Affirmative Action and Peer Effects: Evidence from Caste Based Reservation in General Education Colleges in India *

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October, 2010
Preliminary- Work in Progress

Abstract

Proponents of affirmative action policies in higher education argue that the beneficiaries of affirmative action could gain academically from positive peer effects, whereas critiques argue that they could fall behind due to *competition* with better prepared peers. I examine this hypothesis in the context of caste based affirmative action in college admissions in India. Admission to general education public colleges in India is strictly based on the results of the Senior Secondary School examinations. This rule generates quasi-random variation in the peer quality of the students admitted. I estimate peer effects using a unique data set that links admission data with the educational outcomes on college exit exams. I find that better average quality of the high caste students has a negative effect on the performance of the low caste students, and the peer quality of the low caste students also negatively affects high caste students, with more pronounced effects on high achievers. These findings suggest that integrated college environments may not necessarily benefit the intended social beneficiaries of affirmative action.

JEL classification: O15, I21
Keywords: Affirmative Action, Peer Quality, Higher Education

*I wish to thank the principals, staff, and management of the colleges for their co-operation and Mrs N. Kapoor for her help in data collection. I also thank William Johnson, Leora Friedberg, and Wayne Roy Gayle for discussions that greatly benefitted the paper. Funding from the Ford Foundation and PSTC at Brown University, and Youth Nex Center at University of Virginia is thankfully acknowledged.

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1 Introduction

Affirmative action policies in institutions of higher education are promoted in many countries around the world. The aim of such policies is to aid the disadvantaged minorities in breaking out of poverty traps, and reduce social and economic disparities among population groups. Typically, historically disadvantaged groups are offered admission under government mandates. One of the strongest argument made in favor of such policies is that the beneficiaries may gain from positive peer effects. Advocates contend that disadvantaged minorities will gain academically and socially due to interaction with peers who are academically strong. On the other hand, critics argue that the beneficiaries might be unprepared for college, and hence they will fall behind their better prepared peers. This can have negative effects on the beneficiaries, and they may find it hard to cope psychologically. In addition, this might erode college education quality for non-beneficiaries. In this paper, I aim to empirically investigate the impact of academic peer effects experienced both by beneficiaries and non-beneficiaries of affirmative action to inform this debate in the context of India. Through careful examination of peer effects in college, this paper assesses whether those who gain access to colleges due to affirmative action experience positive peer effects, and whether integrated college environment translates into narrowing of gaps in educational outcomes among caste groups.

India is a pertinent setting for the purpose of this analysis. In the Indian system of higher education, public colleges are required to reserve seats for students from lower caste groups. These groups are historically disadvantaged and under represented among highly educated. The government of India requires public institutions of higher education to admit students from these groups under *reservation quotas* with an aim of increasing their representation in the pool of higher educated. Access to colleges can help open better economic opportunities post college and could reduce social and economic distance among caste groups. Thus, these policies are perceived to promote economic and social mobility and positive peer dynamics. However, there is a paucity of evidence on peer effects due to limitations of micro data required for analysis of such peer effects. In addition, the main empirical challenge in addressing this question is lack of random variation in peer group formation. Students with similar characteristics may join the same institutions, or college admission committees may use common unobserved characteristics in choosing students for admission. This makes the credible estimation of peer effects very challenging.

This paper circumvents these empirical challenges using features of the Indian educational system that allow me to address selection issues. Admission to general education public colleges is based solely on class XII Senior Secondary School exam outcomes. The cutoffs used vary across streams of education, by year of admission, and by college. Also, different

cutoffs are used for beneficiaries and non-beneficiaries of affirmative action. This generates a quasi-natural experiment in the quality of academic peers for each admitted student. For example, if a higher cutoff is used for the non-beneficiaries, the average quality of the peer group would be higher. A student is exposed to higher quality peers if a higher cutoff is used, and I compare outcomes of students who are exposed to different quality of peer groups.

