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Understanding the student success gap: Building models for underrepresented racial minority and non-traditional students' college experience in community college

Wei-Lin Chen
University of Iowa

UNDERSTANDING THE STUDENT SUCCESS GAP: BUILDING MODELS FOR UNDERREPRESENTED RACIAL MINORITY AND NON-TRADITIONAL STUDENTS' COLLEGE EXPERIENCE IN COMMUNITY COLLEGE

by

Wei-Lin Chen

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Thesis Supervisor: Associate Professor Brian P. An

Graduate College
The University of Iowa
Iowa City, Iowa

CERTIFICATE OF APPROVAL

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PH.D. THESIS

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This is to certify that the Ph.D. thesis of

Wei-Lin Chen

has been approved by the Examining Committee for
the thesis requirement for the Doctor of Philosophy degree
in Educational Policy and Leadership Studies at the August 2017 graduation.

Thesis Committee: _____
Brian P. An, Thesis Supervisor

_____
Ernest Pascarella

_____
David Bills

_____
Nicholas Bowman

_____
Sarah Bruch

To
my parents, 于紅梅 (Hung-Mei Yu) and 陳國忠 (Kuo-Chung Chen), and my grandma, 于崔玉書 (Yu-Shu Yu Tsui)

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ABSTRACT

Community colleges are a crucial channel for achieving postsecondary education success, especially for minority and nontraditionally aged students. Nonetheless, community colleges are inadequate to meeting national goals for postsecondary educational attainment. Most notably, the lack of a strong guidance of academic interventions stifles a student's preparation to transfer to four-year institutions as well as to attain an associate's degree.

The majority of research concerning community colleges rarely addresses the issues of low degree attainment rates from rigorous guidance of academic interventions by student status difference, including race/ethnicity, age, first-generation status, motivation, and academic preparation. First, few community colleges and associations have proposed and implemented designed guidance for students. As such, evaluating the impact of guidance plans in community colleges provides us with a better understanding of student success at these schools. Second, previous studies used samples collected from a single community college, city, or state, which make generalizability difficult to attain. Third, researchers have paid little attention to how the variation across community colleges differs across the nation in terms of the mission and purpose of the institutions as well as the students who attend these colleges. This variation may influence students' academic curriculum and exposure to academic advising, which in turn may impact their success. Fourth, even though minority and nontraditional students are overrepresented at two-year intuitions, few studies investigate whether the impact of academic interventions in community colleges differs by race/ethnic and age.

Building upon the literature on student development in higher education, in this dissertation, I examined how academic interventions (i.e., academic advising and faculty–student interactions) promote student success after controlling for potential confounding factors at both

the student and institution level. Employing propensity-scored based techniques, I compared student success (a) among Black, Latino, and White students, and (b) between traditionally aged students (18–21 years of age), and nontraditionally aged students (24 years of age and older).

Using data from the Beginning Postsecondary Students Longitudinal Study (BPS:04/09) and the Integrated Postsecondary Education Data System (IPEDS), I employed doubly robust estimation to provide better estimates of academic advising and formal faculty–student interactions on student success. I measured students' successes by determining whether students attained an associate's degree or whether they transferred to a four-year institution. To accomplish these tasks, I first used a multinomial logit model to estimate the propensity scores of receiving academic advising and faculty–student interactions. I then created a sample weight based on the inverse of the propensity score. I used multinomial logit regression model, weighted by the inverse of the propensity score, to estimate the effects of academic advising and faculty–student interactions. Finally, I examined the conditional effects of academic advising and faculty–student interactions by students' race, age, first-generation status, motivation, and academic preparation.

The findings indicate that both academic advising and formal faculty–student interactions benefit student success at community colleges. Specifically, academic advising increases student success of transferring to a four-year institution, but African American students benefit less from academic advising than their White peers. Academic advising positively influences both Hispanic students and White students in terms of their upward transfer to a four-year institution. In addition to academic advising, formal faculty–student interactions improve student success regarding both upward transfers and attainment of associate degrees. The positive impact of

formal faculty–student interactions is consistent across students' race, age, first-generation status, motivation, and academic preparation.

This dissertation contributes to the existing literature on community colleges in two ways. First, my dissertation seeks to better inform policy makers in designing academic interventions that can improve student development in community colleges, especially for minority and nontraditional students. Second, my dissertation contributes to the research literature on higher education by providing improved estimates that have stronger internal and external validity than estimates from past studies on the effects of academic interventions in community colleges.

PUBLIC ABSTRACT

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CHAPTER 1: INTRODUCTION

Community colleges provide a crucial channel for entrance into four-year postsecondary institutions. In the 2013–2014 academic year, nearly half of all undergraduates who attained a bachelor's degree had attended a community college before transferring to a four-year institution (National Student Clearinghouse Research Center, 2015). In 2015, a federal education policy, the *America's College Promise*, introduced a program that provides students with free community college tuition to help them develop important skills and attain their associate's degrees (The White House, 2015). Inspired by *Tennessee Promise,* this policy proposal aims to establish a more educated workforce by providing tuition waivers for students who maintain a C-grade point average. This policy also enables students to participate in volunteer work and to meet regularly with their mentors who help guide them in the college admission process (*Tennessee Promise*, n.d.). Furthermore, the American Association of Community Colleges (AACC), a national association that serves community colleges, has launched a national program, the *Pathway Project*, to design, implement, and evaluate structured academic and career pathways for community college students (AACC, 2015b).

Because of the well designed, rigorous, and structured strategies to enhance successful outcomes among students in community colleges, federal and state policy makers—as well as those who serve associations—argue that the number of students who attend community colleges will continue to increase, resulting in more sub-baccalaureate degrees, larger numbers of transfers to four-year institutions, and ultimately more recipients of a bachelor's degree (AACC, 2015b; *Tennessee Promise*, n.d.). In addition to four-year transfers from community colleges, having more sub-baccalaureate graduates benefit both individual students and the labor force at

the local and state levels (Hout, 2012; Pascarella & Terenzini, 2005) as well as promoting economic development through a skilled and knowledgeable workforce.

However, critics of community colleges have argued that these institutions track students toward vocational training instead of toward transferring to a four-year institution (Brint & Karabel, 1989). Community colleges have also received criticism because of the large numbers of students who enroll but leave without obtaining any credentials (Rosenbaum, Ahearn, Becker, & Rosenbaum, 2015). Community colleges tend to have an inadequate structured curricula and tend to lack the guidance and student support services that lead to students achieving both their end goals and success in learning (Bailey, Jaggars, & Jenkins, 2015; Brint & Karabel, 1989). Community colleges therefore may not be serving the democratic role of providing opportunities for students to achieve postsecondary degrees as once thought (Baime & Baum, 2016). Furthermore, community colleges have been criticized for their low graduation rates and transfer success because they use the "Cafeteria College" approach, which is characterized by loosely structured programs that do not facilitate successful learning and outcomes for students, unsupported administrative instruction and student support services, and blurred aims for college success that deter students in community colleges from achieving their end learning goals (Bailey, Jaggars, & Jenkins, 2015). Clark (1960; 1980) argues that, with the complicated advising and remediation processes that deter students from realizing their end goals, community colleges reorient students toward lower academic aspirations and goals.

However, Clark's (1960; 1980) argument rarely addresses how race influences transfers and degree attainment. While the representation of racial minorities is growing in postsecondary education (American Association of Community Colleges, 2015a; The Western Interstate Commission for Higher Education, 2016), African American and Hispanic/Latino students

potentially require institutions and their agents to have culturally diverse understandings to assist racial minority students with their enrollment, the learning processes, and degree completion (Museus, Jayakumar, & Robinson, 2012; Museus & Quaye, 2009; Quaye, Griffin, & Museus, 2014). Although students who make upward transfers report high levels of satisfaction in the academic advising services in community colleges (Allen, Smith & Muehleck, 2014; 2013), a racial gap exists in transfer successes among community college students (Crisp & Nunez, 2014). Furthermore, Pascarella's (2005) model addresses how the differences in the statuses of students, such as in their age, influences college outcomes while also discussing how higher education institutions affect individual development. It is necessary therefore to examine student success in community colleges through the lens of racial diversity and inclusion (Museus, Jayakumar, & Robinson, 2012).

Students such as adult learners who do not belong in the traditional age group of students are often excluded from study samples (Kuh & Hu, 2001); therefore, findings from prior studies often address "traditionally aged" populations, even though community colleges may benefit students who are considered "nontraditional" (Gilardi & Guglielmetti, 2011). Furthermore, student outcomes in community college may differ among African American, Hispanic/Latino, and White students; but studies rarely compare the success of different racial/ethnic groups at community colleges. Since researchers have identified factors that relate to student development in community colleges (Crisp & Nunez, 2014; Crisp & Nora, 2010; Zambrana & Hurtado, 2015), this dissertation extends the existing literature on the impact of these colleges on student success and compares the effects of academic interventions on student success by African American, Hispanic/Latino, and White students as well as by undergraduates of traditional and

nontraditional ages (I use the term "nontraditional" to refer to students who are 24 years old or older).

Previous research that focuses on the impact of community colleges are limited in three ways. First, previous studies have tended to focus on a single community college, state, or area, but then demonstrated the possible benefits of improved academic and social organization to community college students more generally (Bailey, Jaggars, & Jenkins, 2015). This dissertation extends the existing literature by using national samples, which allows for greater generalizability than found in previous studies. Second, researchers have paid little attention to variations in the community colleges themselves, and estimation models have shown that this can influence learning processes and influence student success. Third, few studies investigate the differential effects of experiences at community colleges by race and age or provide a theoretical understanding regarding the racial and age gaps in relation to student success, even though minority and nontraditional students are overrepresented at two-year intuitions (American Association of Community Colleges, 2015a).

To increase the number of students who successfully transfer to four-year institutions or attain associate's degrees in community colleges, it is necessary to understand how the community college experience influences student success. Using quasi-experimental techniques, this study examines the influence of academic advising and faculty–student interactions on student success (attaining a degree or transferring to a four-year institution). By using nationally representative data, this study also fills a gap in the knowledge of the effects of undergraduate student statuses in terms of their race/ethnicity (Hispanic/Latino versus White and African American versus White) and traditional/nontraditional ages.

This dissertation seeks to inform policy making so that academic interventions can be designed to improve student success in community colleges, especially among minority and nontraditionally aged students. To estimate the treatment effects of academic advising and faculty–student interactions, I employ propensity score-based techniques that minimizes selection bias by drawing on a rich set of pre-treatment and institutional covariates. As a result, modeling academic interventions on the development of individuals and on community colleges as institutions contribute to how students achieve success based on the *America's College Promise*. In addition, using data from the Beginning Postsecondary Students Longitudinal Study of 2004/09 (BPS:04/09) and the Integrated Postsecondary Education Data System (IPEDS), this dissertation contributes to the research literature on higher education by providing improved estimates, with stronger internal and external validity, on the effects of academic interventions within community colleges.

Background

Although the *America's College Promise* encourages community colleges to strengthen their programs and help students to take responsibility for their engagement, student success is a complex process. There are several models of student development that could help students to achieve learning success and assist administrations at community colleges in designing better instruction and student support services for the learning process. For example, Astin's (1984) theory of involvement addresses policy and program control that aid student involvement. Tinto's (1987) theory of student departure points out that faculty–student interactions and student integration are central to student success. Pascarella's (2005) model also focuses on the role of faculty–student interactions in student development. Although these models help to explain

student engagement and its influence on development, they tend to be based on students at four-year institutions rather than those at community colleges.

The faculty–student relationship plays a vital role in both K–12 education and postsecondary education in increasing student learning outcomes and success. The empirical literature on K–12 education indicates that teacher–student relationships influence the development of students, and their interactions with supportive teachers can improve learning performance, while student characteristics, such as gender, race, and academic preparation, are related to the quality and effectiveness of these relationships (Brophy & Good, 1974; Kelly & Zhang, 2016). Roorda, Koomen, Spilt, and Oort's (2011) meta-analysis of 99 studies highlights the strong influence that teacher–student relationships have in later grades. Research into student experiences at both K–12 and postsecondary education indicates the positive influence that faculty/teacher–student relationships can have on student success (Brophy & Good, 1974; Pascarella & Terenzini, 2005). By examining faculty–student interactions, the findings from my study inform both K–12 and postsecondary education (Brophy & Good, 1974; Kelly & Zhang, 2016; Pascarella & Terenzini, 2005), since community college plays a key transitional role between K–12 and four-year institutions.

The *America's College Promise* outlines expectations for community colleges that provide goal-oriented programs that either align the transfer requirements with a four-year institution or increase students' graduation rates in terms of associate's degrees (The White House, 2015). The AACC (2015b) has also launched reforms to build structured academic and career pathways to accelerate student success. Accelerated programs provide strategic guides for course sequencing, strong advising processes, requirements for alignment with four-year institutions, and a path to workforce development. Research on organizational effectiveness in

K–12 education shows that uniform curriculum structures, such as universal algebra policies, benefit students' academic performances and also highlight the importance of a rigorous and mandatory curriculum for high-school students (Stein, Kaufman, Sherman, & Hillen, 2011). However, studies on community colleges have rarely used national data sets to investigate the effect of rigorous curriculum policies on student success.

Several studies have assessed the impact of the community college experience on student outcomes. Bahr (2008), for example, found a positive relationship between academic advising and course success in community colleges in California. Nitecki (2011) also found that retention and graduation rates increased after career-focused programs had been implemented at an urban community college. Drawing on interviews with community college students, O'Gara et al. (2009) have suggested that guided courses and faculty involvement benefit student persistence. Bailey et al. (2015) documented the positive impact of guided program pathways on student development in community colleges in Arizona, New York City, and Miami.

One of the biggest challenges in community colleges is that students come from diverse backgrounds; many are minority and nontraditionally aged students who perceive the community college experience in different ways and demonstrate unique patterns of learning outcomes. Racial minorities, such as African American and Hispanic/Latino students, are overrepresented in community colleges, which is unlike the case at four-year institutions (Horn & Nevill, 2006). Community colleges provide an important channel for racial minorities to achieve educational mobilization and may also provide opportunities for these students to attain a bachelor's degree and to find a middle-class job (Brint & Karabel, 1989). Students at community colleges are also more likely to be older than those at four-year institutions, even though the numbers of traditionally aged students have been increasing in community colleges over the past couple of

decades (American Association of Community Colleges, 2015a; Horn & Nevill, 2006). Indeed, community colleges provide opportunities for nontraditionally aged students who are 24 years old and older (Dill & Henley, 1998) a postsecondary education.

Purpose of the Study

The purpose of this dissertation is to examine the influence of the community college experience on student success and how both race and traditional/nontraditional status moderate the success of individuals in attaining an associate's degree and transferring to a four-year institution. I specifically aim to investigate two types of college experiences at community colleges: academic advising and faculty–student interactions. I first explore what happens inside community colleges, including academic advising and faculty–student interactions, and then explore how these experiences influence student success. I quantify student success in two ways: attaining an associate degree and transferring to a four-year institution.

I then scrutinize how racial differences between White and Hispanic students as well as between White and African American students at community colleges influence the attainment of a degree or the successful transfer to a four-year institution. Based on the concept of engaging students of color in postsecondary education (Museus, Jayakumar, & Robinson, 2012; Museus & Quaye, 2009; Quaye, Griffin, & Museus, 2014), one of my research purposes is to examine how White, Hispanic, and African American students demonstrate patterns of successful transfers and the attainment of degrees in community colleges, and how individual and college factors influence these potential racial differences. Furthermore, since nontraditionally aged students are overrepresented in community colleges (American Association of Community Colleges (2015b), I further compare whether academic advising and faculty–student interactions affect the transfer or degree attainment differently for traditionally and nontraditionally aged students. To

summarize, this dissertation attempts to address how community colleges influence degree attainment and transfer success in terms of racial differences and traditional/nontraditional status.

Finally, the dissertation examines the heterogeneity of the effects that have been previously outlined. Using propensity score adjustment, this study attempts to evaluate how the academic preparation and motivation of the students moderates the impact of academic advising and faculty–student interactions on their success. Through these results, I identify who can benefit the most from treatment in community college and suggest a useful policy proposal to improve federal and state policies, such as the *America's College Promise* and the *Tennessee Promise*, as well as college-level interventions, such as the AACC *Pathways Project* and the *Accelerated Study in Associate Programs* (ASAP).

The remainder of the chapter is divided into four broad sections. The first section provides a brief explanation of previous studies about academic advising and student success. The next section discusses how previous researchers have explored faculty–student interactions in relation to student success. I also provide my research questions based on the previous literature in the first and second sections. The final two sections discuss how the results of my study contribute to the literature.

Academic Advising and Student Success

Clark (1960, 1980) argues that community colleges serve to "cool out" students, which means that students' academic plans are reoriented toward an associate's degree or a certificate and away from transferring to a four-year institution. Because of a complicated process that has arisen with respect to remedial classes, academic advising that is not related to student degree completion, and influences that other institutions exert without facilitating student learning goals,

students are likely to be stuck in community colleges for longer periods of time instead of transferring from a community college to a four-year institution (Clark 1960, 1980). Investigating student academic advising in community colleges: substantiates the need to reevaluate Clark's argument (1960, 1980) and design better student services for successful learning and outcomes, to advance the models of student development, and contribute to student success in the *America's College Promise*.

Bahr (2008), using data from California's community colleges, has identified the positive impact of academic advising on student persistence. However, Bahr (2008) and Clark (1960, 1980) did not test whether academic advising was related to students' success in transferring to a four-year college. Academic advising could provide students with the information they need for their academic and job choices, create a supportive social relationship, and improve student outcomes (Karp, 2011). Promoting a supportive social relationship could also benefit underrepresented ethnic minority students who are potentially vulnerable in higher education and more likely to leave without obtaining any degrees (Pascarella & Terenzini, 2005). Because of the cooling out function of community colleges, however, Clark (1960, 1980) challenges the positive role of academic advising. Academic advising may therefore influence student development in community colleges in an adverse way toward four-year transfer or attainment of an associate's and other terminal degrees.

Rigorous guidance aimed at student success or a structured pathway plan through academic advising can also be applicable to community colleges, since loosely structured programs have been criticized for impeding students' attainment of degrees (Bailey, Jaggars, & Jenkins, 2015; Rosenbaum, Deil-Amen, & Person, 2007). Community colleges have also been criticized for lacking organized pathways for student learning plans. Rosenbaum, Ahearn,

Becker, and Rosenbaum (2015) advocate for community colleges to provide students with structured procedures on degree attainment because only one-third of students in community colleges attain a bachelor's degree within six years. Bailey, Jaggars, and Jenkins (2015) recommend implementing a more structured pattern of curricula in community colleges. They argue that cafeteria patterns such as loosely structured programs, unsupported instruction, and unclear goals for college commitment impede students' success in attaining their degree or transferring to a four-year college. However, Dougherty (1994) argues that community colleges provide educational opportunities and play a democratic role in postsecondary education from a historical perspective. To improve the democratic function of community colleges, curricula that are structured toward learning outcomes can increase the opportunities for successful transfer to a four-year institution (Bailey, Jaggars, & Jenkins, 2015; Karp, 2011). The service of academic advising provides students with structured guidance, and improves student success in terms of degree attainment as well as transferring successfully.

Due to a race gap in the transfer to a four-year institution (Crisp & Nunez, 2014), academic advising may benefit underrepresented ethnic minorities and White students differently. Academic advising may create a friendly transfer culture for underrepresented ethnic minorities (Crisp & Nunez, 2014). In addition, based on models of student development that explain college transfers (Davidson, 2015; Pascarella & Terenzini, 2005; Stern, 2015), student and institutional factors, such as academic preparation, socioeconomic status, and work status, must be controlled. Therefore, my first study tests two research questions:

1. Does academic advising increase the likelihood that students will be successful in transferring to a four-year college and does this relationship vary in terms of student differences (e.g., motivation levels)?

2. Does the relationship between academic advising and success in transferring differ by racial minority and nontraditional students?

The Role of Faculty–Student Interactions in Student Success

Faculty–student interactions are identified as being crucial to student success in higher education (Karp, 2011; Pascarella & Terenzini, 2005; Tinto, 2012). In models of student development, researchers have shown that faculty–student interactions benefit students in their persistence and educational attainment (Barnett, 2011; Pascarella & Terenzini, 2005; Tinto, 2012; Voorhees, 1987). In Astin's theory of involvement (Astin, 1984), active participation of students has a considerable impact on the learning process, and postsecondary institutions can significantly increase student involvement through institutional policies and programs. Tinto's theory of student departure also shows the ways in which social support is developed through faculty–student interactions and student integration in the classroom (Tinto, 1987; Tinto, 1997; Tinto, 2012). Pascarella's model concerns students and faculty members in student development and identifies a causal model outlining the effects that learning environments have on student development (Pascarella & Terenzini, 2005). Most of the models of faculty–student interactions on student success examine four-year institutions and identify the positive impact of institutions on undergraduates. However, few models of faculty–student interactions have been applied to students at community colleges. Given that the composition of the students is more diverse than at four-year institutions, including students' race and age variance (American Association of Community Colleges, 2015a), it is important to consider whether these models of student development remain predictive at these institutions.

In addition to the impact of faculty–student interactions, students in community colleges tend to belong to and come from disadvantaged backgrounds. Students in community colleges

are more likely than those in four-year institutions to be of nontraditional age, racial minorities, and be less committed to completing their programs (Carnevale & Strohl, 2013; Horn & Nevill, 2006). Based on student development models, student background characteristics can shape faculty–student interactions, which in turn, affect student learning outcomes (Astin, 1984; Pascarella & Terenzini, 2005; Tinto, 1987; Tinto, 1997; Tinto, 2012). Although developed for four-year institutions, these models may be applicable to community colleges; at these colleges, researchers found that individual features, such as academic preparation, age, or attending status, are related to the attainment of an associate's degree or a four-year college transfer (Feldman, 1993; Yu, 2015).

Employing the causal model of environmental influences on student development (Pascarella & Terenzini, 2005), my second study answers four research questions:

1. Do formal faculty–student interactions increase student success (attaining an associate's degree or transferring successfully to a four-year institution)?

2. Do informal faculty–student interactions increase student success (attaining an associate's degree or transferring successfully to a four-year institution)?

3. Do students who are more motivated benefit from interactions with faculty more than those who are less motivated?

4. Is the effect of faculty–student interactions different for racial minorities and nontraditional students than for other students?

