1998; Jumpeter, 2005; Ling, 2006; McGuigan, 1993; Napoli & Wortman, 1998; Neuville et al., 2007; Ogrosky, 1992; Pan, 2010; Pearl, 1993; Pessa Huff, 2009; Stryker, 1997; Tovar, 2013; Woosley et al., 2005). A strong positive relationship between social integration and academic integration was established in the studies included in the analysis. Sixty-seven percent of studies measuring academic integration also included a measure of social integration. All 29 studies showed a significant relationship between the two variables (Angulo-Ruiz & Pergelova, 2013; Bean, 1979; Berger & Braxton, 1998; Braxton J. M. et al., 2000; Bragg, 1994a; Cabrera, 1990; Cleveland-Innes, 1994; Cordell-McNulty, 2009; Damon, 1997; Elkins et al., 1998; Green, 1998; Henningsen, 2003; Hoffman, 1998; Jumpeter, 2005; Ling, 2006; McGuigan, 1993; Nakajima, 2008; Napoli & Wortman, 1998; Neuville et al., 2007; Nippert, 2000; Ogrosky, 1992; Pan, 2010; Pascarella et al., 1986; Pearl, 1993; Saunders, 2004; Stryker, 1997; Tovar, 2013; Wicker, 2003).

In conclusion, academic integration had a direct positive effect on college persistence in 36 (or 83%), of the studies included in the analysis. Older students tended

to have higher academic integration, while results between male and female students, and students of different ethnicities, were mixed. Students with higher income, high school GPA, and test scores were all more likely to report higher academic integration. External factors of financial concerns, hours worked, and marital status were found to have a negative effect on academic integration, and support and encouragement from family showed a positive effect on academic integration. Organizational factors of communication, fairness in policies, participation in decision-making, and satisfaction with the college/university also positively influenced academic integration. A significant positive relationship between institutional/goal commitment and academic integration was established. The strongest relationship in the model was between academic integration and social integration. Sixty-seven percent of studies measuring academic integration also included a measure of social integration. All 29 studies showed a significant positive relationship between the two variables.

     Social integration. The second most common factor included in the analysis was social integration; 43, or 91%, of studies measured the effect of social integration on college persistence. Of the studies included, 72% established a significant positive correlation between social integration and persistence (Angulo-Ruiz & Pergelova, 2013; Berger & Braxton, 1998; Bragg, 1994a; Braxton, J. et al., 2000; Braxton, J. M. et al., 2000; Cabrera, 1990; Damon, 1997; Gill, 1993; Green, 1998; Helland et al., 2002; Henningsen, 2003; Ikegulu & Barham, 1997; Jumpeter, 2005; Lin, 2011; Ling, 2006; Nadler, 2013; Napoli & Wortman, 1998; Neuville et al., 2007; Nippert, 2000; Okun & Finch, 1998; Pan 2010; Pascarella et al., 1986; Pearl, 1993; Saunders, 2004; Sherlin,

2002; Tovar, 2013; White, 1998; Wicker, 2003; Wintre & Bowers, 2007; Yonai, 1991); social integration was measured as a global concept of the quality of peer relationships and social engagement a student experiences at college. It is comprised of factors related to peer relationships, number of friends, social activities and organizations, and social adjustment to college. Additionally, there were significant correlations between measures of social integration when multiple measures were included in the analysis.

Social integration was shown to have a relationship with student background characteristics of age, gender, ethnicity, SES, and test scores. Six studies measured age, four of which showed that older students have lower levels of social integration (Cleveland-Innes, 1994; Napoli & Wortman, 1998; Pascarella et al., 1986; Pearl, 1993) and two suggested the opposite (Gill, 1993; Stryker, 1997). The effect of gender on social integration was completely split, with half of studies showing that females were more likely to have higher social integration (Berger & Braxton, 1998; Braxton, J. et al., 2000; Gill, 1993; Helland et al., 2002; Stryker, 1997; Tovar, 2013), and the other half suggesting that male students report higher levels of social integration (Cleveland-Innes, 1994; Ogrosky, 1992; Pearl, 1993; Sherlin, 2002; Yonai, 1991). Only three studies demonstrated a significant relationship between ethnicity and social integration. Berger and Braxton (1998) and Saunders (2004) suggested that white students were more likely than students of color to report higher levels of social integration. Stryker (1997) implied that Asian students were more likely to report higher levels of social integration. All studies that found a significant relationship between SES and social integration show that students with higher SES have higher levels of social integration (Helland et al., 2002;

Hoffman, 1998; Napoli & Wortman, 1998; Pascarella et al., 1986; Wicker, 2003; Wintre & Bowers, 2007). Finally, students with higher high school GPAs and test scores were also more likely to report higher levels of social integration (Berger & Braxton, 1998; Bragg, 1994b; Braxton, J. et al., 2000; Braxton, J. M. et al., 2000; Cleveland-Innes, 1994; Ikegulu & Barham, 1997; Saunders, 2004).

External factors of support from family/friends, off-campus friends, and encouragement were positively related to higher social integration (Cordell-McNulty, 2009; Damon, 1997; Green, 1998; Lin, 2011; Nakajima, 2008; Napoli & Wortman, 1998; Tovar, 2013). However, as the hours a student worked increased, as well as the number of dependents, the likelihood of social integration decreased (Napoli & Wortman, 1998; Pearl, 1993; Sherlin, 2002).

Organizational factors of institutional quality, satisfaction, communication, and supportwere all positively correlated with greater social integration (Bean, 1979; Bragg, 1994a, 1994b; Berger & Braxton, 1998; Gill, 1993; Green, 1998; Nadler, 2013; Napoli & Wortman, 1998; Tovar, 2013; White, 1998; Wintre & Bowers, 2007). Twenty-six of the studies measuring institutional/goal commitment and social integration (or 62%), demonstrated a positive relationship between the two variables. Students with higher levels of institutional commitment as measured by both initial and/or subsequent measures were more likely to report higher levels of social integration (Angulo-Ruiz & Pergelova, 2013; Berger & Braxton, 1998; Braxton, J. M. et al., 2000; Cabrera, 1990; Cleveland-Innes, 1994; Cordell-McNulty, 2009; Damon, 1997; Gill, 1993; Helland et al., 2002; Henningsen, 2003; Hoffman, 1998; Jumpeter, 2005; Lin, 2011; Ling, 2006;

McGuigan, 1993; Napoli & Wortman, 1998; Neuville et al., 2007; Ogrosky, 1992; Okun & Finch, 1998; Pan 2010; Pearl, 1993; Pessa Huff, 2009; Stryker, 1997; Tovar, 2013; Wicker, 2003; Yonai, 1991).

To reiterate the findings, a strong positive relationship between social integration and academic integration was established in the studies included in the analysis. Academic integration variables of faculty relationships (Bean, 1979; Cordell-McNulty, 2009; Hoffman, 1998; Nakajima, 2008), quality of classroom/teaching (Braxton, J. et al., 2000; Braxton, J. M. et al., 2000), self-efficacy (Gill, 1993; Lin, 2011; Nadler, 2013; Nakajima, 2008; Stryker, 1997), and academic satisfaction and adjustment (Bragg, 1994a, 1994b; McGuigan, 1993; Nippert, 2000) were related to social integration, as well as global measures of academic integration (Angulo-Ruiz & Pergelova, 2013; Cabrera, 1990; Cleveland-Innes, 1994; Damon, 1997; Green, 1998; Helland et al., 2002; Henningsen, 2003; Jumpeter, 2005; Ling, 2006; Napoli & Wortman, 1998; Neuville et al., 2007; Ogrosky, 1992; Pan 2010; Pascarella et al., 1986; Pearl, 1993; Pessa Huff, 2009; Saunders, 2004; Tovar, 2013; White, 1998; Wintre & Bowers, 2007; Yonai, 1991).

In summary, a significant positive correlation was established between social integration and college persistence. Older students in general tended to have lower levels of social integration, whereas the results between male and female social integration were evenly mixed. Very few studies showed a significant relationship between ethnicity and social integration, and those that did had mixed results. Higher achieving high school students and economically advantaged students were more likely to report higher levels of social integration. External factors of financial concerns, hours worked, and marital

status were found to have a negative effect on social integration; and support and encouragement from family showed a positive effect on social integration. Organizational factors of institutional quality, satisfaction, communication, and support were all positively correlated with greater social integration. The majority of the studies measuring institutional/goal commitment and social integration demonstrated a positive relationship between the two variables. Finally, a strong positive relationship between social integration and academic integration was reaffirmed.

Persistence. Persistence was measured in four ways: intent to persist/re-enroll, confirmed persistence through institutional data, graduation, or dropout. Fifteen, or 32%, of the studies included measures of intent to persist as the dependent variable in predicting college student persistence (Berger & Braxton, 1998; Bragg, 1994a, 1994b; Braxton, J. et al., 2000; Braxton, J. M. et al., 2000; Cabrera, 1990; Cordell-McNulty, 2009; Helland et al., 2002; Ikegulu & Barham, 1997; Lin, 2011; Nadler, 2013; Neuville et al., 2007; Saunders, 2004; Tovar, 2013; Woosley et al., 2005). Twenty-six,, or 55% of studies included measures of confirmed persistence (Cabrera, 1990; Damon, 1997; Elkins et al., 1998; Fry, 2010; Henningsen, 2003; Jordan, 2003; Jumpeter, 2005; Ling, 2006; McGuigan, 1993; Nakajima, 2008; Napoli & Wortman, 1998; Nippert, 2000; Ogrosky, 1992; Pan, 2010; Pascarella et al., 1986; Pearl, 1993; Pessa Huff, 2009; Sherlin, 2002; Stryker, 1997; Szafran, 2001; White, 1998; Wicker, 2003; Wintre & Bowers, 2007; Yonai, 1991). Four, or 9%, of the studies included measures of graduation from the college/university (Pascarella et al., 1986; Wicker, 2003; Wintre & Bowers, 2007). Lastly, student dropout was included in eight, or 17%, of studies included in the analysis

(Angulo-Ruiz & Pergelova, 2013; Bean, 1979; Cleveland-Innes, 1994; Gill, 1993; Green, 1998; Hoffman, 1998; Morales, 1998; Okun & Finch, 1998).

The results of the studies included in the analysis indicate that the factors with the strongest direct effects on college student persistence were academic integration, social integration, and institutional commitment, with academic integration being the strongest predictor of college student persistence. Student background characteristics were less likely to directly predict persistence; however, many factors interacted with other variables in the model, suggesting an indirect effect on college persistence. External factors were also less likely to directly influence persistence; however, they are likely to predict a student's level of commitment, and academic and social integration, which directly affect persistence. In addition, a relationship was established between external factors and demographic characteristics suggesting that external factors are more likely to influence the college persistence of students with more external commitments of work, family, and financial concerns. Students who have greater external support engage and persist at higher levels. Organizational factors showed significant relationships with academic and social integration, institutional commitment, and persistence.

Research Design of Meta-Analysis

Meta-analysis has become a commonly used technique to summarize data across studies in the behavioral and social sciences. Meta-analysis is a term created by Glass (1976) and is used to describe "the statistical analysis of a large collection of analysis results from individual studies for the purpose of integrating the findings" (p. 3). Meta-analysis has been adopted across myriad disciplines such as psychology, management,

education, and medical sciences (Cheung, 2014). It is a method of synthesizing study

outcomes represented by effect sizes; it is also a type of literature review. Meta-analysis

is a subset of literature review techniques that emphasize a focus on research results using

a methodological synthesis of research through the application of a statistical analysis of

effect sizes (Card, 2012).

Traditional meta-analytic techniques involve univariate methods of evaluating

effect sizes across samples. For example, Hedges and Olkin (1985) developed a method

referred to as univariate z. This method involves weighting each correlation by the

reciprocal of its estimated conditional variance then averaging the weighted correlations

across studies to obtain the synthesized population correlation estimate (Furlow &

Beretvas, 2005). Hunter and Schmidt (1990, 2004) developed the method referred to as

univariate r using Pearson correlations. The univariate r method computes the average of

individual correlation coefficients weighted by their sampling variances (Cheung &

Chan, 2009). The major disadvantage of univariate models is that they do not account for

the covariance between correlation coefficients, and the inferences are limited to only the

studies included in the model.

Multivariate approaches to meta-analysis include the generalized least squares

method (GLS) and the two-stage meta-analytic structural equation model (TSSEM).

GLS is a commonly used multivariate approach to estimate the pooled correlation matrix

and the asymptotic covariance matrix of parameter estimates (Becker, 2000; Cheung &

Chan, 2005; Hedges & Olkin, 1985). TSSEM is based on the maximum likelihood

estimation (MLE) analytic technique that estimates parameters in the model by taking the

mean and variance and obtaining the values that maximize the likelihood of finding the observed results within those parameters.