Public colleges are very prestigious and highly subsidized. As a result, more than 90 percent of the admitted students choose to attend the college that offers them admission and students do not tend to move out of their home district for enrolling in general education colleges (Sekhri and Rubinstein, 2010).[1] Conditional on the stream of study, those admitted to the same colleges take identical classes, and common double blind college exit exams.[2] Hence, this paper identifies classroom level peer effect. The relevant peer group for a student is the set of students in the same college, stream of study, and year of admission. For the empirical analysis, I use a unique data set that combines the admission records with college educational outcomes of 5 cohort of students attending 2 general education public colleges in a district of India. This data contains student characteristics, information on parents, and educational outcomes at school and college level. Use of contemporaneous measures of academic quality to identify peer effects may reflect common circumstances among peers rather than peer effects. I use the school level exit scores to measure peer quality and I evaluate the effect on subsequent college exit test scores. If these peer groups were already formed in schools, then the unobserved characteristics of the students could be correlated and the results could be confounded. However, there are a large number of schools in the district in our sample and only 2 public colleges.[3] The admission cutoff determines the eligibility for admission into public colleges. Therefore, the incoming college class comprises of students from many different schools.

While peer effects across ethnic groups have been examined in the K-12 school setting (Angrist and Lang, 2004; Hoxby, 2000; Rivkin, 2000),[4] limited number of studies have focused on investigating the peer effects that evolve due to affirmative action policies followed by institutions of higher education.[5] But it is important to focus on tertiary education institutions as well since group dynamics in colleges might be very different than in schools, as children are much more impressionable in their formative years. A few studies have addressed

[1] Alternately, the students could attend private colleges which are more expensive and not as prestigious.

[2] Since public colleges are gender specific and typically a district has 2 public colleges, one for each gender, there is no selection across public colleges in our sample.

[3] In 2008-09, there were 2046 schools in the district.

[4] A number of these studies either use contemporaneous measures of academic ability to isolate peer effects or proxy characteristics for academic ability.

[5] A number of papers including Arcidiancono (2005), Loury and Garman (1993), Rothstein and Yoon (2007) have examined efficacy of affirmative action policies in US.

peer dynamics among different ethnic groups in colleges and explored the implications of such interactions. Arcidiacono and Vigdor (2010) examine whether affirmative action policies result in tangible benefits for majority-race students in the US, and find no beneficial effects for majority students. The major empirical issue is that the students are not randomly selected into the colleges they join. In the Indian setting, the numbers of slots offered to minority students are fixed, but the academic achievement level coming into the college varies. My research design provides a "quasi-natural" variation in the quality of peers a student is exposed to. Hence, the estimates will not suffer from self selection bias. Duncan et al (2006) have examined the effects of exposure to racially diverse peers in colleges using random assignment to dorm rooms on attitudes towards minorities. This study does not focus on effects of peer dynamics on academic achievement.[6] Another closely related paper by Bertrand et al (2008) examines the efficacy of the Indian affirmative action policy by focusing on labor market outcomes of those who get into college compared to those who do not. I examine within college peer effects instead, and the assembled data allows me to examine the effects on college educational achievement.

I find evidence of negative peer effects across groups. Better peer quality of the high caste students has a negative effect on the performance of the low caste students, and likewise better peer quality of the low caste students also negatively effects the performance of high caste students, with more pronounced effects on high achievers in both groups. In contrast, the peers of ones own caste group have a positive and statistically significant effect within each group. I enhance the credibility of my estimation approach by contrasting the estimated peer effects to those based on random allocation of students to different peer groups. I do not discern any peer effects when students are randomly allocated to a different peer group. These findings suggest that integrated college environments may not necessarily benefit the intended social beneficiaries of affirmative action.

The rest of the paper is organized as follows: Section 2 discusses affirmative action policy in India and highlights the important features of the education system that I use in the empirical design. Section 3 describes the data used. Section 4 describes the estimation strategy, and Section 5 discusses the main findings. Section 6 focuses on robustness checks. Section 7 concludes with a discussion of the policy implications of the main findings.

[6]Other papers that examine peer effect in college settings but not across beneficiaries and non-beneficiaries of affirmative action include Carrell et al (2009), Foster and Lyle (2007), Sacerdote (2001), Stinebrickner and Stinebrickner (2006), and Zimmerman (2003). Hoxby and Weingarth (2006),Lavy et al (2008), and Vigdor and Nachyba (2007) examine academic peer effects in the context of schools.