Importance of the Study

Further investigation is required to understand how academic advising and faculty–student interactions affect student success in community colleges. The benefits of community colleges extend beyond individual students. Communities and states also benefit in that community colleges help furnish local businesses with well-prepared employees, and help meet the demands of the global economy. Further examination into these two-year institutions provides stronger evidence to assist in our understanding of the function of community colleges. These colleges provide a crucial channel for disadvantaged, minority, and nontraditional students to achieve higher education. Students from community colleges earn more and demonstrate more economic activity, such as paying taxes and being consumers of goods and services, than students who drop out of high school as well as to those who do not obtain any degree in higher education (Rothwell, 2015; Trostel, 2010). The returns from attaining an associate's degree or successfully transferring to a four-year institution are both social and economic in nature and result in community improvements such as socioeconomic mobility, better health status, more social participation, and higher economic consumption (Hout, 2012; Rothwell, 2015; Trostel, 2010).

In addition to discovering the possible benefits of attaining a degree from a community college, the results of my research have the potential to affect policy and practice. For example, former president Barack Obama announced *America's College Promise* to support free community colleges and emphasized the importance of community colleges in society and in states (Stinson, 2015). *America's College Promise* focuses on student responsibility and high-quality community colleges. The purpose of the *America's College Promise* is to assist students in attaining an associate's degree or transferring to a four-year institution, and this focus on high-

quality community colleges is aimed at making excellent academic programs or occupational training programs available for students.

In addition to federal policy, the *Tennessee Promise* is helping community college students through an emphasis on mentoring. This comprehensive program helps students to finish community college and earn an associate's degree by using mentors who assist the students in completing their requirements and helping to eliminate barriers associated with degree attainment. The findings about academic advising and faculty–student interactions in my dissertation inform programs such as the *Tennessee Promise* to fine-tune their mentoring programs.

In addition, professional associations such as the AACC Pathway Project are developing reforms to improve student success in community colleges, and to provide more structured plans and guidance for students. By examining both academic advising and faculty–student interactions, this study will benefit professional associations in developing a more comprehensive understanding of students from diverse backgrounds and the needs required to prepare students with structured guidance.

Finally, students from minority groups and nontraditional students are more overrepresented in community colleges than they are in four-year institutions (Horn & Nevill, 2006). Hispanic students were the second largest racial demographic in community colleges in 2015, behind White students in these colleges (American Association of Community Colleges, 2015a). Hispanic students represent the fastest growing group and form the majority of students in public schools in some areas, such as California and southwestern states (Contreras, 2015). However, Hispanic students demonstrate the lowest percentage of those who attain bachelor's degrees, when compared to White, Black and Asian students in general (Ogunwole, Drewery, &

Rios-Vargas, 2012). Since Black and Hispanic students are more likely to enroll in community colleges (Carnevale & Strohl, 2013), models for students' college experiences at two-year colleges require further investigation based on these key racial differences to improve student success for a large proportion of students (Crisp & Nunez, 2014).

CHAPTER 2: LITERATURE REVIEW

Postsecondary education benefits individual development and society, including career development, health condition, and civic involvement (Ma, Pender, & Welch, 2016). Professional associations, community colleges, and policy makers attempt to improve student success, such as attainment of any degree or transfer to a four-year institution successfully, in community college through the designing and providing of effective academic interventions (Bailey, Jaggars, & Jenkins, 2015). Given open-access admission policies, community colleges need well-designed academic interventions to improve student success, and provide students with effective academic advice as well as quality faculty–student interactions. This dissertation examines academic interventions on campus by academic advising and faculty-student interventions. The following chapter summarizes the literature regarding academic advising and faculty–student interactions, and also details the gap in relevant literature as it relates to attainment of an associate's degree and transfer to a four-year institution in community colleges.

Why Academic Advising?

Clark (1960, 1980) argues that one function of academic advising in community colleges is *cooling-out*, the process of encouraging students to pursue alternative education goals instead of upward transfer to a four-year institution. In Clark's view, counselors or academic advisors provide options that are different from students' original goals, encourage students to switch to terminal distinction during their community college education, and blur the difference between transfer and non-transfer courses and curricula. The process of cooling out is contrary to the egalitarian view of the purpose of community colleges, which is that community colleges provide postsecondary access for students pursuing a bachelor's degrees through alternative routes than the immediate matriculation to a four-year institution. In support of Clark, Brint

(2003) states that community colleges channel students into vocational training more frequently than toward a track that would prepare them to transfer to a four-year institution, even though the dual goals of community colleges are academic and vocational.

As described by Clark (1960, 1980), academic advisors or counselors play central roles in the cooling-out function. However, using data from California, Bahr (2008) showed that academic advising had a positive impact on students' success in remedial courses and upward transferring to a four-year institution. Since Bahr's results present no evidence to support the cooling-out function of academic advising, there is some question about whether Clark's proposition is indeed correct. However, consulting nationwide data sources rather than using data from one state, as Bahr (2008) has done, I can provide a more generalized understanding of the community college function. It is also important to note that in their explorations of academic advising in community colleges, Clark (1960, 1980), Brint (2003), and Bahr (2008) do not pay specific attention to how academic advising influences degree attainment and four-year transfer.

With the development of more tightly structured design at community colleges, there have been reforms to the advising processes to prepare students for success in learning. For example, *Accelerated Study in Associate Programs* (ASAP), operated by the City University of New York (CUNY), is developing a comprehensive and dedicated advising service for students in terms of both academic and career information (Scrivener, Weiss, Ratledge, Rudd, Sommo, & Fresques, 2015). In addition to the development of reforms by individual community colleges, the American Association of Community Colleges (AACC) is collaborating with these colleges to create guided pathways and improve students' readiness by implementing instructional advising. Having a systematic procedure for advising identifies students at risk and provides the

necessary supports to help students stay on their paths (American Association of Community Colleges, 2015b).

Both the AACC and City University of New York (CUNY) address the issue of increasing planned reforms and guidance, and they have examined the impact of reforms and guidance by students' features, including nontraditional learners and minorities. However, neither of these two organizations discuss the effects that current reforms in academic advising are having on student success or the possibility that they influence students differently based on their race and age (Brint, 2003; Bahr, 2008). In much of the research on student success (Alexander, Bozick & Entwisle, 2008; Brint, 2003; Bahr, 2008; Clark, 1960, 1980), there is a notable absence of examination into current reforms in the guiding and advising functions, such as those operated by the AACC and community colleges. With respect to current reforms, the conditional effects of academic advising by race and age is rarely investigated, even though community college experiences benefit students differently based on certain social characteristics (Crisp & Nunez, 2014; Pascarella, Wolniak, & Pierson 2003). Using multilevel modeling, Crisp and Nunez (2014) indicate that experiences on campus and the institutional environment have different effects on White students and minority students. The authors also suggest that there is a racial gap at community colleges in terms of transfer success.

Differential effects in academic advising by race and age is especially important at community colleges because they represent a large share of these populations attending postsecondary institutions, including both two-year and four-year institutions (American Association of Community Colleges, 2016; Horn, & Nevill, 2006). Since the number of minority students is increasing in postsecondary education (The Western Interstate Commission for Higher Education, 2016), examining the experiences of academic advising among those from

diverse racial backgrounds would benefit the future design of academic advising at community colleges. Finally, the impact of academic advising can certainly be different based on students' academic preparedness. Brint (2003) has found that students with weak academic preparation are more likely to be found at community colleges than at four-year institutions. This dissertation specifically examines whether students with different levels of academic preparedness benefit differently from academic advising, in terms of their future success.

Academic Advising and Student Success

Grubb and Gabriner (2013) criticize the lack of student services in community colleges at California and suggest that these colleges should place greater emphasis on the role of student services, such as academic advising or career services. In his research, Bahr (2008) identifies a positive relationship between academic advising and success in community college courses at California. However, these results cannot be generalized beyond California (Bahr, 2008; Grubb & Gabriner, 2013), and overall there are few evidence-based studies that have examined student success in terms of upward transfer and degree attainment (Bahr, 2008; Brint, 2003). It is necessary to use national data to examine the impact of academic advising on students' attainment of an associate's degree and upward transfer to a four-year institution.

Three types of academic advising are used most frequently at community colleges: a faculty-only model, a split model, and a self-contained model (Kuhn, 2011). Each model presents a different structure of academic advising and identifies the diverse purposes of the community colleges. In a faculty-only model, students are assigned to an instructional faculty member without having access to a separate academic advising office to help them navigate their educational options. In a split model, students who are undecided and/or underprepared are advised separately from other students, who are given advice through academic units or

academic advisors. A split model provides advice services for students based on their needs and preparation. The third model is a self-contained model through which all students of the department are advised by staff at a central unit of the community college (Kuhn, 2011). The concept of the self-contained model comes from public schools, where students receive advice through a central unit, such as a counseling center, that reports to the dean or to student affairs.

According to the findings reported by McArthur (2005), students in community colleges view academic advising as an important resource for making decisions about courses and as a positive indicator of increasing their retention. With regular and active academic advising, students at community colleges are more likely to continue to maintain their educational goals (McArthur, 2005). However, the limitation of McArthur's (2005) study is that the data came from only one institution and its generalizability is therefore restricted to the study institution.

Racial differences also moderate the impact of community colleges on student success (Greene, Marti, & McClenney, 2008). In 2015, Whites made up 50% of the total number of students in community colleges and Latinos form the second largest population in community colleges, making up 21% of the total number of students in community colleges. For Latino students, this translates to over 50% of them starting out at community colleges (American Association of Community Colleges, 2015a). Since Latino students are more likely than those from other racial groups to enroll in community colleges, these colleges provide an important channel for those seeking a postsecondary education. Despite their overrepresentation at community colleges, Latino students experience the lowest rate of success at these colleges. With respect to racial disparity in community college outcomes, African American students also present lower academic performance than their White peers (Greene, Marti, & McClenney,

2008). Clearly, the impact that community colleges have on the success of their students in attaining degrees is not the same for students of different races.

In addition to racial diversity, students who do not belong to the traditional student age group are overrepresented at community colleges. The average community college student is 28 years old. While the median age of students at community colleges is 24 years old, only 37% of students who attend a community college are younger than 21 years old (American Association of Community Colleges, 2015a). Most community college students are nontraditionally aged, which means that they are over 24 years old. On the one hand, this population of students are more likely to struggle with the college experience as well as less likely to finish college (Dill & Henley, 1998; Compton, Cox, & Laanan, 2006). In addition, nontraditional students are more likely to speak languages other than English and to encounter hurdles during their learning experiences (Compton, Cox, & Laanan, 2006). On the other hand, nontraditional students are more self-directed and goal-oriented and use different learning strategies than do traditional students (Kenner & Weinerman, 2011). The community college experience, including academic advising, does, then, influence student success differently by age.

This dissertation examines whether academic advising can help students at community colleges to transfer to four-year institutions. As previously mentioned, academic advising in community colleges may include a faculty-only model, a split model, or a self-contained model (Kuhn, 2011). However, because of the nature of the data limitations in the Beginning Postsecondary Students Longitudinal Study of 2004/09 (BPS:04/09), this study can only examine the general structure of academic advising on student success. The effects of the different types of academic advising on student success cannot be examined, and this reduces the generalizability of the study's results. However, current reforms, such as the *Tennessee Promise*

and the *Pathway Project*, are concerned with the general structure of academic advising, this study still provides evidence to evaluate current reforms of academic advising at community colleges and still allows for practical strategies for practitioners and policy makers.

This study includes three research questions to examine academic advising and student success:

1. Does academic advising increase the success of community college students?

2. Are students who are well prepared academically more likely to succeed after controlling for other important factors (e.g., socioeconomic status [SES], student work status, or pre-college preparation)?

3. Do various features of the students, such as race/ethnicity, motivation, first-generation status, and nontraditional status, moderate the relationship between academic advising and student success?

Based on these research questions, I tested the following five hypotheses.

1. Academic advising helps community college students to be successful.

    1-1 Academic advising helps community college students to attain upward transfers to four-year institutions.

    1-2 Academic advising helps community college students to attain associate's degrees.

2. Academic advising benefits community college students more if they are well prepared academically.

    2-1 Academic advising benefits students who are well prepared more than those who are not well prepared in attaining upward transfers to four-year institutions.

2-2 Academic advising benefits students who are well prepared more than those who are not well prepared in attaining associate's degrees.

3. African American students in community colleges benefit more from academic advising in terms of college success than do White students.

3-1 Compared to White students, African American students benefit more from academic advising in terms of upward transfers to four-year institutions.

3-2 Compared to White students, African American students benefit more from academic advising in terms of attaining associate's degrees.

4. Latino students in community colleges benefit more from academic advising in terms of college success than do White students.

4-1 Compared to White students, Latino students benefit more from academic advising in terms of upward transfers to four-year institutions.

4-2 Compared to White students, Latino students benefit more from academic advising in terms of attaining associate's degrees.

5. Academic advising benefits nontraditionally aged community college students in terms of college success more than it benefits traditionally aged students.

5-1 Compared to traditionally aged college students, nontraditionally aged students benefit more from academic advising in terms of upward transfers to four-year institutions.

5-2 Compared to traditionally aged college students, nontraditionally aged students benefit more from academic advising in terms of associate's degrees.

The Importance of Faculty–Student Interactions

Interactions between faculty members and students have the possibility of creating social relationships. Such social relationships have been shown to promote retention and enhance student success in postsecondary education (Karp, 2011; Tinto, 1987, 1997, 2012). A component of Pascarella's general model concerns interactions between students and faculty members in learning and cognitive development and identifies the causal influence of postsecondary institutions on student measures of college success (Pascarella & Terenzini, 2005). However, even though the majority of models of faculty–student interactions in relation to student success have identified the positive effects of college experience on undergraduate development in higher education, most studies examined four-year institutions while few studies examined two-year institutions (Pascarella & Terenzini, 2005). Aside from the positive impact of faculty members on student success, individual features from students' backgrounds also influence student outcomes in terms of the models of faculty–student interactions in four-year institutions. For example, racial differences play a crucial role in interactions involving faculty members and student outcomes (Pascarella & Terenzini, 2005).

Students in community colleges are a more diverse group than their counterparts at four-year institutions, with minority and nontraditionally aged students being over-represented (American Association of Community Colleges, 2016). Although the research indicates that faculty–student interactions play a positive role in postsecondary education (Pascarella & Terenzini, 2005), models of faculty interactions with students rarely investigate community college students, especially in terms of racial and age differences. Critiques of community colleges include lower rates of degree attainment and transfer success, both of which are due in part to faculty–student relationships often being inadequately developed in two-year institutions

(Bailey, Jaggars, & Jenkins, 2015; Rosenbaum, Ahearn, Becker, & Rosenbaum, 2015). In addition, students from various backgrounds view their social relationships with faculty members differently. For example, Latino students experience more barriers on campus, while interacting with peers and faculty from different cultures (Zambrana & Hurtado, 2015b), and nontraditionally aged students view institutional support systems as important tools and skills for learning (Compton, Cox, & Laanan, 2006). Therefore, the impact of faculty–student interactions on student success can differ by race and age.

Furthermore, Pascarella, Wolniak, and Pierson (2003) have examined the community college experience and indicated the conditional effects, based on students' race, for their end-of-first-year educational plans. Greene, Marti, and McClenney (2008) have also indicated the racial differences in student engagement and outcomes in community colleges and that Latino and African American students express lower engagement and learning performance. Minority students present different patterns of perceiving the community college experience than do their White counterparts. In addition to racial differences, Bye, Pushkar, and Conway (2007) have found that nontraditionally aged students at community colleges express higher levels of motivation in terms of learning than do traditionally aged students. However, Juszkiewicz (2016) also indicates that nontraditional students in community colleges express lower rates of college completion. Clearly, the impact of community college experiences varies according to students' race and age.

This dissertation offers advantages over previous studies in three ways. First, most studies of community colleges compare the results for whether faculty involvement enhances student success from data that comes from a single state (e.g., California, Florida, Arizona, or New York) or a single institution (Bailey, Jaggars, & Jenkins, 2015). Few studies have employed

nationally representative data sets. Second, conditional effects of the treatment in community colleges needs to be addressed because students with varying degrees of pre-existing differences, such as race/ethnicity and age, can have different treatment effects, as Pascarella's general model indicates for conditional effects by race (Pascarella & Terenzini, 2005). Third, by controlling for covariates from individuals and institutions and blocking all possible connections between unobserved variables and observed covariates, it is possible to make casual inferences of faculty –student interactions on student success when treatment assignments are within the levels of covariates (Hong & Raudenbush, 2006; Morgan & Winship, 2014).

Faculty–Student Interactions and Student Success

Poor learning outcomes in college raise questions about the effectiveness of postsecondary education. Arum and Roksa (2011) have shown that four-year undergraduate students attain few cognitive skills in higher education and most graduates demonstrate no significant improvement in critical thinking, complex reasoning, and writing. In terms of two-year institutions, community colleges have been criticized for their poor completion rates (Goldrick-Rab, 2010). Tracy (2015) points out that faculty –student interactions in colleges can improve students' noncognitive skills. However, few studies have focused on faculty–student interactions at community colleges. Therefore, it is necessary to scrutinize the function of community colleges in terms of student success by examining faculty –student interactions.

As an important factor of the college experience in institutions, faculty–student interactions affect students' efforts and outcomes in four-year institutions, while the features that are specific to higher education institutions also influence student outcomes (Pascarella & Terenzini, 2005). Student outcomes include the economic returns on their investment in community college education; for example, students who attain a sub-baccalaureate degree have

higher earnings than students who do not attain such a degree (Romano, 2011). In addition to economic returns, other influences of higher education on student outcomes also include critical thinking, leadership abilities, and attitudes toward diversity, all of which are traditionally investigated at four-year institutions (Pascarella & Terenzini, 2005). Students at four–year institutions are more commonly regarded as a target group in postsecondary education. Even though degree attainment in postsecondary education is also viewed as a student outcome in community college, the models for determining the impact of faculty–student interactions on the students rarely investigate students at community colleges.

Two major types of faculty–student interactions are investigated in higher education: in-class interactions and out-of-class interactions. The impact of faculty–student interactions on student efforts and outcomes has been found to be mixed (Kuh & Hu, 2001). Karp (2011) found that, through interactions with faculty members, students create connections that benefit their future development. Kuh and Hu (2001) agree that faculty–student relationships promote student success, but they have found that these relationships may differ to the types of faculty–student interactions and student features. In addition to institutional and individual characteristics, faculty–student relationships differ according to the purpose of the institution. Since most faculty and staff at community colleges are overworked due to budgetary limitations (Bailey, Jaggars, & Jenkins, 2015), the impact of faculty–student interactions at the community college level is likely to be different from that at a four-year institution. Unless the types of faculty–student relationships at community colleges are specifically investigated (Bailey, Jaggars, & Jenkins, 2015; Kuh & Hu, 2001; Pascarella & Terenzini, 2005), results can only generalize to students at four-year institutions.

With respect to student success at community colleges, the unevenness in the attainment of bachelor's degrees between White and Latino students raises concerns about the role of race in college retention, completion, and graduation.

Faculty–student relationships vary by race, and minority students usually report lower satisfaction with their faculty members (Cole & Griffin, 2013) than do others. Perhaps, as a result of cultural isolation, Latino students have difficulty in constructing their sense of belonging at colleges. Racial barriers that account for this uneven college completion rate between White and Latino students are due to discrimination and stereotyping that perpetuate societal inequality (Zambrana & Hurtado, 2015). Because Latino students witness and experience acts of discrimination on campus, including hostility and harassment, they need institutional support that includes culturally diverse perspectives (Alvarado & Hurtado, 2015). Therefore, campuses need to create friendly environments for minorities (Cabrera & Hurtado, 2015). Institutional factors, such as student–faculty interactions and academic advising, improve college completion rates for Latino students. In addition, African American students present different patterns of learning outcomes in community college from those of White students (Crisp & Nunez, 2014; Greene, Marti, & McClenney, 2008) and have a lower probability of receiving associate's degrees than their White peers (Porchea, Allen, Robbins, & Phelps, 2010).

However, few studies have investigated nontraditional students and even fewer have explored nontraditional community college students. For many reasons, including part-time enrollment and working status, nontraditional students are more likely to be excluded in research studies (Kuh & Hu, 2001). Nontraditional students need to devote more energy to academic preparation, and informal interactions with faculty members have been found to benefit nontraditional students in terms of their learning outcomes in higher education (Gilardi &

Guglielmetti, 2011) because they tend to place greater value on their interactions with faculty and peers than do traditional students (Kasworm, 2005). The fact that nontraditional students are rarely included in empirical studies, especially those with rigorous methods that improve causal inference, is an issue for discussion. Reviewing published papers from 1990 to 2011, Langrehr, Phillips, Melville, and Eum (2015) indicated that only 0.20% of empirical papers presented nontraditional students and only 6% of the studies applied longitudinal methods.

To investigate student success, it is important to determine whether both individual characteristics and institutional features matter. In addition to academic advising, investigating faculty–student interactions may help us to understand how institutional efforts affect student outcomes (Pascarella & Terenzini, 2005). This dissertation examines how faculty–student interactions in community colleges influence student success in terms of either attaining an associate's degree or transferring successfully to a four-year institution.

To investigate the effect of faculty–student interactions on student success, I ask the following two research questions:

1. Do formal faculty–student interactions increase student success (attaining an associate's degree or transferring successfully to a four-year institution)?

2. Do informal faculty–student interactions increase student success (attaining an associate's degree or transferring successfully to a four-year institution)?

This study then examined one additional research question to gain an understanding of the conditional effects of students' features, such as levels of motivation and preparation, race, age differences, and first-generation status:

3. Does the effect of faculty–student interactions on student success differ according to students' academic motivation?

I examined whether the academic motivation levels of students moderate the relationship between faculty–student interaction and success. More specifically, I looked at whether highly-motivated students, such as those expecting to attain a bachelors' degree, who interact with a faculty member more likely to achieve success than students who are less motivated.

Finally, I tested four additional moderators: race/ethnicity, nontraditional status, first-generation status, and academic preparation. I used the model of faculty–student interactions on student success through various types of student motivation and racial differences. I used the same model for faculty–student interactions to compare traditional and nontraditional students and also to compare first-generation and non-first-generation statuses and levels of academic motivation.

