Promoting College Completion Through Leadership Among Underrepresented Urban College Students: A Theory of Change and Evaluation of College Retention Outcomes for the Act Six Leadership and Scholarship Initiative

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Abstract

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The Act Six Leadership and Scholarship Initiative is a leadership development and college retention and success program developed by the Northwest Leadership Foundation that provides intensive cohort-based training and support, along with full-tuition, full-need scholarships, to underrepresented urban college students to attend religiously affiliated liberal arts colleges across the Pacific Northwest. Act Six has produced notably high levels of persistence and graduation when compared to national and local data for students with similar demographic characteristics. This dissertation presents a comprehensive literature-based theory of change that proposes how and why the many interventions of Act Six work together to affect the desired outcomes of the program. It then evaluates the collective impact of these interventions on participants' college persistence and graduation by comparing outcomes for Act Six participants with participants in a comparison program. The Washington State Achievers

(WSA) scholarship program, developed by the College Success Foundation, provides broad but less intensive financial and programmatic support to more than 5,000 diverse, low-income students across Washington State. Because randomized assignment is not possible in evaluating the effects of the Act Six program, propensity score matching techniques are utilized to identify a matched sample of WSA participants who on average are nearly identical to Act Six participants on a set of 10 covariates believed to influence college persistence. After matching, the study finds that Act Six participation has a significant effect on persistence and four-year graduation, with Act Six participants nearly 60% less likely to depart and six times more likely to graduate on time from their first college compared to similar WSA participants, after controlling for all covariates. By ruling out the influence of selection bias from the observed covariates, the study contributes rigorous new evidence that, beyond the selection process and full scholarship, the collective interventions articulated in the Act Six theory of change contribute to significant, substantially higher persistence and graduation outcomes for program participants. These findings invite further investigation of the theory and its implications for college success practices that target underrepresented students and communities.

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DEDICATION

For Anna, Daniel, and Katie,

who I love beyond words, who fill my life with joy,

and who graciously shared their husband and dad with this project.

For all the Act Six scholars and alumni,

who inspire me with their resilience, passion, vision,

and commitment to making their communities better places for all.

CHAPTER ONE

INTRODUCTION AND PROBLEM STATEMENT

The question of why students leave college has been a focus of academic inquiry for more than 80 years (Braxton, 2000) and over the past thirty five years has been one of the most studied areas in higher education (Tierney, 1992; Tinto, 2005). According to national data collected by ACT (2010a), in 2010 more than 44% of students at two-year colleges and 27% of students at four-year institutions failed to return for their second year. Despite concentrated efforts by both researchers and practitioners, the last 20 years have seen virtually no improvement in these rates nationally and the first- to second-year departure rate from four-year institutions has actually increased since reaching a low of 25% in 1991 (ACT, 2010a, 2010b).

Furthermore, troubling disparities continue to exist in departure rates across racial and ethnic groups and between students from different socioeconomic levels. Data from the 2003-04 Beginning Postsecondary Student Survey, a nationally representative longitudinal survey sponsored by the U.S. Department of Education's National Center for Educational Statistics, show that of students who first enrolled in four-year institutions in the fall of 2003, only 39% of American Indian and Alaska Native, 41% of Black, and 42% of Hispanic students had earned a bachelor's degree at any four-year institution within six years, compared to 63% of White and 70% of Asian students. Of students from families earning less than $32,000, 47% earned a bachelor's degree within six years, compared with 76% of students from families making $92,000 or more. Similar gaps remained when the data were disaggregated for students starting at public and private four-year institutions (National Center for Education Statistics, 2011; Radford, Berkner, Wheeless, Shepherd, & Hunt-White, 2010, Table 3, p. 12). Degree attainment rates among students who start at two-year colleges are even more discouraging, with only 18%

of Black and 20% of Hispanic students earning any type of degree within six years, compared with 30% of White and 34% of Asian students (Radford et al., 2010, Table 2, p. 10).

These high and uneven levels of student departure from higher education create a wide range of negative consequences for students, institutions, and communities. Resistant to simple fixes, Braxton et al. (2004) describe college student departure as an ill-structured problem that requires a multidisciplinary approach and demands multiple solutions.

Act Six Leadership and Scholarship Initiative

In 2002, through his work at the nonprofit Northwest Leadership Foundation (NLF) in Tacoma, Washington, the author led the development of the Act Six Leadership and Scholarship Initiative, a program designed to address the problem of retention of underrepresented urban college students at private universities. The Act Six program, which is the focus of this study, traces its roots to the success of The Posse Foundation, a New York-based nonprofit program that recruits, selects, and trains youth leaders from seven major cities and sends them in cohorts (or "posses") with full tuition scholarships to 38 of the most selective colleges in the country. Having sent more than 3,600 underrepresented students, 93% of them students of color, to college since 1989, Posse maintains a 90% graduation rate (Posse Foundation, 2011).

Act Six is a regional initiative in the Pacific Northwest, inspired by the Posse model, that sends roughly 65 underrepresented students each year from five Northwest cities in cohorts to eight religiously affiliated liberal arts colleges in Washington and Oregon. Having selected 254 students in its first nine years (89% students of color, 71% eligible for Pell grants, and 72% first-generation college students), Act Six has experienced similar success to Posse, with 91% of participants who started college still enrolled or graduated (unpublished Act Six data, December 27, 2011). Similar to Posse in many regards, Act Six has several unique aspects that differentiate it from Posse. However, until now a comprehensive theory of change has not been developed to articulate how and why the many interventions of Act Six work together to affect the desired

outcomes of the program. The first contribution of this dissertation, found in Chapter Three, is the development of such a theory, rooted in the literature on retention of underrepresented college students.

Program Description

Unlike most college student retention efforts, Act Six emerges not from a college, but from the urban community. It is intentionally designed as a partnership between urban community-based nonprofits and private, residential, predominantly White, religiously-affiliated liberal arts colleges. It targets high school seniors from historically marginalized urban neighborhoods and schools, particularly students of color, students from low-income families, and first generation college students.

While the program functions as a strategy to increase college retention and completion, it is unique in that it positions college completion as an outcome within a larger framework where the ultimate goals are transformation of the urban community and the college campus, and where the primary strategy for both retention and system change is affirming and developing the leadership of underrepresented students. Central to the theory of the program is the underlying assumption that in the midst of their dysfunctions and injustices, marginalized urban neighborhoods are places of inherent value and beauty with important assets to offer (Kretzmann & McKnight, 1993). Likewise, the students who grow up in these neighborhoods are not deficient, empty vessels that need to be extracted from the community to be fixed and filled through the charitable efforts of colleges that possess all the resources and answers. Quite the contrary, these students possess unique experiences and perspectives that are sorely needed both by the urban communities that raised them and by college campuses where these students can play a critical role in the colleges' transformation into more multicultural and inclusive institutions. The program is rooted in a critical theory consistent with Tierney's (2000) cultural integrity model that challenges the way that colleges traditionally view students from

marginalized communities. It implements interventions that are designed to support and retain urban students in college environments that were not built with them in mind, even as those students contribute to the transformation of those environments. In Tierny's (2000) words, "we seek to enable students to come to grips with the multiple phenomena that hold them back. In effect, we aim to equip students with the necessary cultural capital to succeed within the system that exists, but in doing so we seek to disrupt the process" (p. 218).

Composed of 24 integrated interventions, the program begins in the fall of students' senior year of high school and continues through college graduation and beyond. Program staff who live and work in the urban community promote the program and recruit urban students by leveraging relationships with wide networks of school staff and community partners. Utilizing selection committees composed of both community members and college personnel, the program selects diverse, multicultural cohorts of up to 10 students for each college through an intensive three-stage interactive selection process that considers both traditional and nontraditional measures of college readiness and leadership potential. Selected students receive scholarships that fully meet their demonstrated need with no loans and a limited amount of work study. Once selected, students participate with their cohort in a weekly intensive precollege training program through the seven months prior to enrolling at college. The training curriculum addresses seven themes of the program (vision, leadership, service, diversity, community, preparation, and transformation) through units on intercultural communication, race and identity, time and money management, service and community development, service-minded leadership, and dynamics of change. Training also includes intentional team building activities for the cohorts, extended visits to the college campus, and writing instruction with college faculty. At the conclusion of training, students enroll in college with their cohort. They continue to meet together and receive ongoing support throughout college. Support includes individual and group meetings with college and program staff, individual faculty mentors, and career and graduate school assistance.

Students are expected to participate in leadership on campus and in the community. After graduation, students are encouraged but not required to return to their home communities.

The program is built around five defining elements: (1) a central focus on *leadership* that operationalizes the conviction that urban students have just as much to contribute as to receive in the college process; (2) *cohorts* as a core structure, reflecting the belief that the support and encouragement of a close group of peers can provide the social support students need to successfully navigate the college environment; (3) the importance of *cultural integrity*, the concept that urban students' cultures and experiences are valuable, should be affirmed, and do not need to be abandoned in order to find success in college; (4) an emphasis on *training* that assumes that students can not only acquire effective skills to better understand and navigate the classroom and campus environment, but can also be equipped as intercultural leaders to critically analyze and improve those environments; and (5) the nurturing of *sense of purpose* as a primary strategy, believing that students who go to college knowing that they have something important to contribute to a cause bigger than themselves are more likely to persist through challenges and contribute as agents of positive change.

Research Question

After developing a literature-based theory of change that suggests how the interventions of the Act Six program work together to create unusually high levels of success for program participants, the primary research question of this study is this: **Should the high levels of college retention and graduation experienced in the Act Six program be attributed more to the selection of participants or to the impact of the program's postselection interventions**.

With an overall four-year graduation rate of 83% and retention rates as high as 100% at three partner colleges, it is clear that the Act Six program has produced impressive results (unpublished Act Six program data, December 27, 2011). This graduation rate is markedly higher than national six-year graduation rates for bachelor's-seeking students of color and low-

income students at private four-year institutions (e.g., 41% for Hispanic, 47% for Black, 68% for Asian, and 54% for students from families in the lowest quartile of income, NCES, 2011) and as high or higher than the overall six-year graduation rate for all of the programs' partner colleges (which range from 40% to 83%, NCES, 2009). As stark as these contrasts are, the question remains whether the program's success is more a result of the interventions it provides or of the students it selects. In other words, would the students selected for the program have graduated from college even without the program's intervention? If so, that reality by itself would not negate the value of the program, although it might shift the emphasis from the program's role as a retention intervention to its utility as a recruiting and screening tool to increase access for underrepresented urban students that are too often overlooked in traditional admissions practices. Indeed, Bial (2004) studied the predictive ability of an alternative measure for college admissions adapted from the Posse selection process in hopes that it might be more widely utilized to increase college access for underrepresented students. Given the high cost of the program's interventions, however, those investing in Act Six clearly believe that without those interventions, even the high-potential students selected for the program would not persist and graduate at the same levels at which they do with the interventions. In one effort to establish this effect, a 2008 evaluation of Act Six by Wilder Research utilized a comparison group consisting of urban students with similar demographics who were selected for another local scholarship program that uses selection criteria similar to those of Act Six, finding that the first two cohorts of Act Six participants graduated within four years at a significantly higher rate than students in the comparison group (Schultz, et al., 2008, p. 58). However, the study failed to address either observable or hidden differences between the two groups and was severely constrained by small sample sizes. There remains a need to more rigorously investigate whether the program interventions, apart from selection, cause higher college persistence and graduation among participants. This is an important first step before further exploring whether the theory of change

proposed here accurately describes the complex relationships between the interventions and outcomes of the program.

While the most compelling research method to establish such a causal relationship is an experiment that randomly assigns participants to treatment and control groups, random assignment is neither a feasible nor desirable option in the Act Six context. Therefore, the observational study undertaken here employs a quasi-experimental technique known as propensity score matching to compare retention and graduation rates for Act Six participants against a matched group of students who did not participate in Act Six, but who were similar to Act Six participants on a number of important covariates. The details of the study design are fully described in Chapter Four. First, Chapter Two establishes the groundwork for the study by reviewing the college student retention literature and Chapter Three proposes a comprehensive theory of change for the Act Six program rooted in that literature.

CHAPTER TWO

REVIEW OF THE LITERATURE

Historically, inquiry into college student retention has emerged primarily from four disciplinary perspectives: sociological, organizational, psychological and economic (Braxton & Hirschy, 2005). This chapter begins by exploring key theories and accompanying critiques that have emerged from each of these perspectives.

In the literature and among practitioners, a variety of terms are used, often interchangeably, to describe the movement of students in and out of higher education. For clarity, the following definitions, adapted from Berger and Lyon (2005) and Hagedorn (2005), are utilized in throughout this dissertation. *Persistence* and *departure* are student-centered terms that refer to whether students continue or discontinue their enrollment in higher education. Departure can be either *voluntary* (the student decides not to reenroll, often referred to as *dropout*) or *involuntary* (the institution does not allow the student to reenroll, often referred to as *dismissal*), *temporary* (often referred to as *stopout*) or *permanent*, and from an individual *institution* or from the higher education *system*. *Retention* and *attrition*, on the other hand, are institution-centered terms and refer to the ability or failure of an institution to retain students from enrollment to graduation.

Sociological Perspectives

Student Integration Model

In 1970, Spady reviewed a large body of college dropout literature dating back to 1954 and found that it primarily focused on identifying bivariate correlates of college dropout. Criticizing the lack of coherent theoretical frameworks in the existing research, he became one of the first scholars to propose a sociological, multivariate causal model of the college dropout

process. Beginning with the assumption that dropout is best explained by the interaction of students with their college environment, Spady (1970) applied Durkeim's (1951) theory of the social nature of suicide to the college dropout process. Individuals are most likely to sever their ties with a social system (commit suicide or dropout) when they lack what Durkeim called *social integration* with that system. Spady's (1970, 1971) model posited that in addition to students' family background, their levels of normative congruence (having attitudes and interests compatible with the social environment), friendship support, academic potential and performance, and intellectual development influence their social integration, which in turn influences their satisfaction, commitment to the institution, and ultimately their decision to drop out or persist.

Also a sociologist, Tinto (1975) further developed Spady's model. In an effort to create a "predictive rather than descriptive theory of dropout behavior" (p. 91), Tinto included as input variables additional individual background characteristics (grouped as family background, individual characteristics, and precollege schooling constructs) and added goal commitment as a new construct to take into account students' initial educational expectations (e.g., to earn a two- or four-year degree), academic motivations, and the intensity of those expectations and motivations. Further, he delineated the academic and social domains of the college experience, placing the goal commitment construct alongside Spady's original institutional commitment variable and adding a separate academic integration construct in addition to the original social integration construct.

Tinto's (1975) student integration (or interactionalist) model hypothesizes a process in which students' background characteristics shape their initial goal and institutional commitments, which in turn influence their level of integration into the academic and social structures of the institution. Academic integration has both normative dimensions, which involve students' identification with the norms of the academic system (measured by intellectual

development), and structural dimensions, which involve meeting standards of the academic system (measured by grade performance). Social integration pertains to the level of congruence between the student and the campus environment and occurs primarily through informal peer interactions, participation in semiformal extracurricular activities, and interaction with faculty and staff. Students' levels of academic and social integration continually shape their ongoing commitments to the institution and to the goal of earning a degree, which in turn directly influence students' decision to drop out or persist. Put another way, the more integrated a student is into the systems of the college, the more committed the student will be to that particular college and to the goal of earning a degree. The more committed a student is to the college and to earning a degree, the less likely the student is to drop out (Tinto, 1975).

Over the next 18 years, Tinto continued to clarify, build, and refine his theory. He incorporated four important factors that were missing or not adequately addressed in his initial model: finances, off-campus external communities, intentions, and classroom experiences (Tinto, 1982, 1988, 1993). He also drew on Dutch anthropologist Van Gennep's conception of the rights of passage in tribal societies in an effort to better model the early stages of students' transition to college. Tinto (1988, 1993) utilized Van Gennep's (1960) three stages of passage to describe the process by which students undergo integration into the college community: separation (from communities of the past), transition (from high school to college) and incorporation (into the society of the college).

Assessing empirical validity. In 1997, Braxton, Sullivan, and Johnson formulated Tinto's original 1975 model into 13 testable propositions and categorized (as strong, modest, weak, or indeterminate) the extent of empirical support for each proposition by determining the number and proportion of peer-reviewed multivariate studies that provided significant confirming support for a given proposition. They found strong support for only five of the 13 propositions. Notably, they discovered strong backing for the core propositions that social

integration positively affects subsequent institutional commitment which in turn positively affects persistence, but found only modest support for the proposition that academic integration positively affects subsequent goal commitment. Braxton et al. also disaggregated their findings by institutional type. They found no studies that tested any of Tinto's propositions at liberal arts colleges and a limited number of tests for two-year colleges. For residential institutions, similar to the aggregate results, they found that five propositions received strong empirical support, none of which involved the academic integration construct. For commuter institutions, Braxton et al. found only two strongly supported propositions: student entry characteristics affect initial institutional commitment which in turn positively affects subsequent institutional commitment. Propositions involving social and academic integration at commuter institutions received at most modest support. These findings call into question the role of academic integration as a core construct in Tinto's theory. Finally, Braxton et al. reported finding no empirical tests of any of Tinto's 13 propositions for racial or ethnic minority groups within an individual institution. Questions regarding the validity of Tinto's theory for underrepresented students remain largely unanswered (Braxton et al., 2004, p. 18).

Challenging underlying assumptions. While acknowledging the need for scholars to develop and utilize conceptual frameworks to guide the their inquiry of college student attrition, Attinasi (1989) challenged the way in which Spady, Tinto, and other scholars developed (or uncritically accepted) conceptual frameworks for college student departure based on theories developed to explain other social phenomena (e.g. Durkheim's sociological theory of suicide). He argued that by beginning with the assumption that college attrition is like suicide, Spady and Tinto limited their ability to accurately describe the actual departure process, which could partially explain the limited empirical support for their models. Further, Attinasi claimed that existing departure theories had been developed and tested with data from institutional records and fixed-choice surveys, which did not allow consideration of the student's own perceptions or

of the context surrounding the student's decision to leave college. Attinasi argued that persistence theory should emerge not from frameworks in other fields, but from the actual experience of college students. "What are needed are naturalistic, descriptive studies guided by research perspectives that emphasize the insider's point of view" (p. 250). Attinasi's qualitative exploratory study of Mexican Americans' perceptions of university attendance offered an alternative approach to developing theory, utilizing open-ended interviews to better understand from the student's perspective the context in which Mexican American students make persistence or departure decisions. Using this approach, Attinasi discovered that social integration influences Mexican Americans' persistence less by promoting students' social congruence with the institution than by providing practical assistance for students in negotiating the physical, social, and academic geographies of the campus.

Tierney (1992) challenged Tinto's other foundational building block: the application of Van Gennep's rites of passage to students entering college. Tierney argued that Van Gennep's concept of rites of passage describes rituals designed to move individuals from one developmental stage to another within a specific culture and was never intended to describe movements from one culture to another. "Van Gennep never assumed that a Sioux youth underwent an initiation ritual in Navajo society. Yet Tinto's model assumes that same Sioux youth will undergo a rite of passage in Anglo society" (p. 661). Furthermore, Tierney critiqued Tinto's application of anthropological concepts emerging from a collectivist tribal culture to a highly individualist model of persistence that emphasizes the individual at the expense of the group. Finally, he challenged Tinto's positivist epistemology that theorized generalizable laws to explain social phenomena, yet failed to acknowledge the relevance of the biases and beliefs of both the researcher and those under study. Tierney argued that "one may reject a cultural model that assumes reality is socially constructed, but that cannot be done while at the same time one employs analytical tools derived from those same cultural models" (p. 611).

Tierney (1992, 1999) articulated at least two consequences for underrepresented populations (particularly students of color at predominantly White institutions) from Tinto's misapplication of Van Gennep's and Durkheim's concepts. First, in order to be successful in Tinto's framework, many ethnic minority students must undergo a form of cultural suicide that involves a clean break from their culture and communities of origin and assimilation into the dominant campus culture. Even if such an approach proved effective in increasing persistence for underrepresented populations, its long-term implications undermine the development and empowerment of marginalized students and their communities. As an alternative to this integration/assimilation perspective, Tierney and others (Deyhle, 1995; Tierney, 2000; Tierney & Jun, 2001) have articulated models that emphasize cultural capital and cultural integrity, suggesting that racial or ethnic minority students who are able to affirm their cultural identities and leverage the strengths of their cultures and communities of origin are more likely to persist.

Second, application of Tinto's model often leads campus administrators to subtly frame the attrition *problem* in terms of the *student* while understanding *solutions* to be in the sole domain of the *institution* (McNairy, 1996; Tierney, 1992, 1999). Although Tinto's model rightly prompts institutions to take responsibility for attrition and develop programs to reduce it, the model's focus on student integration can mask issues of structural racism and lead administrators to overlook the potential of marginalized students (and their cultures and communities or origin) to contribute to positive social change on campus. Tierney (1999) points to the Neighborhood Academic Initiative (NAI) in south central Los Angeles as an example of a program that with great success affirms the cultural integrity of its low-income urban Black and Hispanic youth participants, who "are not seen as broken or 'at risk' but instead are viewed as valuable resources for their communities and society at large" (p. 87). He uses the NAI program to illustrate an alternative model to retention based on five key principles: collaborative relations of power; connections across home, community, and schooling; local definitions of identity; challenge over

remediation; and academic support (Tierney, 2000).

Echoing and adding to these theoretical concerns, Rendón, Jalomo, and Nora (2000) offered a systematic critique of Tinto's student integration model applied to minority students. They challenged the assumption that students must separate from their cultures of origin, pointing instead to Valentine's (1971) concepts of biculturalism and de Anda's (1984) notion of dual socialization as more helpful frameworks to understand how minority students can concurrently navigate both their culture of origin and the dominant university culture. Rendón, et al. also critiqued the notion that external family, cultural, and community connections have primarily negative impact on student involvement and persistence. Finally, Rendón, et al. argued the need to develop more sophisticated theories of retention by promoting multidisciplinary approaches and integrating methods and findings from both qualitative and quantitative research.

Other Sociological Models

Residential and commuter models. Braxton et al. (2004), starting with only the strongly supported propositions identified by Braxton et al. (1997), drew on empirical findings from sociological, psychological, organizational and economic perspectives to offer a revision of Tinto's model for residential institutions and a new alternative model for commuter institutions. For residential campuses, Braxton et al. (2004), proposed a new set of factors that influence social integration at these campuses: commitment of the institution to student welfare, communal potential, institutional integrity, proactive social, psychosocial, and ability to pay. Completely abandoning Tinto's academic integration construct, Braxton and Hirschy (2005) integrated these proposed antecedents of social integration into a reduced framework consisting only of the five strongly supported Tinto propositions identified by Braxton et al. (1997), resulting in a revised student integration model for residential campuses that revolves around social integration and institutional commitment. For commuter institutions, where only two of Tinto's propositions garnered strong backing, Braxton et al. (2004) abandoned Tinto's model completely,

synthesizing findings from multiple fields to propose a new theory of student departure from commuter institutions. Recognizing that most commuting students attend college *in addition to* (not *instead of*) other day-to-day obligations such as family and work, the new model emphasizes the role of the external environment in directly influencing persistence. It also makes explicit the ways that academic communities and institutional environment factors influence academic integration, subsequent institutional commitment, and persistence of commuting students (Braxton & Hirschy, 2005).