2 Affirmative Action in Public Colleges

The government of India has followed affirmative action policies since the inception of the constitution in 1950.[7] Seats are reserved for Schedules Castes, Scheduled Tribes, and Other Backward Castes in varying ratio by the central government and state governments. These caste based affiliations are determined at birth and cannot be changed. While mobility across class or religion is possible, the caste of the person is permanent. In higher education institutions that receive government funding, 22.5 percent of available seats are reserved for Scheduled Castes (the lowest echelon in the Hindu caste system) and Scheduled Tribes (the tribal population) students. In addition, states have also reserved seats for the *Other Backward Castes*. The mandated reservation percentage has been raised to 49.5 percent in 2007 including an additional 27 percentage reservation for *Other Backward Castes*. [8] The three beneficiary groups (scheduled caste, scheduled tribes, and other backward castes) constitute about 70 percent of India's population. A supreme court decision in 1963 capped the *reservation* of seats to a maximum of 50 percent. Hence, the most recent change in the reservation policy increased the reserved seats to 49.5 percent.

The government of India also provides reservation for scheduled caste and tribes in public sector jobs. Despite these affirmative action policies, the number of students with graduate degrees remains low compared to high caste groups. In 1999-2000, only 4.7 percent of graduates (students with bachelors degrees) in population aged 20 years or above were from scheduled castes (Deshpande and Yadav, 2006). There is a considerable debate about the efficacy and redistributive effects of the policy. The argument against reservation is that it will affect the quality of tertiary education, which in recent years has been the hall mark of India's economic growth. The exam performance of students from the scheduled castes and other backward castes in nationally administered double blind tests that are used to screen students into colleges is typically poorer as compared to other segments. In the data-set that was assembled to carry out the empirical work, the distribution of grades obtained in Senior Secondary School Examination (equivalent of high school) by lower caste students is dominated by the that of other castes (Figure I.a). The difference in average incoming percentage scores is 9 percentage point and it is highly statistically significant. This is true

[7] Article.15(1) of the Constitution stipulates that the "State shall not discriminate any citizen on grounds only of religion, race, caste, sex, place of birth or any of them ". But at the same time, it also provides for affirmative action to protect historically disadvantaged minorities in the country. Article 15(4) of the Constitution allows the state to make "special provision for the advancement of any socially and educationally backward classes of citizens or for the Scheduled Castes and the Scheduled Tribes."

[8] The reservation for OBC category is subject to exclusion of *creamy layer* or economically strong strata among the OBC (Gupta, 2006).

for all 5 academic cohorts in our sample (Figure I.b). Reservation also tends to dampen the incentives of other students to try and enroll in colleges, and hence undermines 'merit'. There have been widespread protests against an increase in the reservation of seats in institutions of higher education for the other backward castes in 2006 (Gupta , 2006).

Proponents believe that these groups come from disadvantaged backgrounds. They may either be discriminated against [9], or cannot afford adequate preparation to get into highly competitive colleges in the country. To the extent that tertiary education provides opportunities for economic mobility, this will perpetuate the inequities among low and high castes and widen the gap in their economic status. Moreover, there is no empirical evidence on whether there is any significant effect effect of admitting low caste students on quality of education (Thorat, 2006). In this paper, I focus on the peer effects within institutions of higher education and examine whether lower caste students who enter with lower grades benefit from their high performing peers.

2.1 Homogeneity in College Experience

An important feature of the education system is that students in colleges affiliated with same universities take uniform exit tests. The power to grant degrees is vested with the universities. Colleges are not allowed to confer a degree.[10] These colleges have to affiliate with a university in order to operate, and the degree is conferred by the affiliating university. As a result, all students in all the colleges affiliated with the same university, take the same *exit exams*. These exams vary by field of study, but conditional on the field, college students take the same exam. The examinations for the affiliated colleges are conducted by the respective universities in a double blind fashion, which also sets the *uniform course curriculum*. The affiliated colleges only offer 'prescribed' courses of study. The universities across the country also coordinate on developing the curriculum, assessing performance, determining fee structures, and establishing norms for teacher qualifications in an attempt to homogenize tertiary education so that it is more equitable. Students declare their field of study in the second to last year of secondary school (11th grade) and continue on to studying it in college. A very small percentage change fields after entering college.[11] Once they have entered colleges, students in same college and field have limited choice in selecting courses. The courses are taught by a pre-determined set of professors. Hence, students do not have a choice to sort into different classes or same classes taught by different professors. Students