Based on the research questions, I tested the following four hypotheses:

1. Formal faculty–student interactions help community college students to be successful.

1-1 Formal faculty–student interactions help community college students to transfer upwards to a four-year institution.

1-2 Formal faculty–student interactions help community college students to attain an associate's degree.

2. Informal faculty–student interactions increase the opportunities for success of community college students.

2-1 Informal faculty–student interactions increase the opportunities for community college students to transfer upward to a four-year institution.

2-2 Informal faculty–student interactions increase the opportunities for community college students to be successful in attaining an associate's degree.

3. Formal faculty–student interactions are more effective in helping students to be successful if the students are more motivated.

3-1 Formal faculty–student interactions help motivated students to transfer upwards to a four-year institution.

3-2 Formal faculty–student interactions help motivated students to attain an associate's degree.

4. Informal faculty–student interactions are more effective in helping students to be successful, if the students are more motivated.

4-1 Informal faculty–student interactions help motivated students to transfer upwards to a four-year institution.

4-2 Informal faculty–student interactions help motivated students to attain an associate's degree.

CHAPTER 3: DATA AND METHODS

Data

This dissertation used existing data from two nationally representative studies: the Beginning Postsecondary Students Longitudinal Study (BPS:04/09) and the Integrated Postsecondary Education Data System (IPEDS). The BPS:04/09 and IPEDS are nationally representative data sets in higher education and were collected by the U.S. Department of Education's National Center for Education Statistics (NCES). This study investigates students who enrolled at a two-year institution during the 2003–2004 academic year and includes 48.3% of the respondents in the BPS:04/09.

This study has several strengths over other studies due to the data sets chosen. First, although most previous studies that investigated the relationship between academic advising in community colleges and student success were from a single state (Scrivener, Weiss, Ratledge, Rudd, Sommo, & Fresques, 2015), such as California (Bahr, 2008) or North Carolina (Bailey, Jaggars, & Jenkins, 2015), BPS:04/09 and IPEDS data sets are nationally representative. Second, few studies examine different levels of motivation and preparation among students to investigate whether academic advising enhances student success, and few investigate the conditional effects of the treatment by students' motivation and preparation. Finally, by employing propensity score-based techniques, this study has minimized selection bias by using a rich set of pretreatment and institutional covariates that only few studies have addressed.

Beginning Postsecondary Students Longitudinal Study (BPS:04/09)

The BPS:04/09 surveyed students who began their postsecondary education during the 2003–2004 academic year. The BPS:04/09 was administrated at three points in time. The survey

began in the 2004 National Postsecondary Student Aid Study (NPSAS:04) base-year study and collected data from students in the 2003–2004 academic year (Wave 1). The follow-up interviews were conducted in the 2005–2006 academic year (Wave 2/first follow-up) and in the 2008–2009 academic year (Wave 3/second follow-up). The BPS:04/09 used a multi-stage, stratified, college-based design to select institutions and students. Postsecondary institutions in the NPSAS:04 were excluded if they provided only vocational, recreational, remedial, and in-house courses. In addition, United States service academies were excluded (Wine, Janson, & Wheeless, 2011).

Students who were eligible for one of the following criterion were selected. First, students who were enrolled in an academic program for at least one credit-bearing course that could be useful for an academic degree. Second, students who were enrolled in a vocational/occupational program needed at least three months or 300 clock hours to finish a degree/certificate or acquire any formal certification. In the base-year survey, eligible institutions were selected in the first stage, and then eligible students who were within the eligible institutions were selected in the second stage (Wine, Janson, & Wheeless, 2011).

The BPS:04/09 included information that was collected about students in the six years since these students had first enrolled in postsecondary education (Wine, Janson, & Wheeless, 2011). The core sample size of 16,680 participants was selected to be representative of students who had enrolled in any postsecondary institution during the 2003–2004 academic year in the United States and Puerto Rico.

Finally, the data collection methods for the student interviews included three different instruments: a web instrument, an Internet instrument, and filed respondents (in-person interview), to obtain information from students. On average, the interview took 20 minutes to

complete. The interviewers for the BPS:04/09 asked students for their family backgrounds, postsecondary transcripts and information about their experiences in higher education, their education financing, their experience after graduation, their societal and personal outcomes, the job market, and their transitions to employment. Postsecondary transcripts were collected through postsecondary institutions. The institutions were asked to provide transcripts for participants from three points during the following years: 2004, 2006, and 2009 (Wine, Janson, & Wheeless, 2011).

Integrated Postsecondary Education Data System (IPEDS)

The IPEDS gathers information annually from every institution in higher education and collects data on admission, enrollment, student persistence and completion, graduation rates background details about faculty and staff, institutional features, institutional finances and prices, and student financial aid. According to the *Higher Education Act of 1965*, institutions that participate in federal student aid programs must report data on institutional enrollments, tuition fees, institutional budgets, program completions, faculty and staff, finances, student graduation rates, and student financial aid (National Center for Education Statistics, 2015).

The BPS:04/09 provides information from the IPEDS data, since this data set includes detailed information about institutional features such as institutional budgets, tuition fees, and characteristics of faculty and staff members. By incorporating the IPEDS data into the BPS:04/09, I can account for variance across postsecondary institution in this study.

Dependent Variable

The first dependent variable used in the study is attaining an associate's degree. This variable derives from Wave 2 and Wave 3 in the BPS:04/09. In Wave 2, respondents were asked

to indicate the first degree type they had attained by the end of 2006 (AT1TY3Y). In Wave 3, respondents were asked for the first degree type they had attained by the end of 2009 (AT1TY6Y). The measure of attaining an associate's degree is a dichotomous variable to indicate whether respondents had attained an associate's degree by 2009, while still being enrolled by 2009 as a reference group. In the analytical sample of this study, there are 15.88% of total respondents had attained an associate's degree by the end of 2009.

The second dependent variable is a student's successful transfer to a four-year institution. This measure is from Waves 2 and 3 in the BPS:04/09. In Wave 2, respondents who started in community colleges were asked to classify their status of retention and persistence through to 2006 (CCSTAT3Y). In Wave 3, respondents who had started in community colleges were asked again to respond about their retention and persistence through to 2009 (CCSTAT6Y). The measure of transferring successfully to a four-year institution is a dichotomous variable to indicate whether respondents had enrolled in four-year institutions by 2009, while still being enrolled by 2009 as a reference group. In the analytical sample of this study, there are 26.54% of total respondents had transferred to a four-year institution by the end of 2009.

Independent Variables

Academic advising. A measure of academic advising comes from Wave 1. BPS:04/09 respondents were asked whether they had met with their academic advisors. Academic advising is treated as a series of binary variables (*sometimes* and *often*) where never meeting an advisor is the reference category. In the analytical sample of this study, 38.36% of the total respondents reported that they never met an academic advisor, 48.78% of the total respondents reported that they had met sometimes, and 12.86% of the total respondents reported that they met often.

Informal faculty–student interaction. Both informal contact and conversation outside of classrooms are used in this study to measure faculty–student interactions. The first indicator is informal meetings with faculty members. In Wave 1, respondents were asked to give the frequency of informal meetings or social contact they had with faculty members. This measure is treated as a series of binary variables to indicate the levels of informal contact that respondents had in 2004. The binary variables are sometimes and often, and never being the reference category. In the analytical sample, 69.30% of the total respondents reported that they never had any informal meetings or social contact with faculty members outside of classrooms, 25.15% of the total respondents reported that they sometimes had informal meetings or social contact with faculty members, and 5.55% of the total respondents reported that they often had informal meetings or social contact with faculty members.

Formal faculty–student interaction. The second indicator for faculty–student interaction is talking to faculty members outside of class time. In Wave 1, respondents were asked how frequently they talked to faculty members outside of class time. This indicator is treated as a series of binary variables of sometimes and often with never as the reference category. The sample indicated that 31.62% of the total respondents reported that they never talked to faculty members outside of class time, 55.54% of the total respondents reported that they sometimes talked to faculty members, and 12.84% of the total respondents reported that they often talked to faculty members.

Control Variables

This dissertation includes several variables that capture family background, academic performance in high school, college performance and enrollment, as well as college characteristics that influence the academic advising and success of the students. These variables

are necessary for addressing possible preexisting differences between treatment and control participants and for use in the selection models. Measures of these indicators are collected from the BPS:04/09 and IPEDS.

Family Background Variables

The social background variables include race/ethnicity, gender, nontraditional student status, family income, family structure, and parental education. *Race/ethnicity* includes White, African American, and Latino, where White is the reference group. *Gender* was measured as a dichotomous variable where male was coded zero (female=1). *Nontraditional* was measured as a binary variable where less than 24 years old (traditionally aged students) was coded as the reference group. The BPS:04/09 measured family income in 2003 and again in 2005, using different categories. I used the measure of family income in 2005 as continuous scale. *Parental education* reflects the highest level of education of the parents measured in years.

In addition to the basic background characteristics of the students, this study includes variables related to the characteristics of the students while attending the community colleges (Bahr, 2008; Crisp & Nunez, 2014). Dependent indicates students' dependency during the 2003–2004 academic year, while the variable is a continuous variable concerning how many children students had. English ability measures whether English was the students' primary language during the 2003–04 academic year, with students whose primary language was English as the omitted category. Immigration status measures whether students' parents were born in the United States, where students whose parents were born in the United States is an omitted category.

Academic Performance in High School

Several indicators of academic performance are included to capture differences among the students. *Attainment of a high-school degree* is identified as a categorical variable. This includes two categories: General Educational Development (GED)/High school completion and no high school degrees/certificate, where receiving a high-school diploma is an omitted category. This variable is also used to measure students' academic preparation, because it can be applied to all undergraduate students in the BPS:04/09. *GPA in high school* measures the academic performance of students and is on a seven-point scale, where higher scores indicate higher GPAs.

Highest math course taken in high school captures students' patterns of math course selection. This measure includes five categories: none of those courses, algebra II, trigonometry, pre-calculus, and calculus, where none of these courses is an omitted category. *College credit* measures whether students earned any college credits in high school, where no credits being earned is an omitted category.

College Preference and Enrollment

Educational expectations capture students' initial educational goals at the time of postsecondary enrollment during the 2003–2004 academic year. The study identifies three categories: certificate, associate's degree, and bachelor's degree, where a certificate is the reference group. *Living location* measures whether students lived with their parents during enrollment. Living location includes on campus and off campus, where students who reported that they lived with family is the reference group. *Delayed enrollment* measures whether students delay their enrollment in postsecondary education after high school graduation, where students who enrolled in postsecondary education without delay is the reference group. *Curriculum tract*

measures whether students are located in rigorously directed course patterns, and it includes three types of course tracts: not directed, four-year transfer, and general, while four-year transfer is the reference group.

College enrollment includes students' attendance patterns in community colleges. *Admissions test scores* measure students *American College Test (ACT)/Scholastic Assessment Tests (SAT) scores* to capture students' academic preparations for college, *Admissions test scores* are translated into SAT scores while recorded as a continuous variable. A variable of *Admission test scores required* capture whether community colleges require student admission test scores for enrollment, and not requiring this is treated as a reference group. *Highest level of education offering in first institution* includes two categories: associate's degrees and award or diploma, and the reference group is an associate's degree. *Attendance intensity* captures students' attendance patterns and is divided into full-time and part-time categories, while full-time enrollment is treated as a reference group.

The measures of financial aid captures students' financial situations in postsecondary education. *Total merit grants* measures how many dollars students received as any financial aid during the 2003–2004 academic year and is treated as a continuous variable. *Total grants and loans (Except PLUS) in 2003-04* captures the amounts of students' loans (dollars) during the 2003–2004 academic year and is a continuous variable.

College Characteristics

The characteristics of postsecondary institutions from the BPS:04/09 and IPEDS data are also included. *Institution type* captures the postsecondary institutions in which students were enrolled and the indicators identify Latino serving institutions and postsecondary institutions that

have historically been African American (HBCU) during the 2003–2004 academic year in the BPS:04/09, with not being a minority serve institution as a reference group. In addition to identifying unique Latino and African American institutions, I created indicators to capture institution types during the 2003–2004 academic year in the BPS:04/09. I also included *percentage of minority students* to account for campus diversity and treats this as a continuous variable. The analytical sample includes 48.3% of the respondents in the BPS:04/09, because I only investigated students who started with community colleges in the BPS:04/09. The Table A1 presents descriptive statistics for variables used in the dissertation.

<*Table A1* is about here>

Methods

Doubly Robust Estimation

I employed doubly robust estimation in this dissertation to examine the impact of academic interventions on student success. Doubly robust combines regression and weights, created using propensity scores, to estimate the effects of academic interventions on student success (Funk, Westreich, Wiesen, Sturmer, Brookhart, & Davidian, 2011). The advantage of this approach is that it requires that only one of the two modeling approaches—regression or propensity score matching through inverse probability weighting—is correctly specified to obtain unbiased effect estimates (Funk, Westreich, Wiesen, Sturmer, Brookhart, & Davidian, 2011). When applying the doubly robust estimation in this dissertation, first, I modeled academic interventions as a function of covariates to estimate the propensity score for each student. Second, I specified regression models for student success and academic interventions as a function of covariates.

Since student success includes those still enrolled in community colleges, upward transfers, and attainment of associate's degrees, I employed a multinomial logit model. A multinomial logit model predicts the estimates of academic interventions while controlling for other covariates from family background, academic performance in high school, college preference and enrollment, and college characteristics. However, a multinomial logit model cannot control for unobserved non-random chances of receiving different levels of academic advising, and students with higher motivation and preparation are more likely to have higher frequency of seeing academic advisors (Bailey, Jaggars, & Jenkins, 2015; Pascarella & Terenzini, 2005). Therefore, estimates from traditional multinomial logit model could be misspecified, since a traditional multinomial logit model do not control for the probability of receiving different levels of academic advising. This dissertation used doubly robust estimation to reduce the probability of misspecification.

Doubly robust estimation employs maximum likelihood of regression model to estimate the probability of receiving academic interventions with controlling other covariates. After estimating the probability of receiving academic interventions, including academic advising, formal faculty–student interactions, and informal faculty–student interactions, this estimate is used as an inverse probability weight to balance all levels of receiving academic interventions, to and make sure the observed difference among all levels of receiving academic advising is the same statistically at the mean level. Finally, with the weighted model, this study estimated the impact of academic interventions on student success with regression models. The three steps are described in detail in the following paragraphs.

Analytical Process

The first step is to use a multinomial logit model to estimate the propensity scores of receiving academic interventions while controlling for family background, academic performance in high school, college preference and enrollment, and college characteristics. Three types of academic interventions were investigated in the dissertation: academic advising, formal faculty–student interaction, and informal faculty–student interaction.

Given that students reported three levels of academic interventions: *never*, *sometimes*, and *often*, a multinomial logit model was more appropriate than a binary logit model. Figure B1 presents the covariates used for estimating the propensity scores of meetings with academic advisors. Figure B2 presents the variables used for estimating the propensity scores of informal meetings, which is used to measure informal faculty–student interactions in the dissertation. Figure B3 shows the variables employed for estimating propensity scores of talking to faculty members outside of class time, which is formal faculty–student interactions.

< *Figure B1* is about here>

< *Figure B2* is about here>

< *Figure B3* is about here>

Table A2 displays the results from the multinomial logistic regression model that predicts the frequency of academic advising. When compared to four-year track students, those who are in the non-directed track are less likely to receive academic advising ($p < 0.05$). In addition to course tracks, students in minority service institutions are less likely to have academic advising than students who are not in minority service institutions ($p < 0.05$). Finally, students who are enrolled part time received lower frequencies of academic advising than those who were enrolled

full time, and this indicates that enrollment patterns are associated with students' academic activities in community colleges.

With respect to academic performance in high school, math course patterns play a significant role in the predictions for academic advising. Students taking one of the following: algebra, trigonometry/algebra II, pre-calculus, and calculus, are more likely to have frequent academic advising in community colleges than students who did not have an advanced math class in high school. Also, students from higher socioeconomic status backgrounds are more likely to have academic advising while they are enrolled in community colleges ($p < 0.05$).

<*Table A2* is about here>

Table A3 displays the results for the multinomial logistic regression model predicting the frequency of informal meetings with faculty members. As described previously, I use the predictions from this selection model as the inverse probability weight for the outcomes model. Compared to living with parents, living on campus positively predicts students' informal meetings with their faculty members ($p < 0.05$). In addition to residency, students who took advanced math courses in high school also present higher probabilities of having informal meetings with their faculty members. For example, students who took trigonometry/algebra II or pre-calculus are more likely to meet frequently with faculty members in informal settings than students who never took any advanced math courses in high school.

<*Table A3* is about here>

In terms of the frequency of talking to faculty outside of class time, Table A4 presents the results from the multinomial logistic regression model without PSM adjustment. Compared to students on the four-year track, students in non-directed tracks are less likely to talk frequently

with their faculty members outside of class time ($p < 0.05$). In addition to guidance tracks, students who are enrolled part time present lower probabilities of talking with faculty members outside of class ($p < 0.05$), and the results indicate that students' enrollment patterns predict their frequency of interaction with faculty members outside the classroom.

<*Table A4* is about here>

The second step is to take the predictions from the multinomial regression model to create an inverse probability weight (IPW) to balance three levels of academic advising for the association between covariates and academic advising. With IPW approach, this study controlled for confounding variables by using propensity scores, defined as the conditional probability of academic advising given covariates.

After employing a multinomial logit model to estimate the probability of receiving academic advising, I tested to see if the covariates across the treatment conditions were statistically different after I included the balancing score (as an inverse probability weight (see Table A5). After PSM adjustment, all variables became non-significant, and provided evidence of balance among the three levels of academic advising.

<*Table A5* is about here>

In terms of faculty–student interactions, after PSM adjustment, all differences in the covariates across different treatment conditions became non-significant. These results provided evidence of balance among three levels of talking to faculty outside of class time. The PSM adjusted sample would be used to estimate the impact of talking to faculty outside of class time on student success and its conditional effects by students' features, including race, age, first-generation status, motivation, and preparation in the result section.

The final step is to use doubly robust regression to estimate the impact of different levels of academic interventions on student success. This approach is doubly robust because it adjusts for the effects of academic interventions through the inclusion of confounding variables, and adjusts for the relationship between academic interventions on student success through the use of an inverse probability weight based on the propensity score. Social scientists have shown that I can include the propensity score as a sample weight to the multinomial logit model (Guo & Fraser, 2014; Imbens & Wooldridge, 2008).

Community college students with different levels of preparation or pre-existing differences can demonstrate different treatment effects of academic interventions; that is, the treatment effects may impact student success differently based on important individual characteristics. To address this issue of conditional effects of academic interventions on student success, I employed a stratification-multilevel (SM) method (Xie, Brand, & Jann, 2012) to examine the conditional effects of academic advising on student success according to various features of the students. Five different categories were employed to estimate stratum-specific treatment effects: race/ethnicity, academic motivation, academic preparation, first-generation status, and nontraditional status. The study examined the conditional effects of academic interventions using students' features, because this has been applied in most previous studies to model conditional effects of the treatment effects (Pascarella & Terenzini, 2005). Importantly, examining these interaction effects are needed to address the third research question of my dissertation.

CHAPTER 4: RESULTS AND DISCUSSION

This chapter presents the results of estimated academic interventions on student success. Coefficients and Relative Risk Ratio are reported to understand the impact of academic advising, formal faculty–student interaction, and informal faculty–student interaction, and its impact regrading upward transfer and degree attainment. This chapter also provides estimated results by students' features, including race/ethnicity, age, first-generation status, academic preparation, and motivation, and examines the conditional effects of academic interventions.

The Main Effects of Academic Advising on Student Success

Table A6 provides the estimated coefficients from multinomial logit results, both with and without PSM adjustment. *Hypothesis 1-1* concerns whether academic advising helps community college students to attain upward transfers to four-year institutions. Even with the addition of these well-established predictors of student success, academic advising is positively and statistically related to the upward transfers to four-year institutions of students who are enrolled in community colleges. Furthermore, the marginal increase of the effect size remains even with the PSM adjustment. These results provide full support for *Hypothesis 1-1*.

<*Table A6* is about here>

Table A7 presents Relative Risk Ratio of academic advising on student success with PSM adjustment. Academic advising increases community college students by almost 40% of chance of upward transfer to four-year institutions, compared to students who never have academic advising while enrolled in community college. The findings indicate the positive and sizable impact of academic advising on upward transfer for community college students. Figure

B4 provides the results from marginal effects of academic advising on student success, and indicates that academic advising benefits students the most in terms of upward transfer.

<*Table A7* is about here>

< *Figure B4* is about here >

However, academic advising is not significantly associated with attaining an associate's degree, even though the coefficient is positive. The results without PSM adjustment are marginal ($p < 0.1$), and findings from PSM adjustment are non-significant ($p = 0.2$). Therefore, these findings do not provide enough evidence to support *Hypothesis 2-2*.

The Conditional Effects of Academic Advising on Student Success

To understand the conditional effects that academic advising has on student success, I included interaction terms to examine whether the impact of academic advising on upward transfers to four-year institutions might vary in terms of various features of the students such as preparation, race, age, and first-generation status. The results are presented in Table A8.

<*Table A8* is about here>

The conditional effects of students' preparation on their success were also examined. The findings of upward transfer indicate no conditional effects that relate to having a high school degree, since the interaction term between academic advising and academic preparation is non-significant. The findings do indicate that the coefficient of academic advising is consistent across different types of student preparation, which does not support *Hypothesis 2-1*. The results for students who received high school degrees are non-significant, which indicates that the coefficient of academic advising on the attainment of associate's degrees is consistent across

student preparation. Therefore, the findings reject *Hypothesis 2-2*, which is that academic advising provides community college students with more help in attaining degrees if they are well-prepared.

Figure B5 provides the conditional effects of race. The results for African American students are statistically significant ($p < 0.05$) and negative, which indicates that the impact of academic advising may contribute differently to upward transfers among White and African American students and indicate a moderating relationship between White and African American groups in community colleges. The findings do not agree with *Hypothesis 3-1*, which is that academic advising benefits African American community college students more than White students in terms of upward transfers. However, the results for Latino students are not significant and indicate no moderating effect between White and Latino groups regarding the impact of academic advising. In addition, the findings do not provide enough evidence to support *Hypothesis 4-1*, which concerns whether academic advising helps Latino students at community colleges more than it helps White students.

