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Why the Boys are Missing: A New Explanation for the Female Advantage in College Enrollment

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INTRODUCTION

A recent editorial in the New York Times, titled “Boys at the Back” brings readers’ attention to the relative underachievement of boys in school, from kindergarten through graduate school. The article quotes psychologist Judith Kleinfeld whose research determines that even boys from relatively advantaged families are underachieving at alarming rates. She finds that upon high school graduation, 23 percent of males from middle-income families read at below-basic levels and explains, “This means that almost one in four boys who have college-educated parents cannot read a newspaper with understanding,” (Sommers, 2013).

Sommers’ editorial highlights the increasing female advantage in higher education. Research in the 1990’s and 2000’s has documented a distinct shift in the gender advantage at the post-secondary level with respect to college matriculation and completion (Arum, Gamoran, & Shavit, 2007; Blossfeld & Shavit, 1993; Buchmann & DiPrete, 2006; Diprete & Buchmann, 2006; Buchmann, DiPrete, & McDaniel, 2008; Mueller & Shavit 1998). In 1960, over 60 percent of bachelor degrees were awarded to men. However, the rate of women’s college completion increased over the next two decades and gender parity of college completion was achieved in 1982. The rate of women’s college completion continued to rise and, by 2004, women received nearly 60 percent of bachelor degrees (Buchmann & DiPrete, 2006). Among minority and low-income students, women currently are 25 percent more likely than men to enroll in post-secondary education (Jacob, 2002).
The gender shift in higher education has attracted attention from a broad range of researchers including sociologists (Buchman & DiPrete, 2006; Buchman et al., 2008), economists (Jacob, 2002; Goldin, 2006), psychologists (Way, 2004; Way, 2011), and education scholars (Noguera, 2008). Additionally, increased attention by teachers, guidance counselors, college admissions officers, and administrators has been placed upon the decreasing enrollment of boys in higher education (Jacob, 2002; Koerner, 1999; Sommers, 2000). For example, the New York City Department of Education recently launched a $27 million initiative that grants money to forty schools to create innovative programming designed to improve the graduation and college going rates of Black and Latino boys (New York City Department of Education, 2013).

In addition to representing a stark reversal of a persistent pattern of gender stratification, the shift in gender advantage at the post-secondary level has wage and participation implications for the labor market, as well as for marriage and family formation (Buchmann & DiPrete, 2006; Buchmann et al., 2008). Given the potentially expansive impact of the female advantage at the post-secondary level, it is important not only to document this phenomenon but also to understand why such a shift is occurring.

Though the shift in gender advantage in higher education is relatively recent, social scientists have posed at least four possible explanations for this phenomenon, including changes in the labor market (i.e., which has afforded women increasing opportunities to engage in a broader array of careers than previously), the expanding size and number of higher education institutions, the increase in single-mother families (which may disadvantage boys due to the absence of a male role model), and the superior academic performance of females in elementary and secondary education. Given the
complexity of this phenomenon, these explanations, both collectively and individually, must be considered only as partially explanatory, leaving room for further theorizing about the reasons for the gender shift at the post-secondary level.

Drawing on the theoretical contributions of James Coleman, this paper examines the ability of social capital to explain the observed differences in college enrollment. We use data from the 2002 Educational Longitudinal Study to examine social capital and quantify the strength of its relationship to college enrollment. We first establish that males are currently disadvantaged with respect to key social capital variables, consistent with other published studies. Using logistic regression modeling, we demonstrate that social capital is indeed related to college enrollment, after controlling for other relevant variables and examine the degree to which the gender difference in enrollment can be explained by differences in social capital. To do this we use the logistic regression model for counterfactual analysis, simulating outcomes for a hypothetical population of boys with profiles otherwise identical to the girls in the sample (matched in terms of social capital and other factors) to see if the model implies that gender differences remain after controlling for social capital in this way. In the final model, we test to see if gender significantly interacts with social capital, a finding that would be consistent with girls receiving differential returns to social capital.

THEORETICAL FRAMEWORK

Our study is based upon Coleman’s conceptualization of social capital. Coleman describes social capital as productive, meaning that it allows for the achievement of goals that may not be possible in its absence. Inhered in the strength of social ties, social capital
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yields a greater degree of trust, robust information channels, and beneficial norms of behavior (Coleman, 1988; Dika & Singh, 2002). According to Coleman, particular kinds of social structure allow for the development of social capital in its various forms. In particular, higher levels of social capital are characteristic of communities in which there is a high degree of what Coleman referred to as social closure, a social structure in which there are dense linkages between social actors. In his research on schools, Coleman was particularly interested in the intergenerational closure, which refers to the social networks that form among and between students and parents in school communities. Coleman’s research demonstrated that greater degrees of intergenerational closure within school communities yielded increased amounts of social capital, which related to their higher educational achievement outcomes (Coleman, 1987; Coleman, 1988; Morgan & Todd, 2009).