[9] There is mixed evidence on whether educational institutions and teachers discriminate against lower caste students (Hoff and Pandey (2006); Holla (2007); Henna and Linden (2009))

[10] The colleges account for about nine-tenths of undergraduate enrollments (Agarwal, 2006)

[11] This is allowed only in extenuating circumstances and the approval of the university is required.

spend substantial amount of time with their field cohorts both in class and outside. In a time use survey of randomly selected college students (currently enrolled in one of the colleges), 95 percent of the students reported that they spend 6 hours or more with their field cohorts in or out of the classroom. Only 5 percent reported that they spend more than 6 hours or more with students outside their field cohort.

2.2 Admission to Public Colleges

Admission to all public colleges in the general education sector, namely all fields of education except professional colleges such as those dedicated to medicine, is solely determined on the basis of the results of the Senior Secondary School examinations taken in class XII.[12] All high schools in India must be affiliated either with the national board (Central Board of Secondary Education) or with their state's regional board. The exit exams are conducted by school boards across India and are recognized nationally. Students cannot be admitted to college without at least passing this exam, but in order to be admitted to public colleges, their score needs to exceed a specified cutoff. This admission cutoff for public colleges is determined every year and varies by state, gender, and area of study. It also varies by caste as part of the affirmative action policy. Students who score above the cutoff are eligible for admission to public colleges. While a list of students who are invited to take admission in public colleges is announced , the admission cutoffs are unknown to the public. The rules determining the cutoff are confidential. More than 90 percent of the students offered admission in public colleges accept these offers. Sekhri and Rubinstein (2010) show that the public colleges follow these rules very strictly. The percentage of students attending public colleges sharply rises from near 0 to close to 90 percent around the cutoff. This provides a natural variation in the quality of the peers that a student is exposed to in a given college, year, and field. I assembled a unique data set that combines student-level data on their Senior Secondary School exit scores, their social, economic and demographic characteristics, and their college exit exam scores for 5 admission cohorts and 3 fields of study. I use this data-set to estimate the peer effects in general education colleges.

3 Data

The estimates are based on a unique data set that I assembled from admissions records and university exam results of two general education public colleges in a district in a northwestern state in India. The admission records for the academic years 1998-99 to 2002-03 were

[12] Class XII is equivalent to high school grade 12, the last year of high school.

obtained and were matched to the university examination results from the 'Result Gazettes' for the respective years.

3.1 *Colleges in the Sample*

Typically, all the colleges in a particular district are affiliated with the same university.[13] As a result, all the students in the district take the same exams in order to graduate from college. I restricted our choice of sample colleges to the district headquarter. This is an urban area with a population of over one million according to the 2001 Census of India. There are two public colleges and 10 private colleges in the district headquarters all affiliated with the same university. The colleges are either exclusively for men or for women. Among the two public colleges, one is for women and the other is for men. I obtained the admission records for both the public colleges. The variables reported in the admission records include date of birth, gender, medium of instruction in senior secondary school, board of Secondary School examination[14], marks obtained in the senior secondary board exams, place of residence (rural or urban), father's occupation, and income.[15]

The marks obtained in the college exit exams are reported in the university wide 'Result Gazette'. Each student who takes the university exam is assigned a unique roll number. These gazettes, with results for each student listed under a roll number, are available from the university. I obtained these for the 5 years in my sample. These were then matched to individual student admission records in the colleges. For the purposes of the analysis, I look at the overall composite score obtained in the college degree program, which is the accumulated total of the scores on each of three annual exams administered to students during their undergraduate program.