<*Figure B5* is about here>

The study also examines the conditional effect of academic advising on degree attainment in terms of age differences. However, even though the coefficient is negative, the interaction between academic advising and age is not significant. *Hypothesis 5-1* examines whether academic advising helps nontraditionally aged students more than traditionally aged students. The findings do not provide enough evidence to support this hypothesis. In addition to age difference, this study has examined the conditional effects in relation to first-generation status. The findings indicate no statistical difference between students who are first-generation and

those who are not. The results provide evidence in support of the impact of academic advising being consistent across students' age differences and first-generation statuses.

Finally, this study has examined whether the relationship between academic advising and students' attainment of associate's degrees is consistent in terms of various features of the students, such as their academic preparation, motivation, race, age, and first-generation statuses. The results are presented in Table A9. The interaction terms in relation to meeting with academic advisors is not significant in relation to racial and age differences and indicate no conditional effects by race and age. The findings do not provide enough evidence to support *Hypothesis 3-2*, *Hypothesis 4-2*, or *Hypothesis 5-2*.

<*Table A9* is about here>

However, in addition to race and age differences, Figure B6 presents the results for first-generation status and indicates conditional effects in relation to first-generation and non-first-generation statuses in the attainment of associate's degrees. Compared to non-first-generation students, first-generation students benefit more from academic advising in terms of attaining associate's degrees ($p < 0.05$). These results provide evidence in support of academic advising as a critical strategy for improving student success, especially for first-generation students.

<*Figure B6* is about here>

However, the conditional effect of academic advising by first-generation status on degree attainment is different from the conditional effect in relation to race and age. Figure B6 presents the results for first-generation status, showing the conditional effects for students who are first-generation and non-first-generation on the attainment of an associate's degree. First-generation students benefit more from academic advising in terms of attainment of an associate's degree (*p*

< .05) than do non-first-generation students. The results provide evidence in support of academic advising as a critical strategy for improving student success, especially for first-generation students. First-generation students benefit more from academic advising, and community colleges can, through academic advising, provide these students with better access to attaining degrees in postsecondary education.

<*Figure B6* is about here>

The Main Effects of Faculty–Student Interactions on Student Success

Table A10 shows results from the multinomial logistic regression model, both with and without PSM adjustment, that include both control variables and talking to faculty outside of class time. *Hypothesis 1-1* concerns whether formal faculty–student interactions benefit community college students in terms of upward transfers to four-year institutions. After including these well-established predictors of student success and the PSM adjustment, talking with faculty members often is positively and significantly related to students' upward transfers to four-year institutions ($p < 0.05$), compared to students who rarely talked with their faculty members. Furthermore, the median increase of the effect size is shown in the results of the PSM adjustment and indicates the positive effect of formal interactions with faculty members on upward transfers. The results provide full support for *Hypothesis 1-1*.

<*Table A10* is about here>

Hypothesis 1-2 concerns whether formal interactions with faculty members can help students to attain an associate's degree, and the results are presented in Table A10. After PSM adjustment, formal interactions are significantly positive in terms of the attainment of an associate's degree ($p < .05$) and support the second hypothesis. Based on the findings, formal

faculty–student interactions enhance student success, including both upward transfers and degree attainment.

Table A11 provides Relative Risk Ratio of formal faculty–student interactions on student success with PSM adjustment. Formal faculty–student interactions can increase almost 40% of the chance of upward transfer to four-year institutions, and indicate that student benefit from talking with their faculty members after class. In addition to upward transfer, formal faculty–student interactions, which is talking to faculty members, increases students' chance of receiving an associate's degree by almost 40 percent, compared to students who never talk to their faculty members after class. The frequent interactions with faculty members increase students' probability of success in terms of both degree attainment and upward transfer. Figure B7 denotes the marginal effects of formal faculty–student interactions on student success, and indicates that both degree attainment and upward transfer benefits from formal faculty–student interactions. Figure B7 also shows that formal faculty–student interactions benefit upward transfer more than degree attainment in terms of student success probability.

<*Table A11* is about here>

<*Figure B7* is about here>

Hypothesis 2-1 concerns whether informal interactions with faculty members can increase student success, and the results are presented in Table A12. Results, both with and without PSM adjustment, show that the coefficient of informal interactions is non-significant in predicting students' upward transfers, and provide insufficient evidence to support *Hypothesis 2-1*. The findings in the study also provide insufficient evidence to support *Hypothesis 2-2*, which concerns whether informal faculty–student interactions increase the opportunities for community

college students to succeed in attaining an associate's degree. Table A13 provides Relative Risk Ratio of informal faculty–student interactions on student success with PSM adjustment, but none of the informal faculty–student interactions are statistically significant in terms of predicting student success. Figure B8 provides visualized results of marginal effects of informal faculty–student interactions on student success, and shows the probability of both upward transfer and degree attainment is low.

<*Table A12* is about here>

<*Table A13* is about here>

<*Figure B8* is about here>

The Conditional Effects of Academic Advising on Student Success

In contrast to the results from the students' race, age, and first-generation status, there are conditional effects related to the motivation levels of the students and their academic preparation. Figure B9 presents the findings that students who expect to achieve higher degrees, such as associate's and bachelor's degrees, can benefit more than those who do not from informal interactions with faculty members in terms of degree attainment. This figure also shows the conditional effects according to students' motivation levels. Finally, students who have high school degrees can benefit more from informal interaction in terms of attaining associate's degrees than students who do not have high school degrees. Figure B10 shows the conditional effects of informal interactions in terms of students' academic preparation. These findings support *Hypothesis 4-2*, that informal faculty–student interactions help motivated students to attain associate's degrees.

<*Figure B9* is about here>

<*Figure B10* is about here>

The Conditional Effects of Faculty–Student Interactions on Student Success

In addition to academic advising, this study further explores whether the impact of informal interaction with faculty members on students' degree attainment varies by race, age, first-generation status, motivation, and academic preparation. Both motivation and academic preparation is significant, and the results indicate the impact of informal faculty–student interactions vary by students' motivation and academic preparation. Specifically, informal faculty—student interactions benefit students' degree attainment more, while students expect to achieve higher degrees. Regarding academic preparation, students who have no high school degree benefit less than students who have a high school degree. However, none of the interaction terms regarding race, age, and first generation is significant, which indicates that the impact of formal interaction on students' degree attainment is consistent across race, age, and first-generation status (see Table A14).

<*Table A14* is about here>

Additional analyses examined the extent to which the effect of faculty–student interaction might vary by students' age, race, and first-generation status (see Table A15). In addition to students' features, the study examined whether the impact of faculty–student interaction varies by motivation levels. The interaction terms for race, age, and motivation show no conditional effects of informal interactions with faculty members on degree attainment.

Finally, I examined whether formal faculty–student interaction in relation to students' upward transfers to four-year institutions varies by race, age, first-generation status, and motivation, by examining the conditional effects. Table A15 presents the conditional effects of

formal interactions in terms of race, age differences, first-generation status, motivation, and academic preparation. With respect to formal interactions with faculty members, Latino students benefit marginally less ($p < 0.1$) from formal interactions with faculty members than their White peers (see Figure B11). However, the coefficient is consistent between White and African American students, which indicates no conditional effects between these two racial groups. With respect to the differences by age, first-generation status, and motivation, the non-significant findings in formal interactions with faculty members indicate that the impact is consistent across age and first-generation status. Regarding informal interactions with faculty, the findings show that the influence is consistent across races, ages, first-generation statuses, and motivation levels.

<*Table A15* is about here>

<*Figure B11* is about here>

Finally, the results indicate that the impact of informal interactions is consistent in terms of students' races, ages, first-generation statuses, and motivation levels.

Discussion

Academic Advising

In summary, meeting with academic advisors while they are enrolled in community colleges helps students to attain upward transfers to four-year institutions. This beneficial pattern is consistent for Latino and White students, traditional and nontraditional students, first-generation and non-first-generation students, students who expect to achieve a certificate, an associate's degree, or a bachelors' degree, and students who have or do not have a high school degree. However, the coefficient of academic advising on students' upward transfer decreases when African American students are compared to White students. The findings show the

conditional effects of race, especially in terms of White and African American students. African American students benefit less from academic advising than White students with respect to upward transfers to four-year institutions.

Showing the positive impact of academic advising on students' upward transfers contributes to a better understanding of how community colleges help students to achieve success. In contrast to the cooling-out claim made by Clark (1960, 1980), this study finds evidence in support of community college guidance systems with rigorous designs being effective in enhancing student success (Bailey, Jaggars, & Jenkins, 2015). It also argues that structured assistance systems in these college increases student success in transferring to four-year institutions (Karp, 2011), as well as that the colleges provide educational opportunities for students from a variety of backgrounds (Dougherty, 1994).

Notwithstanding the fact that academic advising predicts students' success in attaining upward transfers, academic advising has no impact on the attainment of associate's degrees. With and without PSM adjustment, academic advising predictions indicate no difference between the probability of enrolling in community colleges and the probability of having attained associate's degrees, based on the study of students six years after they had started their postsecondary education in community colleges. The conditional effects of first-generation status indicate that students whose parents have bachelors' degrees benefit less from academic advising in terms of attaining associate's degrees than their peers whose parents only have high school degrees or less.

The finding that academic advising had no impact on the attainment of an associate's degree is different from the claim by Kuh (2011) that academic advising enhances students' persistence, achievement, personal development, and engagement. The study's findings clarify

the specific impact of academic advising on student success, showing that it is beneficial in terms of upward transfers rather than of attaining an associate's degree. Although the study does not show that academic advising benefits all aspects of student success, it provides a clear understanding of how academic advising does increase student success.

Another important contribution of this study is its use of a quasi-experimental design to estimate the effects of academic advising on student success. With PSM adjustment, this study has controlled for possible self-selection bias toward academic advising to estimate the influence of academic advising on student success. Even when accounting for self-selection bias, academic advising still helps students to attain upward transfers to four-year institutions and presents conditional effects of race.

The PSM adjustment offers evidence that academic advising significantly increases the likelihood of transferring to four-year institutions for community college students who have received academic advising, compared to community college students who have had no academic advising in community college. Based on the findings of the study, I provide several recommendations for improving student success in community colleges and for state agents, the federal government, practitioners in community colleges, and community college associations.

State and federal governments need to design more structured guidance for community college students. After the *Tennessee Promise*, which requires students to meet with their mentors to complete the college admission process (*Tennessee Promise*, n.d.), the numbers of community college graduates have been increasing. The results from both the *Tennessee Promise* and this study suggest that structured guidance benefits students who come from a variety of backgrounds, represent different races and age groups, have different levels of motivation and preparation, and have first-generation status. Also, Bailey, Jaggars, and Jenkins (2015) critique

the *cafeteria* design, which provides different curriculum options in community colleges but without clear guidance, and suggest designing aim-oriented guidance with academic advising at community colleges. Through student-centered advising, then, community college students can increase their chances of being able to transfer to four-year institutions, and state and federal governments should encourage more community colleges to design academic advising guidance.

Community college practitioners and member associations should also use the *Pathway Project*, which was proposed by the AACC, to implement structured academic and career guidance for community college students (American Association of Community Colleges, 2015b). With rigorous and structured guidance in community colleges, the students who attend them can use this to help them with their transfer plans, and the community colleges can also improve their effectiveness in terms of student success. However, an awareness of racial differences should be included in the structured guidance, because African American students may otherwise benefit less from academic advising than White students.

There are a few limitations to this study. First, according to Kuhn (2011), a faculty-only model, a split model, and a self-contained model are the most common academic styles in community colleges. However, because of data limitations this study only investigated general academic advising. The study found that academic advising does help students to be successful, but more detailed studies regarding the types of academic advising are necessary. Second, students reported only on the frequency of academic advising while they were in community college, so the actual content during academic advising is unknown. As a result, this study cannot determine what content in academic advising might be more effective, particularly that which relates to upward transfers to four-year institutions and the attainment of an associate's degree.

Faculty–Student Interactions

In summary, formal rather than information faculty–student interactions at community colleges can significantly increase the likelihood of student success, both in terms of transferring to a four-year institution and attaining an associate's degree. The positive pattern is consistent in relation to race, age, motivation, academic preparation, and first-generation status, and it persists even with propensity score adjustments that control for possible selection bias regarding variables of formal faculty–student interaction. The positive impact of formal faculty–student interaction in community colleges confirms the claim made by Karp (2011) concerning the role of faculty–student interaction in community colleges and contributes to Pascarella's general model, which is widely cited as guidance for identifying the causal influence of postsecondary institutions on student measures at four-year institutions (Pascarella & Terezini, 2005). By extending Pascarella's general model into community colleges, this study contributes to a better understanding of the causal influence of faculty–student interaction on student outcomes, including upward transfers and attaining associate degrees. Also, this study provides rich results that build on Pascarella's general model regarding two-year institutions by examining conditional effects regarding the impact of postsecondary education on student success.

Another important contribution of this study is its use of a quasi-experimental design with rich control variables to improve estimates of the effects of faculty–student interactions on student success in community. With PSM adjustment techniques and a rich set of pretreatment and institutional covariates, this study found that formal faculty–student interaction increases the likelihood that students will be able to transfer successfully to a four-year institution and to receive an associate's degree, compared to community college students who rarely interact with faculty in community college. Based on the findings in this study, there are a few

recommendations and solutions for improving student success in community colleges and for targeting state agents, the federal government, practitioners in community colleges, and community college associations.

State and federal governments need to investigate more resources to encourage formal faculty–student interaction among those in community colleges. For example, with state and federal funding, community colleges can design appropriate guidance or a structured progression through formal faculty–student interaction, as well as assist community college students in achieving their goals and academic plans. According to Karp (2011), the benefits of faculty–student interaction includes building positive relationships between students and faculty members, and this study provides evidence to support the positive effect that formal faculty–student interaction has on student success. Given the Tennessee Promise, which requires students to meet with their mentors (Tennessee Promise, n.d.) and encourages increasing the frequency of formal faculty–student interaction, the numbers of community college graduates have been increasing in Tennessee. The results from both the Tennessee Promise and this study suggest that frequency in faculty–student interactions benefits students who come from a variety of backgrounds, represent different races, belong to a variety of age groups, have different levels of motivation and preparation, and have first-generation status. By increasing the frequency of faculty–student interactions, which includes talking to faculty outside of the classroom, community college students can increase their likelihood of transferring successfully to four-year institutions as well as of receiving associate's degrees. Also, state and federal governments should investigate resources to encourage community colleges to design plans for improving faculty–student interactions, such as through workshops and the learning community.

Community college practitioners and member associations should use the Pathway Project, which was proposed by the AACC, to implement structured academic and career planning for community college students (American Association of Community Colleges, 2015b). With learning support and developing clear goals from community colleges, students can get onto the paths for their learning processes and improve their transferring plans as well as their learning outcomes. An additional benefit of strong formal interactions with faculty is that community colleges will increase their retention rates, course completions, and graduation rates, since faculty–student interactions benefit all types of students, regardless of their race, age, levels of motivation and preparation, and their first-generation statuses.

CHAPTER 5: CONCLUSION AND RECOMMENDATIONS

To review, I hypothesized that community college experiences (i.e., academic advising and faculty–student interactions) benefits community college student success, including attainment of an associate's degree and upward transfer. Furthermore, I hypothesized that the impact of community college experience on student success differs by students' features, including race, age, first-generation status, motivation, and academic preparation, and examined the conditional effects of community college experience. I tested the two main hypotheses by using Beginning Postsecondary Students Longitudinal Study (BPS:04/09) and the Integrated Postsecondary Education Data System (IPEDS) datasets as well as employing propensity score techniques. I used multinomial logistic regression to estimate the probability of treatment, which is receiving community college experience (i.e., academic advising and faculty–student interactions). To lead credence to the overall results, I used inverse probability of treatment weights to adjust the selection bias of receiving community experience, and estimated the impact of community college experience on student success. Finally, I analyzed the conditional effects of community college experience by students' race, age, first-generation status, motivation, and academic preparation.

In this chapter, I summarized the findings of the study. I offer policy and practical recommendations based on the results. I conclude this chapter with limitations of this study and opportunities for future research.

The dissertation indicates that both academic advising and formal faculty–student interactions benefit student success. The analysis indicates that students who meet with their academic advisor often are more likely to transfer to a four-year institution or attain an associate's degree, compared with students who meet their academic advisor rarely. Even though

academic advising can increase student success of transferring to a four-year institution, African American students benefit less than their White peers. Academic advising positively impacts both Hispanic/Latino(a) students and White students in terms of their upward transfer to a four-year institution. Contrary to the positive benefit to first-generation students, academic advising benefits non-first-generation students less in terms of their attainment of an associate's degree. Finally, the conditional effects of academic advising by students' age, motivation, and academic preparation are non-significant. It is an indication that the impact of academic advising on student success, including both degree attainment and upward transfer, is consistent across students' age, motivation, academic preparation.

In addition to academic advising, formal faculty–student interactions improve student success probability of both upward transfers and attainment of associate's degrees. The positive impact of formal faculty–student interactions is consistent across students' race, age, first-generation status, motivation, and academic preparation. Community college students from various backgrounds can benefit from formal faculty–student interactions, regardless of individual features. However, this study indicates a lack of evidence to support the impact of informal faculty–student interactions on student success.

Analysis and Implications

This dissertation examined how academic advising and faculty–student interactions impact community college student success, and investigated whether the impact differs by students' features. Currently, community colleges, professional associations, state and federal government have developed policies and procedures to improve community college student success through rigorous curriculum design and structured academic advising (American Association of Community Colleges, 2015b; Bailey, Jaggars, & Jenkins, 2015). As the findings

suggest, academic advising and formal faculty–student interactions positively affect student success, such as upward transfer or degree attainment. There are also conditional effects of academic advising and formal faculty–student interactions by students' race and first-generation status. Based on the findings, this dissertation provides research and policy insights.

Higher Education Researchers

Better understanding of the different types of academic advising and how they impact student success is necessary. Kuhn (2011) claims that three types of academic advising are common in community colleges, including a faculty-only model, a split model, and a self-contained model. However, this study can only examine academic advising as a general concept, given the limitation of the Beginning Postsecondary Students Longitudinal Study (BPS:04/09). Future studies should investigate which methods of academic advising can benefit community college student success more and examine whether different methods of academic advising can improve student success by different levels of academic preparation and the individual features of race, age, and socioeconomic status difference.

It is necessary for higher education researchers to investigate what kinds of formal faculty–student interactions can benefit community college student success, given that student success regarding retention, persistence, and graduation are viewed as a crucial mission in higher education (Baime & Baum, 2016; University Innovation Alliance, n.d.). This study finds that talking to faculty members outside of class time can increase student success, but cannot investigate whether differing forms of formal faculty–student interactions exist. It is quite possible that discussing academic papers, research project participation, or meeting with a faculty member to discuss academic preparation have diverging outcomes. Given this limitation of the BPS dataset, the inclusion of the differing forms could provide further clarity in future

studies. Those who are creating new surveys concerning community college students or studying the formal faculty–student interactions should focus on different types of formal faculty–student interactions, and examine how different types of formal faculty–student interactions by students' features, including race, age, and academic preparation.

Policy Recommendations

State governments must collect data connecting student learning process and outcome. Both the Beginning Postsecondary Students Longitudinal Study (BPS:04/09) and the Integrated Postsecondary Education Data System (IPEDS) provide valuable information to understand national trends of postsecondary education, and this study presents the positive impact of academic advising and faculty–student interactions on student success with employing BPS and IPEDS datasets. To deepen the impact of community college by state difference, datasets from state level is necessary and provide detailed as well as unique information based on the needs from each state. With constructing a data warehouse connecting individual and institutional information, community colleges have information regarding student learning processes and institutional finance, and can make better decisions based on student success data (Soares, Steele, & Wwayt, 2016). With a centralized data warehouse, community colleges have better understanding of academic investment, including revenue, per-class cost, and student completion, and their benchmarks to peer institutions. Some community colleges start collecting investment information regarding student success (Soares, Steele, & Wwayt, 2016), but state government can create data warehouse to collect institutional information and assist community colleges to make better decisions to help student success based on data warehouse and evidence-based findings.

Practice Recommendations for Community Colleges

Community colleges must reexamine academic advising programs to ensure programs are serving the needs of students (American Association of Community Colleges, 2015b). Academic programs need to redesign to help students clarify their paths, get on their path, and stay on their path, rather than rechanneling students into different programs and leaving out students without receiving any credits in community college (Clark, 1960; 1980). Specifically, community colleges should provide students with designed and structured curriculum through academic advising (Bailey, Jaggars, & Jenkins, 2015). For example, in the *Pathway Project*, community colleges implement ongoing advising and tutoring to track students' learning path and track their learning progress to evaluate student success (American Association of Community Colleges, 2015b). In addition to the *Pathway Project*, Georgia State University is employing an online tracking system to assist undergraduates to stay on their academic track, and provides timely as well as necessary advising when students are off academic path (University Innovation Alliance, n.d.). With the online system, graduation rates in George State University improved and more students graduated with degrees than before the implementations. Community colleges also should employ online systems with academic advising to improve student success.

Community colleges should provide resources and support to encourage faculty–student interactions. This study finds that formal faculty–student interactions benefit student success, including both upward transfers and attainment of associate degrees, and expends Pascarella's general model to two-year institutions (Pascarella & Terenzini, 2005), as well as community college students from diverse race, age, academic preparation, and socioeconomic status (American Association of Community Colleges, 2015b). Students benefit from faculty–student interactions in terms of their academic development, career success, cognitive development, and

leadership abilities (Pascarella & Terenzini, 2005). With faculty–student interactions, especially formal faculty–student interactions, students create their social networks with faculty members, have clear path regarding academic preparation, and stay on the path they aspire (Karp, 2011). Community colleges have a need and a responsibility to provide resources and academic support, such as academic assistance, online support system, and student learning record, to support faculty members (University Innovation Alliance, n.d.). With resources and support, faculty can create better faculty–student interactions, and improve community college student success.

Limitations of Study

There are some limitations in the study. First, due to the limitation of the BPS, this study cannot investigate different types of academic advising. Further study needs to examine types of academic advising and how different types of academic advising impact student success, including degree attainment and upward transfer. Second, more study related with faculty–student interactions are necessary. Since this study examine general concept of faculty–student interactions, results indicate the positive impact of formal faculty–student interactions. Future study has to investigate the impact of different types of formal faculty–student interactions on student success, and how the impact differs by students' features, such as whether students receive financial aids in community colleges.