Cultural perspectives. Kuh and Love (2000) offered a cultural perspective on student retention that is largely consistent with Tinto's model, but responds to the critiques of the individualist nature of the model by reconceptualizing persistence as a more group-oriented process (p. 210). Kuh and Love offer eight propositions regarding the impact that a student's cultures of origin and culture of immersion have on student departure. They then challenge colleges and universities to reconsider the pervasive assumption that it is the responsibility of students from different cultural backgrounds to adapt to the campus environment. To successfully operationalize the commitment to diversity that nearly every college and university espouses, institutions must consider how they can adapt and change in order to cultivate communities of difference and become truly multicultural institutions. As part of that transformation, institutions can cultivate cultural enclaves that help students bridge long cultural distances between their cultures of origin and the dominant culture of the institution (Kuh & Love, 2000).

Social reproduction model. Berger (2000) utilized Bourdieu's (1973) theory of social reproduction to develop the outlines of a student retention model that proposes that colleges are part of a larger social reproduction process, that both individual students and institutions attempt to optimize their capital (both social and economic), and that retention is highest when there is a match between the level of cultural capital of the student and the institution. Berger suggested

that as colleges seek to protect their place within the social hierarchy of higher education, they create mechanisms that often preclude students without the right level of cultural capital from successfully integrating into the life of the campus because these students' frame of reference is too different from that of the institution or the dominant peer group. In addition, colleges often fail to recognize as valuable or legitimate the skills, abilities, attitudes, perceptions, and knowledge of students from underrepresented groups (Berger, 2000). Although Berger's social reproduction model does much to explain the structural challenges that students from underrepresented groups face in higher education (challenges that are largely ignored in many leading persistence models), it stops short of providing actionable levers or suggestions for practice to address these deeply imbedded systemic issues.

Organizational Perspectives

Student Attrition Model

Starting with the assumption that dropping out of college is analogous to leaving a job, Bean (1980, 1981, 1982, 1983) developed, tested, and refined a causal model of student attrition that relied on organizational theories of employee turnover in work organizations. His initial model (1980) theorized that student background variables influenced a set of 10 organizational determinants adapted to the college context, which in turn affected satisfaction and institutional commitment, which ultimately influenced the dropout decision. The model contained several constructs similar to those in the student integration model (goal commitment, institutional commitment, and integration), but also introduced new factors from organizational theory. Grades, courses, membership in campus organizations, and opportunity to transfer were also included. As the model developed, Bean (1982, 1983) integrated more external factors (e.g., finances, parental encouragement, and support from friends) and utilized psychological theories to explain how attitudes and intentions shape behaviors, introducing intent to persist as an important factor that mediates actual persistence.

Although originating from a different disciplinary orientation, Bean's student attrition model has much in common with Tinto's student integration model (Cabrera, Castañeda, Nora, & Hengstler, 1992). Less ubiquitous than Tinto's, Bean's model has not been as widely tested or critiqued. However, because of its similar structure and reliance on several similar constructs, it is susceptible to much of the same criticisms noted above for Tinto, particularly in its failure to take into account the unique experiences and challenges of underrepresented students or to address systemic institutional barriers to their success.

Noting the overlap between Tinto's (1975) and Bean's (1982) models, Cabrera et al. (1992) examined the extent to which the two models might be merged to better explain the college persistence process. Sampling from a large, urban commuter institution, Cabrera et al. found validation for a greater proportion of the causal links in Tinto's model, but found that Bean's model accounted for more overall variance in both intent to persist and persistence. The study confirmed the important role of the external factors in Beans' model and the mediating role of intent to persist on persistence. Cabrera et al. concluded—and a follow up study by Cabrera, Nora, and Castañeda (1993) at a large urban institution confirmed—that an integrated model merging leading factors from both Tinto's and Bean's models offers a more accurate description of the persistence process. Building on these integrated models, Nora and Cabrera (1996) added a construct for perceptions of prejudice-discrimination, positing that the extent of these perceptions would have direct effect on persistence and influence a student's academic performance and social and academic experience. A surprising finding of the study at a large, public, predominantly White, commuter institution was that while minority students perceived more prejudice and discrimination than nonminorities, those perceptions did not exert direct influence on their persistence decisions, even though perceptions of discrimination did directly affect the persistence of nonminorities. Nora and Cabrera attributed the result to the resiliency of minority students in predominantly White institutions, but remained concerned "that other

culturally related environmental and institutional factors may collectively exert overwhelming negative influence on the persistence decisions of these students" (p. 142).

Psychological Perspectives

Student Involvement Model

Astin (1984) defined college student involvement as "the amount of physical and psychological energy that the student devotes to the academic experience" (p. 297). Although his student involvement theory is perhaps placed more properly in the realm of student development, Astin stated that the theory emerged from his 1975 study of college dropouts, where every factor that showed significant effect on persistence could be conceptualized in terms of a student's involvement or lack of involvement (1984, p. 302). An intentionally simple theory, its core proposal is that the greater a student's involvement in college, the greater the student's learning and personal development. By conceiving involvement as a continuum with dropping out as the ultimate act of noninvolvement, Astin anchors involvement to the persistence process. As such, involvement plays an important and implicit role in the concepts of social and academic integration in both Tinto's and Bean's models as well as in the integrated models discussed above. However, as Astin points out, "it is easier to become involved when one can identify with the college environment" (1984, p. 303). For underrepresented students, that college environment often feels foreign. Rendón, et al. (2000) claim that student involvement efforts at most campuses are structured to facilitate involvement for dominant culture students and that underrepresented students, for a variety of reasons, often find involvement much more difficult. Rendón, et al. suggested that Rendón's (1994) concept of validation may act as a prerequisite to involvement for such students, who may not feel comfortable enough with their place within the institution to take advantage of involvement opportunities without someone reaching out to them. Therefore, "the role of the institution is not simply to offer involvement opportunities, but to take an active role in fostering validation" (Rendón et al., 2000, p. 147).

Psychological Model

Bean and Eaton (2000) proposed a model of student persistence that integrated four psychological theories (attitude-behavior, coping behavior, self-efficacy, and attribution) into a structure borrowed from Bentler and Speckart's (1979) adaptation of Fishbein and Ajzen's (1975) psychological model. In Bean and Eaton's model, student entry characteristics (e.g., past behavior, beliefs, and coping strategies) influence how students understand the college environment. Students' interactions in the different realms of the institutional environment (bureaucratic, academic, social, external) lead to psychological responses as students make self-efficacy assessments, choose coping behaviors, and reassess attributions. These responses shape students' academic and social integration which in turn influences their institutional fit and commitment, intent to persist, and ultimately their persistence decision. Although it contains many of the same constructs as the student integration and student attrition models, Bean and Eaton (2000) claim that "this model indicates that students are psychological beings and that collective issues of sociology play a secondary role. The social environment is important only as it is perceived by the individual" (p. 58). The highly individualistic nature of the model leaves it especially vulnerable to many of the same critiques directed at Tinto's model, in particular its application to underrepresented populations (Rendón et al., 2000; Tierney, 1992, 2000), its assignment of full responsibility to the individual student, and its failure to recognize any systemic issues or institutional barriers for marginalized students.

Sense of Belonging Model

Hurtado and Carter (1997) developed a psychological model of sense of belonging in an effort to provide an alternative to Tinto's concepts of social integration and membership that would be more applicable to diverse students. Making the distinction between students' interactions with the campus and their psychological sense of identification with the campus, Hurtado and Carter posited that students' *perception* of whether they feel included in the campus

community is a more helpful measure of their affiliation and identity with the college. The study sampled students from a national longitudinal study of academically high performing Latino students and explored the relationships between sense of belonging and participation in a variety of academic activities and social organizations, testing a causal model that links ease of transition, perceptions of a hostile campus environment, and sense of belonging. Hurtado and Carter found that for Latino students, external communities (families, community and religious organizations) play an important role in increasing sense of belonging, challenging Tinto's (1993) assumption that a clear separation is necessary for transition and incorporation in college.

Economic Perspectives

St. John, Cabrera, Nora, and Asker (2000) assert that most economic approaches to student persistence research rely on price-response theories and theories of targeted subsidies. Price-response theories focus on "economic factors whereby the social and economic benefits of attending college are believed to outweigh any costs and benefits associated with alternative activities (e.g., working full-time)" (p. 30). A key element of these theories is the student's perception of their ability to pay for college. Theories of targeted subsidies suggest that the best mechanism for influencing students' college choice and persistence decisions is to provide financial aid to targeted groups based on their ability to pay (pp. 30-31). While many early sociological, organizational, and psychological theories ignored the effects of finances on persistence (with the notable exception of Bean, 1980), most early economic studies on persistence incorporated noneconomic factors only as a means to control for sources of non-economic variance in order to assess the direct effect of finances on persistence (St. John et al., 2000). Among efforts to integrate the two approaches and better understand the relationships between financial and nonfinancial factors as they directly and indirectly influence persistence are the ability to pay model (Cabrera, Stampen, & Hansen, 1990; Cabrera, Nora, & Castañeda, 1992) and the college choice-persistence nexus model (St. John, Paulsen, & Starkey, 1996).

Ability to Pay Model

Using a national sample of students attending public four-year institutions, Cabrera, et al. (1990) incorporated ability to pay, along with other external factors (e.g., support from significant others), into an interactionalist causal model of persistence. They hypothesized that having the resources to pay for college was necessary to achieve cognitive and noncognitive outcomes because students are thereby freed from financial worry and the need to work long hours. The study found that including college-related variables in addition to economic variables increased the amount of variability explained by the model. Further, ability to pay both directly influenced persistence and moderated the effects of goal commitment on persistence.

Cabrera, et al. (1992) extended the model, giving consideration to students' perception of their ability to pay for college as well as the actual amount of financial resources available. Cabrera, et al. posited that these financial factors would influence students' social and academic integration in addition to directly affecting persistence. They found that financial factors had only an indirect effect on persistence, but did directly affect academic integration, socialization process, and intent to persist. They also found that receiving financial aid facilitated students' social interactions.

College Choice-Persistence Nexus Model

The major contribution of St. John, et al.'s (1996) college choice-persistence nexus model is its assertion that persistence decisions are part of a continuous decision making process that begins with the decision to pursue a college education, includes the selection of and initial enrollment in a college, and continues with the decision to stay enrolled. The college choice-persistence nexus model considers the impact of finances (students' socioeconomic status, perceptions of affordability, and levels of financial aid) in each of these phases. Once in college, positive social and academic experiences reinforce students' perceptions of the economic and other benefits of continuing and graduating from the university (St. John et al., 2000). St. John,

et al.'s (1996) study found that college choice had both a direct and indirect effect on persistence and that college cost had a direct negative effect on persistence. They substantiated a connection between college choice and persistence in the financial aid process and concluded that finances are an integral part of the persistence decision, especially when a student's initial college choice was influenced by finance-related factors.

Empirical Evidence for Impact of Financial Aid on Persistence

Tinto (1987) once argued that financial problems were a polite excuse for dropping out, and indeed, financial factors were completely missing from his original model. By the time he published his 1993 revision he had, based on a substantial body of new research, reconsidered his view that finances had little impact on persistence (Tinto, 1993). What follows is a selection of findings from St. John's (2000) review of the literature on the effect of financial factors on persistence. First, St. John notes that historically most studies have found a positive association between financial aid and persistence, with some national studies finding that financial aid variables explained more variance in the persistence process than college experience or achievement variables. Second, students are aware of and consider their financial constraints in both college choice and persistence decisions. Third, students' perception of their ability to pay influences nearly every aspect of their college life. Fourth, there are important social class differences in perceptions of college costs, and poor students are most sensitive to prices and subsidies in college choice. Finally, there are differences in the ways perception of costs influence the persistence of different racial and ethnic groups.

In short, it is increasingly clear that financial factors matter in retention. However, as Swail, Redd, and Perna (2003) conclude, "the research investigating the effects of the types, amounts, and combinations of financial aid on college persistence is, at best, ambivalent" (p. 71). Recent shifts in financial aid awarding from grants to loans and from need-based to merit-based aid do, however, have a clear negative effect on both access and retention for low-income

students (Swail et al., 2003).

Multidisciplinary Perspectives

Over the years, many scholars have identified long lists of factors that influence college persistence, and there have been several noteworthy efforts to develop conceptual models of persistence that incorporate factors and theories from all four of the disciplinary perspectives identified above into a unified model of persistence.

After providing a comprehensive review of the state of research and practice in the retention of underrepresented students, Swail, et al. (2003) proposed a model of student retention built around cognitive, social, and institutional forces, represented as the three sides of a triangle with the student experience at the center. Designed to bridge the gap between theory and practice, Swail, et al.'s geometric model incorporated key factors from psychological, sociological, organizational, and economic perspectives. Built with diverse students in mind, the model addresses many of critiques of earlier models, balancing the roles and responsibilities of the student and the institution. It also incorporates a temporal aspect, representing students' development through the course of college. The geometric model and the accompanying retention framework that Swail, et al. present appear to offer great promise for improving institutional practice of retention, but the model has yet to be subjected to the kind of empirical testing necessary to validate its central constructs.

In 2008, Perna and Thomas identified the top academic journals in education, psychology, sociology, and economics and reviewed all articles related to college student success published in those journals between 1995 and 2005. Analyzing the various theoretical and methodological approaches taken in the articles they reviewed, Perna and Thomas used six central conclusions from their review to formulate a multidisciplinary model of student success. The resulting model consists of four nested layers, beginning with the internal context, expanding to the family context, then to the school context, and finally to the outermost social,

economic, and policy context. At its core, the model utilizes psychological theory to assert that student success is determined by the attitudes, motivations, and behaviors of individual students. However, those individual processes are shaped by the progressively wider contexts surrounding them. Perna and Thomas's multidisciplinary model should provide a useful framework for broadening future research and encouraging the use of multi and interdisciplinary approaches to understanding student success.

Summary

Even after 35 years, Tinto's student integration theory still exerts vast influence in the field. Whether reviewing, expanding, or criticizing it, nearly every journal article or book in this review made reference to Tinto's model. Most offered at least some level of criticism of its shortcomings. Even those with the harshest critiques, however, acknowledged the value of at least some of Tinto's central constructs and propositions (e.g., Hurtado & Carter, 1997; Rendón et al., 2000). While the debate on whether to revise or abandon Tinto's theory continues (Braxton et al., 2004), the theory maintains a central role in the field. At the same time, there has been no shortage of new ideas, and from the multiplicity of disciplinary perspectives, methodological approaches, and theoretical assumptions utilized to study college retention, understanding of why students leave and stay in college has steadily improved (Tinto, 2006). Newer models increasingly integrate findings from multiple perspectives and give more attention to the experiences of students from underrepresented populations (e.g., Perna & Thomas, 2008; Swail et al., 2003). None of these newer models, however, have yet to garner the same level of theoretical scrutiny and empirical testing as Tinto's model. Scholars will need to direct on new developments the same rigorous criticism they have directed on Tinto in order for the field to continue to advance.

Although many of the scholars who have challenged the underlying assumptions of traditional persistence models have advanced promising propositions and models as alternatives,

these assorted alternatives have remained largely disconnected and have rarely converged into integrated, comprehensive causal frameworks that can be submitted to rigorous empirical testing (Rendón, et al., 2000). Further, despite the steady improvement in knowledge about the student departure process, it is discouraging to observe that there has been little or no corresponding progress in actually reducing student departure or closing the racial and socioeconomic disparities in retention rates over the past 20 years, as noted in Chapter One. Translating theory into effective practice remains the most critical challenge. Given the lack of consideration of structural issues in most of the major persistence theories and the absence of any overall national gains in retention practice, researchers should give more attention to building theory by analyzing programs and institutions that have demonstrated success in improving retention and eliminating disparities between different student populations. While there are many sources of lists of effective retention programs (e.g., Braxton et al., 2004; Swail et al., 2003), these lists have more often been used as illustrations of successful implementation of existing theory, rather than as the basis for analysis and development of new theory. Put differently, the research community has traditionally assumed that theory should shape effective practice; this is perhaps a time for effective practice to shape theory.

This study attempts to take a small step in that direction by articulating a theory of change for a retention program that *has* demonstrated notable success in retaining and graduating underrepresented students. By integrating many of the theories and findings from the literature described here with some new concepts and propositions suggested by the program's design, the following section strives to offer an theoretical explanation of how and why the Act Six program is successful that will provide a rich foundation for further research and theory refinement. Among the new concepts explored below are the roles that *cohorts* and students' *sense of purpose* might play in increasing underrepresented students' retention and campus involvement.

CHAPTER THREE

THEORY OF CHANGE

The following theory of change for the Act Six program was developed using a modified version of the methodology described in the Aspen Institute's *The Community Builder's Approach to Theory of Change: A Practical Guide to Theory Development* (Anderson, n.d.). The process began with identifying the *long-term goals* for the program and then worked backward from those goals to develop a *pathway of change*, a visual representation of the prerequisite *short-term and intermediate outcomes* that must exist in chronological progression in order for the long-term goals to be accomplished. The pathway of change also illustrates the causal links that are hypothesized to exist between outcomes and that lead from the starting conditions to the long-term goals. Next, program *interventions* that are intended to facilitate the outcomes on the pathway of change were defined, depicting them with a letter in a hexagon at the appropriate locations on the pathway and distinguishing between interventions that are led by program staff (white), college staff (grey), or both (graduated). Links between outcomes that are facilitated by intervention are illustrated with dotted lines, while those that are likely to occur naturally without intervention are shown as solid lines. Finally, basic *assumptions* and propositions were articulated about why each outcome is necessary in the pathway and about how prerequisite outcomes in conjunction with the associated interventions are sufficient to bring about that particular outcome. Many, but not all, of the assumptions are supported by existing theories and findings from the literature. Some propositions represent new applications of existing theories or findings. Others are informed by the author's professional experience and extensive conversations with urban college students over the years. Each presents an opportunity for empirical testing in future research on the program. Outcome definitions and accompanying

assumptions are referenced with a number in a circle on each outcome in the pathway diagram.

The resulting theory of change presented in Figure 1 and described in detail below is somewhat extensive, involving 24 interventions and 40 outcomes grouped in four phases. The precollege phase includes four interventions and four outcomes associated with the Act Six recruitment and selection processes, along with six interventions and nine outcomes associated with the training program where the largest portion of student preparation and skill development is addressed. The seven bridging outcomes and associated intervention deal with students' knowledge, perceptions, and resources that are influenced by the outcomes of precollege training and that continue to evolve and shape their experience throughout college. The 12 campus outcomes and eight associated interventions deal with students' experience and involvement on campus as they relate to persistence and completion, but also to the larger goals of institutional and community transformation. Finally, the eight long-term goals and four post-college interventions address the three major objectives of the program: student degree attainment and post-graduation leadership, community renewal, and institutional transformation.

Description of Interventions, Outcomes, and Assumptions

What follows are descriptions of each of the interventions, represented by letters, interspersed among descriptions of the numbered outcomes shown in the pathway of change in Figure 1. Each outcome is accompanied by assumptions and propositions about why each outcome is important and how it may be causally related to other outcomes as indicated by the links on the pathway diagram. Interventions that appear in multiple places on the pathway are only described once in the list below, when they first appear.

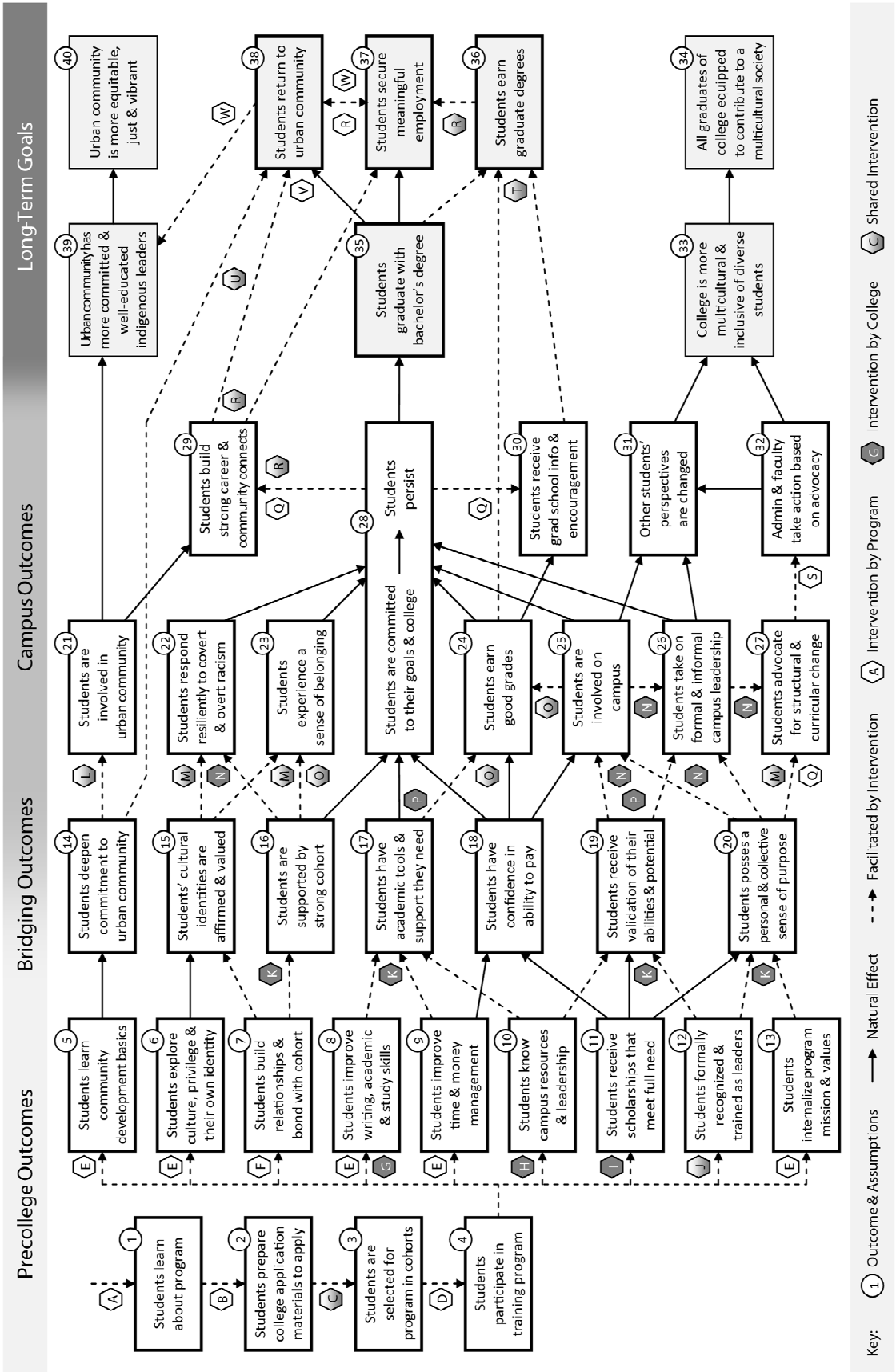

Figure 1. Act Six Theory of Change

A. Program staff leverage school and community networks to promote the program and actively recruit applicants in target communities.

1. **Students learn about the program.** There are large numbers of low-income, ethnically and racially diverse students in underserved urban communities with tremendous potential for leadership and academic success in college. By leveraging local networks, partner colleges build relationships with urban communities where they have not historically had a presence.

B. Program staff provide application workshops for students and support school and community staff assisting students in the application process.