3.2 *Main Sample*

The main micro sample is taken from admission records of public colleges for admissions years 1998 to 2002. The cutoffs vary by year, gender, and field of education. I exclude observations with missing entry or exit exam scores. This results in 909 lower caste and 2586 high caste observations in the final sample. I report the data processing and the variables used in Web

[13]District is the administrative unit below the state. There are three universities that offer general education in the state and the colleges affiliate with a university largely based on geographical proximity to the university.

[14]The Secondary School exams are administered by examination boards which can be national or regional.

[15]The major boards in the data include the regional School Education Board and Central Board of Secondary Education. Almost 80 % of the sample is from the regional board. Women's public college does not record father's income (See Web Appendix).

Appendix Tables A.1 and A.2 Table 1.A reports the summary statistics. In Table 1.B, I also report the summary statistics by different groups - beneficiaries of affirmative action (*lower caste group*) and non-beneficiaries of affirmative action (*high caste group).*As Figures I.a and I.b point out, the average Senior Secondary School Exam scores of *lower caste* groups students is much lower than the average scores of the *higher caste groups.* The difference is statistically significant. The socio-economic status of the parents is also different across the two groups. A higher proportion of non- beneficiaries's fathers are businessmen whereas a higher proportion of beneficiary's fathers are employed as labor. Beneficiaries also tend to attend regional board schools in contrast to non-beneficiaries who tend to attend central board schools.

3.3 Peer Group Level Variation

The relevant peers are the ones in the same college, stream of study, and year of admission. I compare the performance of the students on college exit tests assigned to one of these peer groups. There are 30 such peer groups in the data. Table 2 provides the summary statistics for 10 such groups. A student who enters college in year 1998 group 2 (Row 2, First Panel) faces a different quality of peers compared to a student who enters in year 1998 in (Row 4, First Panel) or who enters in year 2002 in group 6(Row 1, Second Panel). The exit test scores are compared across these groups controlling for own class XII Senior Secondary Scores, demographic characteristics, family background. I also control for stream by year fixed effects and group size in various specifications. The quality of own caste and other caste peers within this overall group also varies as a different cutoff is used for beneficiaries and non-beneficiaries. The range of scores within a peer groups is very wide. For example, the range for group 1 in year 1998 34 percentage points, whereas the range for group 10 in year 2002 is 29.6 percentage points. The distribution of the peer quality varies across these groups and caste based subgroups.

4 Estimation Strategy

The admission rules generate quasi-experimental variation in the quality of the peers that each student in a particular college, field, and year faces. Since the institutional features of the education system rule out any self selection into different fields or professors after applying to colleges, I can determine the effect of peer quality on students of various groups. In addition, I can also isolate the effect of peer quality from own caste group peers and the other caste peers. The reduced form linear-in means empirical model is as follows:

$$Y_{ijt} = \beta_0 + \beta_1 \ X_{ijt} + \beta_2 \ C_{-ijt} \ + \mu_{jt} + \varepsilon_{ijt} \tag{1}$$

where Y_{ijt} is the college exit test scores of student i in field j in admission cohort t. X_{ijt} is the vector of student i's individual specific pre-determined characteristics like age, gender, residence status, father's occupation, board of senior secondary schooling, own senior secondary school exam score, and father's income. C_{-ijt} is the average of the Senior Secondary School exam scores for students in the student's cohort that comprises of students who attend same college, and field and start in the same year. This captures the overall cohort peer effects. μ_{jt} are the field-by-admission year fixed effects to account for any common unobserved shocks to the classroom experience of all students within a field and year of admission. ε_{ijt} is the error term.

I also estimate the peer effects by caste groups in the cohort. The empirical model to analyze these separate peer effects is given by:

$$Y_{ijt} = \alpha_0 + \alpha_1 \ X_{ijt} + \alpha_2 \ W_{-ijt}{}^{S} + \alpha_3 \ Z_{kjt}{}^{O} + \theta_{jt} + \epsilon_{ijt} \tag{2}$$

In this equation, $W_{-ijt}{}^{S}$ is the average of the Senior Secondary School exam scores (predetermined prior to college entry) for the student's own caste group in field j and admission cohort t. $Z_{-ijt}{}^{O}$ is the average of the Senior Secondary School exam scores for students in the other caste group than student i. θ_{jt} are the field-by-admission year fixed effects. ϵ_{ijt} is the error term. I estimate various specifications of (1) and (2), and report huber-white robust standard errors in the results.