The advantage of multivariate approaches is that they can account for the dependence between variables and are therefore less likely to be biased because the within-study covariance is included in the analysis. In addition, they can imply inferences in the population outside of the studies included in the meta-analysis (Cheung & Chan, 2009; Furlow & Beretvas, 2005). When applying the multivariate model, it must be decided whether to utilize a fixed-effects or random-effects model. Fixed-effects models are used to form conditional inferences based on the selected studies. It is assumed that effect sizes are homogeneous and the population correlation matrices are equal for all studies. When fixed-effects models are applied to heterogeneous data, the estimated standard errors are underestimated (Cheung, 2015a; Furlow & Beretvas, 2005). Random-effects models allow studies to have their own study specific correlation matrices even though the proposed structural models remain the same across studies. Random-effects models can also be used to generalize the results beyond the studies in the analysis, which is one of the most important aspects in deciding whether to use the fixed-effects or random-effects models. Researchers must consider which model addresses their research questions and the nature of the inferences being sought. Inferences using fixed-effects can only be applied to the studies included in the sample, whereas random-effects can be applied beyond the included studies (Becker, 2000; Cheung, 2008, 2015a; Hedges & Vevea, 1998).

Structural equation modeling (SEM) is a frequently used multivariate technique for testing theoretical models for both observed and latent variables. An observed variable is one that can be directly measured. A latent variable is a hypothesized construct in the model that cannot be directly measured (Stevens, 2009). Relationships between observed and latent variables are established *a priori* and applied as a structural model to estimate whether the proposed model fits the sample used in the analysis. Special cases of SEM including confirmatory factor analysis and path analysis provide adaptable frameworks for testing complex models (Card, 2012; Cheung & Chan, 2005; Furlow & Beretvas, 2005). SEM and meta-analysis have become very popular in scholarly literature; approximately 2000 studies were published over the last 20 years using SEM (Cheung, 2015a). With that number of studies, it is natural to marry meta-analytic techniques with SEM; it allows for an organic and unique method for theory development.

Proposed Meta-Analytic Structural Equation Model

The proposed meta-analytic structural equation model posits that student background characteristics (i.e., age, gender/sex, ethnicity/race, SES, high school GPA, and test scores) influence the initial level of commitment to the institution. A student's outside commitments (described in the research as external factors of employment, marital status, number of dependents, family support/encouragement) also affect his/her level of initial institutional commitment. In addition, a relationship between student background characteristics and external factors is proposed. Initial institutional

commitment is also influenced by organizational factors (e.g., fairness, internal communication, sense of belonging, satisfaction, and college climate/culture).

Institutional commitment influences the student's interaction with the college and affects the student's level of academic and social integration. Academic integration, which is described as a student's level of academic engagement in activities or experiences both in and out of the classroom, shares a relationship with social integration, or the degree to which a student engages in social activities and the quality of peer relationships. This engagement influences the level of subsequent institutional commitment; the greater the student's levels of integration, the higher the subsequent commitment to the institution. The subsequent level of commitment directly affects the student's intent to persist at the institution.

The following paths were evaluated for model fit:

1. The impact of student characteristics on institutional commitment.

2. The impact of external factors on institutional commitment.

3. The relationship between student characteristics and external factors.

4. The impact of organizational factors on institutional commitment.

5. The impact of institutional commitment on academic integration.

6. The impact of institutional commitment on social integration.

7. The impact of academic integration on a second measure of institutional commitment.

8. The impact of social integration on a second measure of institutional commitment.

9. The relationship between academic integration and social integration.

10. The impact of a second measure of institutional commitment on college student

persistence.

Figure 1. Proposed MASEM model. (Repeated here for ease of reference.)

StF: Student factors, ExF: External factors, OgF: Organizational factors, IC1: 1st measure
of institutional commitment, SI: social integration, AI: Academic Integration, IC2: 2nd
measure of institutional commitment, IP: Intent to persist

Search Methods

The following seven databases were chosen for the systematic review of

literature: Academic Search Complete, Education Research Complete, Educational

Research Information Center (ERIC), PsychInfo, SocIndex, ProQuest Digital

Dissertation, and Google Scholar. Academic Search Complete (EBSCO) was chosen

because it has a collection of full text articles from more than 4,000 scholarly

publications. Education Research Complete was selected due to its vast database of

abstracts for more than 1,500 journals, as well as full text for more than 750 journals.

ERIC maintains resources dating back to 1966 and is useful for conducting historical

research in education. PsychInfo and SOCIndex were selected due to the overlap of

psychology and sociology in educational research. These databases combined contain

over a million records from over 2,500 publications. ProQuest Digital Dissertation

houses millions of dissertation and theses from 1861 and is essential for finding research

studies in higher education. A Google Scholar search was also conducted to include

published and unpublished research not included in the above-mentioned databases.

Searches for unpublished research were also conducted using ERIC, ProQuest

Dissertation and direct communication with authors to reduce the file drawer problem

(Rosenthal, 1979, p. 638). The file drawer problem refers to the publication bias to only

publish significant findings, while studies with non-significant results are "filed away."

Therefore, published studies are biased towards significant results and consequently skew

meta-analyses because not all available studies are included in the analysis. After the

initial systematic review, a citation review was conducted from the research studies

gathered during the initial search as well to find additional studies for inclusion.

The search keywords were chosen based on the language used in primary studies

of college student retention and were used to employ limiters on the scope of the search.

The initial search in each database was a search term for the specific student population

of interest and a search term for persistence. For example, the initial search in ERIC was

"college students" AND "persistence" and yielded 10,768 results. To further refine

search criteria, an additional search category was added. For example, "college students"

AND "persistence" AND "student characteristics" was searched, followed by "college

students" AND "persistence" AND "academic integration"; then "college students" AND "persistence" AND "social integration"; and finally "college students" AND "persistence" AND "structural equation modeling" OR "path analysis."

The keywords listed in Table 1 represent the specific search terms for each category described above; the first row represents the category, and the columns represent each search term for that category. For instance, a search on commitment would include "college students or undergraduate students or university or postsecondary or higher education" AND "persistence or school holding power or retention or dropout or attrition" AND "commitment or satisfaction or satisfied or institutional commitment."

Criteria for inclusion and exclusion of studies. To be included in the meta-analysis, studies were required to include a dependent variable measuring student persistence, intent to persist, retention, drop-out, attrition or graduation. Persistence in higher education was measured as continued enrollment from first semester to second semester. Retention was measured as continued enrollment from first-year to second-year in college. Inclusion was allowed for independent variables measuring student characteristics, social and academic integration, institutional commitment, external factors, and organizational factors.

Studies were required to have a minimum of three of the seven independent variables. Because of the requirements of meta-analytic structural equation modeling, only studies with a full correlation matrix were included. Studies were excluded if they could not be applied and extrapolated into the greater student population, (e.g., specific major, learning community, honors college, special admission). Attempts were made to

the following authors to request a copy of their correlation matrices for inclusion into the study; requests were also made for unpublished studies to reduce publication bias: Cabrera et al. (1992); Nora, Cabrera, Hagedorn, & Pascarella, (1996); Pascarella & Terenzini, (1980); and Stahl & Pavel, (1992). Only Ernest Pascarella and Patrick Terenzini responded to the request and because of the passage of time, they no longer had the correlation matrices and therefore could not provide them for use in this study.

Table 1

Keywords Used in Systematic Review

Population	Persistence	Student Characteristics	Academic Integration	Social Integration	Commitment	Methods
College students	Persistence	age	academic integration	social integration	commitment	structural equation modeling
Under-graduate students	School holding power	ethnicity	academic engagement	social engagement	satisfaction	path analysis
University	Retention	race	faculty interaction	sense of belonging	satisfied	
Post-secondary	Dropout	socio-economic status	faculty relationships	peer	institutional commitment	
higher education	Attrition	sex	advising	peer interaction		
			mentor	extra-curricular		
			mentorship	friend		
			academic achievement	clubs		
				student organiza-tions		

A three-stage screening process was applied to organize data for the analysis. The first stage was reviewing the study abstract for data inclusion criteria. If the data inclusion criteria were met, the second stage was initiated. The second stage of the screening process was a full text review of the studies using the coding guide in Appendix A; if the studies did not include a full correlation matrix, they were automatically excluded from the analysis. The third stage included coding the correlation matrices as illustrated in Appendix B. A total of 1067 studies were evaluated for abstract review. Studies were excluded from a full text review for the following reasons: graduate/master's degree students, international students, students in specific programs such as STEM or nursing, learning communities, case studies or qualitative studies, or faculty teaching style. Of the abstracts reviewed, 179 were chosen for full text review. Upon conclusion of the full text review, 46 studies were coded and included in the meta-analysis. The 133 studies that were excluded were removed because they were too specific or narrow in focus for inclusion (e.g., *Lottery Funded Scholarships in Tennessee increased access but weak for retention for minority students* [Menifield, 2012]), the dependent variable was not persistence, or they did not include a correlation matrix.

Coding of studies. A coding sheet was created to record and organize pertinent information from each study included in the meta-analysis. The coding sheet included identifying characteristics of studies such as title, author, year published, database retrieved, and inclusion of the correlation matrix. A more detailed account of the characteristics of the study (e.g., factors included, number of variables, sample size and sample characteristics, analysis, and results) was also included. Finally, the effect sizes

(*r*) were coded from each study's correlation matrices. The information to be coded included the following factors: student characteristics, an initial measure of institutional commitment, a second measure of institutional commitment, external factors, organizational factors, academic integration, social integration, and persistence.

Student characteristics. The following categories of student characteristics were coded in the analysis: high school grade point average (GPA), ACT/SAT or other standardized scores, gender, race/ethnicity, income or socio-economic status (SES).

Institutional commitment. In several studies, institutional commitment was measured twice: once upon student entry, and again after a period of study, usually at the end of the first semester or the beginning of the second semester. Initial commitment included initial motivation to earn a college degree, plans to continue education at current college, or whether the school was the student's first choice. The subsequent institutional commitment measure was related to confidence in making the right college choice, intent to graduate from the institution, and certainty in re-enrolling. Studies were coded for first institutional commitment measure (IC1) and second institutional commitment measure (IC2).

External factors. Work/family obligations, support from peers/family to attend college, and financial support were coded as external factors.

Organizational factors. Variables related to the College/University as an organization such as campus size, culture, fairness of policies, communication with students, and satisfaction with college were coded as organizational factors.

Academic integration. Academic integration variables measuring classroom experiences, relationships with faculty, intrinsic factors of confidence and self-efficacy, skill, motivation, and goal commitment were coded for the analysis.

Social integration. Social integration variables measured the quality of student peer interactions and support, social expectations, or social adjustment.

Persistence. All studies included were required to measure persistence, retention, attrition/drop out, or graduation. Persistence was measured as intent to re-enroll or depart, or persistence from first to second semester, Retention was measured as enrolling continuously from first year to second year. Dropout and attrition variables were reverse coded to ensure dependent variables were measured using the same scale direction (i.e., positive correlations represent higher student persistence). Graduation was measured as a student earning either an associate degree or bachelor's degree. If multiple measures were included for persistence, they were coded as a single effect size.

Data Analysis

Meta-analytic structural equation modeling (MASEM) is a method of synthesizing correlation matrices and fitting them onto the structure equation model by using a series of correlation matrices to create a pooled correlation matrix (Cheung, 2008, 2015a; Cheung & Chan, 2005; Furlow & Beretvas, 2005). It is usually applied in two stages. In the first stage, meta-analytic techniques are used to create a pooled correlation matrix for the measurement model. In the second stage, the pooled correlation matrix is used as the observed covariance matrix to fit structural models (Cheung & Chan, 2009). Two-Stage Structural Equation Modeling (TSSEM) was chosen as the statistical method

for this meta-analysis. One advantage to this method, according to Cheung (2013, 2015b), is that missing effect sizes are handled automatically through an iterative process that estimates the missing values based on the known values in the model, so the parameter estimates are unbiased and efficient when the missingness is either missing completely at random (MCAR) or missing at random (MAR) data (Graham, Hofer, & MacKinnon, 1996; Wothke, 2000). The random-effects model was chosen because it accounts for both sampling variance and between-studies variance. In addition, the random-effects model can be used to make inferences about studies not included in the analysis (Becker, 1992; Cheung, 2008, 2015; Hedges & Vevea, 1998).

Stage 1: The measurement model. The first step in conducting a TSSEM is to analyze the correlation matrices for each individual study. The model of the correlation structure in a single group analysis is

$$\sum(\boldsymbol{\theta}) = \boldsymbol{D}\boldsymbol{P}(\boldsymbol{\theta})\boldsymbol{D}$$

where

$\sum(\boldsymbol{\theta})$ is the covariance matrix,

$\boldsymbol{D}$ is the diagonal matrix of standard deviations (σ_1 σ_2..., σ_p) of the observed parameters which are treated as free parameters, and

$\boldsymbol{P}(\boldsymbol{\theta})$ is the correlation matrix with the constraints that

$\mathbf{Diag}(\boldsymbol{P}(\boldsymbol{\theta})) = 1,$ where 1 is a vector of ones.

To understand the random-effects model, the fixed-effects model must first be explained. The above equation is applied in the first stage of the fixed-effects TSSEM. The correlation matrix in the ith study can be described as

$$\Sigma_i = D_i P_i D_i$$

where

Σ_i is the population covariance matrix,

D_i is the diagonal matrix of standard deviations, and

P_i is the correlation matrix.