2. **Students prepare college application materials to apply.** In completing by early fall an extensive application for the program that includes application to partner colleges, students gather all of the materials necessary to apply to other colleges and scholarships. As a result, a larger number of underrepresented urban students (including the majority of applicants who will not be selected for the program) increase their likelihood of being admitted to college and receiving other scholarships. Many applicants who are not selected for the program will be admitted and enroll at partner colleges with regular financial aid.

C. Program and college staff implement a three-phase selection process utilizing community-based selection committees, an interactive assessment event, and a multi-day campus visit.

3. **Students are selected for the program in cohorts.** Primarily because of the high financial cost of the program, the number of participants is limited and selection is therefore highly competitive. The three-stage process is multifaceted, includes extended personal interaction, and is purposeful in utilizing a range of noncognitive variables (Sedlacek, 2004) in addition to traditional measures of GPA and test scores to identify high potential urban leaders. At the conclusion, diverse cohorts of underrepresented urban students are selected for each school. Selected students can articulate a personal vision that aligns with the values and mission of the program and are judged to be able to succeed academically with program

support.

D. Program staff coordinate a seven-month training program with regular weekly meetings, weekend retreats, an extended campus visit, and a week-long summer wilderness expedition.

4. **Students participate in training program.** When students are selected for the program, they commit to an intensive seven month training program in the year prior to college. Through the training program and its accompanying curriculum, students build a wide range of knowledge, skills, and relationships that prepare them for successful leadership in college and beyond.

E. Program staff deliver curriculum via training sessions, readings, and homework assignments.

5. **Students learn community development basics.** By studying basic community development principles and examining their urban neighborhoods in new ways, students better understand the strengths and struggles of their communities and deepen a love for and commitment to them.

6. **Students explore culture, privilege, and their own identity.** By studying culture, race, and privilege and actively exploring the multiple dimensions of their own and others' identities, students increase their cultural competence, are more able to affirm their own and others' cultures, and better understand the dynamics of a predominantly White campus environment (Kuh & Love, 2000; Tierney, 2000). Students learn that they can successfully navigate a new culture without abandoning their own (see *biculturalism* in Rendón, et al., 2000, and Valentine, 1971).

F. Program staff facilitate personal story sharing sessions, community building activities, and social activities for cadres.

7. **Students build relationships and bond with their cohort.** By investing in long-term intentional relationships with a small group of peers, students build a family-like support system that provides encouragement, motivation, and accountability throughout and even

beyond the college experience.

G. College faculty provide writing instruction and grade writing assignments from training.

8. **Students improve their writing, academic, and study skills.** By learning and practicing new study strategies and working to improve their writing skills, students better prepare themselves for the rigorous academic demands of a liberal arts curriculum.
9. **Students improve their time and money management skills.** In college students have much more autonomy in the use of their time and money than in high school. By developing strategies to effectively manage these two important resources, students can avoid common pitfalls that contribute to academic and financial stress.

H. College and program staff host campus visits that include resource orientations and meetings with faculty, administration, and student leaders.

10. **Students know campus resources and leadership.** By spending extended time on the college campus before they matriculate and by being introduced to campus resources (e.g., tutoring, writing center, diversity center) students increase their familiarity with the campus and its norms, building their support network and decreasing the stress of their initial transition to college (see *cognitive maps* and *anticipatory socialization* in Attinasi, 1989, and *proactive social adjustment* in Braxton et al., 2004). By meeting with campus leadership (e.g.., administration, faculty, student government) they receive validation of their leadership potential.

I. Colleges provide scholarships, leveraging government and private grant funds to meet full demonstrated need with no loans and limited work study.

11. **Students receive scholarships that meet full need.** By receiving scholarships that meet all of their demonstrated need, students do not need to work long hours, avoid the burden of excessive debt, and can be confident in their ability to cover their costs. Receipt of the highly competitive scholarship also validates their leadership potential and contributes to

their sense of purpose.

J. Program and college staff publicize scholarship recipients and host public community and campus events recognizing and celebrating the leadership and achievement of students.

12. **Students are formally recognized and trained as leaders.** By receiving formal public recognition of their leadership from the college and the community, students' abilities and potential are validated. Students begin to develop a sense of purpose for their college participation that goes beyond their own individual attainment.
13. **Students internalize the program's mission and values.** By continual exposure to the program's values of vision, service, leadership, diversity, community, preparation, and transformation, students internalize a mission that places their leadership at the center of a strategy for creating more just and vibrant college campuses and urban communities. The primary result is a strong personal and collective sense of purpose.
14. **Students deepen their commitment to the urban community.** Students who recognize clearly both the assets and problems in their urban neighborhoods, but none-the-less have a deep love for and commitment to the community are more likely to remain involved during college and to bring their gifts back to their community after college. Love of and commitment to community can be nurtured through exposure to community development principles.
15. **Students' cultural identities are affirmed and valued.** Underrepresented students who possess a strong, positive cultural identity that is affirmed by others are better equipped to navigate the cross-cultural experience of attending an affluent predominantly White college (see *cultural integrity* in Tierney, 1999, 2000). They are more likely to show resilience in response to racism and experience a sense of belonging on the college campus. Cultural identity can be affirmed through intercultural training and through close relationships with culturally competent peers.

K. College staff conduct a weekly first semester seminar for the cohort with emphasis on utilizing campus resources, studying leadership theories, and team building.

16. **Students are supported by a strong cohort.** The strong personal and social support of a close group of peers who know, trust, and understand each other provides students with a built-in support system on campus. A cohort increases resilience to racism and sense of belonging by serving as a social enclave even as it provides a source of encouragement to engage the broader campus (see *communal potential* in Braxton, et al., 2004; *social enclaves* in Kuh & Love, 2000; and the value of segregated grouping in Tatum, 2003, Chapter 4). Strong cohorts require intentional relationship development and need ongoing effort and attention to maintain, but promote higher retention.
17. **Students have the academic tools and support they need.** Even for the best students, the academic transition from high school to college can be difficult. Precollege training and skill development in writing, study strategies, and time management can equip students to be more successful in the classroom. Awareness of campus academic resources (e.g., tutoring, writing center, study groups) adds to students' support system, resulting in better grades and increased retention.
18. **Students have confidence in their ability to pay.** When students receive scholarships that fully meet need and develop effective money management skills, they are freed from worrying about how to pay for college and they do not need to work long hours. With confidence in their ability to cover costs, they more likely to persist (see *ability to pay* in Braxton et al., 2004, and Cabrera, et al., 1990) and can give more time and energy to their studies and involvement on campus.
19. **Students receive validation of their abilities and potential.** When underrepresented students receive validation of their abilities and potential from people in authority, they are empowered to get involved and assume leadership on campus and in the classroom (Rendón,

1994). Receiving a competitive scholarship, being officially recognized as a leader, and being introduced early on to campus leadership all produce validation in students that their contributions really are valued, combating the common feeling that they are guests in someone else's home (see McNairy, 1996, p. 7).

20. **Students posses a personal and collective sense of purpose.** When students possess a strong sense of personal and collective purpose, they believe that they are on campus for a reason, that they have something important and unique to contribute to improving the campus, and that they are part of something bigger than themselves. As a result they are more likely to get involved, to assume leadership, and to advocate for change. A sense of purpose emerges from formal recognition as a leader and is deepened through training as students internalize program values that emphasize their crucial role in leading change.

L. Program and college staff facilitate students' connections with the urban community.

21. **Students are involved in the urban community.** Getting involved in the urban community during college (e.g., volunteering, service learning, participation in religious or cultural groups, work study) is one result of students' commitment to urban communities and contributes to the vibrancy of the community. It also builds connections that can lead to internships and other career opportunities for students. Maintaining connections outside the college community increases sense of belonging and persistence for students of color at predominantly White universities (Hurtado & Carter, 1997).

M. Program and college staff encourage regular cohort-initiated meetings after first semester, and continue to meet with each cohort once per semester and as needed in response to issues.

N. College staff meet individually with each student each semester and as needed for individual coaching and support.

22. **Students respond resiliently to covert and overt racism.** Racism, in both its covert and overt forms, is a reality for students of color at predominantly White colleges (Nora &

Cabrera, 1996). When students are confident in their own identity, experience affirmation of that identity from others, and are supported by a strong peer group that understands the realities of racism, they are more likely to respond in resilient, productive ways (Tatum, 2003). As a result, students are less likely to become disillusioned and angry with their college and are more likely to persist.

O. Program and college staff monitor grades, social satisfaction, and campus involvement, meeting personally with struggling students and connecting them to needed resources.

23. **Students experience a sense of belonging.** When students perceive that they belong on campus, they are more likely to persist. Being a member of a close cohort of peers, they are more likely to experience this sense of belonging (Hurtado & Carter, 1997). Feeling that their own culture is being affirmed and valued also contributes to belonging. Sense of belonging leads to heightened commitment to the college and to persistence.

P. College staff match students with individual faculty mentors who meet regularly with students to provide encouragement and to support students' academic progress.

24. **Students earn good grades.** Earning good grades is important for persisting in college and is prerequisite for gaining admission to graduate school. When students have the academic tools and support that they need and are free from financial concerns, they are more likely to earn good grades (Cabrera, Nora, & Castañeda, 1993).

25. **Students are involved on campus.** When students get involved on campus, they experience more learning and personal development and are more likely to persist (Astin, 1984; Tinto, 1993). Involvement also opens the door to campus leadership and provides opportunities for influential interactions with other students. Involvement is more likely to occur when students are free from financial concerns and the need to work long hours, are validated in their contributions, and have a strong sense of purpose for being on campus. However, the kinds of involvement that matter most for underrepresented students may be different than

dominant culture students (Hurtado & Carter, 1997).

26. **Students take on formal and informal campus leadership.** Participation in formal and informal campus leadership takes involvement to the next level and demonstrates that students have something important to offer to, not just receive from, the campus. Leadership makes students more invested in the campus and improves persistence. It also provides opportunity for powerful engagement with other students, faculty, and administrators. Entry into leadership can be more challenging for underrepresented students, but they are more likely to participate when their abilities and potential are validated and they perceive a strong personal sense of purpose.

Q. Program staff host network-wide convention every other summer featuring encouraging and challenging speakers and workshops, as well as a career and graduate school fair.

27. **Students advocate for structural and curricular changes.** When underrepresented students are strongly committed to making the campus better, they can utilize their formal and informal leadership roles to advocate for change in campus programs, policies, and curriculum based on the challenges they have faced in their personal and collective experience.

28. **Students are committed to their goals and college. Students persist.** Persisting in college is an obvious prerequisite for graduation and the most pivotal outcome of the program. Students are more likely to persist when they are committed to their college and to earning a degree (Tinto, 1993). Of the many factors that affect persistence, some directly influence persistence, some influence persistence by increasing commitment, and others do both (Bean & Eaton, 2000; Cabrera, Castañeda, et al., 1992).

R. Program and college staff build relationships with employers, connecting students with internships, employment, and service opportunities.

29. **Students build strong career and community connections.** Students who build strong

career and community connections and participate in internships or volunteer experiences are more likely to find meaningful employment and return home after graduation. Community involvement during college often facilitates these opportunities.

30. **Students receive graduate school information and encouragement.** Exposure to graduate school and access to reliable information and resources early on in college is particularly important for underrepresented students and improves their attendance rates. Students with good grades are more likely to receive graduate school encouragement and information from faculty.
31. **Other students' perspectives are changed.** Personal interaction with peers that come from different backgrounds is one of the most effective means of confronting stereotypes and overcoming prejudices. When other students interact with participants informally (e.g., classroom, residence halls, dining hall) or through participants' formal leadership roles, their perspectives change and are broadened (Smith & Schonfeld, 2000). Administration and faculty also shape students' perspectives as they implement curricular and structural change in response to participants' advocacy.

S. Program and college staff support and advocate for students with faculty and administration as problems arise or students suggest changes in programs and curriculum.

32. **Administration and faculty take action based on student advocacy.** Well-trained and well-supported student leaders from underrepresented groups, speaking from their personal and collective experience, can be highly effective in identifying and advocating for needed changes in campus programs, policy, and curriculum. Administration and faculty action in response to this advocacy can produce important change that directly influences students and improves the campus environment.
33. **College is more multicultural and inclusive of diverse students.** College campuses that are more multicultural and inclusive of people from all backgrounds experience more equitable

outcomes across student populations and better prepare all students for a rapidly diversifying society and global economy (Shaw, 2005). The failure of institutions to commit the necessary resources to becoming more multicultural is a critical source of the disparity in retention rates across difference student populations (McNairy, 1996). Broadened perspectives among the student body as well as curricular and structural change from the faculty and administration contribute to this kind of environment, but must be accompanied by institution-wide efforts to fundamentally change the way the institution operates.

34. **All graduates of college are equipped to contribute to a multicultural society.** The United States is rapidly diversifying. To remain relevant, colleges must equip all of their graduates to navigate and contribute to a multicultural society and global economy.
35. **Students graduate with bachelor's degrees.** Earning a bachelor's degree is not only the goal of undergraduate college attendance, but is also essential to increasing the likelihood of finding meaningful employment.

T. Program and college staff provide encouragement for graduate school attendance, write recommendations to support students' applications, and help identify financial aid.

36. **Students earn graduate degrees.** Graduate degrees increase options for meaningful work and opportunities for career and community leadership. Good undergraduate grades and access to information and resources are prerequisites of graduate school enrollment.
37. **Students secure meaningful employment.** Finding meaningful employment is critical to financial stability and contentment for individuals and families. It also increases the ability of students to influence change via career or volunteer service. A college degree along with career and community connections facilitate securing a good job. A graduate degree further increases employment options.

U. Program and college staff host senior capstone experience on campus and in the community to guide students in reflecting on their college experience and preparing for graduation.

V. Program staff create opportunities for a post-graduation year of service in the community.

38. **Students return to the community.** Young leaders are more likely to return to their home community when they are committed to it and are able to utilize their college degree to find meaningful employment or service opportunities through strong community connections.

W. Program staff resource and support an alumni association, facilitating networking and hosting an annual alumni retreat.

39. **Urban community has more committed and well-educated indigenous leaders.** Urban communities need more well-educated, committed, and highly-engaged indigenous leaders in order to become more just and vibrant places. College students and graduates who grew up in the community are an important source of this kind of leadership.

40. **Urban community is more equitable, just, and vibrant.** Historically marginalized urban communities have both tremendous assets and deeply rooted problems. They need social, economic, educational, political, and spiritual renewal to reach their potential as thriving communities for all residents. Many of the needed resources, including the next generation of leaders, already exist within these communities (Kretzmann & McKnight, 1993).

Utilizing and Testing the Theory

Rather than a final product, the theory of change articulated here is a starting place. While the documented success of Posse and Act Six (Schultz et al., 2008) have demonstrated that these programs can produce high levels of college completion and campus engagement among underrepresented populations, the theory of change presented here proposes an initial model of how and why those results come to be. It provides fertile ground for empirical testing of its assumptions and for future refinement of both theory and program design. By more accurately mapping and testing the causal pathways underlying the program, we provide not only a better understanding of how the program currently works, but also a launch point for innovation. Which interventions are most essential to the program's long-term goals? What is

likely to be the result of eliminating one or more of the program components? Are there interventions missing from the program that could further increase its impact? How might the program be adapted to other contexts, or scaled to address more students? The theory of change presented here provides a helpful foundation for answering these and other important questions.

However, before answering these questions, before probing and testing internal components of the theory, it is important to first establish the collective impact of the interventions. While the theory of change situates student persistence and graduation among long-term goals of transformation of college campuses and urban communities, measuring progress toward these larger, long-term goals is a complex, challenging, and lengthy endeavor outside the scope of this dissertation. On the other hand, all of the campus and community outcomes in the theory of change are dependent on students persisting on campus. Students cannot take on leadership, advocate for change, or influence others' perspectives if they drop out. And although it is not necessary for students to earn a bachelor's degree to find meaningful work or to contribute to community change, an underlying conviction in the program is that earning a degree enhances students' effectiveness in both. For these reasons, this study will focus on outcomes of persistence and graduation (outcomes 28 and 35 in the theory of change). Specifically, do the interventions, taken together, cause significantly higher college retention and graduation for program participants? Gathering evidence to answer that question is the primary purpose of this study, and the objective of the research design described in the next chapter.

CHAPTER FOUR

STUDY DESIGN AND METHODOLOGY

In its simplest form, the objective of this study was to establish whether the Act Six program interventions collectively cause an increase in persistence and graduation for participants. Program data currently show high levels of persistence for participants, but the counterfactual is missing; the level of persistence and graduation the same participants would have experienced without the program interventions cannot be known. The task was, therefore, to establish the program interventions as the cause and an increase in persistence and graduation as the effect. Shadish, Cook, and Campbell (2002) evoke a classic definition that suggests such a relationship exists when "(1) the cause preceded the effect, (2) the cause was related to the effect, and (3) we can find no plausible alternative explanation for the effect other than the cause" (p. 6). The clearest and most compelling way to demonstrate achievement of these criteria is through the use of a randomized experiment. In any experiment, a treatment (or cause) is intentionally introduced and manipulated by the researcher, who later observes its effect on outcomes. In a randomized experiment the treatment is assigned to experimental units by chance, creating groups that are on average probabilistically similar to each other on both observable and unobservable characteristics. If a difference in outcomes is observed between the groups after treatment, then that difference can be attributed to the treatment because there were no systematic differences between the groups other than the treatment (Shadish et al., 2002, p. 13). In the case of a full implementation of the Act Six program, the random assignment of students to treatment is neither feasible nor desirable. Because the program's full scholarships represent a substantial financial investment for partner colleges, colleges are unwilling to assign those scholarships to students randomly. Indeed, a stated goal of the program is to identify and

select high potential students possessing characteristics that are assumed to be strongly associated with the outcome of college persistence. As a result, within the pool of program applicants, the treated group (selected students) is known to be different from untreated groups (nonselected students) on many measured characteristics and is likely different on important unmeasured characteristics as well. Even if a study were to observe better outcomes for program participants than for nonparticipants, it would be difficult to establish whether those better outcomes for participants are a result of the program interventions or of intended and unintended selection bias. Without the ability to utilize random assignment, other techniques are required to rule out plausible alternative explanations for any observed effects.

Quasi-experiments are a family of research techniques that are similar to experiments but do not employ random assignment of treatments to units. Shadish, et al. (2002) emphasize that quasi-experiments require alternatives to randomization in order to make explanations other than the effect of the treatment implausible; researchers must carefully identify and study the potential threats to internal validity, incorporating prestudy design elements to minimize those threats and poststudy statistical adjustments to correct for the threats' influence on effect estimates (p. 105). Two tools that are particularly important in quasi-experiments are pretests and comparison groups. Because there are no pretests for college persistence, comparison groups become the primary tool available in the attempt to establish causality of the Act Six program. The goal is to identify a comparison group that is as similar to the program participants group as possible on variables that are correlated with the outcomes of college retention and graduation.

Matching is one technique often utilized to improve the similarity of groups, particularly when a potential comparison group is substantially larger than the treatment group. By selecting from the full comparison group a subsample of individuals that match individuals in the treatment group on important covariates, researchers can establish a stronger case that the treatment explains any observed difference in outcomes. The problem with traditional matching

(and stratification) techniques is that they are generally limited to considering a small number of covariates. Propensity score matching (PSM) is an increasingly popular technique that provides a method to summarize a potentially large number of covariates into a single scalar propensity score that can be used to match treatment and comparison subjects. Propensity scores are defined as the likelihood that a subject would have been selected for treatment based on covariate values. When a subject from the treatment group is matched with a subject from the comparison group with a similar propensity score, one can (because the subjects had the same chance of being treated) act as though the assignment to groups was random. Briefly, the steps of PSM involve: (1) selecting covariates that are likely to affect the dependent variable and examining bivariate differences between the treatment and control groups on these variables, (2) estimating propensity scores for each subject by using probabilities generated from logistic regression with a set of the covariates as predictor variables and receipt of treatment as the dependent variable, (3) matching subjects from each group based on propensity scores using one of a variety of matching techniques, (4) assessing the quality of the matching by testing bivariate group differences on each covariate, and (5) analyzing the treatment effect using appropriate multivariate statistical techniques. Examples of studies that utilized PSM techniques in similar situations include Melguizo's (2010) study of the effects of institutional quality on retention of high achieving students of color and a Barth, Greeson, Guo and Green (2007) study comparing outcomes for behaviorally troubled children receiving two different treatment routines.

It is critical to point out that PSM can only adjust for overt bias that arises from measured covariates; it cannot reduce hidden bias that arises from group differences in unobserved covariates. Given the nature of the Act Six selection process, these unobserved differences are almost certainly present between selected and nonselected applicants, so while PSM can be utilized to generate comparison groups more similar on all measured characteristics and thereby strengthen the argument for cause, it cannot completely eliminate selection bias. There are

techniques known as *sensitivity analysis* that can begin to address this fundamental problem by quantifying how much hidden bias would need to be present in order to alter the conclusion of the study. These techniques are, however, complex and computationally intensive and there is limited software available to carry them out. The author was not able to locate appropriate software to apply follow-up sensitivity analysis to results from the specific analyses used in this study, so the potential effects of unmeasured selection bias remain unquantified.

In summary, quasi-experimental techniques utilizing PSM can strengthen the ability of a study to establish causality for the interventions of the Act Six program by correcting for the influence of overt biases and providing stronger arguments against the plausibility of alternative explanations for any observed effects. Short of a randomized experiment, these techniques can never completely remove the possibility that hidden, unmeasured selection biases contribute to any detected effects. As mentioned earlier, it is important to remember that selection bias is actually an intentional and desirable part of the program design (the program assumes it uses an effective process to identify and select underrepresented leaders who are likely to persist and succeed in college). In the end, this study can therefore be conceived as an attempt to discover how much of the program's effect is attributable to the selection process and how much is attributable to the interventions.

Design and Subjects

This study compared the college retention and graduation of Act Six participants with a comparison group consisting of participants in the College Success Foundation (CSF) Washington State Achiever (WSA) program who receive substantial financial and programmatic support for college, but at a less extensive level than Act Six participants.

Act Six Treatment Sample

The primary focus of the study was 180 students in 20 cohorts from 61 high schools across three metro areas who were selected as Act Six participants in the first eight years of the

program and who enrolled at one of six private, residential, predominantly White, religiously-affiliated liberal arts Act Six partner colleges in Washington and Oregon between 2003 and 2010. Sixty-four participants from the 2011 Act Six class currently enrolled in their first year of college were not included in the study because they had not been enrolled long enough to measure persistence to second year. An additional 10 students concurrently enrolled at both a four-year partner college and a community college through a modified version of the program were also excluded because that program deviates in important ways from the core Act Six model.

WSA Comparison Sample

The WSA program provides substantial financial and programmatic support to diverse, low-income students from 16 Washington high schools. From 2001 through 2010, the WSA program selected more than 5,000 racially diverse, low-income students in 10 cohorts. In addition to supplying four-year scholarships worth up to $10,000 per year, the program provides participants with high school-based college advising, individual hometown and college-based mentors, and a four-day summer college preparation workshop. Participants are selected through an extensive, moderately selective application process in their junior year of high school that involves both written and interactive components and places emphasis on Sedlacek's (2004) noncognitive measures over traditional academic preparation measures. Once selected, students receive advising from paid CSF staff and individual mentoring support from volunteer community mentors through the second half of their junior year and throughout their senior year of high school. In the summer before their senior year, WSA students attend the Achievers College Experience (ACE), a four-day college preparation workshop on a college campus. Participants may utilize WSA scholarship funding at any accredited two- or four-year college in Washington until they have earned at least two years of college credit, at which point they are eligible to use the scholarship funding at any accredited college in the country. The program

design calls for colleges to assign campus mentors to every student once they enroll, although the extent to which this intervention is implemented in practice has varied across campuses and for students from different demographics (Hu, 2009). Numerous studies have found that WSA students experience higher college enrollment, persistence, and graduation rates than national averages (e.g., Institute for Higher Education Policy (IHEP), 2010; Pell Institute for the Study of Opportunity in Higher Education, 2006).