Coleman’s theory of social capital and conception of social closure suggest that the following relationships within a school-related network are linked strongly to the achievement of positive academic and behavioral outcomes: peer-peer relationships, parent-child relationships, parent-parent relationships, and student-teacher relationships. In the following literature review, we discuss empirical studies of these key relationships and how they relate to educational outcomes. Because the central focus of our paper is the female advantage in college enrollment, we highlight prior research that addresses gender differences with respect to central relationships that support educational achievement and attainment.

SOCIAL CAPITAL, GENDER, AND STUDENT OUTCOMES
Peer-to-Peer Relationships

Not only does research converge around an understanding that girls’ friendships are “closer” (Giordano, 2003), but also that girls relationships are more academically oriented. Friendships between girls involve greater amounts of school-related information sharing (Riegle-Crumb, 2010) and girls are more likely to report that their friends plan to attend college (Wells, Seifert, Padgett, Park & Umbach, 2011). The greater intimacy and stronger academic orientation of girls’ friendships suggest that girls peer relationships may be inherited with greater levels of social capital than those of boys, translating into academic advantages. Frank and colleagues have demonstrated that peer influence was a significant predictor of girls course-taking in advanced mathematics. In Riegle-Crumb’s study of Hispanic and white girls’ college enrollment in Texas (2010), she found that both Hispanic and white girls had greater levels of peer social capital than their male counterparts and that peer social capital was a significant predictor of college enrollment (Riegle-Crumb, 2010).

A consistent critique of the influence of peer relationships is referred to as the selection versus socialization controversy (Giordano, 2003). In other words, do like students select themselves into peer groups that reflect their academic orientation or does the academic orientation of a friend group influence an individual’s behaviors? Because our study, like others before ours (Wells et al., 2011; Riegle-Crumb, 2010), is descriptive, and not causal, in nature, the question our study addresses with respect to peer groups is whether the fact of having a set of academically-minded peer relationships in high school is a signal of future college enrollment. Scholars also have argued that by considering only the quantity and density of bonds within a community network, theories that draw
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upon social relationships neglect community context (i.e., the set of norms and values that are reinforced within that community) in which social connections occur (Haynie, 2001). By examining not only the quantity and density of bonds within a network, but also the quality and nature of social relationships by including items that capture peers’ orientation towards school (i.e. plans to attend college), the current study responds to these critiques.

Parent-Child Relationships

Typically, researchers have measured the strength of the connection between parent and child by family structure (the presence of a two-parent family or not) and family size (number of siblings in a family) as these measures often reflect the amount of access a child has to his/her parent/s and parental resources. In a 1991 study, Astone and McLanahan found that family structure mattered significantly for educational achievement. Their study indicated that growing up in a single parent family had negative consequences for grade point average, school attendance and educational attainment (high school completion) net other relevant factors, such as socio-economic status. Another study found that growing up in a family with one natural parent and one stepparent also led to a child's lowered college expectations (Astone & McLanahan, 1991). In our study, we include a variable that reflects family structure (i.e., two parent household or not) so as to control for this source of variation.

Until recently, there was little or no doubt about the connection between family size (as measured by the number of siblings in a family) and educational outcomes (Steelman, Powell, Werum & Carter, 2002) as research consistently found an inverse relationship between family size and educational success. Referred to as the resource
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dilution model, because as the number of family members increase, the family resources are spread more thin, this model has been the leading explanation of the negative relationship between family size and educational outcomes. Using the NELS data set to test empirically the resource dilution model, Downey (1995) found that (a) the availability of parental resources decreased as family size increased and that (b) parental resources explained most of the relationship between sibship size (number of siblings in a family) and educational outcomes. Downey acknowledged that a substantial portion of the relationship between sibship size and educational outcomes was reduced when he included background factors such as socioeconomic status in his statistical models. However, even when controlling for background factors, sibship size continued significantly to impact his three educational outcome measures (grades, reading tests scores, and math test scores).  

In addition to the impact of family structure and sibship size, research suggests that parents may raise boys and girls differently (DiPrete & Buchmann, 2013). If boys and girls are receiving differential treatment from their parents, this may matter over and above family structure and sibship size. A growing body of research suggests that parents award a greater degree of independence freedom to boys (Entwisle, Alexander & Olson, 1994; Lopez, 2003; Carter & Wojtkiewicz, 2000). Studies also have suggested that girls report greater levels of closeness in their relationships with parents (Riegle-Crumb, 2010) and that girls engage in more school-related conversations with their

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1 Steelman et al. (2002) have argued that more recent studies of the relationship between sibship size and educational outcomes that have utilized improved methodology suggest that it may be time to revise the widely accepted findings about this relationship. These studies, which utilize longitudinal change models, find that an increase of sibship size has negligible effects on academic tests of verbal ability and possibly a positive effect on math test performance. At the same time, Steelman et al. (2002) noted that these newer studies have their own methodological shortcomings and that their outcomes have yet to be corroborated by a critical mass of scholarship (Steelman et al. 2002).
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parents than do boys (Carter & Wojtkiewicz, 2000; Wells et al., 2011). Wells et al. (2011) also find that parents display higher expectations for girls to go to college. The differences experienced by sons and daughters with respect to their relationships with parents may partially explain the female advantage at the post-secondary level. A number of studies have linked parental involvement with schooling outcomes (Coleman, 1988; Perna & Titus, 2005; Kim & Schneider, 2005; Stage & Hossler, 1989) and at least one study has specifically documented that higher levels of parental involvement experienced by females is a significant predictor of college enrollment (Riegle-Crumb, 2011).