All studies in this meta-analysis must report the correlation matrix; therefore, it is necessary to estimate the pooled or common covariance matrix using equality constraints. In order to obtain the pooled covariance matrix, the formula used above for the correlation matrix in ith study can be applied by imposing $P_F = P_1 = P_2 = \cdots = P_k$ and $D_F = D_1 = D_2 = \cdots = D_k$. By imposing equality constraints on all correlation matrices, and the standard deviations, the subsequent matrix is a common covariance matrix Σ_F under a fixed-effects model. When equality constraints are applied to each matrix, it is implied that all studies contain all variables, which will not be true. Studies were allowed for inclusion if they had at least three of the seven variables, so missing variables must be accounted for in the analysis. MASEM accounts for the missing correlations by using the equality constraints for the parameter estimates across groups.

As each study reported different variables to measure each path tested in the model, the individual study correlations were averaged into a single-factor correlation (e.g., student characteristic correlations of: age, sex, high school GPA, ACT/SAT scores, and parent's income were included when available and were combined into a single student characteristic correlation for every ith study). For example, Berger and Braxton (1998) reported sex, race, high school GPA, and parent's income, whereas Napoli and Wortman (1998) measured race, sex, parent income, high school GPA, and SAT, and Braxton, J. M. et al. (2000) measured high school GPA and ACT. They are all comparable variables to measure student characteristics but are measured or reported slightly differently. Therefore, combining them into a single variable allows for clearer interpretability of the results by reducing the number of variables. It also reduces the statistical error or noise by decreasing the number of missing values.

Prior to synthesizing the factor correlations, the r correlation coefficients were transformed into Fischer's z statistics. Even though Pearson r is considered a standardized correlation fixed at (-1, 1), Fischer's z is approximately normally distributed and unbiased when the correlation is close to zero or the sample size is sufficiently large (Cheung, 2015a). The correlations are summed and averaged into a single variable representing the constructs (i.e., student characteristics, external factors, organizational factors, institutional commitment, academic integration, social integration, and a second measure of institutional commitment). Each correlation is weighted by the reciprocal of its estimated conditional variance. Then the weighted correlations are used to create new correlation matrices for each study. These weighted correlation matrices are then

synthesized to obtain the pooled correlation matrix for the measurement model in stage 1

of the meta-analysis (Card, 2012; Furlow & Beretvas, 2005).

The equation for the r to z transformation is:

$$Z_r = \frac{1}{2} \ln\left(\frac{1+r}{1-r}\right)$$

The standard error is calculated as:

$$\frac{1}{\sqrt{N-3}}$$

The transformed correlation can be reverted back to its original metric for

reporting purposes with the equation:

$$r = \frac{e^{2Z_r} - 1}{e^{2Z_r} + 1},$$

The calculation for the mean effect size M_{ES} is:

$$M_{ES} = \frac{\sum w_i \, ES_i}{\sum(w_i)},$$

where $w = 1/SE^2$

The random effects model for the ith study is

$$\text{Level 1: } r_i = \rho_i + e_i$$

$$\text{Level 2: } \rho_i = \rho_R + u_i$$

where

r_i is the study correlation matrix,

ρ_i is the is the estimated population correlation matrix for the ith study,

ρ_R is the vector of the off diagonal elements, R subscript indicating the random-effects model,

$e_i \sim \mathcal{N}(\mathbf{0}, \mathbf{V}_i)$ is the known vector covariance matrix, and

$u_i \sim \mathcal{N}(0, \mathrm{T}^2)$ is the heterogeneity variance-covariance matrix that has yet to be estimated.

Homogeneity tests. The fixed-effects model was introduced earlier to explain the underlying MASEM model. To apply the random-effects model, the between-study variance must also be estimated. In other words, the random-effects model takes into account the heterogeneity of the sample studies. If heterogeneity is not found, then the fixed-effects model and the random effects model would obtain similar results. The Q statistic is used to test for homogeneity of the correlation matrices (Card, 2012; Cheung, 2015a; Cheung & Chan, 2005).

$$Q = \sum (w_i \, ES_i^2 - \frac{(\sum w_i ES_i^2)}{\sum w_i}$$

where

ES is the effect size, and

W is the weight of the study.

I^2 is often used as an index to measure the heterogeneity of the effect size

(Cheung, 2014, 2015a; Higgins & Thompson, 2002). The general formula is

$$I^2 = \frac{\hat{\tau}^2}{\hat{\tau}^2 + \tilde{v}}$$

where

$\hat{\tau}^2$ is the between study variance component, and

$\tilde{v}$ is the within-study variance.

The I^2 can be understood as the proportion of the total variation of the effect size

that is the result of between-study heterogeneity. Higgins and Thompson (2002)

proposed to estimate $\tilde{v}$ by

$$\tilde{v} = \frac{(n-1)\sum_{i=1}^{n} 1/v_i}{\left(\sum_{i=1}^{n} \frac{1}{v_i}\right)^2 - \sum_{i=1}^{n} 1/v_i^2}$$

where *n* is the number of studies. It is commonly interpreted that I^2 of 25%, 50%, and

75% can be deemed as low, moderate, and high heterogeneity (Cheung, 2014; Higgins,

Thompson, Deeks, & Altman, 2003). If heterogeneity is present, the random-effects

model is more appropriate since it evaluates between-study variance.

Stage 2: Fitting the structural model. In the second stage of the analysis, meta-

analytic SEM applications use the pooled correlation matrix to fit structural models. The

discrepancy function is used to evaluate how well the data fit the proposed model. It is

expressed as

$$F_{WLS}(\theta) = \left(r_R - \rho_R(\theta)\right)^T V_R^{-1} (r_R - \rho_R(\theta))$$

The weighted least squares (WLS) estimation method is used to weight the correlation

elements by the inverse of its sampling covariance matrix. Different weights are assigned

based on sample size and effect size; consequently, larger samples with large effect sizes

will have a greater weight in the analysis. It should be noted that V_R replaces T^2 in stage

2 of the analysis, as V_R is estimated after controlling for T^2 (Cheung, 2015a).

Fitting the structural model can be implemented with SEM software such as

LISREL, (Joreskog & Sorbom, 1996), *R,* or metaSEM (Cheung, 2015a, 2015b). The chi-

square statistic and other goodness-of-fit indices can be used to test whether the proposed

model fits the data satisfactorily (Cheung & Chan, 2009). RMSEA and RMR are

preferred in assessing model fit in TSSEM in addition to the chi-square statistic (Cheung,

2015a).

Missing Data in Meta-Analysis

In traditional statistical analysis, missing data refers to a missing value on a

variable or case from an individual study participant. In meta-analysis, missing data

occur at the primary study level such as a missing effect size (Furlow & Beretvas, 2005).

Henceforth, any further reference to missing data should be interpreted in the meta-

analytic context of data missing at the primary study level.

As mentioned previously, missing data can be categorized into three groups: missing completely at random (MCAR), missing at random (MAR) and missing not at random (MNAR) (Little & Rubin, 1987). In meta-analytic context these three categories are differentiated by the relationship between the missing effect size estimate and the effect size of interest for which missingness was observed as well as the other effect sizes for which complete data were available. A correlation may be missing from meta-analyses of correlation matrices for various reasons.

It is assumed for data missing completely at random (MCAR) that the data are missing randomly; or that their missingness is unrelated to the other correlations in the study data. If study data is missing because a particular construct was not yet conceptualized or considered when the primary analysis was conducted, it would be considered MCAR, as well as a variable that is excluded due to resources or funding and the variable or effect is unrelated to the program being evaluated through the meta-analysis (Furlow & Beretvas, 2005; Pigott, 1994).

If the missing effect is related to one or more of the covariates in the meta-analysis, but not directly related to the effect of the variable itself, then the missingness is considered missing at random (MAR). Pigott (1994) described how the theoretical orientation of the meta-analysis author could lead to MAR data. A measure that is important to the meta-analysis author may not have been pertinent to the author of the primary study and therefore not included, measured, or reported in the study.

One of the most common reasons for missing data in meta-analysis is the "file drawer problem" (Rosenthal, 1979) where the author fails to report an effect because it is

statistically nonsignificant. This would be regarded as missing not at random (MNAR) because the cause of the missingness is directly related to the value of the variable (i.e., the effect size). The effect of this variable would subsequently be related to the other variables in the study.

Two approaches are frequently used when accounting for missing values, introduced by Pigott (2001); listwise deletion and pair-wise deletion (Cheung, 2015a; Cheung & Chan, 2005; Furlow & Beretvas, 2005). Listwise deletion is when a primary study is eliminated from the analysis due to any variable being missing. The researcher assumes that the population variances are representative of the original sample of studies. This is an appropriate approach when all variables included in the meta-analysis measure the same construct; however, these standards are often unrealistic and pose problems because not all studies in a meta-analysis will be represented by exactly the same variables and it is almost certain that one or more variables will be MCAR or MAR. Because of the amount of exclusion inherent in listwise deletion, it is less popular in MASEM (Cheung, 2015a; Furlow & Beretvas, 2005).

As an alternative, pairwise deletion is much more common because it allows for flexibility in handling missing data by estimating the elements of the pooled correlation matrix based on different numbers of studies. The major advantage of the pairwise approach is that it includes all studies that are available (Cheung, 2015a; Cheung & Chan, 2005; Furlow & Beretvas, 2005). One of the drawbacks in using pairwise deletion is that it can result in nonpositive definite correlation matrices due to each component of the correlation matrices' propensity to be computed from a different subset of studies.

Additionally, there is the problem of deciding which sample size to associate with the resulting synthesized correlation matrix in the SEM analyses, as each correlation in the matrix typically has a different sample size associated with it (Furlow & Beretvas, 2005). Multiple group CFA, such as TSSEM and other similar approaches, assume that each study has its own population correlation matrix associated with it. This minimizes the effect of missing data by hypothesizing that the same model holds true across the complete and incomplete data sets; therefore, the whole model can be estimated by utilizing appropriate equality constraints among different samples (Cheung & Chan, 2005, 2009).

Publication Bias

Publication bias is inherent in meta-analysis due to two major types of bias: reporting bias, where researchers are less likely to report non-significant findings, and selective publication bias, where peer-reviewed journals are less likely to publish non-significant results (Card, 2012).

Publication bias was evaluated using two methods: funnel plots and the trim-and-fill method. Funnel plots are a graphical representation of the effect sizes used in relation to the standard error. By plotting the effect sizes relative to standard error, researchers can visually inspect the precision of the effect sizes in various studies in the sample. If there is publication bias, the points will not form a funnel shape and the majority of the points will fall outside the confidence region with bounds $\hat{\theta} \pm 1.96\text{SE}$, where $\hat{\theta}$ is the estimated effect of outcome based on the fixed effects model and *SE* is the standard error value of the y-axis (Sterne & Egger, 2001). The trim-and-fill method can be

conceptualized as a two-stage funnel plot method. The first step is to temporarily remove (or "trim") studies that are creating asymmetry. The funnel plot is then recreated using an estimate of the unbiased mean effect size. The unbiased estimate of mean effect sizes is used in the second step through an iterative process whereby the trimmed studies are filled back into the scatterplot until a symmetrical funnel plot is obtained. The comparison of the original mean effect size and the unbiased mean effect size is evaluated for evidence of publication bias (Card, 2012; Wolf & Wolf, 1986).

Summary of Methods

This chapter described how the systematic review and meta-analysis were conducted. The research design analyzed eight path models that predict college persistence. Criteria for inclusion was reported as well as the keyword search and databases reviewed for the systematic review. The Pearson product-moment correlation coefficient r was chosen as the effect size measure due to the requirement of correlation matrices for meta-analytic SEM. The r statistic was transformed into a Fischer's z statistic and summed for each factor, and then reverted back to an r statistic for reporting. The correlation matrices were then weighted by sample size and the individual weighted matrices for each study were pooled to create a common correlation matrix. The model was tested for homogeneity of variance and then used to create the measurement model for the MASEM. Finally, the pooled correlation matrix was applied as the structural model and tested for goodness of fit.

CHAPTER IV

RESULTS

Chapter 4 provides the results of the meta-analytic structural equation model, including a detailed analysis of the research questions. All analyses were conducted using R open source statistical software. This chapter begins with a summary of the studies included in the study. It is followed by a review of the pooled correlation matrix created in Stage 1 of the TSSEM analysis. Then, the results of the tests for heterogeneity of the model are presented. Next, is an evaluation of TSSEM Stage 2, including an analysis of the goodness of fit indices. Finally, the sample was tested for the presence of publication bias.

Summary of Studies Included

The descriptive statistics of the studies are displayed in Tables 2 and 3. Forty-six studies were included in the meta-analysis; one study contained two separate correlation matrices, therefore 47 correlation matrices were included in the analysis. The total sample of undergraduate college students used in this analysis was 129,011, with an average sample size of 1918 students in each study. The individual sample size range was between 45 and 58,294.