This study examined a subset of WSA participants, utilizing propensity score techniques to select from this group a matched sample of participants comparable to Act Six participants on a set of available covariates believed to influence college persistence. The matched WSA sample provided a helpful comparison group for Act Six participants because it represented a group of students who had similar background characteristics, were chosen through a similar but less competitive selection process, and who received a slightly lower level of financial and programmatic support.

The original WSA sample included 1,887 students from five program classes who first enrolled at one of 17 four-year, residential Washington colleges in the fall immediately following their high school graduation between 2004 and 2010. Participants from the first three cohort years from 2001 to 2003 were not included because important elements of the WSA program model were still being developed and because data for those classes were less complete. In addition, participants from the 2005 class were not included because high school grade point average (GPA) data were not available for those students. Participants who first attended commuter-only campuses, arts colleges, or colleges that ceased operations during the period under study were also excluded. Finally, 24 students with inconsistent or incorrectly coded financial aid, high school, or GPA data were excluded.

Of the 180 students in the Act Six sample, 40 were also WSA participants. Because Act Six provides more competitive selection and more extensive financial and programmatic support

that in many ways builds on to the WSA support, these students were not included in the WSA sample and were treated only as part of the Act Six sample, where they were eligible to be matched with non-Act Six WSA participants. These 40 dual participants with data from both programs also provided an opportunity to explore potential correspondence between different noncognitive selection measures used by the Act Six and WSA programs to assess potential for college success.

Procedure

A five-step procedure was utilized to evaluate the differential effects of the Act Six interventions in comparison with the WSA program. The study:

(1) Collected and screened covariates that were likely to be associated with college retention and graduation and examined the bivariate differences between the primary treatment group (Act Six) and comparison group (WSA) on these measures. The complete variable set is described in detail in the *Data Collection and Measures* section and summarized in Table 1.

(2) Estimated propensity scores for each subject by using probabilities generated from logistic regression with a set of the covariates as independent variables and participation in Act Six as the dependent variable. Two sets of estimated propensity scores were generated, one from a regression using all students together and another by combining the separate regressions for each class of students.

(3) Created matched samples pairing students from each group with similar propensity scores. After evaluating the region of common support in the distributions of propensity scores for each group, a variety of matching algorithms were considered. One-to-one nearest neighbor matching within a caliper without replacement was selected, in part because it allowed for traditional multivariate analysis techniques to be utilized in Step 5 (Guo & Fraser, 2009). Two caliper sizes were used with each of the two propensity score sets to create four matching schemes.

(4) Compared the quality of the four matching schemes by testing bivariate group differences between the Act Six and WSA groups on each covariate to determine the extent to which each matching scheme was able to eliminate significant differences between the two groups. One matching scheme was selected and used for the final outcome analyses.

(5) Used the balanced matched sample from the previous step to assess the effect of Act Six program participation versus WSA participation on retention and graduation outcomes using multivariate statistical techniques described in the *Analysis* section below.

Data Collection and Measures

As a retrospective observational study, all data for the evaluation already existed in program records and were provided to the author by NLF and CSF, stripped of any identifying information. The following sections describe in detail the variables that were collected and utilized in the study. Table 1 provides a summary of descriptive statistics for each variable for Act Six and WSA samples, along with *p*-values from bivariate *t*-tests assessing differences between the two groups.

Table 1

Descriptive Statistics of Complete Variable Set for Act Six and WSA Samples

Variable	Act Six	WSA	*t* Test *p*
N	180	1,887	
Class (CLASS)			
2003	11	0	
2004	11	307	
2005	9	0	
2006	10	317	
2007	19	343	
2008	25	290	
2009	51	321	
2010	44	309	
Demographic			
Gender			
Female (FEMALE)	.583	.602	.638
Race			
Asian or Pacific Islander (RACEA)	.211	.236	.441
African American or Black (RACEB)	**.417**	**.210**	**< .001**
Hispanic or Latino (RACEH)	.300	.235	.068
American Indian or Alaskan Native (RACEN)	**.072**	**.030**	**.035**
White (RACEW)	**.228**	**.373**	**< .001**
Other or unknown (RACEU)	.011	.014	.700
Two or more races (RACEM)	**.222**	**.090**	**< .001**
Black, Hispanic, or American Indian (RACEBHN)	**.722**	**.454**	**< .001**
Academic preparation			
High school GPA (HSGPA)	3.37	3.33	.228
High school GPA, from transcript (HSGPAFINAL)[a]	**3.37**	**3.29**	**.036**
High school rank (HSRANK)	**2.99**	**2.11**	**< .001**
Noncognitive selection measures			
Act Six application reader score (ASREADSCORE)[b]	3.41		
WSA application reader score (WSAREADSCORE)[c]	28.09	27.12	
WSA BDI assessment score (WSABDISCORE)[c]	29.85	28.02	

Note. Significant differences, p < .05, are in boldface. [a]Transcript GPA available for all *n* = 180 Act Six students and only *n* = 717 WSA students. [b]Scores available for *n* = 140 WA Act Six students only. [c]Scores shown for *n* = 34 Act Six students with WSA scores.

Table 1 (continued)

Descriptive Statistics of Complete Variable Set for Act Six and WSA Samples

Variable	Act Six	WSA	*t* Test *p*
First year financial			
Expected family contribution, amount (EFC)	**4,799**	**2,050**	**< .001**
Expected family contribution, bin 0-3 (EFCBIN)	**1.32**	**0.91**	**< .001**
Need, amount (NEED)	**31,527**	**21,093**	**< .001**
Need, bin 0-3 (NEEDBIN)	**1.97**	**1.25**	**< .001**
Need met with grant, percent (NEEDMET)	**107.1**	**90.2**	**< .001**
Need met with grant, bin 0-4 (NEEDMETBIN)	**2.46**	**2.00**	**< .001**
Loan, amount (LOAN)	1,188	1,474	.076
Loan, bin 0-3 (LOANBIN)	0.69	0.85	.056
Work study offered (WORKSTUDY)	**.511**	**.264**	**< .001**
First college characteristics			
College type[d]			**< .001**
Private religious (FCRELIGIOUS)	**1.000**	**.234**	
Private secular (FCSECULAR)	**.000**	**.032**	
Public (FCPUBLIC)	**.000**	**.734**	
Students to faculty ratio (FCSTF)	**11.8**	**16.1**	**< .001**
Incoming high school GPA, mean (FCHSGPA)	**3.62**	**3.48**	**< .001**
Incoming SAT CR+M, 75th percentile (FCSATCRM75)	**1,256**	**1,228**	**< .001**
US News diversity index (FCDIVERSITY)	**0.29**	**0.43**	**< .001**
Same race as student, percent (FCRACEMATCH)	**10.7**	**27.2**	**< .001**
Retention to year two, percent (FCRETAINYR2)	84.3	83.7	.140
Six-year graduation, percent (FCGRADIN6)	68.7	67.5	.064
Six-year grad for student's race, percent (FCGRADIN6MATCH)	60.7	63.9	.071
Persistence and graduation			
Persisted to year two at first college (PERSISTYR2FIRST)	**.939**	**.812**	**< .001**
n at least two years since enrollment	180	1887	
Graduated within four years at first college (GRADIN4FIRST)	**.733**	**.262**	**< .001**
n at least four years since enrollment	60	967	
Graduated within six years at first college (GRADIN6FIRST)	**.936**	**.599**	**< .001**
n at least six years since enrollment	31	307	

Note. Significant differences, $p < .05$, are in boldface. [d]Difference assessed with Pearson's χ^2 test.

Dependent Variables

A dichotomous variable, *persistence to year two at first college,* was calculated as an initial measure of persistence, coded as 1 for students who reenrolled at their first college for the fall or winter of their second year and 0 for those who were not enrolled or who were enrolled at a college other than their first. This measure provided a point-in-time measure of persistent that proved useful for descriptive comparisons of various groups. However, because college departure occurs along a time continuum and the point along the college journey at which a student leaves college is of interest, the study examined differences in retention patterns over the first four years of college between Act Six and WSA using survival analysis techniques. To do so, two closely related variables were calculated: *persistence status at first college* and *persistence time at first college.* The first, persistence status, a dichotomous variable, was assigned a value of 0 if students, over four years, failed to enroll at their initial college for at least half of one year (i.e., missed both fall *and* winter terms, or missed both spring *and* summer terms)[1], and a value of 1 in all other cases. The second, persistence time, measured to the nearest half year the number of years until students failed for the first time to enroll at their initial college, and could be right-censored in three situations: (a) students were still enrolled when the last enrollment data for the study was collected in fall 2011, in which case they were assigned a value equal to the number of years they had been enrolled, including a half year for fall 2011, (b) students were still enrolled at the start of their fifth year, in which case they were assigned a value of 4.5, or (c) students graduated within four years before any departures, in which case they were treated as having never departed and assigned a value of 4.5, even if they graduated in less than four years. The survival analysis techniques used in the analysis are designed specifically for this kind of data and to accommodate censoring.

[1] Reducing enrollment to half years was necessary to accommodate differences in semester and quarter schedules at different colleges.

Two dichotomous variables were calculated to measure graduation outcomes at the first college students attended: *graduated within four years at first college*, and *graduated within six years at first college*, with a value of 1 indicating that a student earned a bachelor's degree in the respective timeframe, and 0 indicating that a bachelor's degree had not been earned. Both measures were also calculated for graduation from any college, as these are likely more important measures from the student's perspective. However, because persistence and graduation at the specific colleges to which participants are selected are requisite to the Act Six program's long-term goals for institutional change, and because students are not allowed to transfer colleges under Act Six, this study only analyzed persistence and graduation outcomes at the first college.[2] These two dichotomous outcomes were best-suited for multivariate analysis using logistic regression. However, because they require that students have been enrolled a minimum of four and six years, respectively, prior to fall 2011, the analyses were limited to students in the 2003 through 2007 classes (n = 60 for Act Six, n = 967 for WSA) for graduation within four years and the 2003 through 2005 classes (n = 31 for Act Six, n = 307 for WSA) for graduation within six years.

These four variables were calculated after first compiling enrollment patterns for each student from raw data supplied by NLF and CSF. Act Six enrollment data was originally recorded by NLF staff from transcripts and enrollment records supplied each term directly by partner colleges. For students who departed the program, NLF obtained subsequent enrollment data by querying the National Student Clearinghouse database. CSF did not collect enrollment records from colleges, but instead tracked its disbursements of scholarship funds for each student by term. This study therefore used scholarship disbursement as a proxy for enrollment for WSA

[2] The discrepancy between graduation rates at first and at any institution is not large in the sample. Only 34 of the 451 WSA college graduates in the study (7.5%) graduated from a college other than their first college.

students, based on the assumption that it is unlikely that students who are enrolled and eligible for scholarship funds would not take advantage of those funds (CSF provides a minimum award for every participant, even if students no longer demonstrate financial need). CSF staff confirm that while the direct relationship between CSF and college financial aid offices prevents funds from being distributed for students who were not in fact enrolled in college, it is theoretically possible that in a small number of cases, students who did not receive funds remained enrolled and were therefore incorrectly coded for this study (S. Thorndill, personal communication, April 4, 2012).

Independent Variable

The independent variable in the final analyses is *Act Six participation*, a dichotomous variable with Act Six participants coded as 1 and WSA participants coded as 0. Note that for the logistic regression analyses used to generate propensity scores, Act Six participation is treated as the dependent variable.

Covariates

The following variables were collected for use as covariates in an effort to identify and control for many of the factors that the literature suggests may influence college persistence and graduation. While the list is limited by the availability of common measures collected and recorded consistently across the two programs and important variables remain unobserved or unrecorded and therefore cannot be controlled for or balanced across groups, the variables described here represent important characteristics from multiple domains that provide a strong basis for balancing the two groups.

Demographic variables. Gender and race variables were originally collected by NLF and CSF from student program application data. In this study, *female* is a dichotomous variable coded 1 for female and 0 for male. The systems used by NLF and CSF to record race varied over time and with changes to federal IPEDS racial categories. For this study, race variables

from both programs were merged and recoded into seven dichotomous variables: *Asian or Pacific Islander*, *African American or Black*, *Hispanic or Latino*, *American Indian or Alaskan Native*, *White*, *other or unknown*, and *two or more races*. Membership in a racial group was coded as 1 in the corresponding variable, and non-membership as 0. Students with more than one racial group indicated in original data were coded 1 for two or more races and 1 for each corresponding racial variable. A small number of students who were recorded only as "multiracial" in original program data were coded 1 for two or more races and 1 for other or unknown. Due to analytical concerns about the number of variables relative to the number of cases, the variable *Black, Hispanic, or American Indian* was also created to collapse race into a single variable. These three racial groups were selected for consolidation because, as referenced in the introduction, national data show similar six-year graduation rates for students from these groups that are markedly lower than those for White and Asian students (NCES, 2011). Students were coded 1 for this variable if they belonged to at least one of African American or Black, Hispanic or Latino, American Indian or Alaskan Native, even if they also belonged to another racial group. In addition to gender and race, the Act Six data included a measure of first generation college status, but because a parallel measure was unavailable for WSA, it was discarded.

Academic preparation variables. Because the WSA program has never collected SAT or ACT scores and theses scores were optional for the first six classes of Act Six, *high school GPA* was used as the primary traditional measure of academic preparedness in this study. NLF obtained Act Six participants' cumulative GPA through junior year from high transcripts submitted as part of the program application in the fall of participants' senior year. For a small number of Act Six participants who applied to the program after graduating from high school, the recorded GPA may have reflected complete grades through senior year of high school, although this distinction was not noted in the program data provided. CSF recorded cumulative

GPA through sophomore year as self-reported by participants on program applications in fall of their junior year. As mentioned previously, GPA data was not provided for the 2005 WSA class and these students were therefore excluded from the sample. In addition to the self-reported GPA data provided by CSF, the BERC Group, an independent research organization, provided high school GPA data recorded from final transcripts obtained directly from school districts for 717 of the WSA participants included in the study. While these transcript data were not complete enough to replace the self-reported data in the analysis as originally hoped, examination of the differences between final transcript GPA and self-reported GPA for students in the subsample with both scores showed those differences to be approximately normally distributed, M = 0.06, SE = 0.01, with a 95% confidence interval for the mean difference of the full sample ranging from 0.04 to 0.08, $t(716) = 6.11$, suggesting that the self-reported scores may be only slightly biased estimators of the final transcript GPA, centered just higher than actual values. There was, however, nontrivial error in the scores, with approximately 20% of self-reported scores more than 0.27 points from the final transcript value. While this error introduces more uncertainty into the analysis, the low estimated level of bias in the measure, the lack of alternative measures, and the critical need to balance students on academic preparation justify the inclusion of a single measure that merged Act Six transcript and WSA self-reported GPA values. The distribution of this variable revealed a left skew that was improved through a reflection and natural log transformation used in the analysis.

In addition to students' individual academic performance, the overall academic quality of students' high schools and the resulting impacts on academic and college preparation are also likely to influence students' success in college and are known to vary widely among the high schools attended by participants in the study. WSA participants graduated from 16 public high schools across Washington, while Act Six participants in the study originated from 61 public and private high schools in Washington and Oregon. Identifying publicly available measures

common to all participant high schools was challenging, but *high school rank* was devised as a rough estimate of the overall academic quality of the students' high schools. Test scores from the 2007-08 school year were collected from the Washington Office of the Superintendent of Public Instruction (2012) and Oregon Department of Education (2012) for every public high school in each state. For each high school, the percent of students meeting or exceeding the state standard in each of three subjects (reading, writing and mathematics) was summed, and high schools were sorted on this value within each state. Each school was then assigned a value of 1 through 5 to represent its quintile rank within its respective state, with 5 assigned to the top 20 percent of schools in each state, and 1 assigned to the lowest 20 percent. Because test score information was only available for public schools, all private schools were assumed to be in the top quintile and assigned a value of 5. For high school rank each student was then assigned the value associated with the high school from which he or she graduated. The decision to assign all private schools a value of 5 was based on examination of the data that revealed that 34 Act Six participants in the study attended private high schools, with 23 of those attending two private schools widely recognized for their rigorous academic environment and high college going rates. While the academic quality of the seven private high schools attended by the remaining 11 students was not as widely recognized, ranking them at the highest level was a plausible and conservative estimate in light of the objective of the study, and a better alternative than removing the corresponding students from the study. The distribution of high school rank for the WSA sample showed a mode of 2 with a slight skew to the right, while the Act Six sample showed a mode of 2 with another smaller peak at 5 due to the private schools.

Noncognitive selection variables. Both the Act Six and WSA programs utilize selection processes that gather and evaluate noncognitive measures (e.g., leadership, confidence, community service, realistic self-appraisal) from written application materials and in-person interactive assessment components as critical elements of assessing students' fit for the programs

and potential for success in college. However, the programs use different sets of variables that are measured and combined in different ways on different scales. Given the important role that these noncognitive measures play in program selection and success in college, an effort was made to examine correlations between the scores collected for each program for the 34 Act Six participants that also had WSA noncognitive scores available,[3] in hopes that a correspondence might be established that could produce comparable measures usable in the analysis.

NLF provided an *Act Six application reader score,* assessed on a continuous 5-point scale by application readers for the 140 participants from Washington.[4] CSF provided both a *WSA application reader score*, assessed on a continuous scale from 0 to 48 that combined scores from multiple application readers, and a *WSA interactive assessment score*, assessed on a 12 to 48 integer scale from an interactive group assessment, for all but one of the WSA participants. Examination of bivariate correlations between the Act Six and WSA measures for the 34 students with scores available for both programs revealed a weak, non-significant positive correlation between Act Six application reader score and WSA application reader score, $r = 0.05$, $p = 0.77$, and surprisingly, a weak non-significant negative correlation between Act Six application reader score and WSA interactive assessment score, $r = -0.19$, $p = 0.34$. The lack of observed relationship between Act Six and WSA measures may be at least partially explained by range restriction on the Act Six application reader score. As a highly selective program, Act Six scores for participants represent only the top-end of scores from all applicants and may therefore not reveal correlations that might be observed if lower scoring students were included. However, given the lack of correlation observed in the data at hand, efforts to establish a correspondence were abandoned, and all three noncognitive selection variables were dropped from the analysis.

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[3] Of the 40 Act Six participants who were also WSA participants, six were from the 2003 class and did not have WSA data available.

[4] Scores were originally assessed but not preserved for the 40 Act Six participants from Oregon.

First year financial variables. Both Act Six and WSA programs record details for participants' financial aid packages as reported directly by colleges every term that students are enrolled. Five common financial aid variables from participants' first year of college were obtained from NLF and CSF to measure the financial resources of participants' families as well as the extent and nature of students' financial aid packages. While students' financial situations and financial aid packages can change from year to year, the assumption was made that substantial changes in subsequent years would not be widespread. Because the first year values were available and provided a common measure for all students, the study focused on those.

Students' *expected family contribution (EFC)*, calculated by the federal Free Application for Federal Student Aid, indicates the amount in dollars that the federal government expects families to be able to pay for a given year of college, providing a measure of the income and assets available to students' families, with the minimum EFC of $0 indicating the lowest level of financial resources. Because both programs specifically target low-income students, a large proportion of participants showed a value of $0, and like many income-related variables, the distribution was highly skewed right, with extreme outliers. Because transformations were not able to adequately address the large spike at the minimum or the extreme skewness and outliers in the distribution, a new variable was created, *expected family contribution bin,* that grouped values into four bins, assigning the following values: 0 for EFC = $0; 1 for $1 ≤ EFC ≤ $2,499; 2 for $2,500 ≤ EFC ≤ $7,499; and 3 for EFC ≥ $7,500. The new variable was treated in analysis as an ordinal variable and the remaining right skewness in its distribution was judged more tolerable for analysis.

Need was defined as the difference between the total cost of attendance (the sum of tuition, books, room and board, personal and travel expenses) at a students' first college and the expected family contribution for the student in the first year. This hybrid measure combines the students' financial situation with the cost of the college they attend. The distribution for WSA

participants was bimodal, reflecting the substantial cost difference between public and private colleges. In keeping with other financial variables, an ordinal, binned version of the variable was derived, *need bin*, using the following assignments: 0 for need ≤ $9,999; 1 for $10,000 ≤ need ≤ $24,999; 2 for $25,000 ≤ need ≤ $39,999; and 3 for need ≥ $40,000. Values for WSA participants, the majority of who attend less expensive public colleges had a large peak at 1 and a skew to the right, whereas values for Act Six students had their mode at 2 with a slight skew to the left.

Need met with grant was defined as the percent of a student's need that was awarded as grant in the student's financial aid package. This variable provided a particularly helpful estimate of students' ability to pay. At the beginning of the program, Act Six scholarships covered tuition, books, and room and board for every participant, regardless of need, and this sometimes resulted in awards that exceeded need, reflected in this variable by values greater than 100%. Beginning with the 2008 class, Act Six changed its scholarship model to cover 100% of need with grant and a between $2,000 to $3,000 in work study, with a minimum grant amount equal to the cost of tuition. This model produced need met with grant values slightly below 100% for most students, with some higher EFC students exceeding 100%. Unique individual circumstances introduce additional variation into this distribution for Act Six participants, but in general the distribution is strongly skewed right with peak just below 100. WSA participants, on the other hand, received grants of up to $10,000 per year depending on the type of college attended. Agreements with colleges allow WSA funds to be "last dollars" that are capped when 100% of need is met. As a result, many WSA participants also had *need met with grant values* close to 100% and the distribution had a sizable spike of values at exactly 100%, with a long tail to the left. Because the measure involves a fraction where the denominator, need, can be zero (and negative), there are several cases that are undefined and a number of extremely large outliers. To address this issue, values were truncated at 199%, with all negative values and any

values greater than 199%, recorded as 199%. While truncating helped limit the distance of extreme outliers, it also created a cluster at the right end of the distribution that was problematic for analysis. To produce a more tolerable distribution, an ordinal variable, *need met with grant bin*, was created with the following assignments: 0 for need met ≤ 49%; 1 for 50% ≤ need met ≤ 84%; 2 for 85% ≤ need met ≤ 99%; 3 for 100% ≤ need met ≤ 114%; and 4 for *need met* ≥ 115%. Given the unique and important role that the "full scholarship" plays in the Act Six model, need met with grant was critical in being able to match Act Six participants with WSA students who received similar levels of financial support.

Because debt level may have an effect on student persistence, *loan amount* was recorded. Similar to EFC, the distribution of this measure had a very large spike at $0, as the majority of participants did not have to borrow at all, and was strongly skewed right. To create a more tolerable distribution for analysis, another binned ordinal variable, *loan bin* was created using the following assignments: 0 for loan = $0; 1 for $1 ≤ loan ≤ $2,499; 2 for $2,500 ≤ loan ≤ $4,999; and 3 for loan ≥ $5,000. The resulting distribution remained skewed right, but with less problematic features.

The amount of work study offered to students was obtained, but given that there was relatively little variation in the amount of work study offered, and because it is unknown how much of the award students actually earned through working, the variable *work study offered* was recorded as a dichotomous variable with 1 assigned to students who were offered any amount of work study in their first year, and 0 assigned those who were not offered work study.