Parent-to-Parent Relationships

While intergenerational closure (dense linkages among students, their peers, and their peers’ parents) has been shown not to be a predictor of higher scores on achievement tests (Morgan & Todd, 2009; Carbonaro, 1999; Hallinan & Kubitschek, 1999; Morgan & Sørensen, 1999b; Carbonaro, 1998; Morgan & Sørensen 1999a), the absence of intergenerational closure has been shown to be an important predictor of high school dropout. In particular, the odds of dropping out of high school have been shown to be seven times greater for a student whose parents knew none of their friends’ parents than for a student whose parents knew five of their friends’ parents (Carbonaro, 1998). In addition, parent-to-parent contact has been shown to positively impact the likelihood of students’ attending a four-year college (Engberg & Wolniak, 2010). To the best of our knowledge, our study will be the first to explore gender differences with respect to parent-to-parent relationships and whether these relationships predict post-secondary enrollment.
Student-Teacher Relationships

The resource dilution model suggests that, just as family size is used as a proxy measure for the strength of a parent-child bond, class size should be similarly used as a measure of the student-teacher bond. However, just as in student-child and student-student relationships, it may be that the quality of the relationships that boys and girls experience with their teachers is more impactful than the amount of access that students have with their teachers. Using data from the Chicago School Study, Hallinan sought to identify teacher characteristics associated with an increase in students’ liking for and attachment to school. She found that students’ attachment to school increased when they perceived that their teachers cared about them, respected them, and praised their work. (Hallinan, 2008).

If girls experience stronger relationships with their teachers relative to boys, it may advantage girls with respect to academic performance and ultimately college enrollment. Indeed, it has been demonstrated that girls feel greater attachment to both school and to their teachers. Buchmann and DiPrete present findings that suggest that not only do greater percentages of girls than boys report that school is important or very important to them, but also that girls report, at a higher rate than boys, feeling “often” or “always” close to their teachers (Buchmann & DiPrete, 2013). Hughes and colleagues (2001) found that girls receive greater levels of support from teachers and are less often in conflict with their teachers than boys. This research suggests that girls’ relationships with their teachers may be constituted with greater levels of social capital than those of boys, an advantage that potentially predicts college enrollment. Indeed, Riegle-Crumb (2010), finds that girls to a greater extent than boys engage in college-related interactions
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with adults in school, a measure of social capital that has been shown to significantly predict college enrollment.

Prior Studies of Social Capital, Gender, and Post-Secondary Outcomes

To our knowledge, only two studies specifically have addressed gender differences in social capital and post-secondary outcomes. Wells and colleagues (2011), using the Educational Longitudinal Study, examine how social capital measures impact the educational expectations of boys and girls. They look specifically at measures of parental involvement, parental expectations, and peers’ plans to attend college and find that girls have greater levels of social capital in all three areas. Additionally, they find that all of the social capital measures in their study are predictive of students’ post-secondary expectations (graduating college, obtaining a Master’s degree, or obtaining a Ph.D., M.D. or other advanced degree). However, their most predictive variable is parental expectations of their student, a measure not classically associated with social capital. We extend upon these findings by examining not only students’ post-secondary expectations, but also students’ post-secondary enrollment. Additionally, we include measures of teacher-student relationships, and parent-parent relationships, which were not included in the study by Wells et al.

Riegle-Crumb (2011), conducted a study of gender, social capital, and post-secondary enrollment with a sample of white and Hispanic students in Texas. She finds that both Hispanic and White girls report having closer relationships than boys with their parents and friendships that are more academically oriented. White and Hispanic girls also reported, to a greater extent than boys, engaging in discussions with their college counselor. She finds that for Hispanic females, academically oriented friends groups and
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A greater number of interactions with college counselors predict college enrollment. For white students, she finds that the only measure of social capital that was significantly predictive of college enrollment was academically oriented friend groups. Riegle-Crumb acknowledges that her Texas-based study should not be understood as representative of nationwide patterns. She also regrets that her data set did not allow for an exploration of student-teacher relationships. We extend upon Riegle-Crumb’s findings by using a national data set, the Educational Longitudinal Study, and by including measures of teacher-student relationships as well as relationships between parents. In addition, we expand the focus of Riegle-Crumb’s study by including students from all racial and ethnic backgrounds.