Table 2

Descriptive Statistics of Studies Included

		Number of Studies	Percent
Number of Schools		47	
	Single Institution	42	89%
	Multiple Institutions	5	11%
Type of Institution		47	
	Private - 4 year	7	15%
	Public - 4 year	23	48%
	Public/Private - 2 year	4	9%
	Community College	8	17%
	Mixed Sample	5	11%
Age		22	
	Reported individual ages	13	28%
	Average student age	9	19%
	Not reported	25	53%
Gender		26	55%
	Not Reported	21	45%
Race/Ethnicity		22	
	Individual Race/Ethnicities	18	38%
	Minority/Non-Minority	4	6%
	Not Reported	25	53%

Table 3

Demographic Breakdown of Sample

	N	Percent
Race/Ethnicity		
Sample Size	16, 104	
Caucasian	8, 213	51%
African-American/Black	2, 576	16%
Hispanic/Latino	2, 255	14%
Asian-American	2, 094	13%
Multi-Ethnic/Other	966	6%
Gender		
Sample Size	21, 864	
Female	12, 462	57%
Male	9, 402	43%
Age		
Sample Size	13, 476	
Age (24 and below)	11, 994	89%
Age (24 and above)	1, 482	11%

Table 3 provides a demographic breakdown of the sample. The sample was representative of national demographic trends in higher education according to the National Center for Education Statistics (NCES, 2018). Nationally, females represent 56% of students enrolled in college; the study sample was 57% female. The sample also reflects the national distribution of minority and non-minority student enrollment. According to NCES data, students who enrolled in college in 2015 were 58% Caucasian, 14% African-American/Black, 17% Hispanic/Latino, 7% Asian-American, and 0.8% Native American/Alaskan Native. The sample mirrored national enrollment trends of

diverse student populations. However, the Caucasian student representation in the sample is lower than the national benchmarks at 51%. Likewise, 89% of students enrolled at 4-year public institutions and 86% of private non-profit institutions were younger than 25 years old. Seventy-six percent of students enrolled at public 2-year or community colleges were 25 years old or younger (NCES, 2018). Eighty-nine percent of students represented in the sample were 24 years or younger.

TSSEM: Stage 1

In the first stage of meta-analytic structural equation modeling (MASEM), meta-analytic techniques are used to create a pooled correlation matrix for the measurement model. This stage synthesizes correlation matrices and fits them onto the structural equation model by combining them into a pooled correlation matrix (Cheung, 2008, 2015a; Cheung & Chan, 2005; Furlow & Beretvas, 2005). To create the pooled correlation matrix, each correlation was weighted by the reciprocal of its estimated conditional variance. Then the weighted correlations were used to create new correlation matrices for each study. These weighted correlation matrices were then synthesized to obtain the pooled correlation matrix for the measurement model in Stage 1 of the meta-analysis (Card, 2012; Furlow & Beretvas, 2005). See Table 4.

Table 4

TSSEM Stage 1: Pooled Correlation Matrix (df = 534)

	Stf	ExF	OgF	IC	AI	SI	IC2	IP
Stf	1							
ExF	0.03842	1						
OgF	0.02825	0.09959	1					
IC	-0.0036	0.0148	0.10613	1				
AI	0.07029	0.03177	0.1789	0.16405	1			
SI	0.04328	0.06715	0.3616	0.19743	0.24452	1		
IC2	0.00949	0.01997	0.14754	0.22007	0.21667	0.36616	1	
IP	0.03634	0.06125	0.20206	0.13554	0.1735	0.18804	0.38029	1

StF: Student factors, ExF: External factors, OgF: Organizational factors, IC1: 1st measure of institutional commitment, SI: social integration, AI: Academic Integration, IC2: 2nd measure of institutional commitment, IP: Intent to persist

Pooled Correlation Matrix

In a review of the pooled correlation matrix, the weakest correlations were found between student factors and other variables in the model. The strongest correlation with student factors was academic integration ($r = .0703$); the lowest correlation was with the first measure of institutional commitment ($r = -.0036$). External factors also demonstrated weak correlations with other variables in the model. Organizational factors showed the strongest correlation with external factors ($r = .0996$), while institutional commitment exhibited the weakest correlation ($r = .0148$). Academic integration showed moderate correlations with the other variables in the model. The strongest correlation was between academic and social integration ($r = .2445$). Social integration demonstrated similar patterns with academic integration, and also showed moderate correlations with other variables in the model. The strongest correlation was between social integration and organizational factors ($r = .3616$). The dependent variable of

persistence showed moderate correlations with organizational factors ($r = .2021$),

institutional commitment ($r = .1355$), academic integration ($r = .1735$), social integration

($r = .1880$), and a second measure of institutional commitment ($r = .3803$).

Q Statistics

The random-effects model was utilized so that the between-study variance could

be estimated. If heterogeneity were not found, then the fixed-effects model and the

random-effects model would obtain similar results. The Q statistic in the testing of

homogeneity of the correlation matrices is $Q = 9442.766$, $p < .001$. The range of the I2

index, the percentage of total variance that can be explained by the between study effect,

is between .4698 and .9877. Both suggest there is a wide range of between-study

heterogeneity, confirming the use of the random-effects model (Card, 2012; Cheung,

2015a; Cheung & Chan, 2005). (See Table 5.)

TSSEM: Stage 2

In the second stage of the analysis, the pooled correlation matrix was tested for

model fit. The discrepancy function was used to evaluate how well the data fit the

proposed model. The weighted least squares (WLS) estimation method was used to

weight the correlation elements by the inverse of its sampling covariance matrix.

Different weights were assigned based on sample size and effect size; consequently,

larger samples with large effect sizes had a greater weight in the analysis. The chi-square

statistic and other goodness-of-fit indices were used to test whether the proposed model

in Figure 6 fit the data satisfactorily (Cheung & Chan, 2009). RMSEA and SRMR are

preferred in assessing model fit in TSSEM in addition to the chi-square statistic (Cheung,

2015a).

Table 5

Heterogeneity Indices

			Estimate
Intercept1:	I²	(Q statistic)	0.7736
Intercept2:	I²	(Q statistic)	0.9565
Intercept3:	I²	(Q statistic)	0.6571
Intercept4:	I²	(Q statistic)	0.9169
Intercept5:	I²	(Q statistic)	0.653
Intercept6:	I²	(Q statistic)	0.7526
Intercept7:	I²	(Q statistic)	0.4698
Intercept8:	I²	(Q statistic)	0.9683
Intercept9:	I²	(Q statistic)	0.7821
Intercept10:	I²	(Q statistic)	0.8996
Intercept11:	I²	(Q statistic)	0.9569
Intercept12:	I²	(Q statistic)	0.9223
Intercept13:	I²	(Q statistic)	0.9595
Intercept14:	I²	(Q statistic)	0.6984
Intercept15:	I²	(Q statistic)	0.9813
Intercept16:	I²	(Q statistic)	0.9869
Intercept17:	I²	(Q statistic)	0.8498
Intercept18:	I²	(Q statistic)	0.9865
Intercept19:	I²	(Q statistic)	0.9584
Intercept20:	I²	(Q statistic)	0.9745
Intercept21:	I²	(Q statistic)	0.9904
Intercept22:	I²	(Q statistic)	0.9746
Intercept23:	I²	(Q statistic)	0.9655
Intercept24:	I²	(Q statistic)	0.9753
Intercept25:	I²	(Q statistic)	0.9438
Intercept26:	I²	(Q statistic)	0.9811
Intercept27:	I²	(Q statistic)	0.9808
Intercept28:	I²	(Q statistic)	0.9877
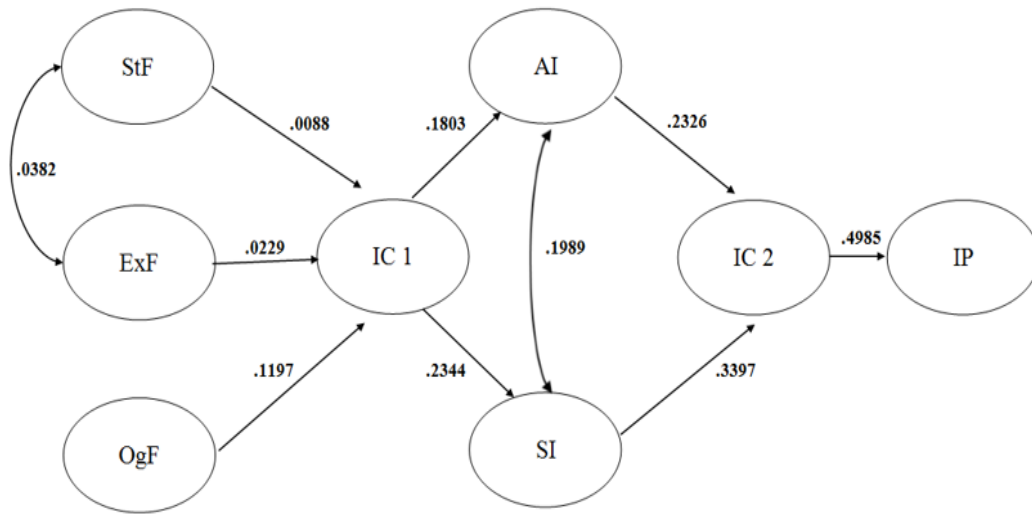
StF: Student factors, ExF: External factors, OgF: Organizational factors, IC1: 1st measure of institutional commitment, SI: social integration, AI: Academic Integration, IC2: 2nd measure of institutional commitment, IP: Intent to persist

Figure 6. Path model with correlation coefficients.

Results of Proposed Model Paths

Eight of the ten paths proposed in the model were statistically significant at the (p < .001) level suggesting that the majority of the model's paths are significant predictors of college student persistence. In metaSEM output, the "Estimate" in Table 6 represents the factor loadings for each path, denoted in this analysis for brevity as "r" as it is similar to Pearson's correlation coefficient (Cheung, 2015). The impact of student characteristics on institutional commitment was not found to be statistically significant (r = .0088, p > .05). In fact, it was found to be the weakest correlation in the analysis. The impact of external factors on institutional commitment was also not significant, with the second weakest correlation in the model (r = .0229, p > .05). These were the only two paths that were not found to be statistically significant. The relationship between student

characteristics and external factors was statistically significant although the correlation was weak ($r = .0382, p < .001$). The impact of organizational factors on institutional commitment was statistically significant ($r = .1197, p < .000$). The impact of institutional commitment on academic integration was statistically significant ($r = .1803, p < .000$), as well as the impact of institutional commitment on social integration ($r = .2344, p < .000$). The impact of academic integration on a second measure of institutional commitment was statistically significant ($r = .2326, p < .000$). Likewise, the impact of social integration on a second measure of institutional commitment was statistically significant ($r = .3397$, $p < .000$). The relationship between academic integration and social integration was statistically significant ($r = .1989, p < .000$). Finally, the impact of a second measure of institutional commitment on college student persistence was also statistically significant ($r = .4985, p < .000$). Table 6 illustrates the z statistic approximation of the individual paths using a 95% confidence interval.

Goodness-of-Fit Indices

The chi-square statistic was evaluated to determine model fit and found (X^2 (df = 18, $N = 129, 011) = 123.9153, p < .001$. The chi-square statistic should be non-significant when determining good model fit. It signifies that the proposed model and the data are consistent with one another and there are no significant differences. However, if the sample size is large, the model will usually be rejected, sometimes unfairly (Cheung, 2015; Keith, 2006). Chi-square is highly related to sample size; therefore, SEM models with large samples and degrees of freedom are more likely to be rejected. The sample size for this dataset is 129,011, which is large enough to influence the chi-square statistic.

Table 6

95% Confidence Intervals: z Statistic Approximation

Coefficients	Estimate	Std.Error	lbound	ubound	z value	Pr(>|z|)	Sig.
Academic Integration on Institutional Commitment (1)	0.1803	0.0264	0.1285	0.2321	6.8245	8.82E-12	***
Institutional Commitment (1) on External Factors	0.0229	0.0195	-0.0154	0.0612	1.1697	0.24212	
Institutional Commitment (1) on Organizational Factors	0.1197	0.0223	0.0760	0.1633	5.3731	7.74E-08	***
Institutional Commitment (1) on Student Factors	0.0088	0.0122	-0.0152	0.0328	0.7174	0.47314	
Institutional Commitment (2) on Academic Integration	0.2326	0.0392	0.1558	0.3094	5.9372	2.90E-09	***
Institutional Commitment (2) on Social Integration	0.3397	0.0500	0.2417	0.4376	6.7991	1.05E-11	***
Persistence on Institutional Commitment (2)	0.4985	0.0504	0.3996	0.5973	9.8850	< 2.2e-16	***
Social Integration on Institutional Commitment (1)	0.2344	0.0329	0.1699	0.2989	7.1197	1.08E-12	***
Student Factors with External Factors	0.0382	0.0146	0.0096	0.0667	2.6173	0.00886	**
Social Integration with Academic Integration	0.1989	0.0252	0.1494	0.2483	7.8875	3.11E-15	***

Note. Significance codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Although the results of the chi-square statistic will be considered in the overall evaluation

of the model, it is recommended that other goodness-of-fit indices be considered in the

analysis, specifically RMSEA, SRMR, TLI, and CFI (Keith, 2006).