Opportunities for Future Research

Based on my current research investigating the role of postsecondary education for underrepresented students, I suggest to expand current research projects to policy field. In particular, examining how postsecondary education affects students by racial, age, and SES difference given that free community-college tuition initiates. For example, more research needs

to focus on student completion in Tennessee, given that the Tennessee Promise has been providing tuition waivers to students who maintain a C-grade point average, participate in volunteer work, and meet with their mentors for completing the college admission process in Tennessee (Tennessee Promise, n.d.). Regarding to policy field, student loans have been viewed as a critical barrier to student success in postsecondary education. Yet higher education as an institution also impacts student accomplishment by providing career advice and building network resources for students. This dissertation finds financial aids are related with academic advising, and further study needs to have an emphasis on the perspectives of disadvantaged students, and examine a variety of programs including student loans. Given that, study results can provide specific recommendations for improving educational equity in two-year institutions.

APPENDIX A. TABLES

Table A1

Summary of Variables Used in the Dissertation

	Percent/Mean	S.D.
Student Success		
Transferring Successfully to a Four-Year Institution	26.50	
Attaining an Associate's Degree	15.90	
Enrolled in Community College	57.60	
Meeting Academic Advisor		
Never	38.40	
Sometimes	48.80	
Often	12.90	
College Characteristics		
Minority Service Institution (HBCU/HSI)		
No	87.30	
Yes	12.70	
Percent Minority Enrollment 2003-04	32.90	23.60
College Preference and Enrollment		
Living Location		
On Campus	4.90	
Off Campus	43.60	
With Parents	51.60	
Curriculum Track		
No Directed	24.10	
Four-Year Transfer	40.10	
General	35.80	
Admissions Test Scores (SAT)	471.20	459.80
Admission Test Scores Required		
No	89.50	
Yes	10.50	
Highest Level of Education Offering in First Institution		
Associate's	66.90	
Award/Diploma	33.10	
Attendance Intensity		
Full-time	61.60	
Part-time	38.40	
Delayed Enrollment		
No	57.50	
Yes	42.50	

(*continued*)

Table A1-continued

	Percent/Mean	S.D.
Degree Goal in the First Year		
Certificate/No Degree	14.30	
Associate's	28.00	
BA	57.70	
Total Merit Grants	201.70	1017.70
Total Grants and Loans (Except PLUS) in 2003-04	2872.90	4022.20
Family Background		
Race		
White	66.90	
African American	17.60	
Latinos	15.50	
Gender		
Male	42.00	
Female	58.00	
Traditional Student		
Non-traditional	23.50	
Traditional	76.50	
Expected Family Contribution (EFC)	7101.80	11876.50
Family Income	4.80	3.20
Highest Level of Parent's Education (Years)	13.30	3.30
Numbers of Dependent Children	0.00	1.00
Native Speaker		
No	10.90	
Yes	89.10	
Immigrant Status		
Native	79.00	
First-Generation	21.00	
Academic Performance in High School		
Attainment of High School Degree		
No	14.50	
Yes	85.50	
High School GPA	3.70	2.70
College Credits Earned		
No	87.60	
Yes	12.40	
Highest Level of High School Mathematics		
None	42.30	
Algebra 2	30.20	
Trigonometry/Algebra II	13.10	
Pre-calculus	10.20	
Calculus	4.20	

Table A2

Multinomial Logistic Regression of Academic Advising without PSM Adjustment

	Coefficient	Robust S.E.
Never (Base)		
Sometimes		
Minority Service Institution (HBCU/HSI)	-0.39*	0.18
Percentage of Minority Enrollment 2003-04	0.00	0.00
Living Location (Ref: With Parents)		
On Campus	-0.05	0.28
Off Campus	-0.07	0.12
Curriculum Track (Ref: Four-Year Transfer)		
No Directed	-0.53**	0.21
General	-0.10	0.15
Admission Test Scores Required	0.12	0.17
Admissions Test Scores	0.00	0.00
Highest Level of Education Offering in First Institution is Award/Diploma (Ref: Associate's)	-0.06	0.11
Race (Ref: White)		
African American	0.14	0.14
Latinos	-0.12	0.17
Female	0.09	0.10
Non-Traditional Student	0.40	0.22
Part-Time Enrollment	-0.24*	0.10
Expected Family Contribution (EFC)	0.00***	0.00
Total Grants and Loans (Except PLUS) in 2003-04	0.00***	0.00
Total Merit Grants	0.00	0.00
Family Income	0.06**	0.02
Highest level of parent’s education (Years)	0.01	0.02
Delayed Enrollment	-0.05	0.13
Numbers of Dependent Children	-0.01	0.06
Not a Native Speaker	-0.11	0.20
First-Generation Immigrant	0.06	0.16
No High School Degree	0.32	0.17
High School GPA	0.00	0.04
Earned College Credits in High School	0.21	0.15
Highest Level of High School Mathematics (Ref: None)		
Algebra 2	0.24	0.14
Trigonometry/Algebra II	0.49***	0.16
Pre-calculus	0.67***	0.20

(*continued*)

Table A2-continued

	Coefficient	Robust S.E.
Calculus	0.65*	0.28
Degree Goal in the First Year (Ref: Certificate/No Degree)		
Associate's	-0.03	0.17
BA	0.15	0.19
Often		
Minority Service Institution (HBCU/HSI)	0.20	0.24
Percentage of Minority Enrollment 2003-04	-0.01	0.00
Living Location (Ref: With Parents)		
On campus	0.55	0.33
Off campus	0.10	0.17
Curriculum Track (Ref: Four-Year Transfer)		
No Directed	-0.61*	0.31
General	-0.27	0.22
Admission Test Scores Required	0.22	0.23
Admissions Test Scores	0.00	0.00
Highest Level of Education Offering in First Institution is Award/Diploma (Ref: Associate's)	-0.05	0.15
Race (Ref: White)		
African American	0.61***	0.18
Latinos	-0.24	0.24
Female	0.25	0.14
Non-Traditional Student	-0.05	0.32
Part-Time Enrollment	-0.59***	0.15
Expected Family Contribution (EFC)	0.00	0.00
Total Grants and Loans (Except PLUS) in 2003-04	0.00***	0.00
Total Merit Grants	0.00	0.00
Family Income	0.05	0.04
Highest level of parent's education (Years)	0.04	0.02
Delayed Enrollment	-0.15	0.17
Numbers of Dependent Children	0.02	0.10
Not a Native Speaker	0.26	0.28
First-Generation Immigrant	0.16	0.24
No High School Degree	0.20	0.26
High School GPA	-0.01	0.05
Earned College Credits in High School	0.42*	0.20
Highest Level of High School Mathematics (Ref: None)		
Algebra 2	0.07	0.21
Trigonometry/Algebra II	0.16	0.24

(*continued*)

Table A2-continued

	Coefficient	Robust S.E.
Pre-calculus	0.53	0.33
Calculus	-0.14	0.38
Degree Goal in the First Year (Ref: Certificate/No Degree)		
Associate's	0.35	0.28
BA	0.45	0.29

Note: *p<.05 **p<.01 ***p<.001

Table A3

Multinomial Logistic Regression of Informal Faculty–Student Interactions without PSM Adjustment

	Coefficient	Robust S.E.
Never (Base)		
Sometimes		
Minority Service Institution (HBCU/HSI)	0.13	0.19
Percentage of Minority Enrollment 2003-04	-0.01*	0.00
Living Location (Ref: With Parents)		
On Campus	0.87***	0.26
Off Campus	-0.17	0.13
Curriculum Track		
No Directed	0.11	0.23
General	-0.23	0.16
Admission Test Scores Required	-0.20	0.18
Admissions Test Scores	0.00	0.00
Highest Level of Education Offering in First Institution is Award/Diploma (Ref: Associate's)	0.10	0.11
Race (Ref: White)		
African American	0.34*	0.15
Latinos	-0.12	0.18
Female	-0.05	0.10
Non-Traditional Student	0.04	0.24
Part-Time Enrollment	-0.34***	0.11
Expected Family Contribution (EFC)	0.00	0.00
Total Grants and Loans (Except PLUS) in 2003-04	0.00	0.00
Total Merit Grants	0.00	0.00
Family Income	-0.01	0.03
Highest level of parent's education (Years)	-0.01	0.02
Delayed Enrollment	0.07	0.14
Numbers of Dependent Children	-0.15	0.08
Not a Native Speaker	0.40	0.21
First-Generation Immigrant	0.29	0.16
No High School Degree	0.03	0.18
High School GPA	-0.02	0.04
Earned College Credits in High School	0.49***	0.14
Highest Level of High School Mathematics (Ref: None)		
Algebra 2	0.14	0.14
Trigonometry/Algebra II	0.45**	0.17
Pre-calculus	0.67***	0.20

(*continued*)

Table A3-continued

	Coefficient	Robust S.E.
Calculus	0.10	0.30
Degree Goal in the First Year (Ref: Certificate/No Degree)		
Associate's	-0.06	0.19
BA	-0.14	0.22
Often		
Minority Service Institution (HBCU/HSI)	1.03**	0.38
Percentage of Minority Enrollment 2003-04	-0.01*	0.01
Living Location		
On Campus	1.03***	0.33
Off Campus	-0.09	0.25
Curriculum Track		
No Directed	-0.36	0.49
General	0.26	0.25
Admission Test Scores Required	0.31	0.28
Admissions Test Scores	0.00	0.00
Highest Level of Education Offering in First Institution is Award/Diploma (Ref: Associate's)	-0.19	0.25
Race (Ref: White)		
African American	0.71**	0.25
Latinos	-0.25	0.30
Female	-0.32	0.19
Non-Traditional Student	-0.08	0.43
Part-Time Enrollment	-0.50*	0.23
Expected Family Contribution (EFC)	0.00*	0.00
Total Grants and Loans (Except PLUS) in 2003-04	0.00*	0.00
Total Merit Grants	0.00	0.00
Family Income	0.05	0.05
Highest level of parent's education (Years)	0.03	0.03
Delayed Enrollment	-0.17	0.27
Numbers of Dependent Children	-0.25	0.16
Not a Native Speaker	0.75*	0.36
First-Generation Immigrant	0.49	0.27
No High School Degree	0.12	0.38
High School GPA	-0.08	0.07
Earned College Credits in High School	0.84***	0.25
Highest Level of High School Mathematics (Ref: None)		
Algebra 2	0.21	0.28
Trigonometry/Algebra II	0.49	0.32

(*continued*)

Table A3-continued

	Coefficient	Robust S.E.
Pre-calculus	0.39	0.41
Calculus	0.59	0.43
Degree Goal in the First Year (Ref: Certificate/No Degree)		
Associate's	-0.96*	0.42
BA	-0.63	0.46

Note: *p<.05 **p<.01 ***p<.001

Table A4

Multinomial Logistic Regression of Formal Faculty–Student Interactions (Talking with Faculty Outside of Class Time)

	Coefficient	Robust S.E.
Never (Base)		
Sometimes		
Minority Service Institution (HBCU/HSI)	-0.17	0.18
Percentage of Minority Enrollment 2003-04	0.00	0.00
Living Location (Ref: With Parents)		
On Campus	0.36	0.33
Off Campus	-0.06	0.13
Curriculum Track		
No Directed	-0.52**	0.21
General	0.12	0.16
Admission Test Scores Required	-0.13	0.17
Admissions Test Scores	0.00	0.00
Highest Level of Education Offering in First Institution is Award/Diploma (Ref: Associate's)	-0.08	0.11
Race		
African American	0.04	0.15
Latinos	-0.05	0.17
Female	0.04	0.10
Non-Traditional Student	0.19	0.23
Part-Time Enrollment	-0.43***	0.11
Expected Family Contribution (EFC)	0.00	0.00
Total Grants and Loans (Except PLUS) in 2003-04	0.00	0.00
Total Merit Grants	0.00	0.00
Family Income	-0.03	0.02
Highest level of parent’s education (Years)	0.02	0.02
Delayed Enrollment	-0.12	0.13
Numbers of Dependent Children	0.06	0.06
Not a Native Speaker	0.38	0.21
First-Generation Immigrant	0.09	0.17
No High School Degree	0.27	0.17
High School GPA	0.00	0.04
Earned College Credits in High School	0.00	0.16
Highest Level of High School Mathematics (Ref: None)		
Algebra 2	-0.03	0.14
Trigonometry/Algebra II	0.32	0.18

(*continued*)

Table A4-continued

	Coefficient	Robust S.E.
Pre-calculus	0.27	0.21
Calculus	-0.42	0.29
Degree Goal in the First Year (Ref: Certificate/No Degree)		
Associate's	0.12	0.17
BA	0.55**	0.20
Often		
Minority Service Institution (HBCU/HSI)	-0.28	0.27
Percentage of Minority Enrollment 2003-04	0.00	0.00
Living Location		
On campus	0.84*	0.36
Off campus	0.02	0.17
Curriculum Track		
No Directed	-0.81**	0.30
General	-0.28	0.22
Admission Test Scores Required	-0.01	0.25
Admissions Test Scores	0.00	0.00
Highest Level of Education Offering in First Institution is Award/Diploma (Ref: Associate's)	-0.06	0.15
Race		
African American	0.70***	0.19
Latinos	0.20	0.25
Female	0.45***	0.15
Non-Traditional Student	0.10	0.31
Part-Time Enrollment	-0.58***	0.16
Expected Family Contribution (EFC)	0.00*	0.00
Total Grants and Loans (Except PLUS) in 2003-04	0.00*	0.00
Total Merit Grants	0.00	0.00
Family Income	0.05	0.04
Highest level of parent's education (Years)	0.03	0.02
Delayed Enrollment	-0.18	0.18
Numbers of Dependent Children	0.10	0.12
Not a Native Speaker	0.41	0.29
First-Generation Immigrant	0.08	0.24
No High School Degree	0.07	0.27
High School GPA	-0.01	0.05
Earned College Credits in High School	0.20	0.20
Highest Level of High School Mathematics (Ref: None)		
Algebra 2	-0.07	0.20

(*continued*)

Table A4-continued

	Coefficient	Robust S.E.
Trigonometry/Algebra II	0.30	0.24
Pre-calculus	0.11	0.29
Calculus	-0.01	0.38
Degree Goal in the First Year (Ref: Certificate/No Degree)		
Associate's	0.37	0.24
BA	0.68*	0.28

Note: *p<.05 **p<.01 ***p<.001

Table A5

Multinomial Logistic Regression of Academic Advising with PSM Adjustment

	Coefficient	Robust S.E.
Never (Base)		
Sometimes		
Minority Service Institution (HBCU/HSI)	0.07	0.18
Percentage of Minority Enrollment 2003-04	0.00	0.00
Living Location (Ref: With Parents)		
On campus	0.06	0.26
Off campus	0.01	0.12
Curriculum Track (Ref: Four-Year Transfer)		
No Directed	0.06	0.21
General	0.05	0.15
Admission Test Scores Required	0.03	0.17
Admissions Test Scores	0.00	0.00
Highest Level of Education Offering in First Institution is Award/Diploma (Ref: Associate's)	-0.01	0.11
Race (Ref: White)		
African American	0.02	0.14
Latinos	0.01	0.17
Female	0.01	0.10
Non-Traditional Student	-0.03	0.22
Part-Time Enrollment	0.01	0.10
Expected Family Contribution (EFC)	0.00	0.00
Total Grants and Loans (Except PLUS) in 2003-04	0.00	0.00
Total Merit Grants	0.00	0.00
Family Income	0.00	0.02
Highest level of parent’s education (Years)	0.00	0.02
Delayed Enrollment	0.01	0.13
Numbers of Dependent Children	-0.01	0.06
Not a Native Speaker	0.04	0.20
First-Generation Immigrant	-0.04	0.16
No High School Degree	0.01	0.17
High School GPA	0.00	0.04
Earned College Credits in High School	0.03	0.15
Highest Level of High School Mathematics (Ref: None)		
Algebra 2	-0.02	0.14
Trigonometry/Algebra II	-0.02	0.16
Pre-calculus	0.01	0.19

(*continued*)

Table A5-continued

	Coefficient	Robust S.E.
Calculus	0.04	0.28
Degree Goal in the First Year (Ref: Certificate/No Degree)		
Associate's	-0.01	0.17
BA	0.05	0.20
Often		
Minority Service Institution (HBCU/HSI)	0.01	0.25
Percentage of Minority Enrollment 2003-04	0.00	0.00
Living Location (Ref: With Parents)		
On campus	0.11	0.32
Off campus	-0.01	0.17
Curriculum Track (Ref: Four-Year Transfer)		
No Directed	0.00	0.31
General	0.16	0.22
Admission Test Scores Required	0.12	0.22
Admissions Test Scores	0.00	0.00
Highest Level of Education Offering in First Institution is Award/Diploma (Ref: Associate's)	0.09	0.16
Race (Ref: White)		
African American	0.06	0.20
Latinos	0.20	0.24
Female	-0.01	0.15
Non-Traditional Student	0.00	0.34
Part-Time Enrollment	-0.03	0.16
Expected Family Contribution (EFC)	0.00	0.00
Total Grants and Loans (Except PLUS) in 2003-04	0.00	0.00
Total Merit Grants	0.00	0.00
Family Income	0.01	0.04
Highest level of parent's education (Years)	0.01	0.02
Delayed Enrollment	-0.01	0.18
Numbers of Dependent Children	0.02	0.10
Not a Native Speaker	0.01	0.31
First-Generation Immigrant	-0.06	0.25
No High School Degree	0.06	0.27
High School GPA	0.01	0.06
Earned College Credits in High School	-0.11	0.20
Highest Level of High School Mathematics (Ref: None)		
Algebra 2	-0.03	0.23
Trigonometry/Algebra II	-0.06	0.26

(*continued*)

Table A5-continued

	Coefficient	Robust S.E.
Pre-calculus	-0.17	0.35
Calculus	0.02	0.40
Degree Goal in the First Year (Ref: Certificate/No Degree)		
Associate's	-0.17	0.28
BA	0.01	0.31

Note: *p<.05 **p<.01 ***p<.001

Table A6

Multinomial Logistic Regression of Academic Advising on Student Success from Both with and without PSM Adjustment

	Before		After	
	Coefficient	Robust S.E.	Coefficient	Robust S.E.
Enrolled (Base)				
Transfer				
Meeting Academic Advisor	0.29***	0.08	0.33***	0.09
Minority Service Institution (HBCU/HSI)	0.16	0.22	0.09	0.22
Percentage of Minority Enrollment 2003-04	0.00	0.00	0.00	0.00
Living Location (Ref: With Parents)				
On Campus	0.30	0.27	0.08	0.32
Off Campus	-0.02	0.15	0.01	0.15
Curriculum Track (Ref: Four-Year Transfer)				
No Directed	-0.60	0.35	-0.80*	0.35
General	-0.57***	0.19	-0.60***	0.20
Admission Test Scores Required	0.23	0.22	0.28	0.23
Admissions Test Scores	0.00***	0.00	0.00***	0.00
Highest Level of Education Offering in First Institution is Award/Diploma (Ref: Associate's)	0.07	0.12	0.05	0.12
Race (Ref: White)				
African American	-0.24	0.17	-0.23	0.17
Latinos	-0.51**	0.21	-0.44*	0.21
Female	0.17	0.11	0.18	0.12
Non-Traditional Student	0.56	0.30	0.59	0.31
Part-Time Enrollment	-0.51***	0.12	-0.46***	0.12
Expected Family Contribution (EFC)	0.00	0.00	0.00	0.00
Total Grants and Loans (Except PLUS) in 2003-04	0.00**	0.00	0.00***	0.00
Total Merit Grants	0.00	0.00	0.00	0.00
Family Income	0.05	0.03	0.06*	0.03
Highest level of parent's education (Years)	0.06***	0.02	0.05**	0.02
Delayed Enrollment	-0.13	0.16	-0.16	0.16
Numbers of Dependent Children	-0.14	0.12	-0.13	0.12
Not a Native Speaker	0.28	0.23	0.21	0.23
First-Generation Immigrant	0.30	0.19	0.25	0.19
No High School Degree	0.34	0.23	0.31	0.23
High School GPA	0.12***	0.04	0.12**	0.04
Earned College Credits in High School	0.21	0.15	0.23	0.16

(*continued*)

Table A6-continued

	Before		After	
	Coefficient	Robust S.E.	Coefficient	Robust S.E.
Highest Level of High School Mathematics (Ref: None)				
Algebra 2	0.37*	0.17	0.44*	0.18
Trigonometry/Algebra II	0.58***	0.19	0.69***	0.19
Pre-calculus	0.32	0.21	0.36	0.22
Calculus	0.58*	0.29	0.62*	0.31
Degree Goal in the First Year (Ref: Certificate/No Degree)				
Associate's	-0.03	0.24	-0.08	0.26
BA	0.65*	0.28	0.59*	0.29
Constant	-3.59***	0.47	-3.57***	0.49
AA				
Meeting Academic Advisor	0.16	0.09	0.12	0.09
Minority Service Institution (HBCU/HSI)	0.32	0.27	0.28	0.28
Percentage of Minority Enrollment 2003-04	0.00	0.00	0.00	0.00
Living Location (Ref: With Parents)				
On Campus	-0.16	0.31	-0.32	0.34
Off Campus	-0.01	0.17	-0.03	0.17
Curriculum Track (Ref: Four-Year Transfer)				
No Directed	1.49***	0.28	1.39***	0.28
General	-0.03	0.21	0.05	0.22
Admission Test Scores Required	0.84***	0.20	0.94***	0.20
Admissions Test Scores	0.00	0.00	0.00	0.00
Highest Level of Education Offering in First Institution is Award/Diploma (Ref: Associate's)	-0.04	0.15	-0.03	0.15
Race (Ref: White)				
African American	-0.63***	0.20	-0.67***	0.20
Latinos	-0.50*	0.23	-0.51*	0.23
Female	0.18	0.14	0.19	0.14
Non-Traditional Student	0.23	0.32	0.26	0.31
Part-Time Enrollment	-0.56***	0.15	-0.57***	0.15
Expected Family Contribution (EFC)	0.00	0.00	0.00	0.00
Total Grants and Loans (Except PLUS) in 2003-04	0.00***	0.00	0.00***	0.00
Total Merit Grants	0.00	0.00	0.00	0.00
Family Income	0.10***	0.03	0.10**	0.03
Highest level of parent's education (Years)	0.00	0.02	-0.01	0.02
Delayed Enrollment	-0.01	0.17	-0.04	0.18