**Differential Returns to Social Capital Measures for Boys and Girls**

Prior research indicates that girls may not only have access to greater quantities of social capital, but also that they may be more susceptible to social pressures than are boys. In a study of advanced course taking in math, Frank and colleagues found that the course taking of friend groups and the broader school population was more predictive of girls’ behavior than it was for boys (Frank, Muller, Schiller, Riegle-Crumb, Mueller, Crosnoe, & Pearson, 2008). Research also has indicated that discussions with parents regarding postsecondary education may be more impactful for girls than boys (Stage & Hossler, 1989). These findings are in synch with prior research on gender and relationships, which suggest that girls are generally more responsive to the beliefs and behaviors of others (Giordano, 2003). This raises an important question about the relationship between gender differences in social capital and post-secondary enrollment. Is the female advantage in college enrollment explained by girls’ access to greater levels
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of social capital or, alternatively, are girls simply more responsive to the opinions of their peers, parents, and teachers? We address this question by empirically testing whether or not girls benefit more than boys from the same levels of social capital.

DATA SOURCES AND METHODS

This study utilizes both public and restricted data from the 2002 Educational Longitudinal Study (ELS). ELS follows a nationally representative sample of students beginning in their sophomore year of high school, through their senior year of high school, and through two years post-secondary school into higher education or the labor market. The base year of the study is 2002, with follow up data collected in 2004 and 2006. The ELS survey draws upon multiple respondent populations including students, parents, teachers, and administrators.

The dependent variable in our study is the dichotomous variable, college enrollment. In the ELS dataset, this variable indicates whether or not a student has ever attended a postsecondary institution in the two years following high school completion. These data were collected in 2006, four years after the base year and two years after students would have been expected to graduate high school. In addition to a number of control variables, including race, mother’s education, father’s education, mother and father present in the home, student’s native language, standardized test scores (a composite of reading and math scores), urbanicity of schools, region of schools, socioeconomic status, and number of siblings in a student’s home, the predictor variables for this study include scales developed through a series of factor analyses applied to items relevant to social capital and control on the ELS. In addition, we also include high school grade point average as a predictor variable because substantial research indicates that
grades are not simply representations of academic ability (Buchmann & DiPrete, 2013). Rather, research suggests that GPA is impacted by a number of noncognitive factors including cooperativeness (Rosenbaum, 2001), disciplinary problems (Rosenbaum, 2001; Farkas, Grobe, Sheehan, & Shuan, 1990), motivation and effort (Rosenbaum, 2001; Kelley, 2008; Brookhart, 1993; Stiggins & Conklin, 1992), attendance and class participation (Rosenbaum, 2001; Kelly, 2008; Farkas et al., 1990), work habits and preparedness (Rosenbaum, 2001; Farkas et al., 1990), self control and interpersonal skills (Cornwell, Mustard, & Van Parys, 2013) and teacher-student relationships (Brookhart, 1993). In this way, GPA is a partial proxy for many aspects of social capital.

Furthermore, prior research indicates that girls typically pay better attention in school and display greater levels of persistence in completing school-related tasks (Buchmann & DiPrete, 2013). Thus, girls likely will benefit from a boost to their GPA due to noncognitive behaviors, which may partially explain the higher rates of college enrollment for females. By including GPA as a predictor variable while controlling for academic ability, our models approximate the advantage conferred upon females by these noncognitive aspects of GPA.

We chose to develop scales because many of the items on the ELS are highly inter-correlated, resulting in small, even negligible net effects per item, which would be difficult to interpret. This methodological approach has been utilized previously by other scholars studying students’ social and relational behavior (DiPrete & Jennings, 2012). The creation of scales as clusters of related items provides not only for an easier interpretation of results, but also an increase in the reliability of the measurement of our constructs over what typically is provided by single item scales. In addition, the creation
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of scales and the approach we used to obtain scores on those scales allowed us to include more individuals in our sample than we might otherwise have using single item scales.²

Our social capital scales are defined in terms of social capital among parents (consisting of four scales), social capital among students (consisting of one scale and four separate individual items), social capital between students and teachers (consisting of one scale and one separate individual item), and social capital between parents and students (consisting of five scales).

With respect to social capital amongst parents, the first scale, Parent to Parent Benefits, measures how much parents benefit from their relationships with other parents. This scale is a composite of the following four items: friend’s parent gave advice about teachers or courses, friend’s parent did a favor, friend’s parent received a favor, friend’s parent supervised 10th grader on a field trip. The internal consistency reliability of this scale is .75 as measured by Cronbach’s alpha. The remaining three scales measure intergenerational closure amongst parents, their students, their student’s friends, and the parents of their student’s friends. These three scales are called Parent to Parent 1st friend, Parent to Parent 2nd friend, and Parent to Parent 3rd friend and reflect relationships between the focal student’s parents and their relationships with the parents of friends identified by the focal student. Parent to Parent 1st friend is a composite measure of two items including: parent knows first friend’s parent and 10th grader knows first friend’s parent. Despite the small number of items on this scale, it has a Cronbach’s alpha of .74.