Browne and Cudeck (1993) determined that the proposed model can be

considered a "close fit" when RMSEA is less than .05. The RMSEA for this model was

(RMSEA = .0068), indicating a good approximation of the model in relation to the

degrees of freedom. SRMR should ideally be < .05 for a reasonably fitted model

(Cheung, 2015) and are acceptable if < .08. The results of the SRMR suggested that the

model was just above the .08 threshold, implying that it was not an adequate fit for the

data (SRMR =.0965). In addition, the TLI value of .6686 is below the recommended .95

for acceptable model fit. CFI was higher at .787, however it still was below the

recommended fit value of .97 (Cheung, 2015). Although the overall results were mixed,

it should be noted that, despite the higher amount of heterogeneity in the model, many of

the individual paths were significant. The relationship between student characteristics

and external factors was statistically significant ($r = .0382$, $z = 2.6173$, SE $= .0146$, $p <$

.001). The impact of organizational factors on institutional commitment was statistically

significant ($r = .1197$, $z = 5.3731$, $SE = .0223$, $p < .000$). The impact of institutional

commitment on academic integration was statistically significant ($r = .1803$, $z = 6.8245$,

$SE = .0264$, $p < .000$). The impact of institutional commitment on social integration was

statistically significant ($r = .2344$, $z = 7.1197$, $SE = .0329$, $p < .000$). The impact of

academic integration on a second measure of institutional commitment was statistically

significant ($r = .2326$, $z = 5.9372$, $SE = .0392$, $p < .000$). The impact of social integration

on a second measure of institutional commitment was statistically significant ($r = .3397$, $z = 6.7991$, $SE = .0500$, $p < .000$).   The relationship between academic integration and social integration was statistically significant ($r = .1989$, $z = 7.8875$, $SE = .0252$, $p < .000$). Finally, the impact of a second measure of institutional commitment on college student persistence was also statistically significant ($r = .4985$, $z = 9.8850$, $SE = .0504$, $p < .000$). This implies there are universal variables that contribute to student persistence across diverse samples.

Publication Bias

Publication bias was evaluated using two methods: funnel plots and the trim-and-fill method. Funnel plots are a graphical representation of the effect sizes used in relation to the standard error. By plotting the effect sizes relative to standard error, researchers can visually inspect the precision of the effect sizes in various studies in the sample. If there is publication bias, the points will not form a funnel shape and the majority of the points will fall outside the confidence region with bounds $\hat{\theta} \pm 1.96SE$, where $\hat{\theta}$ is the estimated effect of outcome based on the fixed effects model and Figure 6A shows the standard error value of the y-axis (Sterne & Egger, 2001).

The overall results of the funnel plot suggest that publication bias was not a problem for this meta-analysis. This is not unexpected given the number of dissertations and theses that were included in the analysis. Dissertations and theses are published regardless of significance of results; whereas peer-reviewed journals tend to reject studies that demonstrate non-significant results (Card, 2012). See Table 7.

Table 7

Journal Name of Included Studies

Journal Name	Number
	2
ProQuest Dissertation and Theses	6
Research in Higher Education	4
Journal of College Student Retention: Research, Theory and Practice	2
Journal of Higher Education	2
Official Report	2
Annual Meeting of the American Educational Research Association (AERA)-Paper presented	1
Association for Institutional Research (AIR) Research Annual Forum Paper	1
Association for the Study of Higher Education (ASHE) Annual Paper	1
Canadian Journal of Behavioural Science	1
Contemporary Educational Psychology	1
ERIC Dissertation/Theses	1
Journal of College Student Development	1
Journal of Nonprofit & Public Sector Marketing	1
Psychologica Belgica	1
Review of Higher Education	1

The trim-and-fill method can be used as a method to estimate the number of studies missing from a meta-analysis due to the suppression of the most extreme results on one side of the funnel plot. The method then augments the observed data so that the funnel plot is more symmetric. It is used to gauge the sensitivity of the results to publication bias (Duval & Tweedie, 2000a; 2000b). The results of the trim-and-fill method shown in Figure 7 propose that seven studies are missing from the lower left region, indicating that studies with high standard errors are underrepresented in the sample (see Figure 8). Given the academic rigor required for dissertations and theses, lower standard errors would be expected.

A   **B**
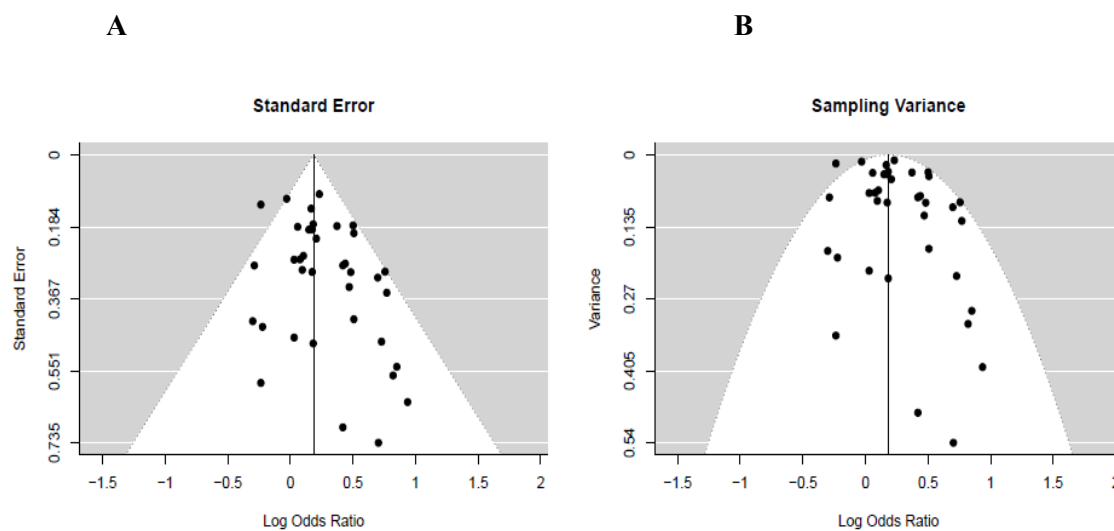
Figure 7. Results of funnel plot. A = Standard Error; B = Sampling Variance.
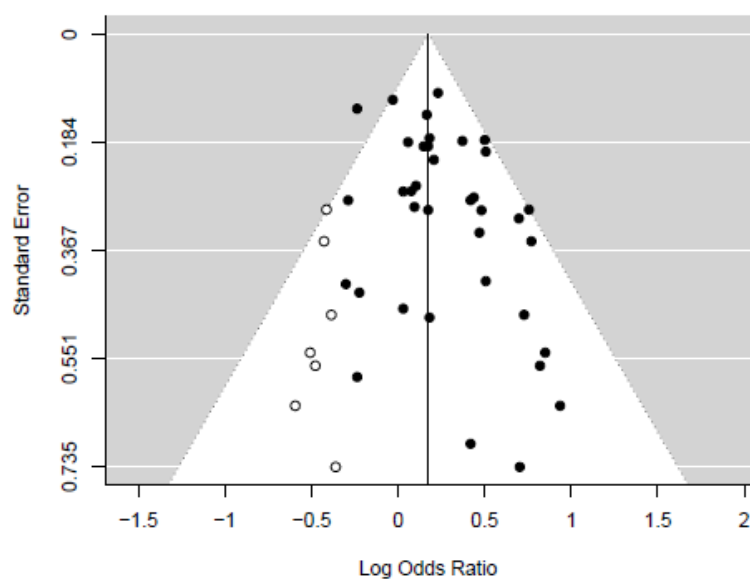
Figure 8. Results of trim and fill.

Summary of Findings

The results of this meta-analytic structural equation model provide valuable insight into the relevance of major theoretical models. The pooled correlation matrix created in TSSEM: Stage 1 determined that the weakest correlations were found between student factors and other variables in the model (lowest, $r = -.0036$; highest, $r = .07029$). External factors also demonstrated weak correlations with other variables (lowest, $r = .0148$; highest, $r = .09959$). All other variables, initial Institutional commitment, Organizational factors, Academic integration, Social Integration, and a second measure of Institutional commitment exhibited moderate to high correlations with the other variables in the model (see Table 4).

The Q statistic was used to test the homogeneity of the correlation matrices ($Q = 9442.766$, $p < .001$). This implies a wide range of between-study heterogeneity, confirming the use of the random-effects model (Card, 2012; Cheung, 2015a; Cheung & Chan, 2005). This range of heterogeneity was expected given the diverse institutions and studies included in the analysis.

The overall path model in TSSEM: Stage 2 had mixed results; nevertheless, the results of the analysis are informative for practice. The impact of student characteristics on institutional commitment was not significant ($r = .0088$, $z = .7174$, $SE = .0122$, $p > .05$). The impact of external factors on institutional commitment was also not significant ($r = .0229$, $z = 1.1697$, $SE = .0195$, $p > .05$). All other paths were found to be statistically significant at ($p < .01$); the majority were found to be statistically significant at the ($p < .001$) level. The relationship between student characteristics and external factors was

statistically significant ($r = .0382$, $z = 2.6173$, SE $= .0146$, $p < .001$). The impact of organizational factors on institutional commitment was statistically significant ($r = .1197$, $z = 5.3731$, *SE* $= .0223$, $p < .000$). The impact of institutional commitment on academic integration was statistically significant ($r = .1803$, $z = 6.8245$, *SE* $= .0264$, $p < .000$). The impact of institutional commitment on social integration was statistically significant ($r = .2344$, $z = 7.1197$, *SE* $= .0329$, $p < .000$). The impact of academic integration on a second measure of institutional commitment was statistically significant ($r.2326 = z = 5.9372$, *SE* $= .0392$, $p < .000$). The impact of social integration on a second measure of institutional commitment was statistically significant ($r = .3397$, $z = 6.7991$, *SE* $= .0500$, $p < .000$). The relationship between academic integration and social integration was statistically significant ($r = .1989$, $z = 7.8875$, *SE* $= .0252$, $p < .000$). Finally, the impact of a second measure of institutional commitment on college student persistence was also statistically significant ($r = .4985$, $z = 9.8850$, *SE* $= .0504$, $p < .000$).

The results of TSSEM Stage 2 were mixed. The chi-square statistic was (X^2 (*df* $= 18$, $N = 129, 011$) $= 123.9153$, $p < .001$ suggesting that the sample was not a good model fit. In addition, SRMR ($.0965$), TLI ($.6686$), and CFI $.787$ were all below the recommended threshold for good model fit. However, RMSEA for this model was $.0068$ indicating a good approximation of the model in relation to the degrees of freedom. Finally, the results of the funnel plot indicated that publication bias was not a concern for this meta-analysis. Given the diverse studies included, the level of homogeneity, and the large dataset, it is impressive that the study showed any significant results.

CHAPTER V

DISCUSSION

The goal of the researcher in this study was to synthesize persistence prediction models when structural equation modeling (SEM) is applied as the methodology of the primary study. In addition, in this study the researcher attempted to confirm the following variables as factors in predicting undergraduate college student persistence: student characteristics of age, sex, ethnicity, SES, and prior educational performance as evidenced by high school GPA, and/or ACT/SAT scores; organizational factors such as University culture, satisfaction, or sense of belonging; external factors of family/friend support and/or work obligations; and institutional commitment, academic integration, and social integration. This chapter begins with a discussion of whether the results from the individual path models met the goal of this analysis. This is followed by a discussion of the contributions of the study to the greater body of research related to college student persistence. Next is an examination of the practical implications of this analysis for institutions of higher education. Finally, the chapter concludes with an inventory of limitations of the study, followed by recommendations for future research and concluding remarks.

Discussion of Path Models

Overall, eight of the 10 proposed paths showed significance at the .001 level.

This is a momentous feat for a meta-analysis of this size and complexity, given that the

data represent 40 years of research in college student persistence, and 129,011

demographically diverse college students at varying types of institutions. One

hypothesizes that the non-significant factors contributed to the mixed results of the model

fit indices. The results of this analysis should not indicate that student background and

external factors are not important in relation to student persistence, but rather, imply that

the relationship between these factors is complex and in need of further investigation,

particularly because the relationship between student background and external factors

was found to be statistically significant. Future research should explore the true

relationship between student background characteristics and external student factors on

college persistence. A detailed discussion of the individual paths in the model is

presented in the next section.

Path 1: The impact of student characteristics on institutional commitment

When presenting their models on college student persistence, theorists proposed

grouping student demographic variables. Astin (1970) utilized a singular variable of

student inputs, which signified the types of students who enroll at an institution. Spady

(1970) suggested that students' family background had an impact on academic potential.

Tinto (1975) created three categories of student demographic characteristics: family

background, individual attributes, and pre-college schooling. As mentioned in Chapter

III, student background characteristics were included in 85% of the studies. A large number of unique variables were measured as student background characteristics; therefore, student demographic characteristics were combined into a single variable to create a parsimonious model. As each study reported different variables to measure each path tested in the model, the individual study correlations were averaged into a single-factor correlation (e.g., student characteristic correlations of: age, sex, ethnicity, high school GPA, ACT/SAT scores, and parents' income were included when available and were combined into a single student characteristic correlation for every ith study). The results of the current analysis found that the impact of student characteristics had no effect on institutional commitment.