(*continued*)

Table A6-continued

	Before		After	
	Coefficient	Robust S.E.	Coefficient	Robust S.E.
Numbers of Dependent Children	-0.06	0.09	-0.06	0.09
Not a Native Speaker	-0.14	0.28	-0.04	0.29
First-Generation Immigrant	0.59**	0.22	0.50*	0.23
No High School Degree	0.36	0.22	0.36	0.22
High School GPA	0.09	0.05	0.07	0.05
Earned College Credits in High School	0.05	0.20	0.01	0.20
Highest Level of High School Mathematics (Ref: None)				
Algebra 2	0.11	0.19	0.20	0.19
Trigonometry/Algebra II	0.29	0.23	0.45*	0.22
Pre-calculus	0.17	0.27	0.34	0.28
Calculus	0.12	0.45	0.09	0.44
Degree Goal in the First Year (Ref: Certificate/No Degree)				
Associate's	2.13***	0.33	2.02***	0.33
BA	1.76***	0.35	1.71***	0.36
Constant	-4.41****	0.59	-4.23***	0.60

Note: *p<.05 **p<.01 ***p<.001

Table A7

Relative Risk Ratio of Academic Advising on Student Success (with PSM Adjusted)

	Relative Risk Ratio	Robust S.E.
Enrolled (Base)		
Transfer		
Meeting Academic Advisor	1.39***	0.12
Minority Service Institution (HBCU/HSI)	1.09	0.24
Percentage of Minority Enrollment 2003-04	1.00	0.00
Living Location (Ref: With Parents)		
On Campus	1.08	0.35
Off Campus	1.01	0.15
Curriculum Track (Ref: Four-Year Transfer)		
No Directed	0.45*	0.16
General	0.55***	0.11
Admission Test Scores Required	1.32	0.31
Admissions Test Scores	1.00***	0.00
Highest Level of Education Offering in First Institution is Award/Diploma (Ref: Associate's)	1.05	0.13
Race (Ref: White)		
African American	0.80	0.14
Latinos	0.64*	0.14
Female	1.20	0.14
Non-Traditional Student	1.80	0.56
Part-Time Enrollment	0.63***	0.08
Expected Family Contribution (EFC)	1.00	0.00
Total Grants and Loans (Except PLUS) in 2003-04	1.00***	0.00
Total Merit Grants	1.00	0.00
Family Income	1.06*	0.03
Highest level of parent's education (Years)	1.06**	0.02
Delayed Enrollment	0.85	0.14
Numbers of Dependent Children	0.88	0.10
Not a Native Speaker	1.24	0.28
First-Generation Immigrant	1.28	0.25
No High School Degree	1.36	0.32
High School GPA	1.13**	0.05
Earned College Credits in High School	1.26	0.20
Highest Level of High School Mathematics (Ref: None)		
Algebra 2	1.55*	0.28
Trigonometry/Algebra II	2.00***	0.39

(*continued*)

Table A7-continued

	Relative Risk Ratio	Robust S.E.
Pre-calculus	1.43	0.32
Calculus	1.86*	0.58
Degree Goal in the First Year (Ref: Certificate/No Degree)		
Associate's	0.92	0.24
BA	1.81*	0.52
Constant	0.03***	0.01
AA		
Meeting Academic Advisor	1.13	0.10
Minority Service Institution (HBCU/HSI)	1.32	0.36
Percentage of Minority Enrollment 2003-04	1.00	0.00
Living Location (Ref: With Parents)		
On Campus	0.72	0.24
Off Campus	0.97	0.16
Curriculum Track (Ref: Four-Year Transfer)		
No Directed	4.01***	1.10
General	1.05	0.23
Admission Test Scores Required	2.55***	0.51
Admissions Test Scores	1.00	0.00
Highest Level of Education Offering in First Institution is Award/Diploma (Ref: Associate's)	0.97	0.14
Race (Ref: White)		
African American	0.51***	0.10
Latinos	0.60*	0.14
Female	1.21	0.17
Non-Traditional Student	1.30	0.41
Part-Time Enrollment	0.56***	0.08
Expected Family Contribution (EFC)	1.00	0.00
Total Grants and Loans (Except PLUS) in 2003-04	1.00***	0.00
Total Merit Grants	1.00	0.00
Family Income	1.10**	0.04
Highest level of parent's education (Years)	0.99	0.02
Delayed Enrollment	0.96	0.17
Numbers of Dependent Children	0.94	0.09
Not a Native Speaker	0.96	0.28
First-Generation Immigrant	1.64*	0.38
No High School Degree	1.43	0.32
High School GPA	1.07	0.05
Earned College Credits in High School	1.01	0.20

(*continued*)

Table A7-continued

	Relative Risk Ratio	Robust S.E.
Highest Level of High School Mathematics (Ref: None)		
Algebra 2	1.22	0.24
Trigonometry/Algebra II	1.56*	0.35
Pre-calculus	1.41	0.39
Calculus	1.10	0.49
Degree Goal in the First Year (Ref: Certificate/No Degree)		
Associate's	7.53***	2.51
BA	5.53***	2.02
Constant	0.01***	0.01

Note: *p<.05 **p<.01 ***p<.001

Table A8

Conditional Effects of Academic Advising by Students' Features on Upper Transfer (With PSM Adjustment)

	Coefficient	Robust S.E.
Race		
African American	-0.55**	0.21
Latinos	-0.16	0.23
Age		
Non-traditional Student	-0.19	0.26
First-generation Status		
Not a First-generation Student	-0.27	0.19
Motivation		
Associate's	-0.10	0.39
BA	-0.01	0.37
Academic Preparation		
No High School Degree	0.02	0.30

Note: *p<.05 **p<.01 ***p<.001

Table A9

Conditional Effects of Academic Advising by Students' Features on Attainment of Associate's Degree (With PSM Adjustment)

	Coefficient	Robust S.E.
Race		
African American	0.22	0.27
Latinos	0.26	0.30
Age		
Non-traditional Student	0.01	0.22
First-generation Status		
Not a First-generation Student	-0.49*	0.24
Motivation		
Associate's	-0.49	0.35
BA	-0.66	0.35
Academic Preparation		
No High School Degree	0.32	0.24

Note: *p<.05 **p<.01 ***p<.001

Table A10

Multinomial Logistic Regression of Formal Faculty–Student Interactions on Student Success from Both with and without PSM Adjustment

	Before		After	
	Coefficient	Robust S.E.	Coefficient	Robust S.E.
Enrolled (Base)				
Transfer				
Talking to Faculty Members Outside of Class Time	0.33***	0.09	0.34***	0.10
Minority Service Institution (HBCU/HSI)	0.18	0.22	0.10	0.23
Percentage of Minority Enrollment 2003-04	0.00	0.00	0.00	0.00
Living Location (Ref: With Parents)				
On Campus	0.27	0.27	0.26	0.30
Off Campus	-0.01	0.14	0.02	0.15
Curriculum Track				
No Directed	-0.58	0.36	-1.10***	0.37
General	-0.58***	0.19	-0.60***	0.21
Admission Test Scores Required	0.26	0.21	0.32	0.22
Admissions Test Scores	0.00***	0.00	0.00***	0.00
Highest Level of Education Offering in First Institution is Award/Diploma (Ref: Associate's)	0.07	0.12	0.05	0.13
Race (Ref: White)				
African American	-0.24	0.17	-0.26	0.18
Latinos	-0.54**	0.21	-0.49***	0.21
Female	0.16	0.12	0.11	0.12
Non-Traditional Student	0.56	0.30	0.51	0.32
Part-Time Enrollment	-0.50***	0.12	-0.48***	0.12
Expected Family Contribution (EFC)	0.00	0.00	0.00	0.00
Total Grants and Loans (Except PLUS) in 2003-04	0.00**	0.00	0.00***	0.00
Total Merit Grants	0.00	0.00	0.00	0.00
Family Income	0.05	0.03	0.05	0.03
Highest level of parent's education (Years)	0.06***	0.02	0.06***	0.02
Delayed Enrollment	-0.14	0.16	-0.18	0.16
Numbers of Dependent Children	-0.14	0.12	-0.14	0.12
Not a Native Speaker	0.25	0.23	0.25	0.24
First-Generation Immigrant	0.30	0.19	0.30	0.21
No High School Degree	0.34	0.23	0.36	0.25
High School GPA	0.13***	0.04	0.09*	0.05

(*continued*)

Table A10-continued

	Before		After	
	Coefficient	Robust S.E.	Coefficient	Robust S.E.
Earned College Credits in High School	0.24	0.15	0.29	0.16
Highest Level of High School Mathematics (Ref: None)				
Algebra 2	0.39*	0.17	0.45**	0.18
Trigonometry/Algebra II	0.58***	0.19	0.67***	0.20
Pre-calculus	0.35	0.22	0.42	0.23
Calculus	0.60*	0.29	0.73*	0.30
Degree Goal in the First Year (Ref: Certificate/No Degree)				
Associate's	-0.03	0.24	-0.01	0.29
BA	0.63*	0.28	0.63*	0.32
Constant	-3.62***	0.47	-3.46***	0.52
AA				
Talking to Faculty Members Outside of Class Time	0.34***	0.10	0.32***	0.10
Minority Service Institution (HBCU/HSI)	0.33	0.27	0.34	0.28
Percentage of Minority Enrollment 2003-04	0.00	0.00	-0.01	0.00
Living Location (Ref: With Parents)				
On Campus	-0.20	0.30	-0.32	0.30
Off Campus	-0.01	0.17	0.09	0.17
Curriculum Track				
No Directed	1.53***	0.29	1.42***	0.29
General	-0.04	0.21	-0.14	0.22
Admission Test Scores Required	0.85***	0.19	0.92***	0.22
Admissions Test Scores	0.00	0.00	0.00	0.00
Highest Level of Education Offering in First Institution is Award/Diploma (Ref: Associate's)	-0.03	0.15	-0.03	0.15
Race (Ref: White)				
African American	-0.63***	0.20	-0.64***	0.20
Latinos	-0.51*	0.23	-0.49*	0.23
Female	0.16	0.14	0.18	0.14
Non-Traditional Student	0.24	0.32	0.20	0.32
Part-Time Enrollment	-0.54***	0.15	-0.49	0.15
Expected Family Contribution (EFC)	0.00	0.00	0.00	0.00
Total Grants and Loans (Except PLUS) in 2003-04	0.00***	0.00	0.00***	0.00
Total Merit Grants	0.00	0.00	0.00	0.00
Family Income	0.10***	0.03	0.10***	0.03

(*continued*)

Table A10-continued

	Before		After	
Highest level of parent's education (Years)	0.00	0.02	0.00	0.02
Delayed Enrollment	0.00	0.17	-0.10	0.17
Numbers of Dependent Children	-0.06	0.09	-0.09	0.09
Not a Native Speaker	-0.16	0.28	-0.22	0.27
First-Generation Immigrant	0.58**	0.22	0.53*	0.22
No High School Degree	0.37	0.23	0.39	0.23
High School GPA	0.09	0.05	0.08	0.05
Earned College Credits in High School	0.06	0.20	0.11	0.21
Highest Level of High School Mathematics (Ref: None)				
Algebra 2	0.14	0.19	0.15	0.19
Trigonometry/Algebra II	0.29	0.23	0.38	0.23
Pre-calculus	0.19	0.27	0.21	0.27
Calculus	0.16	0.44	0.30	0.45
Degree Goal in the First Year (Ref: Certificate/No Degree)				
Associate's	2.13***	0.33	2.13***	0.33
BA	1.72***	0.35	1.63***	0.36
Constant	-4.54***	0.59	-4.38***	0.60

Note: *p<.05 **p<.01 ***p<.001

Table A11

Relative Risk Ratio of Formal Faculty–Student Interactions (Talking with Faculty Outside of Class Time) with PSM Adjustment

	Relative Risk Ratio	Robust S.E.
Enrolled (Base)		
Transfer		
Talking to Faculty Members Outside of Class Time	1.41***	0.14
Minority Service Institution (HBCU/HSI)	1.10	0.25
Percentage of Minority Enrollment 2003-04	1.00	0.00
Living Location (Ref: With Parents)		
On Campus	1.30	0.40
Off Campus	1.02	0.15
Curriculum Track		
No Directed	0.33***	0.12
General	0.55***	0.11
Admission Test Scores Required	1.37	0.31
Admissions Test Scores	1.00***	0.00
Highest Level of Education Offering in First Institution is Award/Diploma (Ref: Associate's)	1.06	0.13
Race (Ref: White)		
African American	0.77	0.14
Latinos	0.61*	0.13
Female	1.12	0.13
Non-Traditional Student	1.66	0.54
Part-Time Enrollment	0.62***	0.08
Expected Family Contribution (EFC)	1.00	0.00
Total Grants and Loans (Except PLUS) in 2003-04	1.00**	0.00
Total Merit Grants	1.00	0.00
Family Income	1.05	0.03
Highest level of parent's education (Years)	1.06***	0.02
Delayed Enrollment	0.84	0.14
Numbers of Dependent Children	0.87	0.11
Not a Native Speaker	1.29	0.31
First-Generation Immigrant	1.34	0.28
No High School Degree	1.44	0.36
High School GPA	1.10*	0.05
Earned College Credits in High School	1.34	0.21
Highest Level of High School Mathematics (Ref: None)		
Algebra 2	1.58*	0.29

(*continued*)

Table A11-continued

	Relative Risk Ratio	Robust S.E.
Trigonometry/Algebra II	1.96***	0.38
Pre-calculus	1.52	0.34
Calculus	2.07*	0.63
Degree Goal in the First Year (Ref: Certificate/No Degree)		
Associate's	0.99	0.29
BA	1.87*	0.60
Constant	0.03***	0.02
AA		
Talking to Faculty Members Outside of Class Time	1.38***	0.13
Minority Service Institution (HBCU/HSI)	1.40	0.39
Percentage of Minority Enrollment 2003-04	0.99	0.00
Living Location (Ref: With Parents)		
On Campus	0.72	0.22
Off Campus	1.09	0.18
Curriculum Track		
No Directed	4.12***	1.20
General	0.87	0.19
Admission Test Scores Required	2.50***	0.55
Admissions Test Scores	1.00	0.00
Highest Level of Education Offering in First Institution is Award/Diploma (Ref: Associate's)	0.97	0.15
Race (Ref: White)		
African American	0.53***	0.10
Latinos	0.61*	0.14
Female	1.19	0.16
Non-Traditional Student	1.22	0.39
Part-Time Enrollment	0.61***	0.09
Expected Family Contribution (EFC)	1.00	0.00
Total Grants and Loans (Except PLUS) in 2003-04	1.00***	0.00
Total Merit Grants	1.00	0.00
Family Income	1.11***	0.04
Highest level of parent's education (Years)	1.00	0.02
Delayed Enrollment	0.91	0.16
Numbers of Dependent Children	0.91	0.08
Not a Native Speaker	0.80	0.22
First-Generation Immigrant	1.69*	0.37
No High School Degree	1.48	0.34
High School GPA	1.08	0.05

(*continued*)

Table A11-continued

	Relative Risk Ratio	Robust S.E.
Earned College Credits in High School	1.12	0.23
Highest Level of High School Mathematics (Ref: None)		
Algebra 2	1.16	0.22
Trigonometry/Algebra II	1.46	0.34
Pre-calculus	1.23	0.33
Calculus	1.35	0.61
Degree Goal in the First Year (Ref: Certificate/No Degree)		
Associate's	8.39***	2.78
BA	5.11***	1.82
Constant	0.01***	0.01

Note: *p<.05 **p<.01 ***p<.001

Table A12

Multinomial Logistic Regression of Informal Faculty–Student Interactions (Informal Interaction with Faculty Members) on Student Success from Both with and without PSM Adjustment

	Before		After	
	Coefficient	Robust S.E.	Coefficient	Robust S.E.
Enrolled (Base)				
Transfer				
Informal Meeting with Faculty Members	0.05	0.09	-0.05	0.10
Minority Service Institution (HBCU/HSI)	0.16	0.21	0.16	0.21
Percentage of Minority Enrollment 2003-04	0.00	0.00	0.00	0.00
Living Location (Ref: With Parents)				
On Campus	0.31	0.28	0.00	0.36
Off Campus	-0.02	0.14	0.03	0.14
Curriculum Track				
No Directed	-0.66	0.35	-0.73*	0.34
General	-0.59***	0.19	-0.61***	0.19
Admission Test Scores Required	0.26	0.21	0.20	0.21
Admissions Test Scores	0.00***	0.00	0.00***	0.00
Highest Level of Education Offering in First Institution is Award/Diploma (Ref: Associate's)	0.07	0.12	0.03	0.12
Race (Ref: White)				
African American	-0.19	0.16	-0.23	0.16
Latinos	-0.51	0.21	-0.49*	0.20
Female	0.19	0.12	0.19	0.12
Non-Traditional Student	0.57	0.30	0.59*	0.30
Part-Time Enrollment	-0.53***	0.12	-0.54***	0.12
Expected Family Contribution (EFC)	0.00	0.00	0.00	0.00
Total Grants and Loans (Except PLUS) in 2003-04	0.00***	0.00	0.00***	0.00
Total Merit Grants	0.00	0.00	0.00	0.00
Family Income	0.05	0.03	0.06*	0.03
Highest level of parent's education (Years)	0.06***	0.02	0.06***	0.02
Delayed Enrollment	-0.15	0.16	-0.18	0.16
Numbers of Dependent Children	-0.13	0.12	-0.13	0.13
Not a Native Speaker	0.28	0.23	0.45*	0.23
First-Generation Immigrant	0.29	0.19	0.30	0.20
No High School Degree	0.35	0.23	0.15	0.23
High School GPA	0.13***	0.04	0.12**	0.04
Earned College Credits in High School	0.23	0.15	0.25	0.15

(*continued*)

Table A12-continued

	Before		After	
	Coefficient	Robust S.E.	Coefficient	Robust S.E.
Highest Level of High School Mathematics (Ref: None)				
Algebra 2	0.37*	0.17	0.46**	0.17
Trigonometry/Algebra II	0.59***	0.19	0.67***	0.19
Pre-calculus	0.34	0.21	0.44*	0.21
Calculus	0.58*	0.29	0.69*	0.29
Degree Goal in the First Year (Ref: Certificate/No Degree)				
Associate's	-0.01	0.24	-0.12	0.24
BA	0.67*	0.28	0.54*	0.27
Constant	-3.42***	0.47	-3.32***	0.47
AA				
Informal Meeting with Faculty Members	0.15	0.11	0.08	0.12
Minority Service Institution (HBCU/HSI)	0.30	0.27	0.39	0.27
Percentage of Minority Enrollment 2003-04	0.00	0.00	-0.01	0.00
Living Location				
On campus	-0.18	0.31	-0.20	0.36
Off campus	-0.01	0.17	-0.06	0.17
Curriculum Track				
No Directed	1.46***	0.28	1.31***	0.29
General	-0.04	0.21	-0.10	0.22
Admission Test Scores Required	0.85***	0.20	0.89***	0.20
Admissions Test Scores	0.00	0.00	0.00	0.00
Highest Level of Education Offering in First Institution is Award/Diploma (Ref: Associate's)	-0.04	0.15	0.00	0.15
Race (Ref: White)				
African American	-0.62***	0.20	-0.65***	0.21
Latinos	-0.49*	0.23	-0.52*	0.23
Female	0.19	0.14	0.15	0.14
Non-Traditional Student	0.25	0.32	0.31	0.32
Part-Time Enrollment	-0.57***	0.15	-0.58***	0.15
Expected Family Contribution (EFC)	0.00	0.00	0.00	0.00
Total Grants and Loans (Except PLUS) in 2003-04	0.00***	0.00	0.00***	0.00
Total Merit Grants	0.00	0.00	0.00	0.00
Family Income	0.10***	0.03	0.10***	0.03
Highest level of parent's education (Years)	0.00	0.02	0.00	0.02
Delayed Enrollment	-0.01	0.17	-0.05	0.18

(*continued*)

Table A12-continued

	Before		After	
	Coefficient	Robust S.E.	Coefficient	Robust S.E.
Numbers of Dependent Children	-0.05	0.09	-0.05	0.09
Not a Native Speaker	-0.16	0.28	0.00	0.29
First-Generation Immigrant	0.58**	0.22	0.63**	0.22
No High School Degree	0.36	0.23	0.33	0.24
High School GPA	0.09	0.05	0.08	0.05
Earned College Credits in High School	0.04	0.21	0.04	0.21
Highest Level of High School Mathematics (Ref: None)				
Algebra 2	0.12	0.19	0.21	0.20
Trigonometry/Algebra II	0.29	0.23	0.34	0.23
Pre-calculus	0.17	0.27	0.24	0.26
Calculus	0.13	0.45	0.30	0.43
Degree Goal in the First Year (Ref: Certificate/No Degree)				
Associate's	2.16***	0.33	2.04***	0.33
BA	1.78***	0.36	1.59***	0.36
Constant	-4.40***	0.59	-4.17***	0.60

Note: *p<.05 **p<.01 ***p<.001

Table A13

Relative Risk Ratio of Informal Faculty–Student Interactions (Informal Interaction with Faculty Members) with PSM Adjustment

	Relative Risk Ratio	Robust S.E.
Enrolled (Base)		
Transfer		
Informal Meeting with Faculty Members	0.95	0.09
Minority Service Institution (HBCU/HSI)	1.17	0.25
Percentage of Minority Enrollment 2003-04	1.00	0.00
Living Location (Ref: With Parents)		
On Campus	1.00	0.36
Off Campus	1.03	0.15
Curriculum Track		
No Directed	0.48*	0.16
General	0.54***	0.10
Admission Test Scores Required	1.23	0.26
Admissions Test Scores	1.00***	0.00
Highest Level of Education Offering in First Institution is Award/Diploma (Ref: Associate's)	1.03	0.13
Race (Ref: White)		
African American	0.79	0.13
Latinos	0.61*	0.13
Female	1.20	0.14
Non-Traditional Student	1.80*	0.54
Part-Time Enrollment	0.58***	0.07
Expected Family Contribution (EFC)	1.00	0.00
Total Grants and Loans (Except PLUS) in 2003-04	1.00***	0.00
Total Merit Grants	1.00	0.00
Family Income	1.06*	0.03
Highest level of parent's education (Years)	1.07***	0.02
Delayed Enrollment	0.84	0.13
Numbers of Dependent Children	0.88	0.11
Not a Native Speaker	1.56*	0.35
First-Generation Immigrant	1.34	0.26
No High School Degree	1.16	0.27
High School GPA	1.12**	0.05
Earned College Credits in High School	1.28	0.20
Highest Level of High School Mathematics (Ref: None)		
Algebra 2	1.58**	0.27