5 Results

5.1 Effects on Beneficiaries of Affirmative Action

I first examine the peer effects on college exit test scores of the beneficiaries of affirmative action policies. These include students from lower castes (*Schedules Castes and Backward Castes*). *Cohort* in the following sections is defined as the students who enter a college in a specific year and field. I measure the peer quality in terms of performance on the Senior Secondary School exams which are taken prior to entering college. I estimate the effect of this pre-determined academic peer quality on college exit exam scores.

5.1.1 Influence of Overall Cohort's Academic Quality and Academic Quality of Different Caste Group Peers

I estimate (1) and (2) using Ordinary Least Squares and report the results for beneficiaries of affirmative action in Table 3. In column (i) , I report the peer effects of the the overall average cohort quality. The overall average cohort quality leads to a gain of 93.38 points (Table 3, column (i)) on the college exit test scores for beneficiaries of affirmative action. This is equivalent to a gain of 0.35 of a standard deviation for this population, and the effect is highly statistically significant. In order to address any concerns about common shocks to the cohort for example shared professors, I include a field-by-admission year fixed effects in the specification. The results are reported in column (ii). The estimated academic peer influence is similar in magnitude to the one reported in column (i). The academic peer influence of the overall cohort might mask heterogeneity in the effects of caste based peer groups. In order to address this, I separately estimate the peer effects of different caste groups. The results are reported in column (iii). I find that much of the gain in academic performance induced by peers comes from the peers of the same caste group. The peer quality of other caste groups has a negative effect on the performance in college exit test scores. The gain from peers of own caste for low caste students is 0.46 of a standard deviation and the loss from peers of higher castes is 0.13 of a standard deviation. Both effects are statistically significant at 1 percent significance level. These results are robust to inclusion of field-by-year fixed effects as reported in column (iv).[16] These results suggest that low caste peers do not connect with high caste peers even in an integrated class room environment.

5.1.2 Peer Effects Across Different Academic Achievement Levels

Students with different academic achievement levels may experience a different influence of the quality of their peers. I examine this possibility by estimating the peer effects over the distribution of scores obtained in Senior Secondary School Exams. I estimate the academic peer influence separately for students i) who are in the bottom 25th percentile of the Senior Secondary School Exams Scores, ii) for those between 25th and 50th percentile, iii) for the ones between 50th and 75th percentile, and iv) for the ones between 75th and 100th percentile. The results are reported in Table 4. [17] Students in both the tails (below 25th percentile and between 75th to 100th percentile) gain less from the quality of their own

[16]The results are also robust to including a higher order polynomial of the student's own score and also excluding all covariates. Results are shown in Appendix table A.3. In a specification accounting for the group size, I find that the results are no different (Web Appendix Table A.4.).

[17] These specifications control for field-by-year fixed effects and own score in Senior Secondary School Exams .

caste peers. However, the lower caste students with highest scores in the Senior Secondary School exams experience a much bigger negative effect (0.17 of a standard deviation) from academic peer quality of high caste peers. The relative benefits to the lower caste students with highest academic ability on entering colleges are the smallest. The most pronounced negative effect may be coming from a *competition effect* from high caste peers who enter colleges with higher average Senior Secondary exam scores. These dampen the already small positive gains from peers of own caste.