The individual studies included in the analysis suggested that student background characteristics are directly and indirectly related to college student persistence; therefore, it was surprising that student characteristics were not found to have strong relationships with the other variables in the meta-analysis. In the primary studies, high school GPA exhibited a direct relationship with persistence. The results found indirect relationships between student background characteristics and all other variables in the model. The strongest indirect relationship with persistence was the effect of student background characteristics on academic integration, particularly the effects of ethnicity, SES, and high school GPA on academic integration that influence the likelihood of persistence. When reviewing the individual results of the studies, the researcher noted significant correlations with age, gender, ethnicity, SES, and high school GPA and institutional

commitment. However, ethnicity yielded contradictory results in the analysis of the individual results. Ethnicity demonstrated different results when minority status was generalized to "minority" or "non-minority" versus reporting specific ethnicity/race of the student. The results demonstrated a difference between ethnic minority groups and measures of institutional commitment. For example, J. Braxton et al. (2000) indicated that non-white students reported lower institutional commitment than white students reported. Conversely, Helland et al. (2002) determined that white students reported lower institutional commitment than non-white students reported. Stryker's (1997) and Tovar's (2013) research suggested that Asian students had the lowest institutional commitment. This discrepancy would imply that non-white student groups reported varying levels of institutional commitment. There are differences in the levels of institutional commitment of Asian, Latino(a), and African-American/Black students. It is recommended that future models should report each ethnic group separately to allow further examination of differences between groups.

Path 2: The impact of external factors on institutional commitment

The theory that external factors played a role in college student persistence was introduced by Tinto (1993). He indicated a relationship between external commitments and goal/institutional commitments, which is the basis of this hypothesized path in this meta-analysis. The results suggested that there is not a significant relationship between external factors and institutional commitment. The external factor variable included a general measure of external commitments, family/parental support and involvement,

support from peers, financial concerns including financial need/support and ability to pay for college, work obligations or number of hours spent working, and family obligations related to marriage and childcare. External factors were included in 21, or 45%, of the studies in this analysis. Eight of the studies demonstrated a significant direct correlation between external factors and student persistence (Fry, 2010; Gill, 1993; Green, 1998; Ikegulu & Barham, 1997; Nakajima, 2008; Nippert, 2000; Sherlin, 2002; Wicker, 2003; Wintre & Bowers, 2007). The studies suggested that older students with lower SES, and in some cases women, worked more hours and had greater work obligations while attending college. Married students as well as students with low SES and minority students were more likely to demonstrate greater financial need. Financial need, family obligations, and greater work hours led to lower levels of academic and social integration. Family and peer support both showed positive effects on academic and social integration, as well as persistence (Cordell-McNulty, 2009; Henningsen, 2003). Overall, students with more work obligations and/or who worked more hours were less likely to persist in college.

Path 3: The relationship between student characteristics and external factors

The results of the meta-analysis implied a significant relationship between student factors and external factors. However, these two factors did not show significant relationships with any other factors in the MASEM. The results of the individual studies indicated that older students with lower SES, and in some cases women, worked more hours and had greater work obligations while attending college. Nippert (2000) found

that women and economically disadvantaged students worked more hours than men did.

Older students were also found to work more hours than younger students did (Morales,

1998; Nakajima, 2008; White, 1998). Married students as well as students with low SES

and minority students were more likely to demonstrate greater financial need. The lower

a student's high school GPA, the more hours they worked while attending college

(Nippert, 2000; Sherlin, 2002; Szafran, 2001). One study by Wicker (2003) found that

students who worked more hours had lower SAT scores. Students with higher financial

need were significantly less likely to persist in college in two studies (Gill, 1993;

Morales, 1998). In Cabrera's (1990) study, high financial concern correlated with lower

SES and minority student status, as well as marital status (Pascarella et al., 1986).

Path 4: The impact of organizational factors on institutional commitment

The impact of organizational factors on institutional commitment were significant

($p < .001$). Twelve studies evaluated organizational factors related to the

College/University as an organization. Variables such as campus size,

culture/environment, sense of belonging, fairness of policies, communication with

students, and satisfaction with college were included as organizational factors. Campus

size was not found to have a significant relationship with persistence or any other factors

in the model (Napoli & Wortman, 1998). Several studies showed a significant

correlation between institutional commitment and organizational factors of satisfaction,

fairness, communication of information, and quality (Bean, 1979; Berger & Braxton,

1998; Fry, 2010; Napoli & Wortman, 1998; White, 1998).

Path 5: The impact of initial institutional commitment on academic integration

The impact of institutional commitment on academic integration was significant at the $p < .001$ level. Academic integration was measured by multiple constructs. GPA was the most common measurement of academic integration, along with global constructs of academic integration and academic adjustment, intrinsic characteristics such as academic self-concept and self-efficacy, relationships and interactions with faculty in and out of the classroom, as well as quality of instruction, and faculty expressing concern. All 24 studies incorporating measures of institutional commitment and academic integration established a significant positive relationship between institutional commitment, goal commitment, and academic integration (Angulo-Ruiz & Pergelova, 2013 Bean, 1979; Berger & Braxton, 1998; Braxton, J. M. et al., 2000; Cabrera, 1990; Cleveland-Innes, 1994; Cordell-McNulty, 2009; Damon, 1997; Elkins et al., 1998; Helland et al., 2002; Henningsen, 2003; Hoffman, 1998; Jumpeter, 2005; Ling, 2006; McGuigan, 1993; Napoli & Wortman, 1998; Neuville et al., 2007; Ogrosky, 1992; Pan, 2010; Pearl, 1993; Pessa Huff, 2009; Stryker, 1997; Tovar, 2013; Woosley et al., 2005). In addition, the following measures of academic integration were found to have a significant effect on student persistence: global constructs of academic integration and academic adjustment, relationships and interactions with faculty both in and out of the classroom, quality of instruction, intrinsic characteristics such as academic self-concept and self-efficacy, GPA and academic satisfaction (Angulo-Ruiz & Pergelova, 2013; Bean, 1979; Berger & Braxton, 1998; Bragg, 1994a, 1994b; Braxton, J. et al., 2000;

Braxton, J. M. et al., 2000; Cabrera, 1990; Cleveland-Innes, 1994; Cordell-McNulty,

2009; Damon, 1997; Elkins et al., 1998; Fry, 2010; Gill, 1993; Green, 1998; Helland et

al., 2002; Henningsen, 2003; Jordan, 2003; Jumpeter, 2005; Ling, 2006; Morales, 1998;

Ikegulu & Barham, 1997; Nadler, 2013; Napoli & Wortman, 1998; Neuville et al., 2007;

Nippert, 2000; Pan, 2010; Pascarella et al., 1986; Pearl, 1993; Saunders, 2004; Sherlin,

2002; Stryker, 1997; Szafran, 2001; Tovar, 2013; Wicker, 2003; Wintre & Bowers, 2007;

Woosley et al., 2005; Yonai, 1991).

Path 6: The impact of initial institutional commitment on social integration

The impact of institutional commitment on social integration was significant in

the model ($p < .001$). The results suggested that students with higher levels of

institutional commitment have greater social integration. Social integration was measured

by the quality of peer relationships and amount of social engagement a student

experiences at college. It was comprised of factors related to peer relationships, number

of friends, social activities and organizations, and social adjustment to college. Twenty-

six, or 62%, of the studies measuring institutional/goal commitment and social

integration demonstrated a positive relationship between the two variables. Students with

higher levels of institutional commitment, as measured by both initial and/or subsequent

measures, are more likely to report higher levels of social integration (Angulo-Ruiz &

Pergelova, 2013; Berger & Braxton, 1998; Braxton, J. M. et al., 2000; Cabrera, 1990;

Cleveland-Innes, 1994; Cordell-McNulty, 2009; Damon, 1997; Gill, 1993; Helland et al.,

2002; Henningsen, 2003; Hoffman, 1998; Jumpeter, 2005; Lin, 2011; Ling, 2006;

McGuigan, 1993; Napoli & Wortman, 1998; Neuville et al., 2007; Ogrosky, 1992; Okun

& Finch, 1998; Pan 2010; Pearl, 1993; Pessa Huff, 2009; Stryker, 1997; Tovar, 2013;

Wicker, 2003; Yonai, 1991).

Path 7: The impact of academic integration on a second measure of institutional

commitment

The impact of academic integration on a second measure of institutional

commitment was significant at the $p < .001$ level (Table 6). Similar results were found in

the correlations between initial measures of institutional commitment, academic

integration, and successive measures of institutional commitment. All the studies that

included a measure for academic integration also included measures of social integration.

In each study, a positive significant correlation was found between both variables and a

second measure of institutional commitment (Berger & Braxton, 1998; Braxton, J. M. et

al., 2000; Braxton, Milem, & Sullivan, 2000; Helland et al, 2002; Jumpeter, 2005).

Path 8: The impact of social integration on a second measure of institutional

commitment

The impact of social integration on a second measure of institutional commitment

was significant at the $p < .001$ level (Table 6). Similar results were found in the

correlations between initial measures of institutional commitment, social integration, and

successive measures of institutional commitment. A positive significant correlation was

found between social integration and a second measure of institutional commitment in all

the studies measuring both variables (Berger & Braxton, 1998; Braxton, J. M. et al.,

2000; Braxton, Milem, & Sullivan, 2000; Helland et al, 2002). Jumpeter (2005)

demonstrated relationships between secondary measures of goal commitment and social

integration.

Path 9: The relationship between academic integration and social integration

The relationship between academic integration and social integration was also

significant (*p* < .001). A strong positive relationship between social integration and

academic integration was established in the studies included in the analysis. Sixty-seven

percent of studies measuring academic integration also included a measure of social

integration. All 29 studies showed a significant positive relationship between the two

variables (Angulo-Ruiz & Pergelova, 2013; Bean, 1979; Berger & Braxton, 1998;

Braxton, J.M et al., 2000; Bragg, 1994a; Cabrera, 1990; Cleveland-Innes, 1994; Cordell-

McNulty, 2009; Damon, 1997; Elkins et al., 1998; Green, 1998; Henningsen, 2003;

Hoffman, 1998; Jumpeter, 2005; Ling, 2006; McGuigan, 1993; Nakajima, 2008; Napoli

& Wortman, 1998; Neuville et al., 2007; Nippert, 2000; Ogrosky, 1992; Pan, 2010;

Pascarella et al., 1986; Pearl, 1993; Saunders, 2004; Stryker, 1997; Tovar, 2013; Wicker,

2003). Specifically, academic integration variables of faculty relationships (Bean, 1979;

Cordell-McNulty, 2009; Hoffman, 1998; Nakajima, 2008), quality of classroom/teaching

(Braxton, J. et al., 2000; Braxton, J. M. et al., 2000), self-efficacy (Gill, 1993; Lin, 2011;

Nadler, 2013; Nakajima, 2008; Stryker, 1997), and academic satisfaction and adjustment

(Bragg, 1994a, 1994b; McGuigan, 1993; Nippert, 2000) were related to social

integration, as well as global measures of academic integration (Angulo-Ruiz &

Pergelova, 2013; Cabrera, 1990; Cleveland-Innes, 1994; Damon, 1997; Green, 1998; Helland et al., 2002; Henningsen, 2003; Jumpeter, 2005; Ling, 2006; Napoli & Wortman, 1998; Neuville et al., 2007; Ogrosky, 1992; Pan 2010; Pascarella et al., 1986; Pearl, 1993; Pessa Huff, 2009; Saunders, 2004; Tovar, 2013; White, 1998; Wintre & Bowers, 2007; Yonai, 1991).

Path 10: The impact of a second measure of institutional commitment on college student persistence

The impact of a secondary measure of institutional commitment on college student persistence was found to be statistically significant. Ten studies included a second measure of institutional commitment collected either at the end of the first semester or the beginning of the second semester. Ninety percent of the studies including a subsequent measure of institutional commitment implied a positive direct correlation with student persistence (Berger & Braxton, 1998; Braxton, J. M. et al., 2000; Braxton, Milem, & Sullivan, 2000; Helland et al., 2002; Henningsen, 2003; Jumpeter, 2005; Okun & Finch, 1998; Pascarella et al., 1986; Pearl, 1993). A second measure of goal commitment was included in four studies, all of which demonstrated a positive direct correlation between the second measure of goal commitment and student persistence (Gill, 1993; Jumpeter, 2005; Napoli & Wortman, 1998; Pearl, 1993).

Contributions and Implications

The purpose of this study was to synthesize undergraduate student persistence models into a singular parsimonious model using meta-analytic structural equation

modeling to test the accuracy of the model across diverse studies. The analysis was successful in confirming many aspects of the major theoretical models proposed about college student persistence from a wide breadth of research on this subject. Recent statistical methods by Cheung (2015a) made it possible to apply structural equation modeling techniques to meta-analytic research, which allowed for a more robust and complex analysis. Therefore, the contribution of this work is notable because it applies rigorous statistical methods and analysis to assess common theoretical constructs related to college student persistence over a period of 40 years. This allows IHEs a greater understanding of the universal factors that contribute to college persistence across diverse groups of students and types of institutions, which have practical implications regarding policy, strategic planning, and allocation of resources.