(*continued*)

Table A13-continued

	Relative Risk Ratio	Robust S.E.
Trigonometry/Algebra II	1.95***	0.38
Pre-calculus	1.56*	0.33
Calculus	2.00*	0.57
Degree Goal in the First Year (Ref: Certificate/No Degree)		
Associate's	0.89	0.22
BA	1.72*	0.47
Constant	0.04***	0.02
AA		
Informal Meeting with Faculty Members	1.08	0.13
Minority Service Institution (HBCU/HSI)	1.48	0.40
Percentage of Minority Enrollment 2003-04	0.99	0.00
Living Location		
On campus	0.82	0.30
Off campus	0.95	0.16
Curriculum Track		
No Directed	3.71***	1.08
General	0.90	0.20
Admission Test Scores Required	2.43***	0.49
Admissions Test Scores	1.00	0.00
Highest Level of Education Offering in First Institution is Award/Diploma (Ref: Associate's)	1.00	0.15
Race (Ref: White)		
African American	0.52***	0.11
Latinos	0.59*	0.14
Female	1.16	0.17
Non-Traditional Student	1.37	0.44
Part-Time Enrollment	0.56***	0.09
Expected Family Contribution (EFC)	1.00	0.00
Total Grants and Loans (Except PLUS) in 2003-04	1.00***	0.00
Total Merit Grants	1.00	0.00
Family Income	1.10***	0.04
Highest level of parent's education (Years)	1.00	0.02
Delayed Enrollment	0.95	0.17
Numbers of Dependent Children	0.95	0.09
Not a Native Speaker	1.00	0.29
First-Generation Immigrant	1.87**	0.42
No High School Degree	1.39	0.34
High School GPA	1.09	0.06

(*continued*)

Table A13-continued

	Relative Risk Ratio	Robust S.E.
Earned College Credits in High School	1.04	0.21
Highest Level of High School Mathematics (Ref: None)		
Algebra 2	1.23	0.24
Trigonometry/Algebra II	1.41	0.32
Pre-calculus	1.27	0.34
Calculus	1.35	0.59
Degree Goal in the First Year (Ref: Certificate/No Degree)		
Associate's	7.69***	2.55
BA	4.93***	1.76
Constant	0.02***	0.01

Note: *p<.05 **p<.01 ***p<.001

Table A14

Conditional Effects of Informal Interaction with Faculty Members on Student Success (With PSM Adjustment)

	Upper Transfer		Associate's Degree	
	Coefficient	Robust S.E.	Coefficient	Robust S.E.
Race				
African American	-0.21	0.24	-0.15	0.42
Latinos	-0.16	0.27	0.22	0.33
Age				
Non-traditional Student	0.19	0.33	-0.31	0.32
First-generation Status				
Not a First-generation Student	-0.01	0.21	-0.06	0.27
Motivation				
Associate's	0.53	0.41	1.13*	0.47
BA	0.20	0.38	0.98*	0.47
Academic Preparation				
No High School Degree	-0.38	0.34	-0.74*	0.35

Note: *p<.05 **p<.01 ***p<.001

Table A15

Conditional Effects of Formal Interaction with Faculty Members on Student Success (With PSM Adjustment)

	Upper Transfer			Associate's Degree		
	Coefficient	Robust S.E.	P>z	Coefficient	Robust S.E.	P>z
Race						
African American	-0.27	0.24	0.27	-0.05	0.29	0.86
Latinos	-0.47	0.25	0.06	-0.16	0.29	0.57
Age						
Non-traditional Student	-0.04	0.33	0.90	-0.26	0.23	0.27
First-generation Status						
Not a First-generation Student	-0.05	0.21	0.82	-0.21	0.25	0.40
Motivation						
Associate's	0.59	0.58	0.31	-0.19	0.53	0.72
BA	0.21	0.53	0.69	-0.45	0.52	0.39
Academic Preparation						
No High School Degree	-0.02	0.45	0.96	-0.33	0.26	0.21

Note: *p<.05 **p<.01 ***p<.001

APPENDIX B. FIGURES

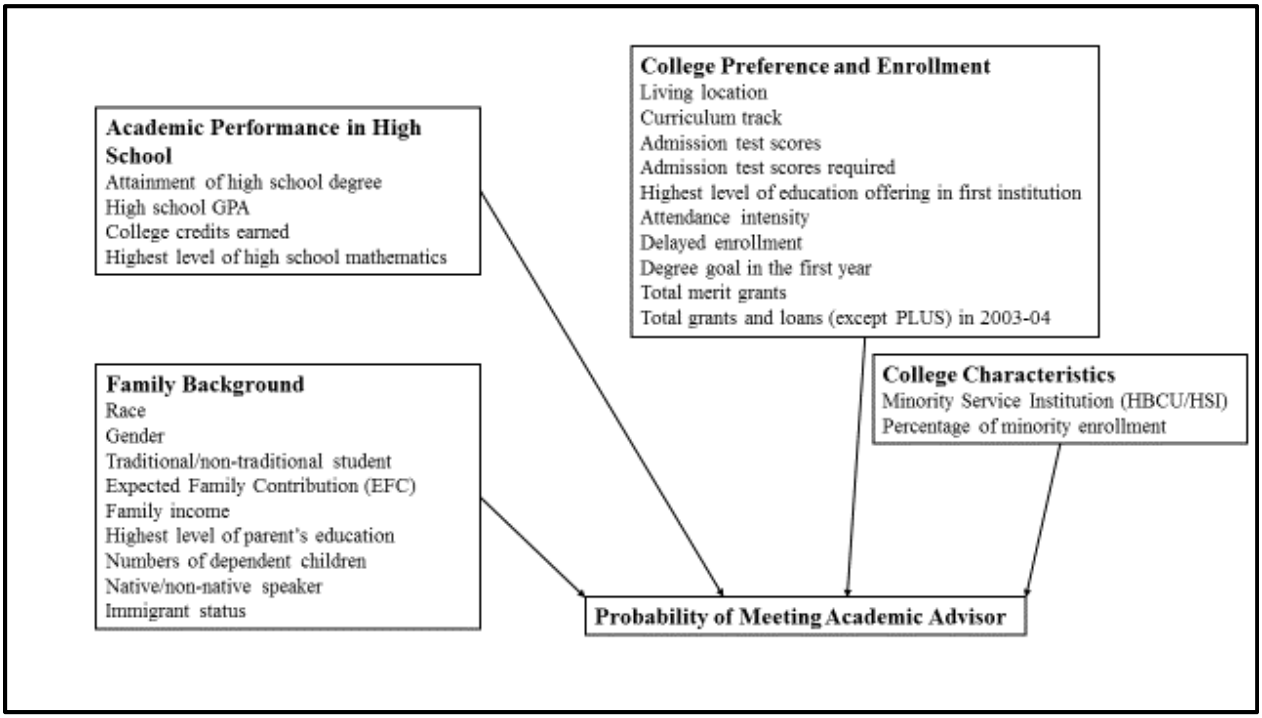

Figure B1. Conceptual Model Used to Create Propensity Score of Meeting Academic Advisor

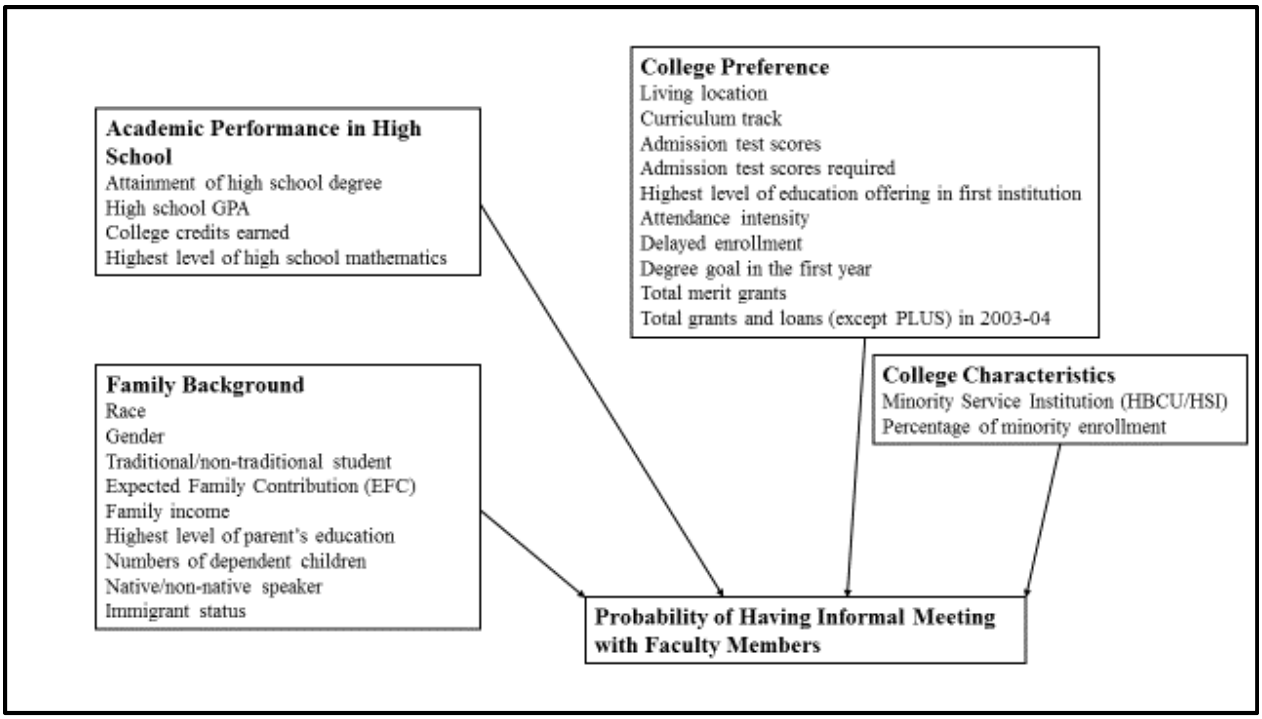

Figure B2. Conceptual Model Used to Create Propensity Scores of Informal Faculty–Student Interactions (Informal Meetings)

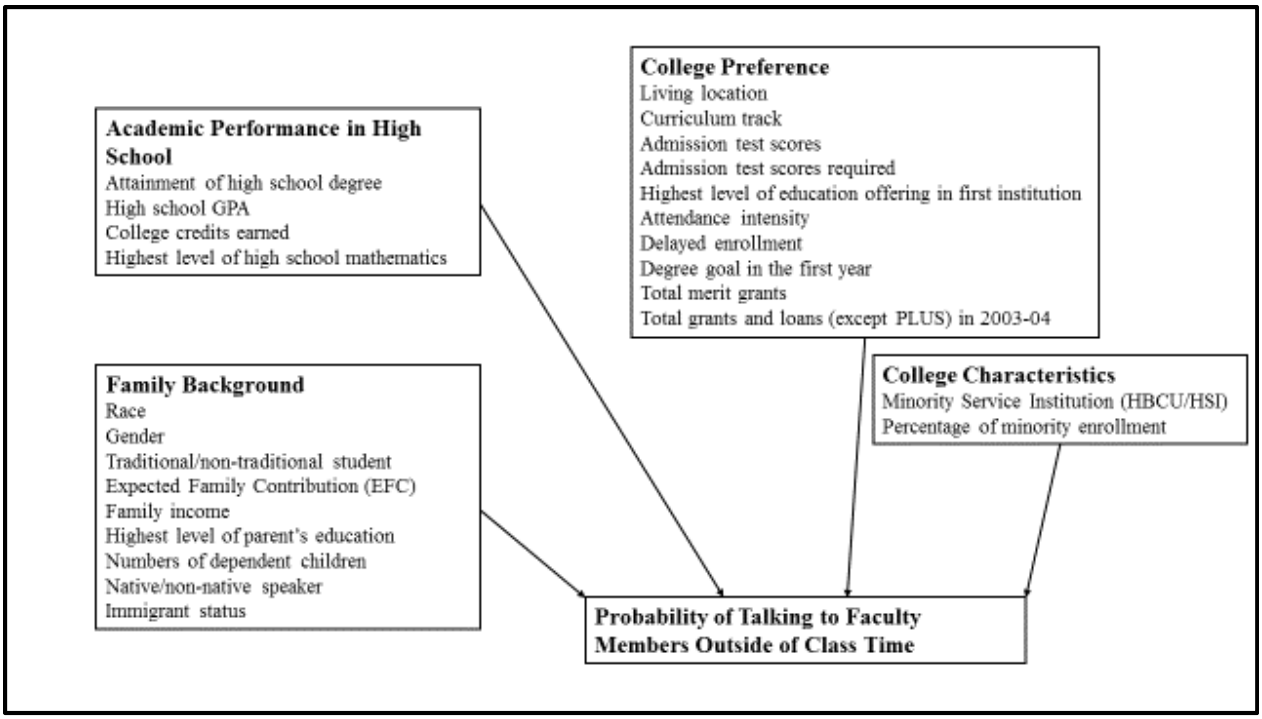

Figure B3. Conceptual Model Used to Create Propensity Scores of Formal Faculty–Student Interactions (Talking to Faculty Members)

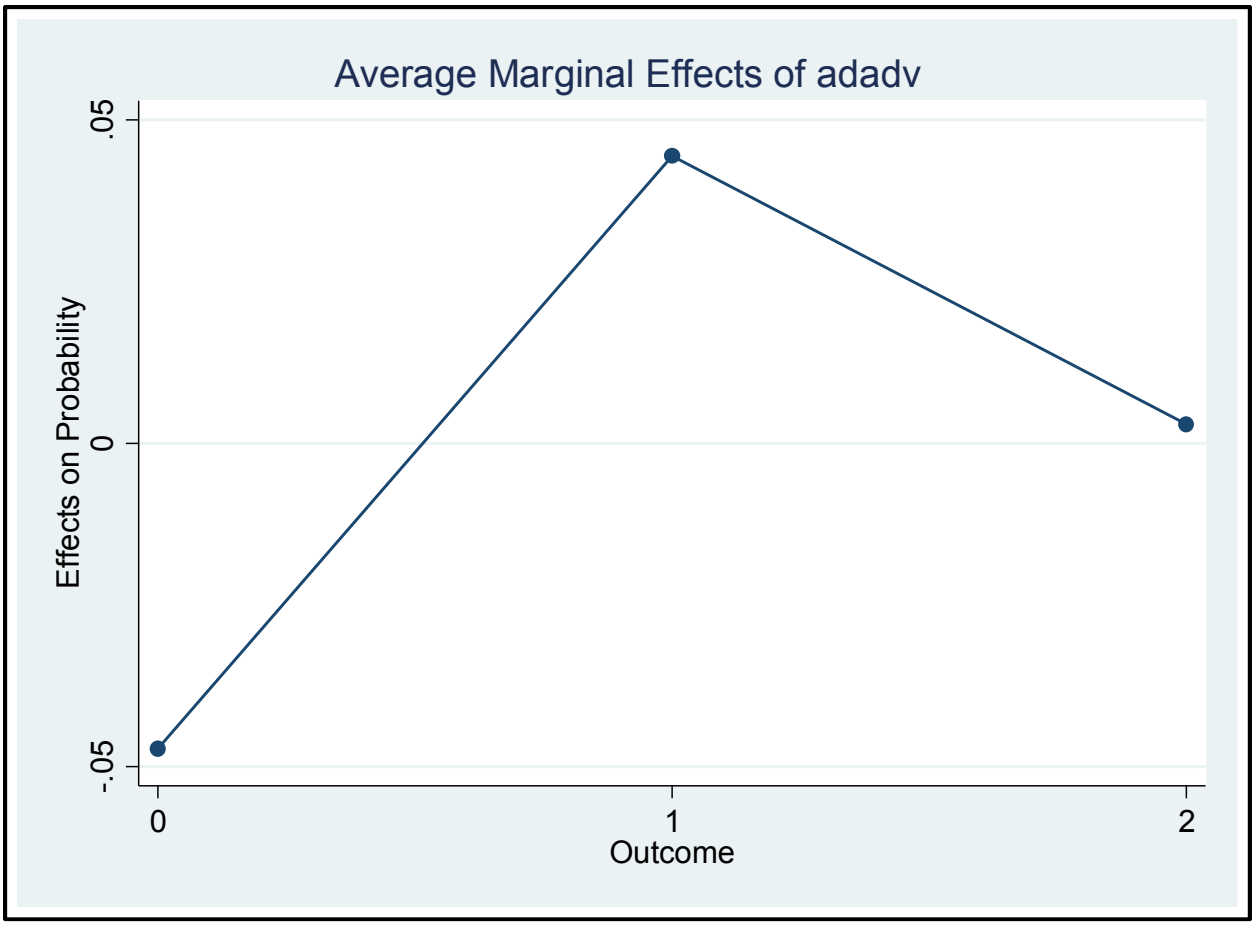

Figure B4. Marginal Effects of Academic Advising on Student Success (With PSM Adjustment). 0 refers to students who were still enrolled in community college, 1 refers to students who transferred successfully to a four-year institution, and 2 refers to students who attained an Associate's degree.

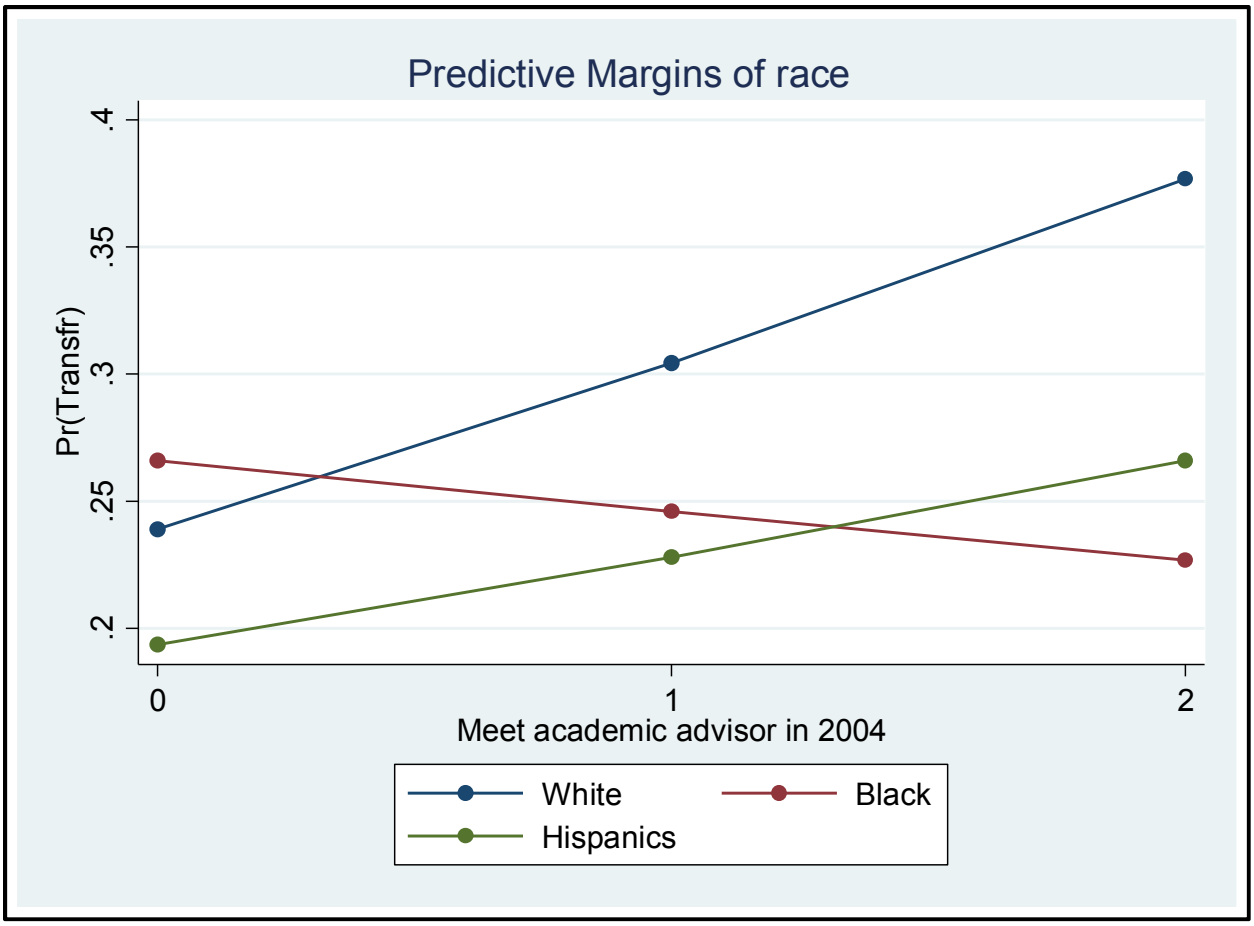

Figure B5. Conditional Effects by Racial Difference (With PSM Adjustment)