² Because an individual’s score on each scale was obtained as the mean score across all items on that scale, we were able to compute scale scores for individuals even if they had missing values on a minority of items on a scale, as long as they had values on a majority of the items on that scale. For example, the scale for minor delinquency includes four items. Individuals responding to at least three of the four items on that scale were assigned a score on that scale equal to their mean score based on however many items they completed, whether three or four. Using this approach, we were able to reduce, prior to applying a general missing data imputation routine to our data, the number of missing values in the data set from what would have been the case had single items been used as individual predictors.
Parent to Parent 2nd Friend and Parent to Parent 3rd friend are comprised of the same items for these particular friendships, and each has a Cronbach’s alpha equal to .75. Because of the moderately high internal consistency reliability of each of these three two-item scales, we chose to keep them as they were rather than combine them into a single six-item scale so that we could investigate whether the effect of intergenerational closure on college enrollment became salient only after considering the parent to parent relationships of friends more removed than first friends.

With respect to social capital amongst students, our one scale, Perceived Importance of Friends to Achieve, is a composite of the following three scales: importance of grades to first friend, importance of grades to second friend, and importance of grades to third friend. The Cronbach’s alpha for this scale is .55. Although the internal consistency reliability of this scale is lower than .60, we chose to retain it in our analysis as an overall, yet imperfect, indicator of the degree to which individuals tend to befriend achievement-minded individuals. The lack of internal consistency in this scale suggests that friendships are not based solely on one reason alone (e.g., achievement), but rather on many different reasons that reflect the many different interests of an individual beyond the academic (e.g., social, athletic, etc.). The three individual items that were used capture additional aspects of social capital amongst students are: how many of the student’s friends dropped out of high school, how many of the student’s friends plan to attend 2-year community college and how many of the students’ friends plan to attend 4-year college/university.3

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3 Given that individuals are often known to seek out friends who share their college aspirations, the variable, Perceived Importance of Friends to Achieve, may be endogenous. Because current research suggests that the norms and values of a particular peer group significantly impact the benefits that may be accrued from increased levels of social capital (see
Social capital between students and teacher is measured using the scale, Teacher-Student Relations, and an individual item, student-teacher ratio. The scale, Teacher-Student Relations, is a factor composite in the ELS data set with a Cronbach’s alpha of .73. Higher scores on this scale indicate better relationships between teachers and students.

Lastly, social capital between students and their own parents is operationalized using five scales. The first scale, Student Parent Relations, is a composite of seven items including how often the student discussed school courses with their parents, how often the student discussed school activities with their parents, how often the students discussed things studied in class with their parents, how often the student discussed grades with their parents, how often the student discussed prep for the ACT/SAT with their parents, how often the student discussed going to college with their parents, and how often the students discussed issues troubling them with their parents. The Cronbach’s alpha of this scale is .84. The second scale, Parent Student Relations-Structured Activities, captures the amount of time a student spent with his or her parents doing structured activities such as school activities; concerts, plays, and movies; sports events outside of school; religious services; family social functions; day trips/vacations; and time spent on hobbies. This scale is a composite of seven items, and has a Cronbach’s alpha equal to.75. The third scale, Parent Student Relations-Advice is made up of six items which reflect areas in which the focal students’ parent provided advice such as selecting courses/programs, college entrance exams, applying to post-secondary school, applying for jobs, community and current events, and issues troubling the student.

p. 10-11), we include this variable in our analysis, limiting our conclusions regarding it to descriptive claims about its contribution to explaining college enrollment variance.
The Cronbach’s alpha for this scale is .77. The fourth scale, Parent Student Relations-Unstructured Activities, is comprised of four items including how often parents went shopping with their student, went to restaurants with their student, how much time parents spent talking to their student, and how often parents did something fun with their student. It has a Cronbach’s alpha equal to .70. The final scale, Parent Student Relations-Homework/Oversight, is made up of 5 items including how often parents checked their students homework, how often parents discussed their students’ report card, how often parents knew their child’s whereabouts, how often parents make/enforce night curfews, and how often parents worked on homework or school projects with their student. The Cronbach’s alpha of this scale is .56. Once again, although the reliability of this scale is less than .60, we decided to retain it in our analyses. In this case, we did so to obtain an overall, yet imperfect, measure of the degree to which parents oversee their children’s activities, whether they are related to academics (e.g., homework, report cards) or more generally to whereabouts and curfews. Table 1 displays each scale along with its label, composite items, and internal consistency reliability coefficient.