First college characteristics variables. All students in the Act Six sample attended one of six four-year, private, residential, religiously-affiliated, predominantly White, liberal arts institutions. While WSA students attend a variety of two-year and four-year, public and private, research and liberal arts, residential and commuter campuses, the WSA participants included in this study were be limited to those who first attended one of 17 four-year, residential colleges in

Washington. Because all Act Six participants attend religiously affiliated liberal arts colleges, *college type* could not be used as a covariate, although it was recorded for descriptive purposes for the WSA sample and is summarized in Table 1.

While it is reasonable to expect that the experiences of students at religiously affiliated colleges might be considerably different from those at public universities or secular private colleges, there were not sufficient numbers of WSA participants enrolled at religiously affiliated colleges to limit the comparison group to students at just those colleges. However, in a study of the effects of religious affiliation and institutional type on student engagement, Gonyea and Kuh (2006) found significant differences in patterns of student engagement and learning not only between religiously affiliated colleges and secular institutions, but also between colleges with various types of religious affiliations (e.g., mainline protestant, Roman Catholic, faith-based/fundamentalist). Given the tremendous variation in size, selectivity, denominational affiliation, and retention and graduation rates among Act Six partner colleges, there is likely as much difference *within* the group of religiously affiliated Act Six partner colleges as there is *between* some of those colleges and other public or private college attended by WSA participants in the study. The goal in this setting was to match Act Six participants with WSA students attending colleges that are similar on important characteristics related to the persistence and graduation outcomes examined in the study. With that goal in mind, eight institutional characteristics were identified and recorded for all 18 of the colleges first attended by study participants.

The first four institutional measures were obtained from data reported by colleges to U.S. News and World Report (2012a). Given that every public college in the study was significantly larger than every Act Six college, size of student body would not have been useful in matching, but *student-to-faculty ratio* provided a relevant measure of the level of interaction students may have had with faculty that could be compared among institutions of various sizes, showing the

number of students for every one faculty. Values for colleges ranged from 3 to 23, with most Act Six colleges in the lower half of the list, and public colleges producing the four biggest values. However, the two largest public colleges had values comparable with several Act Six colleges. *Mean incoming high school GPA* and *75th percentile of incoming SAT critical reading + math* provided measures of selectivity for the fall 2010 class and ranged from 3.0 to 3.8 and 1,050 to 1,440, respectively. Act Six partner colleges were distributed throughout the range in both measures. Incoming high school GPA was not reported by U.S. News for two colleges in the study, but was obtained by email from a registrar (C. Nelson, personal communication, March 21, 2012) and from a university fact book (Carter, Denney, Ketting-Weller, Ragenovich, & Wagner, 2011, p. 12). *U.S. News diversity index* is a measure of overall campus diversity devised by the news agency that "factors in the total proportion of minority students, leaving out international students, and the overall mix of groups," (U. S. News and World Report, 2012b) producing a continuous variable that ranges from 0 to 1, with larger values representing a more diverse student population. The index score was not reported for one Act Six partner college, but was estimated by referencing the index of another college with similar racial distribution in its student body. Values for colleges ranged from 0.25 to 0.57, with Act Six colleges showing notably less diversity than other colleges, representing seven of the lowest eight values in the list.

The final four institutional variables were derived from student body racial distribution and second year retention data for the fall 2009 entering class and six-year cohort graduation rates for the fall 2003 entering class retrieved from the federal IPEDS data system (NCES, 2012). *Same race as student* estimates the percent of students at the institution who share the same racial group as the student. Students coded in a single racial category were assigned the percent of students reported in that category for the college. Students coded in more than one racial category were assigned the sum of the percent of students reported as two or more races and the percent reported as unknown at the college. Overall, values ranged from 0% to 87% and

were skewed right, but the distribution was distinctly bimodal, with values for students of color and multiracial students ranging from 0% to 26% and values for White students ranging from 49% to 87%. Various transformations were considered, but because the two modes accurately reflected the significant gap in racial representation at predominantly White campuses, the decision was made to retain the original scale. *Retention to year two* showed the overall percent of the fall 2009 entering cohort at the college that reenrolled for fall 2010, and because it was closely related to the persistence time outcome that is the focus of the study, it provided an important baseline measure of the overall retention performance of each college. Values for the 18 colleges ranged from 72% to 100%, with Act Six colleges distributed throughout this spectrum. *Six-year graduation rate* measured the college's overall performance in graduating students that began college in the fall 2003 cohort, providing a critical institutional reference point that parallels the participant graduation outcomes examined in the study. Values on the measure vary from 47% to 89%, with a slight skew left resulting from the large number of WSA participants who attend a public college with a particularly high graduation rate. Given that graduation rates can vary widely across racial groups within the same institution, an additional graduation variable was created, *six-year graduation rate for student's race*, which assigned each student the rate at which students of their same race graduated within six years at their first college. The race-matching scheme used with same race as student was used again, and resulting values spanned the full range of 0% to 100%. Overall, the distribution was skewed left with four students at 0% as outliers. A cube root transformation did not pull the outliers closer but did greatly reduce the skewness and was therefore used in the analysis.

Six-year graduation rate for student's race provided perhaps the most important summary of the overall institutional experience of students at different colleges as they relate to the outcome variables that the study examines. While there are myriad differences in the environments that students encounter at various colleges, six-year graduation rate for student's

race provided an estimate of the net effect of those combined differences on the graduation outcomes for students of the same race. By matching students on this variable, the study accounted in some degree for the bias inherent in comparing Act Six participants at private religious institutions with WSA participants at public or secular private colleges.

Analysis

The purpose of the PSM techniques utilized in the first five steps of the study procedure was to approximate a randomized assignment of students to treatment (Act Six) by balancing a set of observed covariates (described above) that affect the outcomes (persistence and graduation) between the treatment and comparison (WSA) groups. The goal was to leave treatment received as the only significant observable difference between the groups. Once this balance was achieved, postmatching analysis could proceed as it would for a randomized experiment, using an appropriate multivariate analysis with a dichotomous independent variable indicating treatment group (Guo & Fraser, 2009).

In analyzing persistence, rather than examining multiple point-in-time measures like persistence to year two, analysis was conducted using multivariate survival analysis techniques. Survival analysis has been employed to study persistence and departure in higher education at both the undergraduate (e.g., Ishitani, 2006; Murtaugh, Burns, & Schuster, 1999) and graduate levels (e.g., Lott, Gardner, & Powers, 2009), and offers two clear advantages over point-in-time measures: its consideration of the timing of the departure in analysis and its ability to account for censored data, or cases where departure does not occur by a given time or by the end of the study. Both of these were important issues in this study. A Cox regression survival analysis was performed with the same set of covariates used in the logistic regression to estimate propensity scores in Step 2, but with Act Six participation included as an additional covariate. Persistence time was the dependent variable and persistence status indicated censored cases. If Act Six participation was found to have a significant effect on persistence time, then the odds ratio of its

regression coefficient would provide an estimate of the size of that effect on persistence. For the sake of comparison, the analysis was conducted with the full unmatched sample in addition to the PSM-matched sample.

Analyses for the dichotomous graduation within four years and graduation within six years outcomes were conducted utilizing logistic regression with the same set of covariates. The graduation measures (one at a time) were the dependent variables and Act Six participation was included as the independent variable among the covariates. If there was adequate model fit and if the regression coefficient for Act Six participation was significant, the effect of participating in the Act Six program compared with the WSA program could be estimated from the odds ratio of the coefficient for Act Six participation. Again, the analysis was also conducted with the full unmatched sample in addition to the PSM-matched sample.

Limitations

Even with the best matching techniques for addressing differences in the observed variables, hidden selection bias arising from unknown or unmeasured variables may still be a problem, and this study could not avoid the inherent limitations of internal validity faced by any observational study attempting to address questions of causality. Among the myriad unmeasured variables that could produce hidden selection bias, one critical domain warrants particular mention. In evaluating a program that places great emphasis on leadership and other noncognitive characteristics, the lack of any covariate measures that would have allowed for matching or controlling for these kinds of characteristics is a serious limitation. It simply cannot be known through this study if their remain significant differences between Act Six participants and the matched WSA comparison group in terms of motivation, resilience, or other noncognitive measures that might provide a more compelling explanation for the higher retention and graduation rates Act Six experiences. Future studies should look for opportunities to consistently measure these characteristics for both Act Six participants and a comparison group,

perhaps by examining nonselected Act Six applicants for whom a common set of noncognitive measures exists from the selection process.

In addition to unmeasured variables that might produce selection bias, it also important to note that not all of the covariates collected for the study were utilized in the final model for matching the Act Six and WSA groups. As explained in the following chapter, six of the original eight college characteristics covariates were dropped from the model because of concerns about multicollinearity or lack of correlation with the outcomes, and therefore were not balanced in the resulting matched sample. While the two college characteristics covariates that were preserved and balanced were selected because they were believed to best capture the cumulative effect of college differences on the outcomes under study, it is important to note as a potential limitation that there remained differences between groups on some of the observed but unutilized covariates.

As mentioned earlier, the computational software to conduct follow-up sensitivity analysis that might have quantified the potential threat to the study's findings by all of these sources of bias was not located. It is a limitation, then, that the robustness of the study's findings against these potential biases remains unknown. A follow-up study providing this sensitivity analysis when the appropriate software is identified could strengthen the findings.

One limitation associated with the data collected for the study and mentioned in the earlier description of measures is worth noting again here. The observed level of error in self-reported high school GPA for WSA participants, combined with the lack of alternative academic preparation measures (e.g., SAT or ACT scores) introduces some uncertainty in the extent to which matching successfully balances the academic preparation levels of the Act Six and WSA groups. It also somewhat limits the ability to control for academic preparation in the multivariate analyses. While the low level of bias in the self-reported values mitigates this concern to some extent, the substantial variation of those values from the true values remains a concern.

Finally, while the goal of most quantitative techniques is to generate at least some level of generalizability, the approaches presented here are hindered by numerous issues that limit the ability to generalize any findings beyond the specific context in which they are situated. Neither students nor settings are randomly or purposefully sampled in a way that would support external validity (Shadish et al., 2002, chap. 11). In other words, if we find that the program is indeed effective in its current context, that does not necessarily imply that it will be effective when implemented in another region. One learning from early efforts to replicate the Act Six model in new sites is that program outcomes are clearly influenced by the experience, skills, and motivation of the program staff as well as the unique social and political dynamics of local urban communities. What works with one staff in Tacoma does not necessarily work equally well with another staff in Memphis.

CHAPTER FIVE

RESULTS

Step 1: Data Screening, Covariate Selection, and Description of Group Differences

All of the variables described in the previous chapter were screened for missing values, accuracy of data entry, and appropriateness of their distributions for the assumptions of the planned multivariate analyses using a variety of visual and analytic SPSS programs. As noted earlier, the entire 2005 WSA class (n = 346) was missing high school GPA data and excluded from the study; high school final transcript GPA was available for only 717 WSA participants and was not utilized in the analyses; and Act Six application reader score was only available for 140 Act Six participants from Washington and together with WSA application reader score and WSA interactive assessment score were abandoned for the main study. There were no other missing values in the resulting dataset of 2,067 students (180 Act Six and 1,887 WSA participants). See Table 1 for descriptive statistics and results from bivariate t-tests assessing differences between Act Six and WSA for all of variables.

To reduce skewness, two variables were transformed, high school GPA with a reflection and natural log transformation, and six-year graduation rate for student's race with a cube root transformation. The transformed variables were used throughout the remaining analyses, although tests on the original values were also reported to aid in interpretation when comparing match quality in Step 4. Because various transformations were not able to adequately correct for spikes at the ends of distributions, extreme skewness, and outliers in the first four financial aid variables, expected family contribution, need, need met with grant, and loan amount were each recoded into ordinal, binned variables using the schemes described in the previous chapter. The

resulting distributions were judged appropriate for analysis, although a likely loss in power in analysis was acknowledged as a tradeoff.

Twenty students (11 Act Six and 9 WSA) were identified as multivariate outliers using Mahalanobis distance with $p < .001$ and excluded, leaving 2,047 students (169 Act Six and 1,878 WSA) available for analysis. All 11 Act Six outliers were still enrolled at their first college, while five of the nine WSA outliers were no longer enrolled at their first college, suggesting that any potential bias in the final analyses arising from the exclusions would not favor Act Six.

Evaluation of sample size relative to total number of covariates and expected frequencies for categorical covariates indicated that while tolerable for the full unmatched sample with $n = 2,047$, the total number of covariates needed to be reduced substantially to avoid problems in analyses using much smaller matched samples. Specifically, reducing the number of categorical variables to avoid low expected frequencies that would restrict model goodness-of-fit tests in the regressions appeared prudent. For the empirical reasons described in the previous chapter and because of the low expected values in the American Indian or Alaska Native and other or unknown cells, the seven race variables were consolidated using the single Black, Hispanic, or American Indian variable for analysis.

Using the Box-Tidwell approach described by Tabachnick and Fidell (2007, p. 443), no serious violation of linearity in the logit was found with either of the graduation outcomes. Concerns regarding potential multicollinearity prompted examination of correlations between each pair of variables (see the full correlation matrix in Table 2). Aside from the expected high correlations between transformed variables and their source variables, all other high correlations ($| r | \geq 0.7$) involved college characteristics variables. Same race as student was, not surprisingly, highly correlated with White and American Indian, both of which were discarded with the consolidation of race variables. The strong positive correlation between need and attending a religious college and the associated strong negative correlation between need and attending a

public college were consistent with the bimodal distribution of need described earlier, and did not present a problem given that college type was not included in the analysis. The remaining strong correlations were all within college characteristics variables, suggesting the reasonableness and necessity of selecting just one or two of the most important of these variables for inclusion in analysis. Student-to-faculty ratio and both selectivity measures were highly correlated with all three college retention and graduation measures and were dropped in deference to the measures more logically aligned with the study's outcome measures. While neither of the two college diversity measures was highly correlated with the college retention or graduation measures, they both also had close to zero correlation with the study outcomes, and were dropped from analysis. Among the remaining three, retention to year two and six-year graduation rate for student's race were retained to reflect both the retention and graduation focus of the ultimate analysis and to maintain the individual customization contained in six-year graduation rate for student's race. Finally, because need and need bin were highly correlated with college type and represent a combination of EFC and college type, it was dropped in favor of need met with grant, which provided a more relevant measure of students' ability to pay that was comparable across different college types. A test for multicollinearity that examined squared multiple correlations among the remaining variables revealed no problems using the criteria advised by Tabachnick and Fidell (2007, p. 551). After screening, 10 covariates were preserved for analysis: female; Black, Hispanic, or American Indian; transformed high school gpa; high school rank; expected family contribution bin; need met bin; loan amount bin; work study; first college retention to year two; and transformed first college six-year graduation rate for student's race.

Table 2

Correlation Table for Complete Variable Set

Variable	*M*	*(SD)*	*n*	1.	2.	3.	4.	5.	6.
1. CLASS	2007.4	(2.0)	2,067	--					
2. FEMALE	.600	(.490)	2,067	-.04	--				
3. RACEA	.234	(.423)	2,067	.01	-.03	--			
4. RACEB	.228	(.420)	2,067	.03	.00	-.24 *	--		
5. RACEH	.240	(.428)	2,067	.10 *	.00	-.27 *	-.25 *	--	
6. RACEN	.034	(.181)	2,067	.04	.06 *	-.07 *	.04	-.02	--
7. RACEW	.360	(.480)	2,067	-.09 *	.05 *	-.33 *	-.24 *	-.34 *	.05 *
8. RACEU	.014	(.118)	2,067	-.01	.00	-.07 *	-.07 *	-.07 *	-.02
9. RACEM	.101	(.302)	2,067	.02	.04	.05 *	.22 *	.04	.37 *
10. RACEBHN	.478	(.500)	2,067	.11 *	.01	-.45 *	.57 *	.59 *	.20 *
11. HSGPA	3.33	(.506)	2,067	.04	.13 *	.22 *	-.25 *	-.08 *	-.04 *
12. HSGPAFINAL	3.31	(.455)	897	.00	.15 *	.18 *	-.26 *	-.07 *	-.05
13. HSRANK	2.18	(.906)	2,067	.03	.02	-.11 *	-.11 *	-.04	.04
14. ASREADSCORE	3.41	(0.58)	140	-.61 *	.01	.01	.11	-.04	-.02
15. WSAREADSCORE	27.1	(3.7)	1,921	-.24 *	.07 *	.07 *	-.10 *	-.06 *	-.02
16. WSABDISCORE	28.1	(5.1)	1,920	.04	.10 *	.02	-.03	-.14 *	.02
17. EFC	2,290	(4,052)	2,067	-.01	.00	.00	-.01	-.08 *	.00
18. EFCBIN	0.94	(0.99)	2,067	-.11 *	-.01	.00	-.04	-.12 *	-.01
19. NEED	22,001	(9,672)	2,067	.22 *	.06 *	.05 *	.04	-.01	.02
20. NEEDBIN	1.31	(0.66)	2,067	.12 *	.05 *	.03	.04	-.04	.02
21. NEEDMET	91.7	(19.9)	2,067	-.12 *	.02	.06 *	.02	-.08 *	-.01
22. NEEDMETBIN	2.04	(0.84)	2,067	-.17 *	.02	.06 *	.01	-.08 *	-.01
23. LOAN	1,449	(2,131)	2,067	.30 *	-.01	-.02	.08 *	-.04	.05 *
24. LOANBIN	0.84	(1.04)	2,067	.25 *	-.01	-.02	.07 *	-.05 *	.05 *
25. WORKSTUDY	.286	(.452)	2,067	.02	.04	.03	.06 *	-.07 *	.01
26. FCRELIGIOUS	.301	(.459)	2,067	.00	.07 *	-.02	.07 *	-.07 *	.04
27. FCSECULAR	.029	(.168)	2,067	-.04	.03	.07 *	-.04	-.03	-.02
28. FCPUBLIC	.670	(.470)	2,067	.01	-.08 *	-.01	-.05 *	.08 *	-.03
29. FCSTF	15.7	(4.4)	2,067	.02	-.04	-.24 *	.06 *	.08 *	.01
30. FCHSGPA	3.49	(0.22)	2,067	-.03	.06 *	.27 *	-.08 *	-.10 *	-.03
31. FCSATCRM75	1,231	(96)	2,067	-.04	.04	.30 *	-.11 *	-.10 *	-.02
32. FCDIVERSITY	0.42	(0.10)	2,067	.00	-.03	.26 *	-.10 *	-.06 *	-.04
33. FCRACEMATCH	.257	(.273)	2,067	-.12 *	.02	-.20 *	-.42 *	-.39 *	-.13 *
34. FCRETAINYR2	.837	(.076)	2,067	-.02	.02	.28 *	-.13 *	-.05 *	-.02
35. FCGRADIN6	.676	(.121)	2,067	-.04	.04	.28 *	-.13 *	-.07 *	-.03
36. FCGRADIN6MATCH	.637	(.169)	2,067	-.09 *	.02	.32 *	-.25 *	-.21 *	-.09 *
37. PERSISTYR2FIRST	.823	(.381)	2,067	.00	-.04	.05 *	.03	.01	-.02
38. GRADIN4FIRST	.289	(.454)	1,027	-.13 *	.09 *	.04	-.07 *	-.06	.06
39. GRADIN6FIRST	.630	(.484)	338	-.04	.03	.02	.07	.03	-.07

Note. High correlations, |r| > .70, are in boldface.
*$p < .05$.

Table 2 (continued)

Correlation Table for Complete Variable Set

Variable	7.	8.	9.	10.	11.	12.	13.	14.	15.
1. CLASS									
2. FEMALE									
3. RACEA									
4. RACEB									
5. RACEH									
6. RACEN									
7. RACEW	--								
8. RACEU	-.09 *	--							
9. RACEM	.22 *	.23 *	--						
10. RACEBHN	-.48 *	-.11 *	.21 *	--					
11. HSGPA	.08 *	-.01	-.06 *	-.28 *	--				
12. HSGPAFINAL	.12 *	.00	-.05	-.28 *	**.89** *	--			
13. HSRANK	.23 *	-.03	.00	-.11 *	.02	.05	--		
14. ASREADSCORE	-.15	-- **a**	-.05	.03	-.13	-.13	-.10	--	
15. WSAREADSCORE	.07 *	-.01	-.02	-.13 *	.29 *	.35 *	.04	.05	--
16. WSABDISCORE	.13 *	.01	.04	-.12 *	.07 *	.15 *	.08 *	-.17	.10 *
17. EFC	.12 *	-.02	.04	-.08 *	.02	.03	.14 *	-.12	.02
18. EFCBIN	.15 *	-.01	.01	-.13 *	.04	.03	.14 *	-.10	.06 *
19. NEED	-.05 *	.01	.03	.02	.20 *	.23 *	.03	-.08	.05 *
20. NEEDBIN	-.02	.02	.02	.00	.16 *	.19 *	.03	-.12	.05 *
21. NEEDMET	.03	.00	.04	-.05 *	.11 *	.17 *	.10 *	.05	.09 *
22. NEEDMETBIN	.04	.01	.04	-.06 *	.17 *	.21 *	.06 *	.10	.11 *
23. LOAN	.02	-.01	.04	.03	-.12 *	-.22 *	-.02	-.17 *	-.12 *
24. LOANBIN	.04	.00	.04 *	.02	-.14 *	-.24 *	-.03	-.13	-.12 *
25. WORKSTUDY	.02	.02	.04	-.02	.03	.07 *	.00	-.08	.03
26. FCRELIGIOUS	.05 *	.00	.06 *	.00	.07 *	.13 *	.12 *	-- **a**	.05 *
27. FCSECULAR	.00	.00	-.01	-.06 *	.13 *	.11 *	-.03	-- **a**	.09 *
28. FCPUBLIC	-.04 *	.00	-.06 *	.02	-.12 *	-.16 *	-.11 *	-- **a**	-.08 *
29. FCSTF	.09 *	.02	.00	.12 *	-.40 *	-.41 *	-.02	-.11	-.22 *
30. FCHSGPA	-.10 *	-.01	-.04	-.16 *	.50 *	.54 *	-.03	.23 *	.23 *
31. FCSATCRM75	-.09 *	-.01	-.02	-.18 *	.48 *	.51 *	-.07 *	.27 *	.23 *
32. FCDIVERSITY	-.11 *	-.01	-.07 *	-.14 *	.25 *	.22 *	-.18 *	-.35 *	.14 *
33. FCRACEMATCH	**.82** *	-.07 *	-.20 *	**-.70** *	.15 *	.19 *	.22 *	-.06	.10 *
34. FCRETAINYR2	-.11 *	-.01	-.04 *	-.15 *	.46 *	.45 *	-.08 *	.11	.23 *
35. FCGRADIN6	-.09 *	.00	-.04	-.17 *	.51 *	.54 *	-.07 *	.19 *	.24 *
36. FCGRADIN6MATCH	.09 *	-.02	-.09 *	-.40 *	.47 *	.47 *	-.02	.13	.23 *
37. PERSISTYR2FIRST	-.05 *	-.04	-.01	.04	.15 *	.23 *	.06 *	-.24 *	.09 *
38. GRADIN4FIRST	.06	.02	.01	-.09 *	.26 *	.31 *	.13 *	-.09	.14 *
39. GRADIN6FIRST	-.02	-.03	.07	.08	.20 *	.29 *	.11 *	-.07	.11 *

Note. High correlations, |r| > .70, are in boldface. [a]Cannot be computed because at least one of the variables is constant.
*$p < .05$.