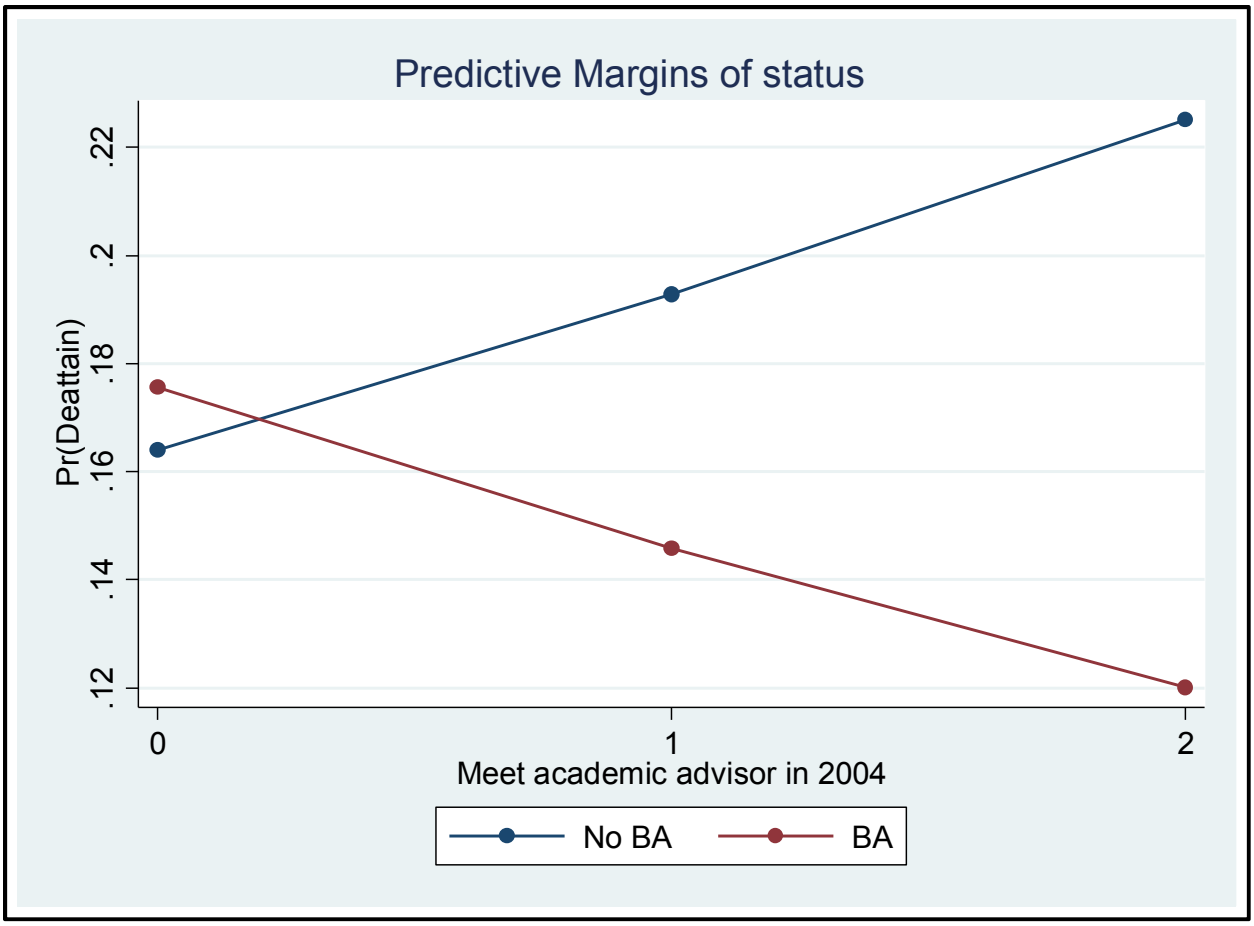

Figure B6. Conditional Effects by First-Generation Status on Associate's Degree Attainment (With PSM Adjustment)

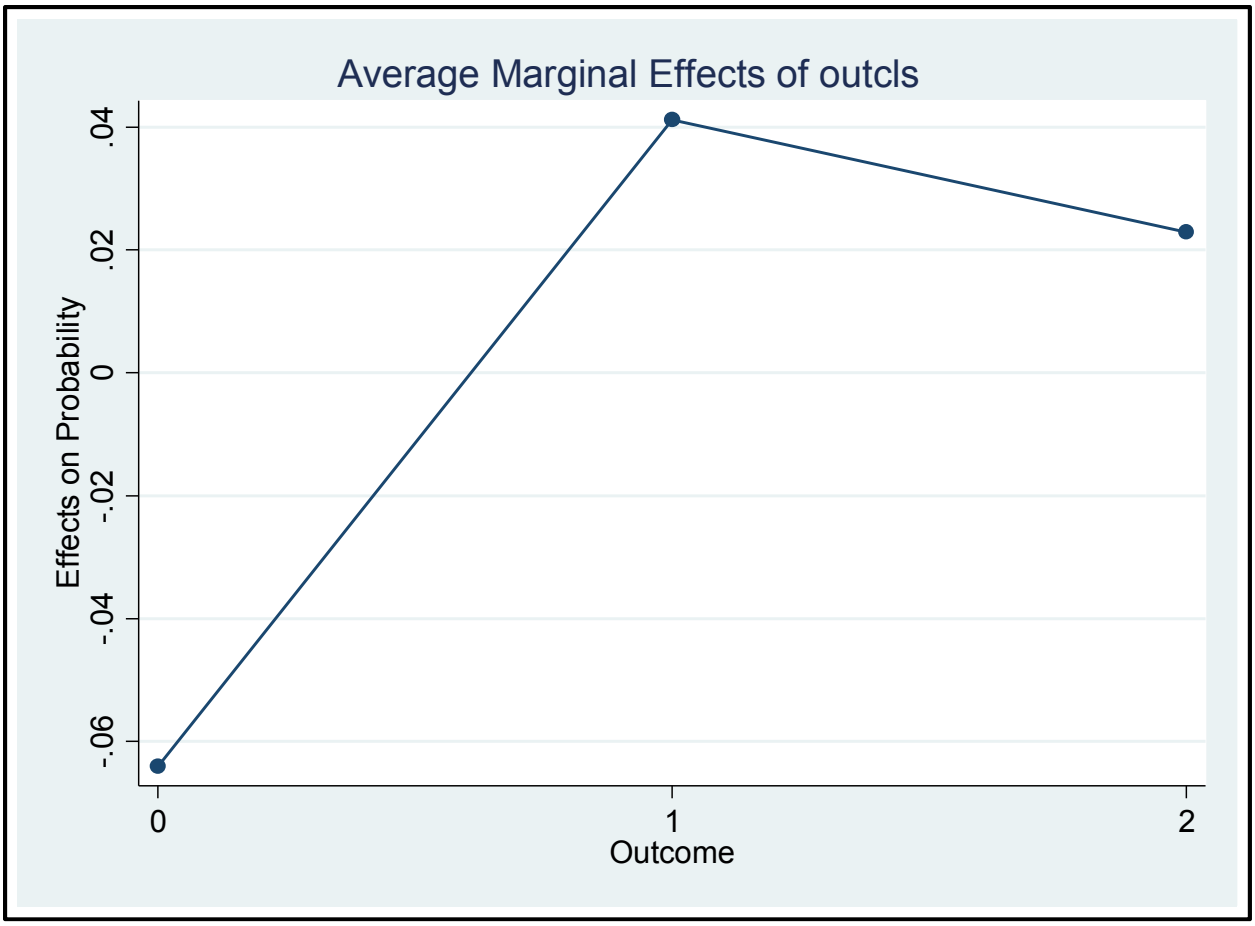

Figure B7. The Marginal Effects of Formal Faculty–Student Interactions on Student Success (With PSM Adjustment). 0 refers to students who were still enrolled in community college, 1 refers to students who transferred successfully to a four-year institution, and 2 refers to students who attained an Associate's degree.

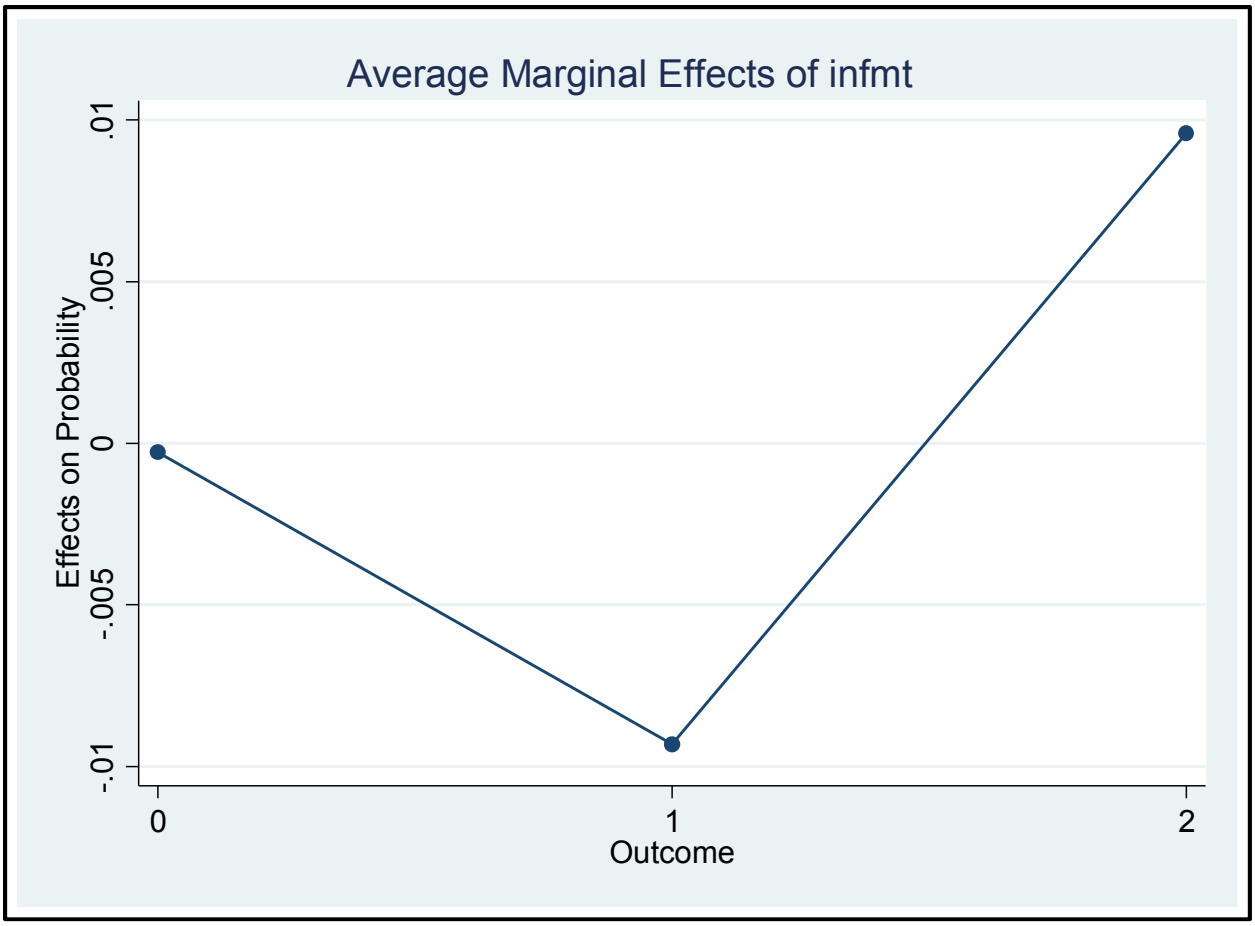

Figure B8. The Marginal Effects of Informal Faculty–Student Interactions on Student Success (With PSM Adjustment). 0 refers to students who were still enrolled in community college, 1 refers to students who transferred successfully to a four-year institution, and 2 refers to students who attained an Associate's degree.

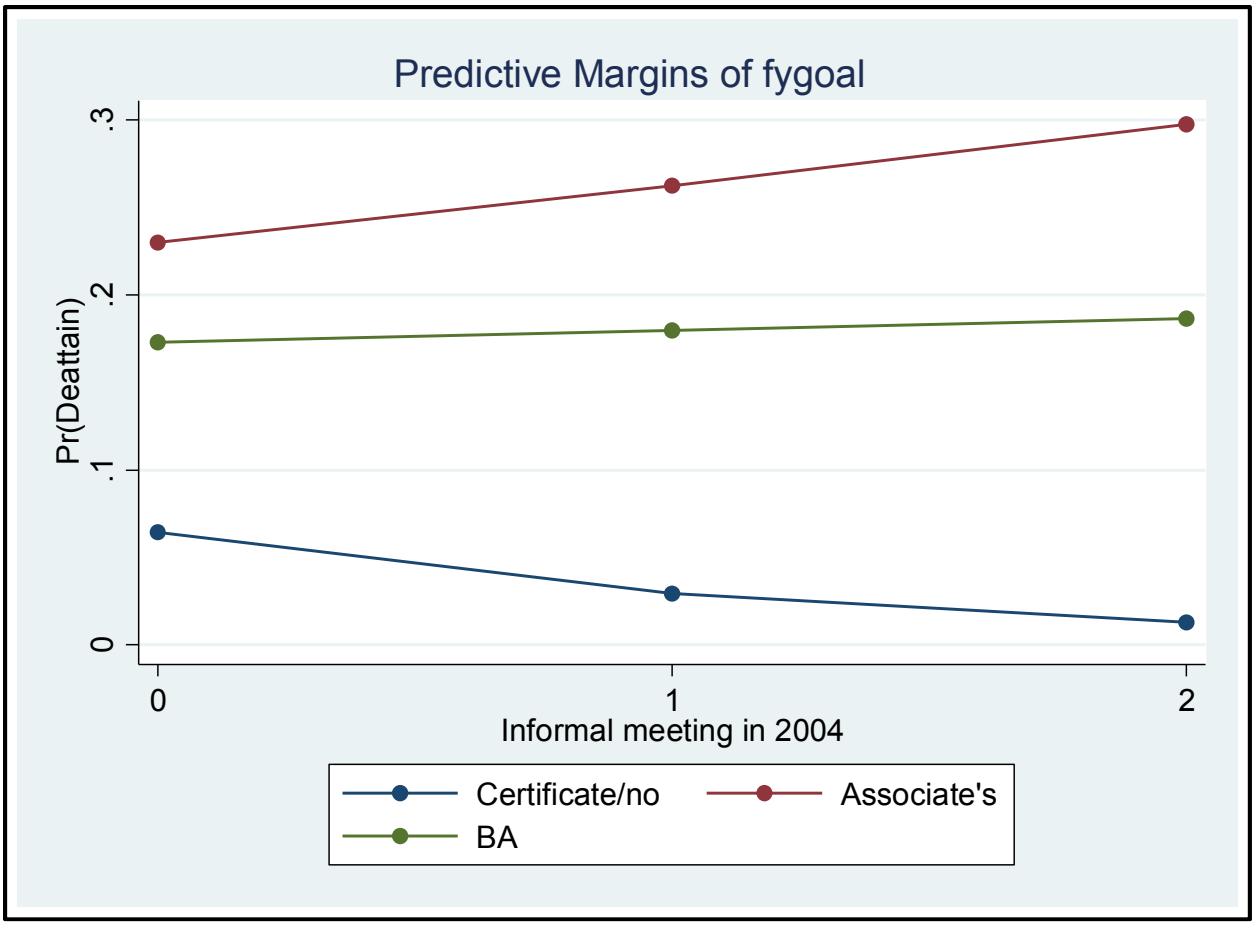

Figure B9. The Conditional Effects on Associate's Degree by Student Motivation (With PSM Adjustment)

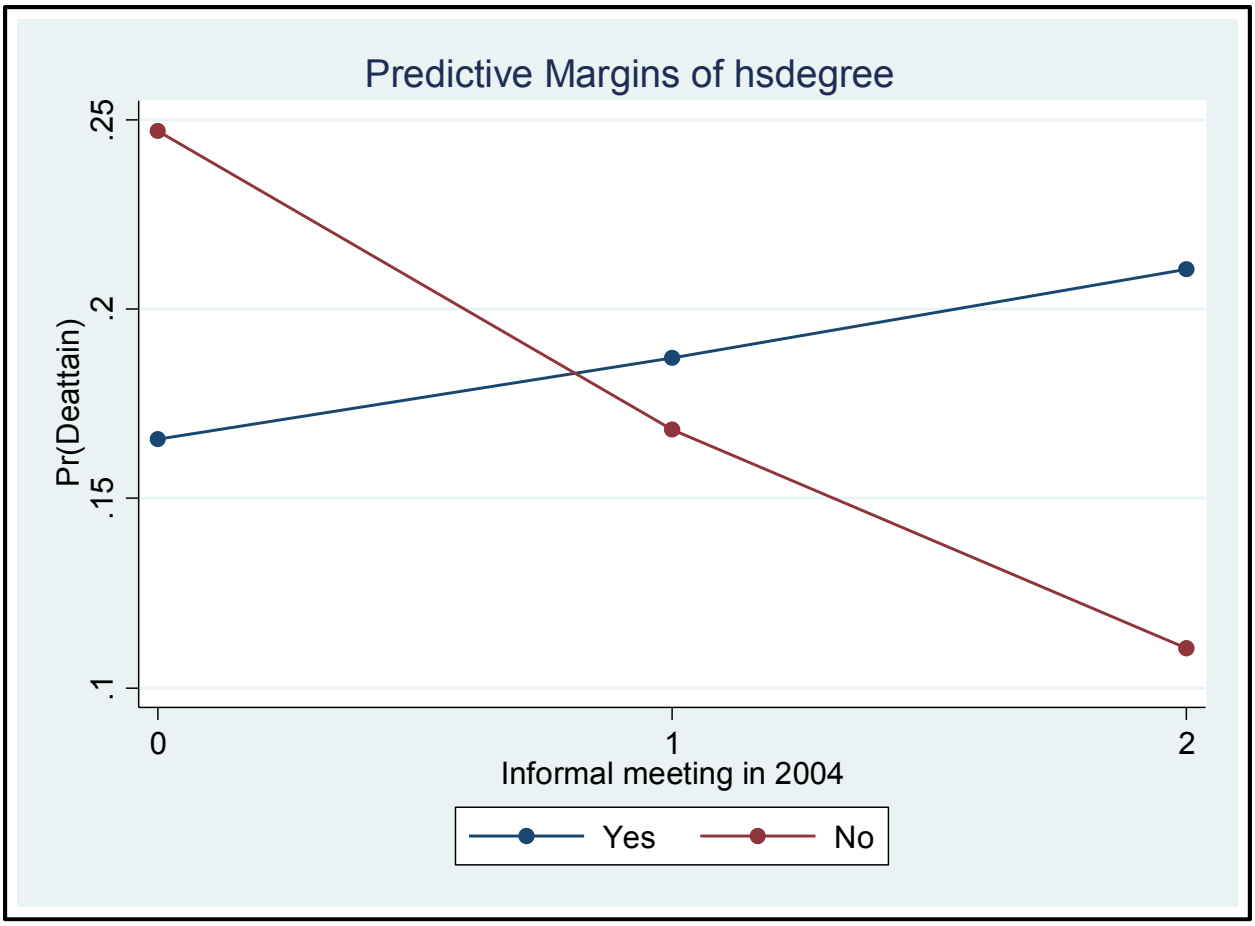

Figure B10. The Conditional Effects on Associate's Degree by Students' Academic Preparation (With PSM Adjustment)

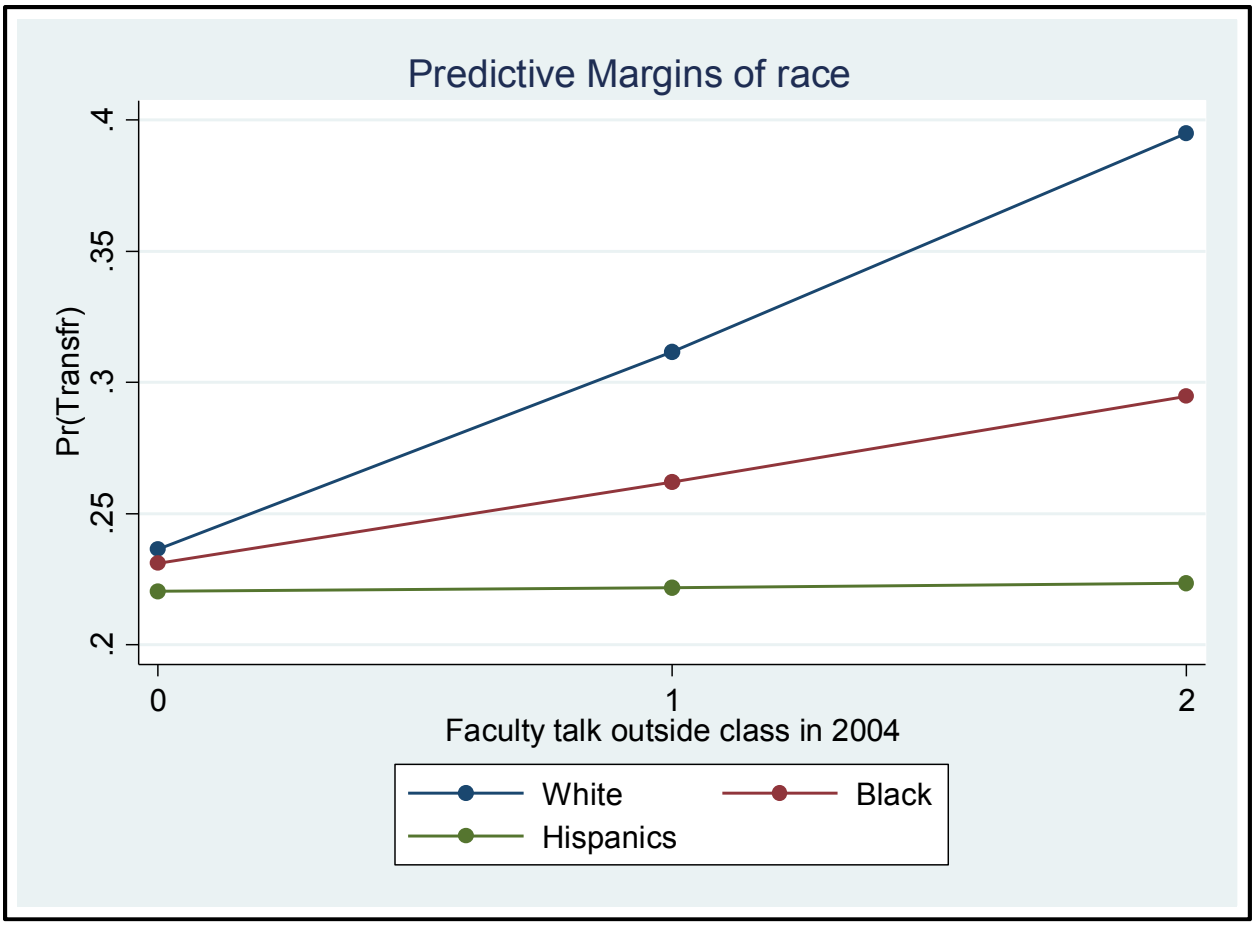

Figure B11. The Conditional Effects on Upward Transfer to a Four-Year Institution by Racial Groups (With PSM Adjustment)

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