Table 2 contains the means and standard deviations of each variable of interest for the original sample of data, and the percentage of missing values per variable. According to Table 2, the range of missingness for our predictors and outcome was low to moderate, ranging from 0% to 23%. A list-wise deletion of cases based on an analysis with all variables in the model would have resulted in a sample equal to only 4,680 cases, less than half of the original 11,417 cases. In order to recover these lost cases, we used

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4 In addition to the loss in power that would have resulted by conducting a list-wise deletion analysis, we noted demographic differences between the 4,680 cases that remained following list-wise deletion, and those of its complement, consisting of the 6,737 cases that would not have been included in our primary analysis because these cases had missing values for one or more variables. Tables 3 and 4 contain the descriptives for the list-wise deletion
multiple imputation (Rubin, 1987; Schafer, 1997). In MI, multiple copies of a complete dataset ($N = 4$ datasets in the current study) are generated, with missing values imputed via a statistical model that relies on the relationships between the observed variables. We used the STATA user-written command ICE for data imputation. This command implements a chained-regression approach to imputation. Estimates from the four datasets are combined to identify an average coefficient for each predictor variable and the added uncertainty due to the imputation is estimated by examining the variation in estimates across the imputations (Royston & White, 2011; Van Buuren, Boshuizen, & Knook, 1999). The STATA binary logistic regression program was used to model the dichotomous dependent variable college enrollment from our set of continuous and categorical predictors.

As is typically the case for most national datasets, simple random sampling techniques were not used to collect the ELS data. Instead, schools were selected first, then tenth-grade students were selected randomly within each school, creating a clustered sampling design in which the primary sampling unit is the school. Because clustered designs produce standard errors that are, in general, larger than those based on simple random sampling, our logistic regression analyses took into account the design effects due to this clustering. In addition, because some groups were sampled at a higher rate than other groups to ensure that the ELS sample would be large enough to support comparisons with those groups, we also incorporated weights into our logistic regression analysis.
analyses to compensate for this unequal probability in the selection of individuals. We used STATA’s `svy` option with schools as the primary sampling unit and the individual sampling weights provided by the ELS dataset to carry out our MI logistic regression analyses in STATA.

In Table 5 we first establish an implicit assumption underlying our analysis – that girls and boys have differing levels of social capital. The table presents means for twenty social capital variables. Differences in social capital is a fundamental premise of our analysis because girls’ and boys’ social capital levels must be different in order for social capital to explain differences in their college enrollment.

We define four models in connection with the next series of analyses. Having established differences between boys’ and girls’ levels of social capital, we then estimate the baseline difference in enrollment rates controlling for demographic factors. Model 1 includes the set of Demographic variables in addition to the variable Female.\(^6\)

\[
\text{Logit(College Enrollment)} = b_0 + b_1 \text{Demographics} + b_2 \text{Female}
\]

In successive models, we examine the degree to which social capital can explain the difference identified in Model 1. Model 2 includes the variables in Model 1 in addition to the set of Social Capital variables as follows

\[
\text{Logit(College Enrollment)} = b_0 + b_1 \text{Demographics} + b_2 \text{Female} + b_3 \text{Social Capital}
\]

Model 3 includes the variables in Model 2 as well as the variable HSGPA as follows

\[
\text{Logit(College Enrollment)} = b_0 + b_1 \text{Demographics} + b_2 \text{Female} + b_3 \text{Social Capital} + b_4 \text{HSGPA}
\]

In the final model, Model 4, we examine the possibility that girls benefit more than boys from the same levels of demographics, grade point average, and social capital. In this

\(^6\) We consider the model controlling for demographic variables to be a baseline model because demographics should be independent of gender since parents of all backgrounds have essentially the same chance of having a boy or girl. Therefore, demographic controls should simply improve the precision of the estimates without modifying them.
model, the logit of our binary dependent variable, college enrollment, is expressed as a linear combination of our set of demographic variables, gender, social capital variables, grade point average, and the interaction of gender with the other sets of variables in the equation.

\[
\text{Logit(College Enrollment)} = b_0 + b_1 \text{Demographics} + b_2 \text{Female} + b_3 \text{Social Capital} + b_4 \text{HSGPA} + b_5 \text{Female} \times \text{Demographics} + b_6 \text{Female} \times \text{HSGPA} + b_7 \text{Female} \times \text{Social Capital}
\]  

(1)

We use an omnibus test of the significance of this set of two-way interactions to examine the degree to which differences in social capital can explain the difference in enrollment by gender.

Each of the Models 1 through 4, as defined, may be considered to be nested within each of the succeeding models. Typically, within the context of linear regression, to determine the extent to which the female advantage is explained by the other variables hypothesized to relate to college enrollment, one would measure the difference in the female coefficient across these nested models since that coefficient captures the female advantage. By analogy, within the context of binary logistic regression, it might seem reasonable to compare the coefficients across models. For reasons cited by Breen, Karlson, and Holm (2013) and Freedman (2008), however, such direct comparisons are not appropriate\(^7\).