Table 2 (continued)

Correlation Table for Complete Variable Set

Variable	16.	17.	18.	19.	20.	21.	22.	23.	24.
1. CLASS									
2. FEMALE									
3. RACEA									
4. RACEB									
5. RACEH									
6. RACEN									
7. RACEW									
8. RACEU									
9. RACEM									
10. RACEBHN									
11. HSGPA									
12. HSGPAFINAL									
13. HSRANK									
14. ASREADSCORE									
15. WSAREADSCORE									
16. WSABDISCORE	--								
17. EFC	.08 *	--							
18. EFCBIN	.10 *	**.78** *	--						
19. NEED	.09 *	-.31 *	-.24 *	--					
20. NEEDBIN	.08 *	-.23 *	-.16 *	**.93** *	--				
21. NEEDMET	.00	.43 *	.22 *	-.24 *	-.20 *	--			
22. NEEDMETBIN	.00	.23 *	.17 *	-.24 *	-.21 *	**.82** *	--		
23. LOAN	.05 *	.14 *	.12 *	.24 *	.24 *	-.27 *	-.41 *	--	
24. LOANBIN	.04	.14 *	.14 *	.19 *	.19 *	-.26 *	-.41 *	**.94** *	--
25. WORKSTUDY	.06 *	-.07 *	-.07 *	.49 *	.46 *	-.16 *	-.29 *	.18 *	.16 *
26. FCRELIGIOUS	.08 *	.13 *	.12 *	**.73** *	**.72** *	-.04	-.13 *	.26 *	.23 *
27. FCSECULAR	.06 *	.00	.01	.33 *	.33 *	-.01	-.02	.01	.00
28. FCPUBLIC	-.10 *	-.12 *	-.12 *	**-.83** *	**-.82** *	.04	.14 *	-.26 *	-.22 *
29. FCSTF	-.11 *	-.07 *	-.08 *	-.48 *	-.42 *	-.04	-.02	-.04	-.01
30. FCHSGPA	.13 *	.05 *	.07 *	.37 *	.33 *	.09 *	.11 *	-.08 *	-.11 *
31. FCSATCRM75	.13 *	.03	.05 *	.27 *	.22 *	.10 *	.15 *	-.12 *	-.15 *
32. FCDIVERSITY	.02	-.07 *	-.04	-.22 *	-.26 *	.03	.11 *	-.16 *	-.16 *
33. FCRACEMATCH	.12 *	.10 *	.15 *	-.08 *	-.05 *	.02	.03	-.01	.00
34. FCRETAINYR2	.09 *	.03	.04 *	.13 *	.07 *	.09 *	.14 *	-.14 *	-.16 *
35. FCGRADIN6	.12 *	.02	.04 *	.22 *	.16 *	.08 *	.14 *	-.13 *	-.16 *
36. FCGRADIN6MATCH	.12 *	.04	.08 *	.10 *	.08 *	.09 *	.15 *	-.14 *	-.15 *
37. PERSISTYR2FIRST	.06 *	.01	.02	.03	.02	.18 *	.21 *	-.12 *	-.11 *
38. GRADIN4FIRST	.11 *	.10 *	.11 *	.13 *	.13 *	.14 *	.17 *	-.05	-.05
39. GRADIN6FIRST	.04	.02	.03	.10	.08	.14 *	.21 *	-.01	-.02

Note. High correlations, |r| > .70, are in boldface.
*$p < .05$.

Table 2 (continued)

Correlation Table for Complete Variable Set

Variable	25.	26.	27.	28.	29.	30.	31.	32.	33.
1. CLASS									
2. FEMALE									
3. RACEA									
4. RACEB									
5. RACEH									
6. RACEN									
7. RACEW									
8. RACEU									
9. RACEM									
10. RACEBHN									
11. HSGPA									
12. HSGPAFINAL									
13. HSRANK									
14. ASREADSCORE									
15. WSAREADSCORE									
16. WSABDISCORE									
17. EFC									
18. EFCBIN									
19. NEED									
20. NEEDBIN									
21. NEEDMET									
22. NEEDMETBIN									
23. LOAN									
24. LOANBIN									
25. WORKSTUDY	--								
26. FCRELIGIOUS	.43 *	--							
27. FCSECULAR	.17 *	-.11 *	--						
28. FCPUBLIC	-.48 *	**-.94** *	-.25 *	--					
29. FCSTF	-.29 *	-.44 *	-.18 *	.50 *	--				
30. FCHSGPA	.17 *	.28 *	.11 *	-.32 *	**-.77** *	--			
31. FCSATCRM75	.10 *	.08 *	.28 *	-.18 *	**-.74** *	**.90** *	--		
32. FCDIVERSITY	-.19 *	-.32 *	-.12 *	.35 *	-.36 *	.41 *	.51 *	--	
33. FCRACEMATCH	-.01	.00	.01	.00	.06 *	-.04 *	-.03	-.05 *	--
34. FCRETAINYR2	.07 *	-.02	.12 *	-.02	**-.75** *	**.78** *	**.84** *	.57 *	-.04
35. FCGRADIN6	.09 *	.01	.22 *	-.09 *	**-.72** *	**.89** *	**.95** *	.50 *	-.02
36. FCGRADIN6MATCH	.07 *	-.08 *	.20 *	.00	-.53 *	**.71** *	**.78** *	.43 *	.21 *
37. PERSISTYR2FIRST	-.04	-.01	.01	.01	-.11 *	.14 *	.13 *	.09 *	-.05 *
38. GRADIN4FIRST	.06	.16 *	.06	-.18 *	-.26 *	.23 *	.25 *	-.04	.04
39. GRADIN6FIRST	.00	.04	.05	-.06	-.08	.04	.08	-.04	-.06

Note. High correlations, |r| > .70, are in boldface.
*$p < .05$.

Table 2 (continued)

Correlation Table for Complete Variable Set

Variable	34.	35.	36.	37.	38.
1. CLASS					
2. FEMALE					
3. RACEA					
4. RACEB					
5. RACEH					
6. RACEN					
7. RACEW					
8. RACEU					
9. RACEM					
10. RACEBHN					
11. HSGPA					
12. HSGPAFINAL					
13. HSRANK					
14. ASREADSCORE					
15. WSAREADSCORE					
16. WSABDISCORE					
17. EFC					
18. EFCBIN					
19. NEED					
20. NEEDBIN					
21. NEEDMET					
22. NEEDMETBIN					
23. LOAN					
24. LOANBIN					
25. WORKSTUDY					
26. FCRELIGIOUS					
27. FCSECULAR					
28. FCPUBLIC					
29. FCSTF					
30. FCHSGPA					
31. FCSATCRM75					
32. FCDIVERSITY					
33. FCRACEMATCH					
34. FCRETAINYR2	--				
35. FCGRADIN6	**.92 ***	--			
36. FCGRADIN6MATCH	**.74 ***	**.82 ***	--		
37. PERSISTYR2FIRST	.17 *	.16 *	.12 *	--	
38. GRADIN4FIRST	.22 *	.24 *	.24 *	.28 *	--
39. GRADIN6FIRST	.07	.07	.08	.54 *	.61 *

Note. High correlations, |r| > .70, are in boldface.
*$p < .05$.

Description of Group Differences

Table 1 summarizes the differences observed between the full Act Six and WSA samples on all of the variables collected. Overall, Act Six participants' retention and graduation outcomes were significantly and substantially higher than those of WSA participants, beginning with a persistence to second year rate of 94% compared to WSA participants' 81%. Act Six participants' four-year graduation rate of 73% for a smaller subsample of eligible students (in the 2003 through 2007 classes) was nearly triple the 26% for WSA students. The Act Six six-year graduation rate of 94% for an even smaller group of eligible students (in the 2003 through 2005 classes) remained more than 33 percentage points higher than the WSA figure of 60%. One would assume that at least some portion of these sizable group differences can be explained by differences between the two groups on some of covariates collected for the study. One would further expect that after creating a closely matched sample, the large gaps in outcomes between groups may narrow. To what extent the gaps narrow or are fully erased becomes the fundamental question of the study. Initially exploring the bivariate differences on the covariates may hint at some possible explanations for the outcome differences in the unmatched sample ahead of the matching process.

Racially, the Act Six sample included nearly twice the proportion of Black students and more than double the percent of American Indian and multiracial students compared to the WSA sample. The consolidated Black, Hispanic, or American Indian group represented nearly three-quarters of the Act Six sample and less than half of the WSA sample. Because students from these racial groups have substantially lower retention and graduation rates nationally, their over-representation in the Act Six sample is somewhat counter-intuitive in light of the higher Act Six outcomes.

In terms of academic preparation, the two groups have very similar mean high school GPAs with the Act Six advantage of 0.04 not a significant one. (It is interesting to note that the

difference of 0.08 when using transcript GPA for the 717 WSA students with those scores reported is significant.) The mean high school rank for Act Six participants is significantly higher, however, influenced primarily by the 34 Act Six students from private high schools.

Differences in first year financial variables are not unexpected in light of differences in the two program models. Low-income status is an important consideration but not a requirement for Act Six participants, whereas there are clear income limits in the CSF application process. Both programs have participants with high EFCs, but the difference in application requirements is evidenced in the significant difference in EFC, with the Act Six average more than double that of WSA. Give that 73% of WSA students attend lower-priced public colleges, it is not surprising that their lower mean EFC is overcome by the substantially higher price of private schools to produce a significant difference in average need with Act Six more than $10,000 higher than WSA. The higher level of Act Six scholarship commitment is also evident, with Act Six participants receiving grants that on average meet 107% of need, significantly higher than the 90% met for WSA participants. The difference in loan amount was not significant, with WSA students borrowing just $1,474 in the first year, slightly higher than the $1,188 for Act Six. Act Six students were offered work study at a significantly higher rate, nearly twice that of WSA. Given the strong skew and large spikes in the distributions of many financial aid variables, it is worth noting that the pattern of significance for the binned versions of the variables mirrored that of the original versions.

In terms of first college characteristics, the most obvious significant difference is that all Act Six participants attended religiously affiliated colleges, compared to just 23% of WSA participants, with nearly three quarters of WSA students attending public colleges and the remaining 3% attending private secular colleges. While two public institutions are comparable to Act Six colleges in faculty ratio and the two selectivity measures, the remaining public colleges have higher faculty to student ratios than all of the Act Six colleges and lower

selectivity scores than all but two Act Six partners. This helps explain the significantly lower mean student-to-faculty ratio and significantly higher incoming class GPA and SAT averages encountered by Act Six participants. Act Six colleges are also substantially less diverse than other colleges, reflected in significantly lower diversity index and same race as student averages. Importantly, however, there were no significant differences between groups in the three measures of retention or graduation rates of the college attended by the student. Act Six participants experienced a very small advantage in the measures of their colleges' overall retention and graduation rates, but the college graduation rates for the same racial group as the student were slightly lower on average for Act Six participants.

In summary, Act Six participants, when compared on average to WSA participants in the sample were more likely to be Black, Hispanic or American Indian; attended higher performing high schools; had higher EFCs and higher need; received better financial aid packages; and were offered more work study. Further, Act Six students attended colleges that were more selective, less diverse, and had fewer students per faculty, but were no more likely to retain or graduate students, including students of the same race as participants, than the colleges attended by WSA students. Given these clear differences, the goal of the next three steps was to select a matched subsample of participants that balanced the two groups on all of these covariates, eliminating any significant differences between groups.

Step 2: Propensity Score Estimation

A propensity score in this setting is defined as the likelihood that a student would be selected for Act Six based on the values of the student's covariates. Propensity scores can be estimated by the predicted probabilities generated from a logistic regression where the covariates are used as predictor variables and receipt of treatment is the dependent variable.

The time-censored nature the data in this study was an important factor in designing an appropriate propensity estimation and matching scheme. For all students in the study, at least one

year had passed since their first enrollment, allowing persistence to year two to be measured in every case. However, as enrollment for each subsequent year was examined, an additional class of participants had to be dropped from analysis. Only students from the 2007 class and earlier were eligible for the four-year graduation analysis and only students in the 2005 class and earlier were eligible for the six-year analysis. It was a desirable goal then, to match students separately within each class so that when classes were excluded from analysis, matched pairs would not be broken, leaving unmatched students stranded in the analysis. It was uncertain the extent to which such a stratified matching scheme would affect the match quality or the resulting sample sizes, so two matching schemes were utilized and compared. The first "open-matched" scheme generated propensity scores by running a single regression for all participants. The second "class-matched" scheme ran six separate regressions, generating propensity scores separately for students from each individual class from 2006 to 2010, and for students from the combined classes of 2003 through 2005 (all of whom were eligible for six-year graduation). Matching was then implemented separately within each class in the next step.

Altogether, seven logistic regression models were run and the resulting predicted probabilities recorded for each student for each model. Table 3 shows sample sizes, χ^2 model fit and Negelkerke R^2 statistics, and regression coefficients with accompanying p-value levels for each of the seven models. All models showed significant model fit, all at $p < .001$, indicating that the set of covariates reliably distinguished between Act Six and WSA participants for each sample. The covariates that reliably predicted Act Six participation after Bonferroni correction varied in each model and are indicated in boldface in Table 3. High school rank and work study offered were the most consistent predictors, showing significance in the full model and four of the six subsample models. Female, transformed high school GPA, and first college retention to year two were the only measures that were not significant in any of the models. The mean and

Table 3

Logistic Regression Model, Resulting Propensity Scores, and Matches by Classes Included in Model

	Classes Included													
Variable	2003-10		2003-05		2006		2007		2008		2009		2010	
Regression model														
n	2,047		338		326		358		313		361		351	
$\chi^2_{(10)}$	354.6	***	100.8	***	44.6	***	55.3	***	45.2	***	127.0	***	135.7	***
Negelkerke R^2	0.37		0.56		0.53		0.42		0.32		0.58		0.61	
b														
FEMALE	-0.19		0.17		-0.68		-1.57	*	-0.07		1.03	*	-0.72	
RACEBHN	**1.66**	***	**2.45**	***	2.11		1.82	*	2.16	**	1.50	*	0.43	
HSGPALN	-0.22		0.09		1.72		0.30		-0.66		-0.15		-0.64	
HSRANK	**0.99**	***	**0.85**	***	1.08	*	**1.00**	**	0.88	**	**1.33**	***	**1.10**	***
EFCBIN	**0.29**	**	0.42		0.32		0.34		0.05		**0.70**	**	0.52	*
NEEDMETBIN	**1.18**	***	**1.93**	***	1.70	*	1.57	**	0.82	*	**1.96**	***	**2.16**	***
LOANBIN	-0.07		0.86	*	-0.18		-1.39	*	0.18		**-0.83**	**	-0.49	*
WORKSTUDY	**2.20**	***	**3.07**	***	1.80		1.31		**2.11**	***	**2.78**	***	**3.46**	***
FCRETAINYR2	0.02		-0.18		-0.14		-0.10		0.04		-0.01		0.08	
FCGRADIN6MATCHRT	0.34		**-5.32**	***	-5.15	*	-2.05		1.71	*	1.29		**3.54**	**
Intercept	**-12.09**	***	18.63		16.60		5.19		-18.38	*	-16.57	*	**-29.23**	**
Propensity scores[a]														
M	0.083		0.092		0.031		0.053		0.077		0.116		0.123	
SD	0.143		0.198		0.113		0.123		0.123		0.221		0.236	
Matching[b]														
Caliper size = .25*SD*	0.036		0.050		0.028		0.031		0.031		0.055		0.059	
Number of matches	132		17		5		15		21		21		22	
Caliper size = .10	0.100		0.100		0.100		0.100		0.100		0.100		0.100	
Number of matches	136		21		6		16		21		23		23	

Note. Significant predictors using Bonferroni correction, $p < \alpha = .05/11 = .004$, *are in boldface*. [a]Propensity scores are predicted probability values from regresion. [b]Matching implemented using 1-1 nearest neighbor matching within caliper. $^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

standard deviation of the resulting propensity scores are also displayed for each model in Table 3, and the next step in the procedure examined and utilized those scores.

Step 3: Selection and Application of Matching Algorithm

The next task was to use the propensity scores produced by the logistic regressions in the previous step to match Act Six participants with WSA students having similar scores (or similar likelihoods of being selected for Act Six). If successful, the matching process would produce two groups that were very similar and had no significant differences on any of the observed covariates. There are a variety of matching algorithms available and selection of the appropriate method should be based on the data at hand and the objectives of the planned analysis. The decision often involves trade-offs between bias and variability (Caliendo & Kopeinig, 2005), or put more simply, between generating more matches or closer matches.

Before selecting a matching technique, the distributions of the propensity scores for each group were visually compared to determine the degree to which they overlapped. Figure 2 and Figure 3 show seven plots representing the propensity score distributions for each of the regression models in the previous step. The common support region is typically defined as the interval where the two groups overlap, and all students whose propensity score is smaller than the minimum or larger than the maximum in the other group are not considered for matching. Inspection of the plots showed that while the common support region in each model was substantial, the differences between groups were striking, with the vast majority of WSA participants having very low propensity scores and most of the potential matches representing outliers in the WSA group. Despite the much larger WSA samples, only a small proportion of WSA students were comparable on the set of covariates to most Act Six participants. It was therefore to be expected that a substantial number of Act Six participants would not be matched and the resulting sample sizes would be reduced.

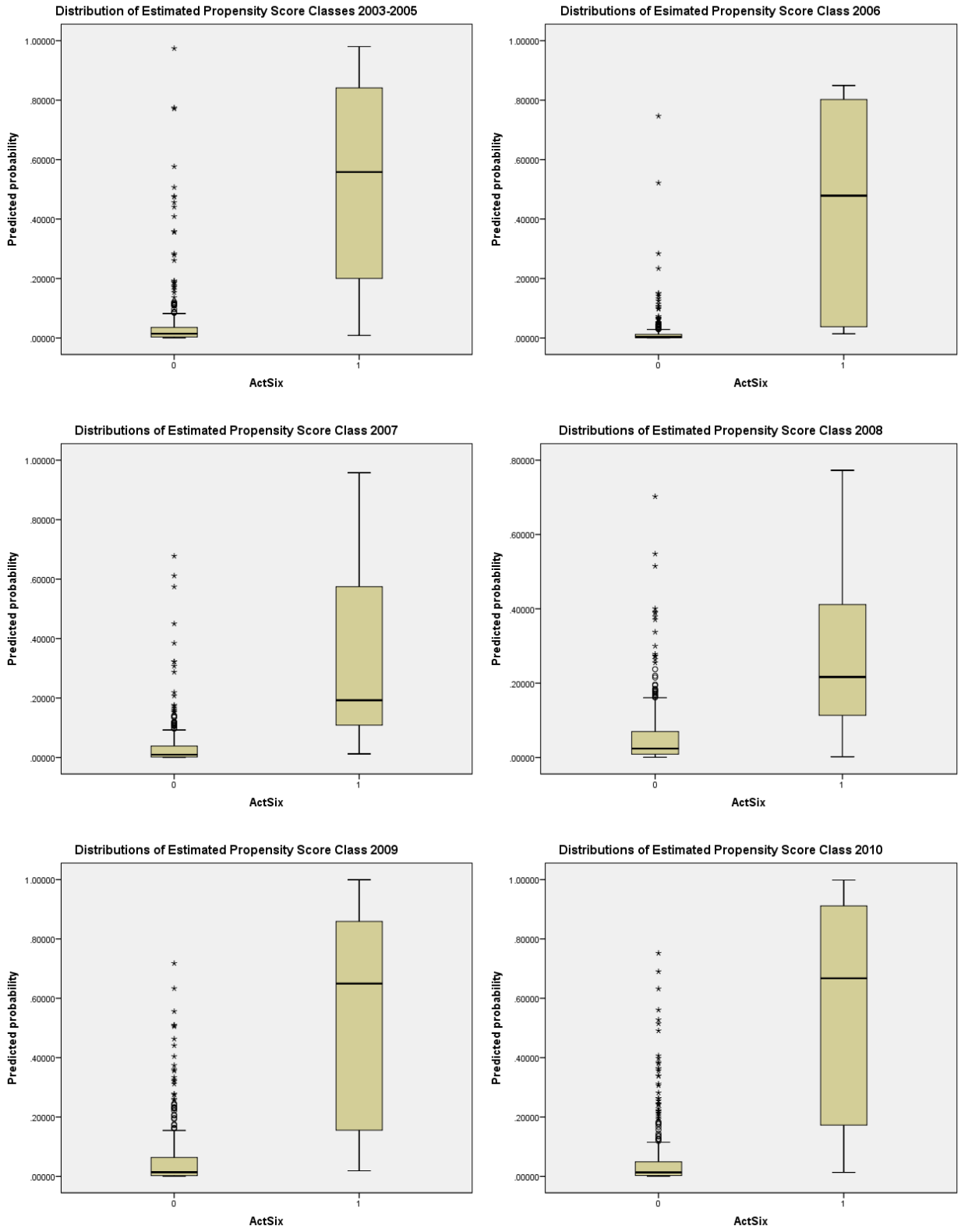

Figure 2. Distributions of Estimated Propensity Scores for Act Six and WSA by Classes Included in Model

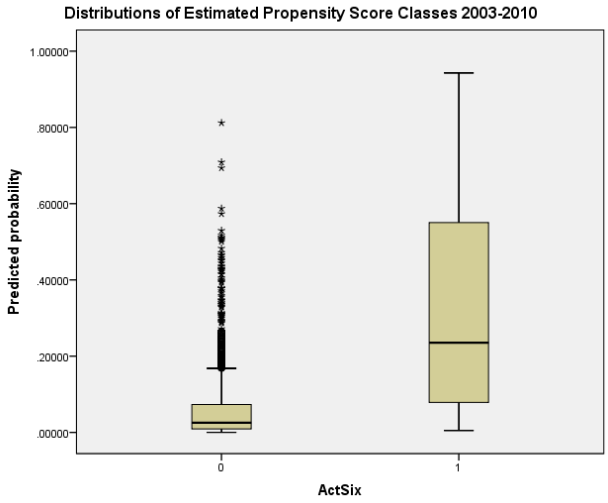

Figure 3. Distributions of Estimated Propensity Scores for Act Six and WSA for All Students

In light of the data and after considering a number of different algorithms, one-to-one nearest neighbor matching within a caliper without replacement was chosen. This straightforward technique places an emphasis on controlling bias and is appropriate when there are a limited number comparison cases available. The technique was also selected because it allows for traditional multivariate analysis on the resulting matched samples. The algorithm can be described as follows: (1) all of the students are randomly ordered, (2) the first treated student is selected and matched with the student from the comparison group that has the closest propensity score, as long as the distance between the two scores is less than a predefined caliper value, (3) if a match is identified, then both matched students are removed from further consideration, (4) if no match is available, then the treated student remains unmatched and is removed from further consideration, (5) the process repeats for the next treated student in the list until all of the treated students have been considered.

Before beginning matching, a caliper size had to be defined. There are two common caliper sizes in the literature: 0.10 and 0.25 times the standard deviation of the propensity scores (S. Y. Guo & Fraser, 2009). A larger caliper size can allow for more matches (decreasing bias)

but may reduce the closeness of those matches (increasing variance) and could prevent the removal of significant differences from the resulting matched samples. Borrowing from Guo, Barth & Gibbons (2006), the decision was made to test and compare both common caliper size options for each matching scheme. The matching process was implemented for each of the seven regression schemes using the PSMATCH2 (Leuven & Sianesi, 2003) module in Stata. The number of resulting matches for each regression model and each caliper size is reported at the bottom of Table 3.