The lack of significant relationships between student background characteristics and other variables in the model was the biggest surprise in the results. It was predicted that student background characteristics would have an impact on institutional commitment. The summary of studies included in the model demonstrated that there were several examples of student background characteristics having an impact on institutional commitment, particularly in regard to age, ethnicity, and student input factors such as high school GPA and test scores (Berger & Braxton, 1998**;** Braxton, J. M. et al., 2000; Braxton, Milem, & Sullivan, 2000; Cleveland-Innes, 1994; Helland et al., 2002; Pascarella et al., 1986 Stryker, 1997; White, 1998; Woosley et al., 2005; Yonai, 1991). This may imply that individual factors have an impact on institutional

commitment, but when taken as a whole, the cumulative value negates the individual

contributions.

Bean and Metzner (1985) and other researchers found that external factors

contributed to varying levels of institutional commitment; however, this study did not

replicate their results. The same problems that arose using student background

characteristics posed a problem for external factors, in that too many variables were

collapsed into one single factor to allow for meaningful and practical conclusions on the

effect of this variable. It is recommended that researchers divide positive external factors

such as family support and peer support from negative factors such as hours worked,

financial concerns, and outside obligations related to marriage and dependents to get a

clearer understanding of the effect of these variables. Separating the variables into two

categories would provide an opportunity to determine whether there is a difference in the

relationship between positive and negative external factors and other variables in the

model.

The importance of academic and social integration as the foremost contributors of

college student persistence was confirmed, with the pooled correlation matrix showing a

moderate correlation between these two variables ($r = .1641$; $r = .1974$). The majority of

the studies contained all three of these variables;: academic integration, social integration,

and persistence. Therefore, the relationship established between them is more powerful

due to fewer missing data. It was clear across student demographic factors of age,

gender, and SES that the relationship with academic integration was consistent. It

appeared that academic integration was a significant predictor of persistence across all demographic factors to varying degrees. Social integration shows similar results; however, there were slight differences in the importance of social integration between older students and traditional aged students. Differences between ethnicity and social and academic integration varied amongst ethnic groups. The studies included in the meta-analysis showed that diverse ethnic groups have varying levels of interaction with academic and social integration variables. In the research, minority students report the importance of sense of belonging, and college cultural congruence, which suggests there may be an interaction between organizational factors and academic and social integration of minority students (Fleming, 1985; Hurtado, 1992, 1994; Nora et al., 1996). In this model, organizational factors were shown to have a moderate relationship with academic integration ($r = .178$ and social integration ($r = .3616$).

Organizational factors need to be further explored, as they were found to have moderate to strong relationships with other variables in the model. They have one of the strongest relationships with intent to persist in the model, second only to the second measure of institutional commitment. In addition to the previously noted moderate relationships with academic integration and social integration, organizational factors also have moderate correlations with the first and second measures of institutional commitment ($r = .1061$; $r = .1475$). Such factors as culture/environment, sense of belonging, fairness of policies, communication with students, and satisfaction with college were shown to have a positive impact on college student persistence, and should

be further investigated as to the magnitude of their effect on college student persistence.

Organizational factors were also missing from the majority of studies. Therefore, the

data may underestimate the impact of these relationships, much like the data reported on

the second measure of institutional commitment. Regardless of this missing data, the

relationship between organizational factors and many of the variables in the model

remain strong, suggesting that further research may confirm a moderate relationship.

Although the second measure of institutional commitment demonstrated the

strongest relationship with college student persistence as the model specified, it was the

variable that was missing from the most studies. Therefore, the results do not have the

same impact in the model as academic and social integration, which were present in the

majority of the studies. In fact, this variable was almost eliminated because it was

missing from the majority of studies and was only included in less than a third of the

studies in the analysis. However, the researcher trusted the robust studies by Furlow and

Beretvas (2005) and Cheung and Chan (2005), which indicated that because the

missingness was MCAR, the robustness of the TSSEM model would withstand these

conditions, and decided to retain the variable in the analysis. Nevertheless, this could

have negatively impacted the overall model fit.

Limitations

Although this meta-analysis has contributed to the greater body of research in

college student persistence, several limitations need to be addressed. The first limitation

is the subjective nature of the coding of the variables. The paths selected for the model,

as well as the variables included to measure each path, were selected based on prior research. For the analysis to be manageable, decisions were made regarding the inclusion or exclusion of variables reported in each correlation matrix. Due to the use of different variables measuring each factor, a cumulative variable was created to represent each factor. This could have minimized the effects of the separate variables in each factor, particularly in regard to student factors and external factors. Future meta-analysis researchers should investigate the individual contributions of the different variables included in these factors. In addition, several supplemental studies could be conducted to investigate the data further. Although it was the purview of this study's researcher to investigate diverse institutions, it may be informative to conduct separate metaSEM with each type of institution. As mentioned previously, using studies that differentiated each minority group would help clarify similarities and differences across diverse groups.

Meta-analytic techniques have been criticized for comparing "apples to oranges" by allowing different elements in the individual studies to represent a comprehensive variable at the meta-analytic level (Card, 2012). This effect was reduced by requiring a minimum amount of similar data from each study, as well as including individual items that were reported consistently in the majority of the sample. Studies were required to have a minimum of three of the seven independent variables; all studies were required to include persistence, intent to persist, or retention as the dependent variable. There is no precedent for this type of meta-analysis regarding how many missing factors are allowable. This number was chosen because, including the dependent variable, at least

half of the model was accounted for in every model. The majority of the studies included

at least five variables. TSSEM was chosen as the method for this analysis because,

according to Cheung (2013, 2015b), missing effect sizes are handled automatically

through an iterative process that estimates the missing values based on the known values

in the model, so the parameter estimates are unbiased and efficient (Graham et al., 1996;

Wothke, 2000). However, due to the breadth of this research, missing data was

unavoidable. Lastly, because of the requirements of meta-analytic structural equation

modeling, only studies with a full correlation matrix were included, which greatly

reduced the number of studies that met this requirement.

The results of the analysis were mixed; some of the statistical tests determined a

good model fit, others concluded that it was a poor model fit. However, MASEM is

capable of analyzing correlation matrices across diverse samples, environments, and

measurements, which is not possible in conventional SEM. If the proposed models fit the

data well, there is strong evidence in the validity of the proposed model. However, if the

model does not fit the data well, the studies may be grouped according to the study

characteristics such as samples and measurements. This type of analysis is new to the

field of college student persistence and further research is necessary to understand

differences between groups in the model (Cheung, 2015).

Recommendations and Conclusions

Institutions have invested considerably in resources and staff to increase student

success and persistence. However, retention rates have remained fairly steady over time

(Kirk, 2013; Kuh et al., 2005). The conclusions of this analysis suggest that all types of institutions invest in programs and services related to academic and social integration, institutional commitment, and organizational factors of the university environment. Organizational factors are consistent across demographics; however, the relationship was stronger among minority students in the primary studies. Institutional commitment significantly influenced academic and social integration. This means that students' motivation to earn a college degree, their plans to continue their education at their current college, or whether the school was the student's first choice greatly influences their academic and social interactions with the institution, which in turn influences persistence.

The results of this analysis show that nearly all measures of academic integration have a significant positive influence on college persistence. A broad range of variables were included in the academic integration factor, including interactions with faculty both in and out of the classroom, quality of instruction, faculty expressing concern, and characteristics of the classroom experience. Intrinsic student characteristics such as academic self-efficacy, academic self-concept, academic behaviors, involvement, and activities were also included in this analysis. GPA was the most common measure of academic integration and achievement. Based on these results, it is recommended that colleges use resources that focus on improving student achievement, the classroom experience, and increasing student self-efficacy, positive academic behaviors and involvement, as academic integration has shown to be equally important across all student demographics. For example, improving relationships between students and

faculty, and increasing the quality of classroom instruction are all aspects that can be enhanced through faculty training and professional development. Institutions should consider ways to motivate faculty to increase the quality of their relationships with students and provide innovative classroom experiences. Major changes to the tenure process may be unlikely, but changes to faculty expectations upon hire and the type of training new faculty are required to attend, could provide incremental changes in the ways that faculty view their relationship with students. Not only as lecturer, and researcher, but also educator and teacher. Training department chairs on how to create a culture of student success would have positive influences on student satisfaction with the institution, and increase academic integration. Services related to increasing a student's academic aptitude, confidence, and self-efficacy would also be sound investments towards improving student persistence rates. Continued investment in supplemental instruction, tutoring, and mentoring all increase student performance. As well as high quality academic advising from faculty and professional advisors not only to help reduce time to graduation, but also to help students with appropriate career and professional development.

Social integration exhibited a significant positive correlation with persistence. It was comprised of a comprehensive group of variables, including the quality of peer relationships, number of friends, social activities and organizations, and social adjustment to college. The importance of social integration and its strong positive correlation with academic integration should not be underestimated. It suggests a reciprocal relationship

between students' social and academic integration. A student who is not academically integrated at an institution is less likely to be socially integrated and vice versa. This means that social activities and programming are important to student persistence, particularly social programming that is related to academics. As mentioned previously, there are differences between diverse demographics of students and the influence of social integration. For example, community colleges and commuter campuses may consider more social-academic programs such as peer mentoring, and career-related student clubs/activities to yield greater results in student persistence.

Institutional commitment significantly influenced academic and social integration, which are the two most important aspects of student persistence. This means that students' motivation to earn a college degree, their plans to continue their education at their current college, or whether the school was the student's first choice greatly influences their academic and social interactions with the institution, which in turn influences persistence. Although this seems like an aspect of persistence outside the locus of control of the institution, there are many ways that a college can influence institutional commitment. Student Orientation programs, Academic and Career Advising, and First Year Experience courses/programming can increase a student's commitment to the institution by setting the foundation of the institution's culture, explaining policies, linking students to communication channels (apps, digital communities, email, etc.),and connecting them to academic and social opportunities. In addition, peer leaders can be used to mentor first year students to increase both the persistence of the first year

students, and also the upper-class mentors. This will positively influence how the student experiences and interacts with organizational factors, which will positively influence a student's academic and social integration within the institution, thereby increasing subsequent measures of institutional commitment and increasing the likelihood of persistence.

The results indicated a moderate correlation between institutional commitment and organizational factors. This implies that factors such as institutional culture, sense of belonging, fairness of policies, communication with students, and satisfaction with college are related to students' motivation to continue enrolling or earn a degree at the current college. To determine the culture of the institution as it is experienced by students, it is best to ask the students directly. Institutions are able to conduct climate studies using qualitative and quantitative methods to assess the culture and/or climate of the college. This could be an informative way to address many college persistence factors identified in the study, such as organizational factors, institutional commitment, academic integration, and social integration.). Future studies could explore how organizational factors of fairness, communication, and justice affect the level of academic and social integration amongst different ethnic groups.

This study succeeded in its purpose of synthesizing undergraduate student persistence models into a singular parsimonious model using meta-analytic structural equation modeling to test the accuracy of the model across diverse studies. It was comprehensive in type of institution, and was representative of the demographics of

college students. Using research from the past 40 years, eight of the 10 paths were statistically significant. The analysis was successful in confirming most aspects of the major theoretical models proposed about college student persistence from a wide breadth of research. The significance of institutional commitment, academic integration, and social integration have been solidly confirmed, and the importance of organizational factors needs to be further explored, particularly in relation to social integration and persistence. This gives credence to Tinto's (1993) model suggesting that organizational factors contribute to college student persistence. Furthermore, the complexities of student demographics suggest that combining student factors into a single variable may not establish the complicated relationship between student factors and college persistence. Due to the increase of minority students enrolling in college, the influence of student characteristics on college persistence may be more complicated than previous research has indicated and is in need of further study (NCES, 2013; Table 333.10). Similarly, combining positive and negative external student factors may have underestimated the effects of those factors on college student persistence. External factors may also have a complicated relationship with college student persistence, and future research would allow for greater understanding of how these factors interact with other variables. Fortunately, recent statistical methods by Cheung (2015a) made it possible to apply structural equation modeling techniques to meta-analytic research, which can allow future researchers to apply robust and complex analysis of college student persistence to the greater body of research.