Both Breen, et al. (2013) and Freedman (2008) provide an alternative approach to comparing nested logistic models. In this paper we have chosen to use the approach suggested by Freedman (2008), called the “plug-in estimator for the log odds” (p. 239).

\(^7\) According to Breen, et al. (2013), in linear models, the total relationship of a predictor on an outcome variable may be decomposed into a direct and mediated (indirect) effect. In logit models, however, total effects cannot be decomposed in a similar way. In particular, “[g]iven a dichotomous outcome variable, y, the logit coefficient for x omitting the control variable, z, will not equal the sum of the direct and indirect (via z) effects of x on y” (p. 165).
In particular, using binary logistic regression, we ask whether the probability of enrolling in college for boys would begin to approach that for girls if boys had the same set of covariate values as the girls; that is, if boys consisted of a sample that was matched to the girls on all covariates hypothesized to be related to college enrollment\(^8\). Conceptually, one may view this approach as constructing a counterfactual group of males for the females in our sample using the estimated model. We focus on finding a counterfactual group of males for the females as opposed to the reverse because we are interested in the extent to which being female confers an advantage in college enrollment as implied by the estimated Models 1-3. In particular we are interested in whether the female advantage is explained away by successive models with more predictors.

To answer our question of whether the probability of enrolling in college for boys approaches that for girls if boys had the same values on a set of covariates hypothesized to be related to college enrollment as girls, we begin with Model 1, which controls for demographic differences and fit Model 1 to the data contained in our combined sample of females and males. Using our fitted Model 1, we obtain the average marginal probability of college enrollment for the females in our sample (AMP\(_{F1}\)). We then fix the demographic covariates at the female values and, use once again our fitted Model 1, to obtain the average marginal probability of college enrollment for a hypothetical group of demographically-matched males (AMP\(_{M1}\)). Following Freedman (2008), these two values, AMP\(_{F1}\) and AMP\(_{M1}\), become our plug-in estimators in Equation (2) for computing

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\(^8\) By focusing on the females, conceptually our analysis is analogous to estimating an average treatment effect on the treated (ATT). Were we to conduct the counterfactual analysis on all individuals in the sample, our analysis conceptually would be analogous to estimating a sample average treatment effect (SATE) for all individuals. Likewise, conducting the counterfactual analysis among males would be analogous to estimating an average treatment on the controls (ATC). We say it is conceptually analogous, because our focus in this study is on making descriptive rather than causal claims.
the log odds, and then, in turn, our parameter of interest, the differential log odds for Model 1.

\[
\text{Differential log odds} = \log(\frac{AMP_{F1}}{1-AMP_{F1}}) - \log(\frac{AMP_{M1}}{1-AMP_{M1}}) 
\] (2)

The differential log odds of college enrollment for females and males under Model 1 is a baseline measure of the difference in male and female enrollment rates. We then fit Model 2 and compare the differential log odds obtained using Equation (2) under Model 2 to the differential log odds obtained under Model 1, and so on for Model 3. If our hypotheses are correct, the implied female advantage in college enrollment will diminish with additional sets of variables included in each successive model. In other words, we would expect the log odds of college enrollment for the hypothetical set of matched boys to approach that for girls as we move successively from one model to the next – i.e, the \textit{differential} log odds will approach zero.

Because our research focuses on the probability of college enrollment for students coming from public high schools, we restrict our analyses to those individuals who had attended a public high school.

RESULTS

The coefficients from the binary logistic regression results relating to Models 1 to 4 are presented in Table 6 and the plug in estimators of log odds are presented in Table 7. According to the results attached to Model 1 in Table 6, the set of 17 demographics, including the variable female, is statistically significantly related to college enrollment \((F(17, 230.6) = 62.40, p = 0.000)\). Furthermore, according to Table 7, the differential log odds between girls and boys after controlling for demographics is .49 (odds ratio 1.63). This establishes the baseline difference between girls and boys.
We now add the set of social capital variables to Model 1 to obtain Model 2. According to the results attached to Model 2 in Table 6, the set of 15 social capital variables is statistically significantly related to college enrollment \((F(15, 196.4) = 24.81, p = 0.000)\) after controlling for the other variables in the equation. Furthermore, according to Table 7, the differential log odds between girls and boys after adding social capital to the equation is reduced from .49 to .34 (odds ratio is reduced from 1.63 to 1.41).

Next, we add grade point average to Model 2 to obtain Model 3. As noted earlier, because we control for academic ability by virtue of the fact that it is one of the variables included in our set of demographics, grade point average may be viewed in this context as approximating the advantage conferred upon girls by its non-cognitive aspects (consistency of behavior, persistence, relationship with one’s teacher, and so on). According to the results attached to Model 3 in Table 6, grade point average is statistically significantly related to college enrollment \((F(1, 24.4) = 388.66, p = 0.000)\) after controlling for the other variables in the equation. Furthermore, according to Table 7, the differential log odds between girls and boys after additionally controlling for grade point average is reduced further from .34 to .20, (odds ratio is reduced from 1.41 to 1.23).