Step 4: Comparison of Matching Schemes

After applying the matching algorithm, the two open-matched samples (based on the regression with all students) contained 132 matches (264 students) from the caliper of 0.25SD, and 136 matches from the wider 0.10 caliper. The matches generated from within each of the six class subsamples were combined to create two class-matched samples, with 101 matches from the 0.25SD calipers and 110 matches from the wider 0.10 caliper. For each of these four resulting samples, bivariate *t*-tests were performed on all covariates to test for differences between Act Six and WSA students. The results for the four matched samples were compared with the original unmatched sample and with each other to assess the quality of matching schemes. The results are presented in Table 4 (the final three columns of Table 4 will be discussed shortly). Note that while the transformed high school GPA and six-year graduation rate for student's race variables were used in all analyses, results for the original variables are also reported in the table for comparison and to aid in interpretation.

All four matching schemes succeeded in balancing the groups by removing all significant differences between Act Six and WSA students. The wider caliper size of 0.10 in both the open-matched and class-matched schemes resulted in slightly larger sample sizes without any apparent loss in match quality. In fact, the best balancing was obtained from the 0.10 caliper class-matched sample which produced nearly equal values for both groups on all variables, with every

Table 4

Comparison of Match Quality Produced by Various Matching Schemes

	Full Unmatched Sample[a]			Open-Matched Sample					
				Caliper = .25*SD*			Caliper = .10		
	M		*t* Test	*M*		*t* Test	*M*		*t* Test
Variable	Act Six	WSA	*p*	Act Six	WSA	*p*	Act Six	WSA	*p*
n	169	1,878		132	132		136	136	
CLASS									
2003-2005[c]	31	307		23	20		24	20	
2006[d]	10	316		5	27		6	27	
2007[e]	19	339		16	30		15	31	
2008	24	289		22	22		22	23	
2009	42	319		31	18		34	19	
2010	43	308		35	15		35	16	
FEMALE	.586	.602	.689	.614	.606	.900	.610	.610	1.000
RACEBHN	**.722**	**.455**	**< .001**	.659	.606	.373	.669	.618	.377
HSGPA[f]	**3.41**	**3.33**	**.018**	3.44	3.45	.858	3.43	3.46	.559
HSGPALN	-0.57	-0.53	.490	-0.62	-0.70	.401	-0.60	-0.70	.242
HSRANK	**3.04**	**2.11**	**< .001**	2.58	2.58	1.000	2.63	2.59	.773
EFCBIN	**1.31**	**0.91**	**< .001**	1.22	1.27	.731	1.20	1.25	.691
NEEDMETBIN	**2.46**	**2.01**	**< .001**	2.41	2.36	.633	2.39	2.36	.751
LOANBIN	**0.63**	**0.85**	**.007**	0.67	0.72	.667	0.66	0.71	.668
WORKSTUDY	**.497**	**.263**	**< .001**	.470	.500	.624	.493	.515	.717
FCRETAINYR2	83.8	83.6	.723	83.4	84.1	.384	83.6	84.1	.473
FCGRADIN6MATCH[f]	62.0	64.0	.220	61.0	63.1	.384	61.4	63.2	.421
FCGRADIN6MATCHRT	3.3	3.3	.474	3.3	3.3	.574	3.3	3.3	.579

Note. Significant differences, p < .05, are in boldface.

[a]Excludes 20 multivariate outliers removed in screening. [c]Available for 4- through 6-year graduation analysis. [d]Available for 4- through 5-year graduation analysis. [e]Available for 4-year graduation analysis. [f]Matching procedures and follow-up analysis used the transformed variable, but values for the original variable are reported as well, for comparison and to aid in interpretation.

Table 4 (continued)

Comparison of Match Quality Produced by Various Matching Schemes

	Class-Matched Sample								
	Caliper = .25*SD*			Caliper = .10			Classes 2003-07 Only[b]		
	M		*t* Test	*M*		*t* Test	*M*		*t* Test
Variable	Act Six	WSA	*p*	Act Six	WSA	*p*	Act Six	WSA	*p*
n	101	101		110	110		43	43	
CLASS									
2003-2005[c]	17	17		21	21		21	21	
2006[d]	5	5		6	6		6	6	
2007[e]	15	15		16	16		16	16	
2008	21	21		21	21				
2009	21	21		23	23				
2010	22	22		23	23				
FEMALE	.644	.624	.772	.618	.627	.890	.605	.605	1.000
RACEBHN	.644	.634	.884	.645	.655	.888	.605	.535	.519
HSGPA[f]	3.46	3.50	.393	3.46	3.46	.944	3.40	3.36	.697
HSGPALN	-0.64	-0.78	.178	-0.64	-0.71	.502	-0.47	-0.53	.645
HSRANK	2.35	2.49	.316	2.50	2.49	.948	2.53	2.53	1.000
EFCBIN	1.07	1.15	.600	1.02	1.09	.607	1.23	1.26	.910
NEEDMETBIN	2.35	2.32	.777	2.34	2.31	.782	2.53	2.51	.889
LOANBIN	0.69	0.62	.620	0.61	0.60	.944	0.42	0.40	.874
WORKSTUDY	.515	.485	.675	.527	.509	.788	.465	.488	.832
FCRETAINYR2	83.9	84.6	.459	84.3	84.6	.684	85.7	86.8	.394
FCGRADIN6MATCH[f]	63.6	65.3	.533	64.6	65.6	.688	71.6	73.2	.621
FCGRADIN6MATCHRT	3.2	3.2	.516	3.2	3.2	.680	3.0	2.9	.435

Note. Significant differences, p < .05, are in boldface.

[b]Caliper = .10. This scheme used in 4-year graduation analysis. [c]Available for 4- through 6-year graduation analysis. [d]Available for 4- through 5-year graduation analysis. [e]Available for 4-year graduation analysis. [f]Matching procedures and follow-up analysis used the transformed variable, but values for the original variable are reported as well, for comparison and to aid in interpretation.

t test *p*-value above 0.50 and seven of the 12 *p*-values above 0.75. In plain terms, it is safe to say that Act Six and WSA students in this matched sample of 220 students are on average nearly identical on all covariate measures.

The superior quality of the match in this sample, together with the assurance that matched students will remain paired in all outcome analyses as classes are time-censored, led to the decision to utilize the .10 caliper class-matched sample for all final outcome analyses, despite the trade-off in lower power in analyses that may result from slightly lower sample size compared to the open-matched schemes. Having chosen this sample for analyses, a final comparison was run to test whether the smaller subsample available for the four-year graduation analysis (43 pairs from classes 2003 through 2007) would remain balanced. Results are presented in the last three columns of Table 4 and show that the subsample remained nicely balanced on all variables with no significant differences appearing.

Before proceeding with this matched sample, however, it is important to recognize that 39% of Act Six participants were not matched and will therefore not be accounted for in the outcomes analysis that follows. While one would assume from the fact that they were not matched that they were notably different from the Act Six students who were matched on many of the covariates, if they were also different on the outcome variables, then it would be more difficult to generalize any results found from the matched pairs analysis to all Act Six participants. If, for example, the unmatched Act Six students left out of the analysis departed college at a higher rate than the matched Act Six students included in the analysis, then the survival time and graduation rates for Act Six in the analysis would be too high and not representative of all Act Six participants.

Table 5 shows the results of bivariate *t*-tests for differences between matched and unmatched Act Six participants on all covariates as well as on *persistence to year two*, *graduation within four years* and *graduation within six years* outcomes. It is not surprising to

find significant differences between the two groups on most of the same variables that were significantly different between Act Six and WSA participants in the full sample. Compared with matched Act Six students, the unmatched students were more likely Black, Hispanic or American Indian, had lower high school grades, attended higher performing high schools, had higher EFCs, had more of their need met with grant, and encountered lower graduation rates for students of their race at their college. However, while the unmatched Act Six participants had a slightly higher persistence to year two rate and slightly lower four- and six-year graduation rates, none of these differences on outcomes were significant. This result provides confidence that the attrition from matching does not likely bias the results in the outcome analyses that follow.

Table 5

Comparison of Matched and Unmatched Act Six Participants

	M		*t* Test
Variable	Matched	Unmatched	*p*
n	110	70	
CLASS			
2003-2005[a]	21	10	
2006[b]	6	4	
2007[c]	16	3	
2008	21	4	
2009	23	28	
2010	23	21	
FEMALE	.618	.529	.240
RACEBHN	**.645**	**.843**	**.002**
HSGPA[d]	**3.46**	**3.22**	**.001**
HSGPALN	**-0.64**	**-0.34**	**.005**
HSRANK	**2.50**	**3.77**	**< .001**
EFCBIN	**1.02**	**1.80**	**< .001**
NEEDMETBIN	**2.34**	**2.64**	**.015**
LOANBIN	0.61	0.83	.196
WORKSTUDY	.527	.486	.590
FCRETAINYR2	84.3	84.5	.840
FCGRADIN6MATCH[d]	**64.6**	**54.6**	**.008**
FCGRADIN6MATCHRT	3.2	3.4	.060
PERSISTYR2FIRST	.936	.943	.859
GRADIN4FIRST	.744	.706	.767
n eligible	43	17	
GRADIN6FIRST	.952	.900	.594
n eligible	21	10	

Note. Significant differences, p < .05, are in boldface.
[a]Available for 4- through 6-year graduation analysis. [b]Available for 4- through 5-year graduation analysis. [c]Available for 4-year graduation analysis. [d]Matching procedures and follow-up analysis used the transformed variable, but values for the original variable are reported as well, for comparison and to aid in interpretation.

Step 5: Outcome Analyses

Using the PSM-matched sample of 220 students, multivariate analyses were conducted to test the effect of Act Six participation on three student outcomes: persistence through the first four years, graduation within four years, and graduation within six years, all at the first college attended. PSM techniques produced a sample where Act Six and WSA participants were on average nearly identical for every covariate under examination, differing only on program participation. Using multivariate techniques for the postmatching analyses provided an additional level of control for those covariates and allowed for estimation of the additional gain in persistence and graduation for Act Six participants, holding all other factors constant. For the sake of comparison, all three multivariate analyses were also conducted on the full unmatched sample and the results compared to those for the PSM-matched sample.

Persistence Through Four Years

Matched sample. Figure 3 presents plots of the survival functions for Act Six and WSA persistence at first college in the PSM-matched sample, showing persistence rates at the end of year two of 85% for Act Six participants and 71% for WSA students. At the end of year four, the gap between groups had increased to 21%, with a rate of 76% for Act Six compared to 55% for WSA. Despite the expanding gap between persistence rates observed in the plot, the analytical check for proportionality of hazards recommended by Tabachnick and Fidell (2007, pp. 535–536) revealed no concerns that the effects of the covariates on persistence changed significantly over time.

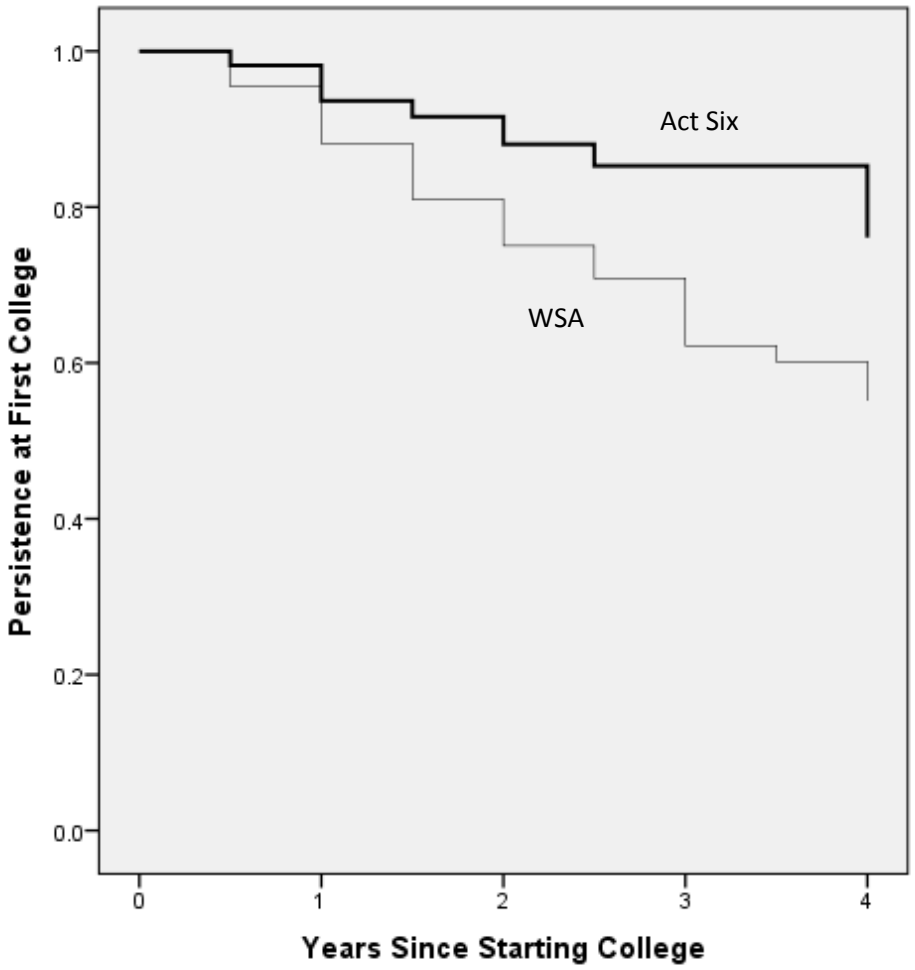

Figure 4. Survival Functions for Persistence in PSM-Matched Sample for Act Six and WSA Participants.

A Cox regression survival analysis was run using SPSS COXREG to assess the effect of Act Six participation on persistence time after controlling for the 10 covariates identified in Step 1. Of the 220 students in the analysis, 166 were censored because either they graduated or they remained enrolled at the start of their fifth year or at the end of the study in fall 2010. A test of a full model with the 10 covariates and Act Six participation against a model with only the 10 covariates revealed a significant effect of Act Six participation after adjusting for the other covariates, $G^2(1) = 9.900$, $p = .002$. Table 6 shows regression coefficients, standard errors, Wald statistics, *p*-values, and odds ratios with 95% confidence intervals for each covariate in the full model. Act Six participation was the only covariate that reliably predicted persistence time at

Bonferroni-corrected $\alpha = .05 / 11 = .005$, with $b = -0.89$, Wald(1) = 9.24, $p = .002$. Negative regression coefficients correspond with odds ratios less than 1.00 and in this setting indicate a decrease in the odds of departing. Therefore, an odds ratio for Act Six participation of 0.41 suggests that Act Six participants are only 41% as likely as WSA students to depart from their first college during the first four years. That is, they are 59% less likely to depart or 59% more likely to persist. Using the 95% confidence interval, students who participate in Act Six are between 27% and 77% more likely than WSA participants to persist at their first college, keeping all other covariates constant.

Table 6

Cox Regression Survival Analysis of Retention at First College Using PSM-Matched Sample

					Odds	95% CI	
Variable	*b*	*(SE)*	*Wald(1)*	*p*	Ratio	Lower	Upper
ACTSIX	**-0.89**	**(0.29)**	**9.24**	**.002**	**0.41**	**0.23**	**0.73**
FEMALE	0.38	(0.30)	1.58	.208	1.46	0.81	2.62
RACEBHN	0.05	(0.37)	0.02	.891	1.05	0.51	2.16
HSGPALN	0.52	(0.24)	4.70	.030	1.68	1.05	2.69
HSRANK	0.02	(0.15)	0.03	.872	1.02	0.76	1.38
EFCBIN	-0.02	(0.04)	0.18	.675	0.98	0.91	1.06
NEEDMETBIN	-0.03	(0.51)	0.00	.959	0.97	0.36	2.63
LOANBIN	0.30	(0.15)	4.12	.042	1.35	1.01	1.80
WORKSTUDY	0.09	(0.23)	0.16	.690	1.10	0.70	1.71
FCRETAINYR2	-0.04	(0.17)	0.06	.811	0.96	0.69	1.34
FCGRADIN6MATCHRT	0.12	(0.36)	0.12	.730	1.13	0.56	2.28

Note. $n = 220$ with 54 departures and 166 censored by year 4. CI = confidence interval for odds ratio. Significant predictors using Bonferroni correction, $p < \alpha = .05/11 = .005$, are in boldface.

Full unmatched sample. For the sake of comparison, the same analysis was also run using the full unmatched sample. Figure 4 presents plots of the survival functions for Act Six and WSA persistence at first college for all students in the full unmatched sample, showing persistence rates at the end of year two of 87% for Act Six participants and 62% for WSA

students. At the end of year four, the gap between groups had grown to 30%, with a rate was 79% for Act Six compared to 49% for WSA. In this case, an analytical check revealed some concern that the effects of EFC bin, need met with grant bin, and first college retention to year two may change over time. To address these violations of the proportionality of hazards assumption for the Cox regression survival analysis, interactions between each of these three covariates and time was included in the regression model, following the recommendation of Tabachnick and Fidell (2007, p. 536). Of the 2,047 students in the analysis, 1,223 were censored because either they graduated or they remained enrolled at the start of their fifth year or at the end of the study in fall 2010.

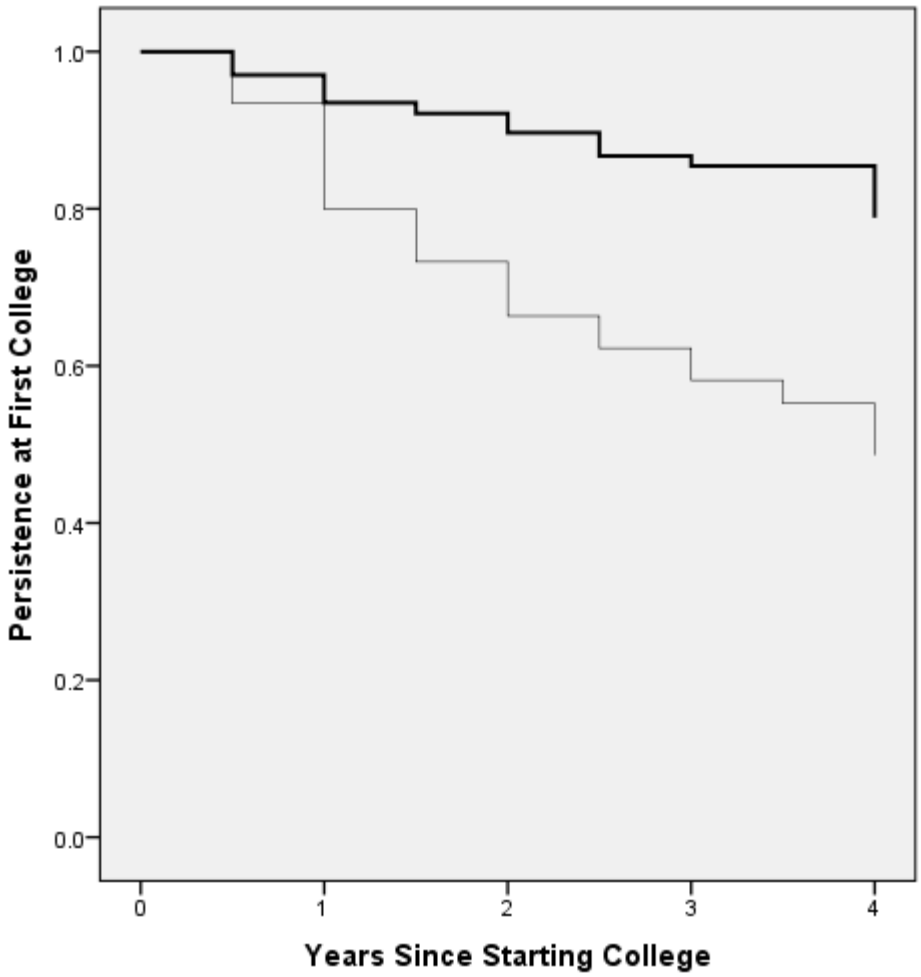

Figure 5. Survival Functions for Persistence in Full Unmatched Sample for Act Six and WSA Participants.

A test of a full model with the 10 covariates, three interaction terms, and Act Six participation against the model without Act Six participation revealed a significant effect of Act Six participation after adjusting for the other covariates, $G^2(1) = 20.78$, $p < .001$. Table 7 shows regression coefficients, standard errors, Wald statistics, *p*-values, and odds ratios with 95% confidence intervals for each covariate in the full model. Using Bonferroni-corrected $\alpha = .05 / 14 = .004$, Act Six participation once again reliably predicted persistence time, $b = -0.86$, Wald(1) = 16.3, $p < .001$. The odds ratio for Act Six participation of 0.42 in this test was nearly identical to the 0.41 value from the matched sample with the larger sample size producing a slightly narrower 95% confidence interval, suggesting that students who participate in Act Six

are between 36% and 72% more likely than WSA participants to persist at their first college, keeping all other covariates constant.

Without the balancing of covariates as in the matched sample, six covariates in addition to Act Six participation reliably predicted persistence time: Black, Hispanic, or American Indian, transformed high school GPA, high school rank, first college retention to year two, need met with grant bin and the interaction of time with need met with grant bin. Black, Hispanic, or American Indian students and students with higher grades, from higher performing high schools, and attending colleges with better retention rates were more likely to persist. Those with more need met with grant in their first year were also more likely to persist although the effect of that additional grant in the first year varied as time went on.

The similarity of the results from this conventional multivariate analysis controlling for covariates on the full unmatched sample to those obtained from the PSM-matched sample add confirmation to the PSM findings. Because of the additional control of selection bias provided by the PSM techniques, results from that analysis will be reported.

Table 7

Cox Regression Survival Analysis of Retention at First College Using Full Unmatched Sample

Variable	*b*	*(SE)*	*Wald(1)*	*p*	Odds Ratio	95% CI Lower	95% CI Upper
ACTSIX	**-0.86**	**(0.21)**	**16.30**	**< .001**	**0.42**	**0.28**	**0.64**
FEMALE	0.15	(0.07)	4.54	.033	1.17	1.01	1.35
RACEBHN	**-0.31**	**(0.09)**	**12.44**	**< .001**	**0.73**	**0.61**	**0.87**
HSGPALN	**0.37**	**(0.06)**	**41.54**	**< .001**	**1.45**	**1.29**	**1.62**
HSRANK	**-0.16**	**(0.04)**	**13.16**	**< .001**	**0.85**	**0.78**	**0.93**
EFCBIN	0.17	(0.07)	6.43	.011	1.18	1.04	1.35
NEEDMETBIN	**-0.58**	**(0.08)**	**49.69**	**< .001**	**0.56**	**0.47**	**0.66**
LOANBIN	-0.03	(0.04)	0.66	.416	0.97	0.89	1.05
WORKSTUDY	0.03	(0.08)	0.11	.737	1.03	0.87	1.21
FCRETAINYR2	**-0.03**	**(0.01)**	**6.20**	**.013**	**0.97**	**0.95**	**0.99**
FCGRADIN6MATCHRT	0.10	(0.17)	0.31	.578	1.10	0.78	1.55
TIME*FCRETAINYR2	0.01	(0.00)	7.48	.006	1.01	1.00	1.02
TIME*EFCBIN	-0.10	(0.04)	8.46	.004	0.90	0.84	0.97
TIME*NEEDMETBIN	**0.25**	**(0.04)**	**33.71**	**< .001**	**1.29**	**1.18**	**1.40**

Note. n = 2,047 with 824 departures and 1,223 censored by year 4.5. CI = confidence interval for odds ratio. Significant predictors using Bonferroni correction, $p < \alpha = .05/14 = .004$, are in boldface.