APPENDICES

APPENDIX A

**DEFINITION OF FACTORS AND VARIABLES
INCLUDED IN THE MODEL**

Factor Definitions	*Variables included in each factor*
Student Background Characteristics • The student characteristics included in the model were the most common factors measured across the studies in this analysis. The following categories of student characteristics were included: high school grade point average (GPA), ACT/SAT scores, gender, race/ethnicity, income or socio-economic status (SES).	Age Gender/Sex Ethnicity/Race SES **High School GPA** Test Scores
External Factors • Work/family obligations, support from peers/family to attend college, and financial support were included as external factors.	External commitments **Family/parental support** External peer support Financial concerns **Work obligations** Family obligations
Organizational Factors • Variables related to the College/University as an organization such as campus size, culture/climate of institution, fairness of policies, communication with students, and satisfaction with college were coded as organizational factors.	Campus size Culture/environment Sense of belonging **Fairness of policies** **Communication** Satisfaction with college as an organization
Institutional Commitment 1 • Initial commitment includes initial motivation to earn a college degree, a student's plans to continue his/her education at current college, or whether the school was the student's first choice, or confidence in major or career.	**General institutional commitment** Initial motivation to earn a college degree Plans to continue enrolling at current college Whether the school was the students' first choice. Confidence in major and/or career choice **Commitment to educational goals**

Academic Integration • Academic integration variables measure quality of classroom experiences, relationships with faculty, intrinsic factors of confidence and self-efficacy, skill, and motivation.	**Global academic integration** **Interactions with faculty in and out of the classroom** **Quality of instruction** **Faculty expressing concern** **Academic self-concept** **Academic self-efficacy** **Academic involvement** **Academic Satisfaction** **GPA**
Social Integration • Social integration variables measure the quality and frequency of student peer interactions, social expectations, social adjustment, and involvement in student activities and/or student organizations/clubs.	**Global social integration** **Peer relationships** **Number of friends** **Social activities and organizations** **Social adjustment**
Institutional Commitment 2 • The subsequent institutional commitment measure is related to confidence in making the right college or career choice, intent to graduate from the institution, and certainty in re-enrolling.	**General institutional commitment** **Continued motivation to earn a college degree** **Confidence in major and/or career choice** **Commitment to educational goals**
Persistence Persistence is a student's intent to re-enroll or depart, or continued enrollment from first to second semester or beyond, or graduation.	Intent to persist/re-enroll Confirmed persistence Graduation Dropout
*Variables in **bold** were significant at $p < .05$ in more than 50% of the studies measuring that specific variable.	

APPENDIX B

CODING GUIDE FOR FULL-TEXT REVIEW

Study #_____   Title:_____

         Author:_____   Year_____

Total # of variables:_____   Sample:_____

         Analysis:_____

Results_____ Correlation Matrix:
Y or N

Instrument(s):

Student Characteristic Factors:

Institutional Commitment Factors:

Academic Integration Factors:

Social Integration Factors:

External Factors:

Organizational Factors:

Intent to Persist/Persistence:

APPENDIX C

CODING SHEETS FOR EFFECT SIZES

Study #	Authors	Sample Size	pg # of matrix	Variables	Correlation Matrix												
					StF Corr.	fZ StF Corr	ExF	fZ ExF	OgF	fZ OgF	IC	fZ IC	AI	fZ AI	SI	fZ SI	IC2

StF: Student factors, ExF: External factors, OgF: Organizational factors, IC1: 1st measure of institutional commitment, SI: social integration, AI: Academic Integration, IC2: 2nd measure of institutional commitment

APPENDIX D

SUMMARY OF STUDIES INCLUDED

Summary of Studies Included

Title	Authors	Year	Instrument	Type of Institution	Sample
The student retention puzzle revisited: The role of institutional image	Angulo-Ruiz & Pergelova	2013	surveys 1st semester	Canadian University	217
Dropouts and turnover: The synthesis and test of a causal model of student attrition	Bean	1979	questionnaire using mode l of turnover in work organizations	4-year public	1171
Revising Tinto's Interactionalist Theory	Berger & Braxton	1998	Student Information Form (SIF),-Orientation, Early Collegiate Experiences Survey (ECES),-Fall and the Freshman Survey (FYS)-Spring	highly selective private	718
Investigating First-Semester Freshman Adjustment to College Using a Measurement of Student Psychosocial Adjustment (AIR 1994 Annual Forum Paper)	Bragg	1994a	modified version of the Anticipated Student Adaptation to College Questionnaire; the Social Propensity Scale	research institution in the Midwest	338
A study of the relationship between adjustment to college and freshman retention	Bragg	1994b	Anticipated Student Adaptation to College Questionnaire	University of Oklahoma	338

Faculty Teaching Skills and Their Influence on the College Student Departure Process	Braxton, Bray, & Berger	2000	Student Information Forum; Early Collegiate Experiences Survey; Freshman-Year Survey;	highly selective, private I university	696
The Influence of Active Learning on the College Student Departure Process: Toward a Revision of Tinto's Theory	Braxton, Milem, & Sullivan	2000	Student Information Form; The Early Collegiate Experience Survey; FYS	highly selective, private research I university	718
Determinants of Persistence: The inclusion and testing of ability to pay factors in Tinto's model of student attrition	Cabrera	1990	45-item survey by author	large urban public U	466
Adult student dropout at post-secondary institutions	Cleveland-Innes	1994	survey questionnaire	large, government-funded university, primarily of commuter students	325
Predictors of academic achievement, social adjustment, and intention to persist: A bioecological analysis of college retention	Cordell-McNulty	2009	social adjustment subscale of the Student Adaptation to College Questionnaire; single item adapted from Hausmann et al.; GPAs	large Southeastern university	299
Factors influencing community college student attrition: An application of Tinto's model at a public community college in Hawaii	Damon	1996	survey instrument by Nora, Attinasi, & Matonek, 1990	community college	269
Tinto's Separation Stage and Its Influence on First-Semester College Student Persistence. (AIR 1998 Annual Forum Paper)	Elkins, Braxton, & James	1998	First-Semester Collegiate Experiences Survey	public, four-year institution	411

Models of College Persistence Intentions	Fry	2010	results of a survey instrument that was administered to a sample of freshman and sophomore classes	Large, comprehensive, public state university in the Midwest	372
A causal model analysis of nontraditional undergraduate student attrition	Gill	1993	Student Information System; Appendix Questionnaire	Eastern Washington University	195
Retention and achievement in one first-year program: A multivariate analysis	Green	1998	National Surveys of First-Year Programs (FYP)	national sample	373
The Fulfillment of Expectations for College and Student Departure Decisions	Helland, Stallings & Braxton	2001	1st survey: Student Information Form (SIF)	Seminole CC	718
Assessing the fit of Tinto's longitudinal model of institutional departure at a community college	Henningsen	2003	Freshman Experience Survey based on Institutional Integration scale	Seminole CC	395
Application of Tinto's theoretical model of college withdrawal to developmental reading students at a two-year residential college	Hoffman	1998	Nelson-Denny reading test, Terenzini's Institutional integration scales	Blinn College: 2-year residential	98
Students' Intentional Persistence as a Web of Causal Factors: A Preliminary Study I	Ikegulu & Barham	1997	Institution-Instructor-Student Inventory Survey	Grambling SU (Louisiana)	219
The evaluation of two freshman-year interventions at Dowling College	Jordan	2003	First Year At Dowling (FYAD)	Dowling College, Oakdale, NY	45

The Influence of Student Academic Behaviors on the Academic Integration and the Persistence of Students at a two-year Campus of a Multi-campus University: An Exploratory Study	Jumpeter	2005	survey developed by authors	two-year	236
Intersections of Race, SES, and First-Generation College Student Status in Understanding the Factors Affecting Undergraduate Academic Persistence: A Psychosociocultural Approach	Lin	2011	general demographic questions, 12 scales (11 standardized and 1 unstandardized); College Self-Efficacy Inventory, the Educational Degree Behaviors Self-Efficacy Scale, the Imposter Phenomenon Scale, the Student Motivation for Attending University-Revised, and the Problem-Solving Inventory	large, public research I university located in the Midwest	530
The Relation of Self Variables to Transfer Student Success as Measured by Academic, Psychological, and Career Functioning	Ling	2006	College Self-efficacy study; self-efficacy for broad academic milestones scale, Ac and Intelligence Dev subscale, social efficacy, roommate efficacy, social efficacy subscale, roommate efficacy subscale, Inst. Integration Scale-peer group interaction	large mid-Atlantic U	163
Development and validation of a structural model of student attrition on native and transfer students	McGuigan	1993	Questionnaire given 2 times: once at beginning of FA91 and once midway through FA91	mid-size, rural, residential U	240
A comparison of the undergraduates in good academic standing who persist and who depart the City College of New York	Morales	1998	The Leaver's Survey; persister survey	City College of New York	850

The influence of social class on academic outcomes: A structural equation model examining the relationships between student dependency style, student-academic environment fit, and satisfaction on academic outcomes	Nadler	2013	survey by authors	Midwestern University	500
What Factors Influence Student Persistence in the Community College Setting?	Nakajima	2008	63-item survey assessing psychosocial variables and the academic integration variable, and a number of background variables	community college	427
Psychosocial factors related to retention at CC	Napoli and Wortman	1998	Time 1 and Time 2 questionnaires. T1 was 1st or 2nd week of first sem. T2 was at the end of first semester	community college	1011
Tinto's Theoretical Perspective and Expectancy-Value Paradigm: A Confrontation to Explain Freshmen's Academic Achievement	Neuville et al.	2007	survey by authors	U in Belgium	2637
Influences on the educational degree attainment of two-year college students	Nippert	2000-2001	Cooperative Institutional Research Program (CIRP) surveys	2-year college	4408
The effect of new student orientation programs on social and academic integration and persistence	Ogrosky	1992	pre-test: New Student Survey. Post test: New Student Follow-up Survey. dev & based on Pascarella and Terenzini & Wolfe (1986)	large Mid-western U	378
The Big Five Personality Dimensions and the Process of Institutional Departure	Okun & Finch	1998	Big-5 (BFI-V44); Student Adaptation to College Questionnaire	large Southwest state university	240

Title	Author	Year	Source/Instrument	Setting	Sample
Modeling the effects of academic and social integration on college student success: A systematic review	Pan	2010	Education Resources Information Clearinghouse; Psychlnfo, ProQuest Digital Dissertations, EBSCO Academic, Education Full Text, and Social Sciences Citation Index	four-year institutions; residential universities; commuter universities; two-year institutions	58,294
Long-term persistence of two-year college students	Pascarella	1986	Cooperative Institutional Research Program (CIRP) surveys	national sample of 2-year college	825
Extended freshman orientation participation and persistence behavior of students at a rural commuter community college	Pearl	1993	Institutional integration Scales (P & T 1980)	Clinton community colleges rural SUNY commuter campus	1165
Fostering sense of relatedness in classrooms, self-determined motivation, and institutional persistence among first-year college students	Pessa Huff	2009	Survey developed by author, Perceptions of Pedagogical Caring (PPC), on a motivational model re: relatedness as a psychological mechanism through which students' perceptions of caring in college classrooms promoted their self-determined motivation. in turn affecting perceived competency, grades, IC and persistence	large Southwestern U	490
Degree attainment of low-socioeconomic status students: Structural equation modeling test of an elaborated theory of socialization	Saunders	2004	Beginning Postsecondary Students (BPS) Longitudinal study, interviewed as part of National Postsecondary Student Aid Study (NPSAS:96); BPS follow-up after 1 yr; 2nd follow-up after 3 yrs	national sample of 4-year IHE students with low SES scores	437

Understanding the System: Persistence of First-generation Students through Path Modeling	Sherlin	2002	Beginning Postsecondary Longitudinal Study (BPS:96/98), study sponsored by US DOE	Beginning Postsecondary Longitudinal Study (BPS:96/98), study sponsored by US DOE	1233
Predicting institutional persistence in first-year community college students	Stryker	1997	Student Adaptation to College Questionnaire (SACQ), Byrd & Sirky, 1989.	North Shore comm coll	420
The Effect of Academic Load on Success for New College Students: Is Lighter Better?	Szafran	2001	Student Data Records	Stephen F Austin State University-comprehensive regional U	512
A Conceptual Model on the Impact of Mattering, Sense of Belonging, Engagement, and Socio-Academic Integrative Experiences on Community College Students' Intent to Persist	Tovar	2013	College Mattering Inventory; Sense of Belonging Scales	community college	2088
An analysis of the influence of the fit between learning styles and educational experiences on retention of selected community college students	White	1998	Institutional integration Scales; Kolb's Learning Style Instrument; Learner- Environment Interaction questionnaire; Institutional Integration Instrument	Orange County Community College--State University of New York	1076
A social cognitive model of attrition: A test against the competing Tinto (1993) longitudinal model of institutional departure	Wicker	2003	College Experience Q; College Self-Efficacy Scale; Self-Efficacy Inventory; AA Career Outcome Expect Inventory; Edu Outcome Expect scale; The Integration Scale; Interactions with Faculty Scale	seven different universities within the state of California	196

Predictors of Persistence to Graduation: Extending a Model and Data on the Transition to University Model	Wintre & Bowers	2007	Student Adaptation to College Questionnaire (SACQ), Byrd & Sirky, 1989. The Autonomy Scale of the Psychosocial Maturity Inventory (Greenberger, Josselson, Knerr, & Knerr, 1974). The Self-Esteem Scale (Rosenberg, 1965).	large commuter Canadian university	944
The Mystery of Stop-Outs: Do Commitment and Intentions Predict Reenrollment?	Woosley, Slabaugh, Sadler, & Mason	2005	survey developed by authors: Withdrawing Student Survey	Midwest public- Ball State	995
The effects of a prefreshman summer bridge program on student persistence into the sophomore year	Yonai	1991	survey developed by U committee called Freshman Panel Survey	Syracuse University	578

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* Study included in meta-analysis