Finally, for Model 4 we include the set of two-way interactions to determine whether in fact girls benefit more than boys from the same levels of demographics, grade point average, and social capital. Our results related to Model 4 suggest that the set of two-way interactions is not statistically significant \((F(31, 247.8) = .71, p = 0.8705)\), nor are any of the individual two-way interactions listed in Table 6 statistically significant. DISCUSSION
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The significance of our results suggests that the intersection between gender, social capital, and grade point average contributes needed complexity to the understanding of the gender inequality in college enrollment. Based on the fact, however, that the set of two-way interactions between gender and the list of social capital variables is not statistically significant, our results further suggest that, in contrast to what one might expect, boys and girls do not receive differential benefits from the same level of social capital. As previously discussed, prior research has established that boys and girls form friendships differently, are raised differently by their parents, and typically form different levels of attachment to their teachers; furthermore, our results indicate that girls have greater levels of access to sources of social capital. That we do not find a differential effect of social capital for boys and girls, however, merits particular attention, because implications of our findings prove easier to translate into practice. These findings suggest that practices which improve primary in-school and out-of-school relationships can be expected to improve schooling outcomes for boys, since they would be expected to benefit from these relationships in the same ways that girls have.

With respect to what was observed to be significant, we may note that, by adding grade point average to the equation in Model 3 there is an additional drop in the girls to boys college enrollment log odds (from .34 to .20). This finding substantiates prior research, which has determined that academic performance is one of the most salient predictors of college enrollment and explains a significant piece of the gender differential in college-going. According to Buchmann and DiPrete, “The huge female advantage in academic performance translates directly into large gender differences in educational attainment in general and into higher rates of four-year college completion in particular.”
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(Buchmann & DiPrete, 2013, p. 95). Our results corroborate this finding but also suggest that even the non-cognitive aspects of grade point average relate significantly to college enrollment after other salient variables, like social capital, also are taken into account.

Though not the central focus of this current study, our findings also indicate that while some indicators of social capital significantly relate to college enrollment, others do not. Notably Table 6 suggests, although unstructured time (shopping, going to restaurants, etc.) spent between students and their parents was not a significant predictor in our models, time spent between students and parents doing structured activities (attending school activities, attending social functions, attending religious services) was a significant predictor of college enrollment. One interpretation of this finding is that the frequency of structured activities that students and their parents participate in together indicates a more concerted effort on the part of the parent and is therefore a better indicator of social capital than informal time spent together. These findings echo results from Lareau’s study, which explored the ways in which race and class shape child rearing. Lareau finds that while children of middle class families were involved in numerous formal extracurricular activities (piano lessons, sports teams, etc.), children of working class and poor families were involved in informal activities such as playing games in the neighborhood and watching television. Our findings suggest that girls, in comparison with boys, are more involved in formal activities and that such involvement predicts college enrollment.

We also note that only the parent-to-parent relationships between the parents of the child’s next-to-best friends (not the best friends or the third best friends) were explanatory of college enrollment. One may argue that the relationships between the
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parents of best friends are more typical and that the relationships between the parents of third best friends are too rare to be explanatory, but that relationships between the parents of second best friends reflect the kind of tighter knit school community that according to Coleman would predict greater school achievement and, in turn, college enrollment.

Surprisingly, our Homework and Oversight scale was not a significant predictor of post-secondary enrollment. Because this scale included a number of items that measure how vigilantly parents monitor their students’ school performance and whereabouts, we expected that this variable would account for variance in college enrollment. Scholars well versed in the gender gap in higher education have suggested that boys may benefit from more effective parental controls (Buchmann & DiPrete, 2013). Our findings, unexpectedly, imply that parental controls may not be the most effective lever for improving rates of college going for boys. However, of all of our scales, our Homework and Oversight scale had the lowest reliability coefficient (Cronbach’s alpha=.56) and perhaps its relatively low reliability explains why this scale was not predictive of college enrollment. Also surprising was that student/teacher ratio was not statistically significant. We hypothesized that teacher-student ratio would operate similar to family size. As the resource dilution model suggests, when more siblings are present in the home, parental resources are spread more thinly amongst children. Similarly, we expected that larger class size, as a proxy for teacher-student relationships, would have a potential impact on college enrollment. However, we find that teacher-student ratio is not a significant predictor of college enrollment, suggesting that the addition of a few more students to a class does not dilute resources to an extent that impacts college enrollment.
Because our study is not longitudinal, our results only allow us to conclude that boys *currently* experience deficits in social control and social capital measures and that these deficits disadvantage boys with respect to college enrollment. However, the data and analyses we present here do not explain *why* boys are more susceptible to disadvantages in social control and social capital today than in other historical periods. Additionally, our research does not address when gaps in social capital and social control emerge or if these gaps narrow and widen at different points along the educational trajectories of young men and women. These longitudinal questions represent an important direction for future research.
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References


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