Graduation Within Four Years

Matched sample. Utilizing the PSM-matched sample, a direct logistic regression was run using SPSS LOGISTIC REGRESSION to assess the effect of Act Six participation on graduation within four years from first college, after controlling for the same 10 covariates used in previous analyses. Only the 86 students with four or more years since initial enrollment by the end of the study in fall 2010 (classes 2003 through 2007) were included in the analysis. A test of the full model with all covariates and the independent variable Act Six participation was statistically significant, $\chi^2(11, n = 86) = 23.81$, $p = .014$, indicating adequate model fit, with Cox and Snell's $R^2 = .242$.

Table 8 shows regression coefficients, standard errors, Wald statistics, *p*-values, and odds ratios with 95% confidence intervals for each covariate in the full model. Act Six participation was the only reliable predictor of graduation within four years, $b = 1.79$, Wald(1) = 11.5, $p < .001$, indicating that Act Six participation does have a significant effect. Positive regression coefficients correspond with odds ratios greater than 1.00 and in this setting indicate an increase in the odds of graduating within four years. Therefore, the odds ratio for Act Six participation of 5.97 suggests that Act Six participants are nearly six times as likely to graduate within four years as similar WSA students. Using the 95% confidence interval, students who participate in Act Six are between 5.94 and 6.01 times more likely than WSA participants to graduate from their first college, when all other covariates are held constant.

Table 8

Logistic Regression of Graduation Within Four Years from First College Using PSM-Matched Sample

					Odds	95% CI	
Variable	*b*	*(SE)*	*Wald(1)*	*p*	Ratio	Lower	Upper
ACTSIX	**1.79**	**(0.53)**	**11.46**	**< .001**	**5.97**	**5.94**	**6.01**
FEMALE	0.46	(0.57)	0.67	.411	1.59	1.58	1.60
RACEBHN	0.39	(0.67)	0.33	.564	1.48	1.46	1.49
HSGPALN	-0.86	(0.51)	2.87	.090	0.42	0.42	0.43
HSRANK	0.05	(0.28)	0.03	.853	1.05	1.05	1.06
EFCBIN	-0.27	(0.31)	0.77	.381	0.76	0.76	0.77
NEEDMETBIN	-0.22	(0.46)	0.23	.631	0.80	0.80	0.81
LOANBIN	-0.08	(0.41)	0.03	.854	0.93	0.92	0.93
WORKSTUDY	-0.14	(0.71)	0.04	.843	0.87	0.86	0.88
FCRETAINYR2	-0.02	(0.08)	0.08	.775	0.98	0.98	0.98
FCGRADIN6MATCHRT	-1.29	(1.01)	1.64	.200	0.28	0.27	0.28
Intercept	5.15	(9.3)	0.31	.581	172.38		

Note. $n = 86$. CI = confidence interval for odds ratio. Significant predictors using Bonferroni correction, $p < \alpha = .05/11 = .005$, are in boldface.

Full unmatched sample. As before, the same analysis was also run using the full unmatched sample for the sake of comparison. This time, 1,022 students in classes 2003 through 2007 were included in the analysis. A test of the full model with all covariates and the independent variable Act Six participation was statistically significant, $\chi^2(11, n = 1{,}022) = 185.6$, $p < .001$, indicating adequate model fit, with Cox and Snell's $R^2 = .166$.

Table 9 shows regression coefficients, standard errors, Wald statistics, *p*-values, and odds ratios with 95% confidence intervals for each covariate in the full model. Act Six participation was a reliable predictor of graduation within four years, $b = 1.62$, Wald(1) = 22.1, $p < .001$, indicating that Act Six participation does have a significant effect. Using the 95% confidence interval for the odds ratio for Act Six participation, students who participate in Act Six are between 5.04 and 5.08 times more likely than WSA participants to graduate from their first college within four year, when all other covariates are held constant. Without the balancing of covariates as in the matched sample, two other covariates in addition to Act Six participation reliably predicted persistence time: transformed high school GPA and need met with grant bin, indicating that students with higher high school grades and more need met with grant in the first year were more likely to graduate within four years.

As in the earlier persistence time analysis, the similarity of the results from this conventional multivariate analysis of four-year graduation controlling for covariates and using the full unmatched sample to those obtained from the PSM-matched sample adds confirmation to the PSM findings. Once again, because of the additional control of selection bias provided by the PSM techniques, results from that analysis will be reported.

Table 9

Logistic Regression of Graduation Within Four Years from First College Using Full Unmatched Sample

Variable	*b*	*(SE)*	*Wald(1)*	*p*	Odds Ratio	95% CI Lower	95% CI Upper
ACTSIX	**1.62**	**(0.35)**	**22.06**	**< .001**	**5.06**	**5.04**	**5.08**
FEMALE	0.40	(0.16)	5.81	.016	1.48	1.48	1.49
RACEBHN	0.15	(0.20)	0.56	.453	1.16	1.16	1.17
HSGPALN	**-0.60**	**(0.11)**	**28.12**	**< .001**	**0.55**	**0.55**	**0.55**
HSRANK	0.20	(0.09)	4.58	.032	1.22	1.22	1.22
EFCBIN	0.12	(0.08)	1.92	.165	1.12	1.12	1.12
NEEDMETBIN	**0.37**	**(0.12)**	**9.88**	**.002**	**1.45**	**1.44**	**1.45**
LOANBIN	0.15	(0.11)	2.09	.149	1.16	1.16	1.17
WORKSTUDY	0.41	(0.20)	4.38	.036	1.50	1.50	1.51
FCRETAINYR2	-0.02	(0.02)	0.51	.476	0.98	0.98	0.98
FCGRADIN6MATCHRT	-1.11	(0.42)	7.04	.008	0.33	0.33	0.33
Intercept	1.72	(3.3)	0.28	.597	5.61		

Note. n = 1,022. CI = confidence interval for odds ratio. Significant predictors using Bonferroni correction, $p < \alpha = .05/12 = .005$, are in boldface.

Graduation Within Six Years

Matched sample. Utilizing the PSM-matched sample, a direct logistic regression was attempted to assess the effect of Act Six participation on graduation within six years from first college, after controlling for the same 10 covariates used in previous analyses. However, only 42 matched students with six or more years since initial enrollment by the end of the study in fall 2010 (2003 through 2005 classes) were available for the analysis. Because of the small sample size relative to the number of predictors, a test of the full model with all covariates and the independent variable Act Six participation failed to converge. Therefore, it could not be determined whether the 95% six-year graduation rate observed for the 21 Act Six students in the matched sample was significantly higher than the 71% six-year graduation rate for the 21 matched WSA students.

Full unmatched sample. The full unmatched sample with 338 students in the 2003 through 2005 classes was of sufficient size to allow for analysis, however. A test of the full model with all covariates and the independent variable Act Six participation was statistically significant, $\chi^2(11, n = 388) = 50.76, p < .001$, indicating adequate model fit, with Cox and Snell's $R^2 = .139$.

Table 10 shows regression coefficients, standard errors, Wald statistics, *p*-values, and odds ratios with 95% confidence intervals for each covariate in the full model. Act Six participation was significant at $\alpha = .05$, but not at the Bonferroni-corrected $\alpha = .05 / 11 = .005$ used throughout the study, Wald(1) = 4.45, $p = .035$, leaving the significant of Act Six participation on six-year graduation in question. Because the result would have been significant without the Bonferroni correction and the low *p*-value may possibly be attributed at least in part to low power from the small number of Act Six students eligible for six-year graduation ($n = 31$), it is worth noting that the odds ratio for Act Six participation of 5.26 is similar to that in the four-year graduation analysis, suggesting that if this result had been significant, the effect size would have been roughly on par with that for graduation within four years.

Two other covariates did reliably predict persistence time: transformed high school GPA and need met with grant bin, indicating that as with the four-year graduation, students with higher high school grades and more need met with grant in the first year were more likely to graduate within six years.

Table 10

Logistic Regression of Graduation Within Six Years from First College Using Full Unmatched Sample

Variable	*b*	*(SE)*	*Wald(1)*	*p*	Odds Ratio	95% CI Lower	95% CI Upper
ACTSIX	1.66	(0.79)	4.45	.035	5.26	5.21	5.31
FEMALE	-0.02	(0.25)	0.01	.928	0.98	0.97	0.98
RACEBHN	0.75	(0.33)	5.34	.021	2.12	2.11	2.13
HSGPALN	**-0.72**	**(0.20)**	**12.43**	**.000**	**0.49**	**0.48**	**0.49**
HSRANK	0.28	(0.15)	3.34	.067	1.32	1.32	1.33
EFCBIN	-0.04	(0.14)	0.07	.796	0.96	0.96	0.97
NEEDMETBIN	**0.54**	**(0.18)**	**8.83**	**.003**	**1.71**	**1.71**	**1.72**
LOANBIN	0.27	(0.18)	2.35	.125	1.31	1.31	1.31
WORKSTUDY	0.28	(0.29)	0.91	.339	1.32	1.31	1.32
FCRETAINYR2	-0.02	(0.04)	0.22	.642	0.98	0.98	0.98
FCGRADIN6MATCHRT	-0.17	(0.71)	0.05	.817	0.85	0.84	0.86
Intercept	0.03	(5.6)	0.00	.996	1.03		

Note. n = 338. CI = confidence interval for odds ratio. Significant predictors using Bonferroni correction, $p < \alpha = .05/11 = .005$, are in boldface.

Summary

Multivariate analyses were conducted on both the PSM-matched and full unmatched samples to determine whether Act Six participation had effect on persistence and graduation within four and six years at students' first college. For persistence and four-year graduation, results were consistent with both samples. Participation in Act Six was found to significantly decrease the odds of departure by between 27% and 77% compared to WSA participation, and Act Six participants were found to be 5.94 to 6.01 times more likely than WSA participants to graduate within four years. Due to reduced sample sizes from time-censoring, findings for six-year graduation were inconclusive, with regression results unavailable for the PSM-matched sample and results from the full unmatched sample showing a nonsignificant effect size similar to those for four-year graduation.

CHAPTER SIX

DISCUSSION AND CONCLUSION

This study employed a rigorous evaluation method to assess the collective impact of the Act Six interventions articulated in the theory of change on Act Six participants' persistence and graduation outcomes. Results indicate that Act Six participants are nearly 60% less likely to depart and six times more likely to graduate on time than similar WSA participants, after controlling for differences in 10 demographic, academic, high school, college, and financial aid characteristics. These findings offer compelling evidence that the comprehensive interventions provided by Act Six provide additional benefit beyond the advising, scholarship, and mentoring support provided by the WSA program.

While the inherent limitations of the study prevent a definitive claim that Act Six interventions cause higher persistence and graduation for participants, the PSM techniques utilized in this study offer ample defense against contentions that the Act Six program experiences higher outcomes simply because it selects students with higher grades or from better schools, or simply because it provides more scholarship funds or sends students to colleges with higher graduation rates. Conventional multivariate techniques were used to control for these covariate influences, and the additional PSM strategies also corrected for observed selection bias on the covariates. Because the final analyses were conducted on balanced samples of Act Six and WSA students who were on average nearly identical across all the covariates, one can conclude that none of those covariates contributed to the observed differences in outcomes. The findings in effect rule out some of the factors other than the program interventions that might explain Act Six persistence and graduation rates. The 10 covariates ruled out by this study (gender, race, high school GPA, high school rank, expected family contribution, need meet with

grant, loan amount, work study, college retention, and college graduation rates) are important ones and are clear suspects as sources of selection bias, but other sources of potential bias remain unobserved and should be investigated in future studies. Primary among these might be additional academic preparation measures (rigor of high school coursework, SAT/ACT scores, etc.) and noncognitive measures (motivation, resilience, leadership, long-range goals, etc.).

One covariate merits special attention for its relationship with a prominent intervention and an outcome in the theory of change. The percent of need met with grant is directly influenced by the full scholarship component of the Act Six program (see intervention I and outcome 11 in Figure 1). Many observers assume that the full scholarship by itself explains a considerable amount of the higher retention for Act Six scholars (who, after all, would want to drop out and leave a full scholarship?). However, the matched group of WSA participants in the study had on average the same level of grant support but still experienced significantly lower levels of persistence and graduation. While this does not imply that the full scholarship isn't important or necessary for Act Six success, it does suggest that it is not sufficient, and that Act Six interventions other than the full scholarship provide substantial added value, even for students who have similarly high levels of scholarship support.

Directions for Future Research

While the question remains open how much of the effect of Act Six should be attributed to the selection process and how much to the program interventions, the findings of this study strengthen the evidence that taken together, the interventions have considerable effect. Future research, then, can begin testing and refining the causal relationships between interventions and outcomes hypothesized within the theory of change. Structural equation modeling (SEM) might be employed to test the extent to which the theory accurately describes those relationships. Qualitative techniques also have an important role to play in better understanding how Act Six actually affect students. While quantitative techniques like the ones employed in this study and

the SEM methods just mentioned can be well suited for analyzing the internal validity of causal inferences, they are not as well suited to capture and explain the complex, contextualized, and subtle interactions of program interventions with campus and community experiences that characterize a student's actual lived experience in the Act Six program. The rich description that ethnographic and other qualitative research approaches provide may be better suited to deeply understand the nuance in how and why the Act Six interventions influence participants' decisions to persist in or to leave college. As encouraged by Attinasi (1989) and Rendón, et al. (2000), qualitative research can be critical in creating and shaping theory that can then be tested and refined with quantitative approaches.

This study only examined one set of outcomes (persistence and graduation) for one set of long-term goals (impact on students) articulated in the theory of change. While the outcomes investigated here are perhaps the most pivotal in the model, there are other important outcomes for students such as community involvement and campus leadership that were not explored in this study that should be explored in future investigations, perhaps using similar techniques. Further, as the program matures and the numbers of participants and alumni grow, evaluation efforts will need to address the more challenging aspects of the program's effect on the long-term goals of institutional and community change.

Implications for Practice

The results of the study suggest that the comprehensive approach of Act Six has significant and substantial benefit beyond the advising, scholarship, and mentoring approach provided by WSA. Far from minimizing the effectiveness or impact of the WSA program on the thousands of students it has supported, these findings simply highlight the fundamental tradeoff between breadth and depth that nearly all service providers face. The WSA program provides a lower level of support and scholarship than Act Six, but does so for a far greater number of students at a lower cost per student. Numerous studies have confirmed the benefits of WSA for

its participants (IHEP, 2010) and there is no doubt that the scale of the program is needed in light of the widespread and stubborn inequities in college success that continue to confront underrepresented students. This study does, however, confirm that the additional support provided by Act Six and the considerable cost per student of that added support are in fact associated with sizable additional benefits in persistence and graduation. This study provides an opportunity for CSF to consider how some of the Act Six interventions and outcomes articulated in the theory of change might be integrated into its program designs to realize additional benefit for participants, even as the scale of the WSA program challenges Act Six to consider how elements of the theory might be repackaged or modified to serve larger numbers of students at more diverse institutions, while preserving as much program effect as possible for participants.

The theory of change presented here can provide a useful framework for both of these and other conversations. Even though the internal causal pathways proposed in the theory still need to be empirically tested and opportunities for further research on the program and the theory abound, the strong collective effects of the interventions observed in this study suggest some important implications for practitioners seeking to build or enhance programs to close the gaps in college persistence and graduation among underrepresented urban students. In particular, three specific recommendations for practice are described below.

Recommendation 1: Establish Strong Partnerships Between Colleges and Community Groups

Both colleges and community-based college success programs have a stake in increasing persistence and graduation among the underrepresented students they serve. Typically, however, their efforts take place in isolated silos with little communication or collaboration between the two. College student life departments traditionally understand their work to be self-contained on campus, with FERPA regulations reinforcing the perception that resources in students' home communities are not accessible or relevant to their day-to-day work. For their part, community-

based college success programs that provide ongoing support once students leave for college tend to work directly with students, unsure how to engage college staff or systems in support of their students. The Act Six model demonstrates the potential of formal partnerships between colleges and community organizations. When community and college support is coordinated and aligned as demonstrated in the Act Six theory of change, underrepresented students experience a powerful wrap-around effect that promotes their persistence and success.

Colleges should look for opportunities to partner with community organizations in places from which they draw (or hope to draw) substantial numbers of underrepresented students. By identifying and connecting with organizations that understand and effectively serve young people in those communities, colleges are able to both amplify their presence and reputation in the community (increasing enrollment) and bring culturally relevant supports from the community to bear for students on campus (increasing retention).

Recommendation 2: Increase Emphasis on Leadership, Cultural Integrity, and Sense of Purpose

College and community-based college success programs should place increased emphasis on leadership training that promotes cultural integrity and nurtures a sense of purpose in underrepresented students. Many college preparation programs place their primary focus on academic preparation and the development of technical skills to help students navigate the college classroom experience. Those skills are clearly essential, but this study highlights the reality that it is more than academic preparedness that holds back students of color, first generation college students, and students from low-income families in college. By providing students with explicit training about the realities of culture and privilege that they are likely to face on campus, as well as the need for and value in their unique contributions, programs can bolster students' resilience to institutional challenges and provide alternatives to the false dichotomy between succeeding in the college environment and staying true to themselves. For

example, introducing students to the concepts of biculturalism and dual socialization (Rendón et al., 2000) provides an alternative perspective that suggests that they can contribute and thrive in the college world without sacrificing their identity and culture.

When college success programs do address the social aspects of the college experience for underrepresented students, they often focus on helping students survive college and navigate institutions that have not been built with them in mind. The Act Six program pushes the conversation past survival to leadership. Participants are challenged to consider what they have to offer to campuses that need to hear their voices in order to achieve their institutional missions. Act Six extends Hurtado and Carter's (1997) concept of *sense of belonging* to *sense of purpose*, suggesting that students are more likely to persist through adversity when they understand themselves as being part of a greater purpose with something uniquely important to contribute. This extension of belonging to contributing in the Act Six theory of change is a subtle but important concept that can be easily integrated into existing and new college success programs.

Recommendation 3: Increase Use of Community-Based Cohorts

While it is common practice for graduate programs to utilize cohort structures, the use of cohorts remains largely absent from the undergraduate experience. We continue to send students to college on their own and expect them to transition and learn to navigate their new institutions individually. Indeed, Tinto's interactionalist paradigm and nearly all of the persistence theories in the literature are framed around the student's individual experience of college. For underrepresented students who must travel long cultural distances in the transition to college and who often find it difficult to find supportive community when they are immersed in the dominant campus culture, navigating the experience alone can often result in a profound sense of isolation. But there are alternatives. The success of the Act Six model suggests the benefit that community-based cohorts can deliver by providing a family-like support system—a built-in social enclave

that provides support and accountability, helps to affirm and validate students' cultural identities, and increases students' sense of belonging.

The growing movement to develop first-year academic learning communities where students are grouped together for multiple academic courses (and sometimes in living arrangements) on campus is promising in its utilization of cohorts. Such learning communities tend, however, to be formed based on academic interests or other factors that don't take into account cultural differences. As a result, underrepresented students often still find themselves in the minority and the communities are limited in their ability to supply the specific kind of social support these students need. On the other hand, college-based summer bridge programs that bring together targeted groups of underrepresented students for an extended, intensive academic or team-building experience on campus in the summer before the first year have been utilized by colleges for many years and can provide powerful relationship- and skill-building experiences for participants. Most campus bridge programs, however, are typically disconnected from the resources of students' home communities and like most learning community programs do not continue to nurture or support the cohorts beyond the first year of college. In contrast, the community-based cohorts utilized by the Act Six model are unique in that they: (1) are rooted in a shared home community experience and maintain students' connection to their home community, (2) provide extended time for training and relationship-building before students come to campus, (3) are intentional in equipping members of the cohorts to affirm, validate, and support each other, and (4) are nurtured and sustained throughout the college experience.

The full scholarship commitments and the deep level of partnership with colleges that Act Six employs allow the program to form cohorts of students from the same community headed to the same college midway through students' senior year, yielding seven months of training and preparation time with the cohorts. While this high level of cost and partnership makes the model difficult for other programs to replicate and severely limits its scalability, there

remains a largely untapped window of opportunity for college success programs to take advantage of naturally occurring community-based cohorts. By May every year, the majority of students planning to attend four-year colleges have made decisions and have committed to attending particular colleges, at which point colleges have lists of students from particular communities that plan to enroll in the fall. Traditionally, however, little is done by either colleges or community groups to invest in these naturally occurring community-based cohorts headed to the same college in the months between May and the start of school in the fall. Opportunity abounds to utilize this window of time to convene and invest intentionally in these cohorts of students during the summer months. The findings of this study suggest that there is substantial value in the Act Six interventions, even beyond the scholarship, that could be delivered to these cohorts of students in a condensed form between May and August. If colleges are intentional in working with community partners to recruit multiple students from targeted communities, those community partners can then convene and train the students, taking advantage of the summer months to build the supportive cohorts that can promote college persistence and success. Colleges can then design campus support structures that continue to support these established community cohorts. Further, these cohorts also offer promise to become inclusive, welcoming communities of support for other underrepresented students on campus who were not originally part of a cohort.

Finally, in an age of dramatic growth of online collaboration and social media, it is also worth exploring how social media tools can be utilized to provide a virtual cohort experience for community-based groups of students who experience the precollege Act Six training interventions together in person through a community-based college success program but then spread out to attend different colleges. Recent world events suggest the powerful motivational effect that social media can play in promoting change and stirring people to corporate action. If the campus-based interventions in the Act Six theory of change could be effectively delivered

virtually across campuses then the scalability of the Act Six interventions could be dramatically increased via the myriad community programs that work with cohorts of students throughout high school but send those students to college across multiple campuses.

Conclusion

This dissertation began with a review of the college student retention literature and then utilized and built on that literature to propose a comprehensive theory of change for the Act Six program that articulates how the five defining elements of Act Six (focus on leadership, cohorts as a core structure, importance of cultural integrity, emphasis on training, and nurturing of sense of purpose) are operationalized through the related interventions and outcomes of the program. It then evaluated the collective impact of these interventions on participants' college persistence and graduation, finding that after controlling for differences in 10 important covariates Act Six participants are nearly 60% less likely to depart and six times more likely to graduate on time than closely matched WSA participants.

These findings offer compelling evidence that the deep and comprehensive interventions delivered by Act Six provide additional benefit beyond the broader but less intensive interventions of the WSA program. They invite further investigation of the theory of change to test and refine the internal causal relationships proposed in the model and to more deeply understand the complex ways that the program interventions play out in students' lived experiences on campus. They also suggest new strategies for increasing college completion for underrepresented students that leverage strong partnerships between colleges and urban communities; emphasize leadership, cultural integrity, and sense of purpose; and expand the use of community-based cohorts. Finally, the findings prompt the question of how the most essential elements of the model might be repackaged in ways that preserve the program's effects while reducing obstacles to replication and allowing more extensive scaling.

Beyond simply evaluating the effectiveness of Act Six, the ultimate hope for this project is to inspire new thinking and fuel new practices that will enhance the effectiveness and expand the reach of college and community-based college success programs that take seriously the potential of diverse, emerging urban leaders to make our college campuses and urban communities more just and vibrant places.

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