5.1.3 Peer Effects across Gender

My data allows me to identify the peer groups by different gender as colleges are exclusively for men or for women. I report results of (2) for women and for men separately. Women from lower caste groups tend to gain more than men from peers of own caste. The own caste peer influence leads to a gain of 0.44 of a standard deviation for women and 0.28 of a standard deviation for men. These effects are statistically significant at 1 percent significance level. On the other hand, women from lower caste groups also experience a more pronounced negative peer effect from high caste women. The negative effect is around 0.18 of a standard deviation for women and 0.11 of a standard deviation for men. These results indicate that women interact more among the peers of their own caste than men. I also examine if these effects across gender also vary by academic achievement on Senior Secondary School Exam Scores. I separately estimate the academic peer effects for women who scored below the mean in Senior Secondary School Exams and for those who scored above. The results are reported in Table 6, column (i) and (ii). The lower caste women with lower than average scores gain 0.46 of a standard deviation from own caste peers. However, the lower caste women with higher than average scores do not experience any gain from their own caste peers. Contrary to this, lower caste women with below average scores experience a smaller negative effect from high caste women. These effects are statistically significant. The same patterns hold for low caste men for own caste group peer effects except the magnitudes are smaller than women. The negative peer effects from high caste men are comparable for lower caste men who score below or above average. These results are consistent with the previous ones reported in Table 4. The benefits of integrated college environments are not uniform across students ability. High achieving students from low caste groups may not always benefit from their peers. In fact, they may be hurt in some circumstances. On the hand, low achieving students from lower castes do benefit from peers but from peers of their own caste groups.

5.2 Effects on Non-Beneficiaries of Affirmative Action

In the preceding section, I examined the academic peer effects on beneficiaries of affirmative action. Next, I turn to evaluating these peer effects on non-beneficiaries i.e. students belonging to higher caste groups.

5.2.1 Influence of Overall Cohort's Academic Quality and Academic Quality of Different Caste Group Peers

I estimate (2) using Ordinary Least Squares for the high caste students and report the results in Table 7. The estimated peer effects are similar to those experienced by lower caste students. I report the peer effects of the the overall average cohort quality in column (i). The overall average cohort quality leads to a gain of 83.54 points on the college exit test scores for non-beneficiaries of affirmative action. This is equivalent to a gain of 0.31 of a standard deviation , and the effect is statistically significant at 1 percent significance level. This estimated effect is robust to the inclusion of field-by-admission year fixed effects in our specification (column(ii)). The peers of own caste group have a positive and statistically significant effect that leads to a gain of 0.4 standard deviations in the exit test scores of higher caste students (columns (iv) and (v), Table 7). The negative peer effects from the *lower caste groups* are somewhat smaller in magnitude and result in a loss of 0.084 of a standard deviation.

5.2.2 Peer Effects Across Different Academic Achievement Levels

Next, I examine the *peer effects* over the distribution of scores obtained in Senior Secondary School Exams for students from high castes. I again estimate the academic peer influence separately for students i) who are in the bottom 25th percentile of the Senior Secondary School Exams Scores, ii) for those between 25th and 50th percentile, iii) for the ones between 50th and 75th percentile, and finally iv) for the ones between 75th and 100th percentile. Table 8 reports the results. These estimated *peer effects* are different from the ones experienced by the *lower caste* students. The '*own caste group*' peer effects increase monotonically for students along the support of the achievement distribution in Senior Secondary School Exams. The highest achieving students gain the most (0.5 of a standard deviation, column iv) whereas the lowest achieving students gain 0.23 standard deviations (column i). There is a sharp increase in the gains among the highest achievers and the peer effects from own caste group students almost double in magnitude.

Students with the lowest scores in the Senior Secondary School Exams do not experience any negative peer effects from the opposite (in this case lower) caste students. In contrast, the

highest scoring students experience the largest negative peer effects of 0.16 standard deviation from opposite caste students. The negative effects on 'higher caste' highest achievers are similar in magnitude to those experienced by 'lower caste' highest achievers (Table 4 and Table 8). However, high caste high achievers benefit much more significantly from their peers in contrast to low caste high achievers. On the other end of the distribution, low caste low achievers are hurt from the negative opposite caste peer effects whereas high caste low achievers are not hurt at all although the positive peer effects from own caste for high caste low achievers are smaller than the low caste low achievers. In the intermediate ranges of Senior School Exam scores, high caste students tend to gain less from peers of own quality and lose less from peers of opposite castes relative to lower caste students.

Overall, high caste students in both tails of the distribution gain. The students in the lower tail are not hurt by peer effects of opposite castes and gain less from peers of same caste. The students in the right tail are hurt the most from peers of opposite caste, but gain sharply from the peers of own caste. The lower achieving students are not hurt, but the high achieving students are hurt the most.

5.2.3 Peer Effects across Gender

Across gender groups, women benefit almost as much as men from own caste peers (0.45 of a standard deviation for women versus 0.41 standard deviation reported in columns (ii) and (iv) of Table 9). However, they experience a much larger negative peer effect from peers of opposite caste than men (0.13 of a standard deviation for women versus 0.045 of a standard deviation for men). In comparison, lower caste women experienced a much larger gain from own caste peers than lower caste men (Table 5). These patterns indicate that women form closer networks along caste lines, and these peer identities are much more tight among women who belong to lower caste groups. Finally, I also estimate the academic peer effects for women and men of higher castes who scored below the mean in Senior Secondary School Exams and for those who scored above. Results are reported in Table 10. The estimated Peer effects are stark contrast to those for lower caste students reported in Table 6. High caste women with below average Senior Secondary Scores gain almost half as much as those who score above average (0.22 of a standard deviation compared to 0.46 of a standard deviation). Low achievers do not gain as much from their own caste peers whereas high achievers do. In contrast, among lower caste women, below average women gained significantly and above average women did not experience positive own caste peer effects. Among men of high caste, we observe the same pattern. Above average students gain much more than below average students. The below average men and women from high castes do not experience negative peer effects from peers of opposite caste, whereas high achieving ones do. The effect is more

pronounced in women.

6 Robustness Checks

In order to examine if I am examining the correct peer groups, I conduct falsification tests using synthetic peer groups. Each student's actual peer group is defined by his or her year of admission, stream of study and college. The students in these peer groups spend most of their class time together in the same rooms and take same classes. To test whether these are the relevant peer groups and the identified effects arise from peer effects, I synthetically place the student in a random peer group. I randomly choose a year out of the 5 admission years, a field out of the 3 fields, and a college out of the 2 colleges. I assign the student to this peer group instead. In this case, I do not expect to see any peer effects of this synthetic peer group.

I estimate (1) and (2) for beneficiaries and non-beneficiaries assigning students to a randomly generated peer group. The results are reported in Tables 11 and 13 respectively. As expected, the newly assigned peer groups do not have any overall peer effect (columns (i) and (ii)). There is also no caste group specific peer effect (columns (iii) and (iv)). In addition, I also synthetically create caste based peer groups by randomly shuffling the caste status in addition to the admission year, stream and college. These results are reported in Table 12 and 14. Again, I do not detect any peer effects. Neither overall effects are statistically significant (reported in columns (i) and (ii)), nor caste specific effects are distinguishable from 0 (reported in columns (iii) and (iv)). These tests confirm that the stream and college specific class that the student enters defines his or her peer network.

7 Conclusion

The students with the highest scores in Senior Secondary School Exams are hurt disproportionately due to peer effects from peers of other castes. For lower caste students, this effect may be mediated by a *competition effect* whereas for higher caste students, this could additionally be an on account of differential preparation among caste groups coming into college, and hence teachers teaching at a lower level. While the highest achieving high caste students, who are also the highest achievers in the entire cohort, gain substantially from peers of their own group, this positive effect is much weaker for the lower caste students. The low achievers tend to gain less from own caste peer effects than the average students of their caste. Among low achieving students, opposite caste peers have a negative effect only the lower caste students, while the higher caste students neither gain, nor lose from these

opposite caste peer effects. The own caste peer quality has a positive effect on both low and high caste low achieving students but the magnitude is smaller than for those in the middle of the distribution. These results are consistent with a model in which teachers target their teaching to high caste low achievers. Own caste peer effects almost always dominate the opposite caste peer effects and hence, overall there is a positive effect from the peers from ones cohort.

These results suggest that more integrated, and hence more heterogenous environments in selective higher education institutions are not academically benefitting at college level. Neither the beneficiaries nor the non-beneficiaries of affirmative action gain from the quality of opposite caste peers. In fact the beneficiaries experience larger negative peer effects from peers of opposite castes over the entire distribution of the achievement levels in Senior Secondary School Exam Scores which are pre-determined before entering college. The students with highest scores gain from peers with similar scores but experience a negative effect because of low scoring students. Overall, the results suggest that affirmative action based college admission puts the under prepared students in a much more challenging situation which results in negative externalities on both high caste and low caste students.

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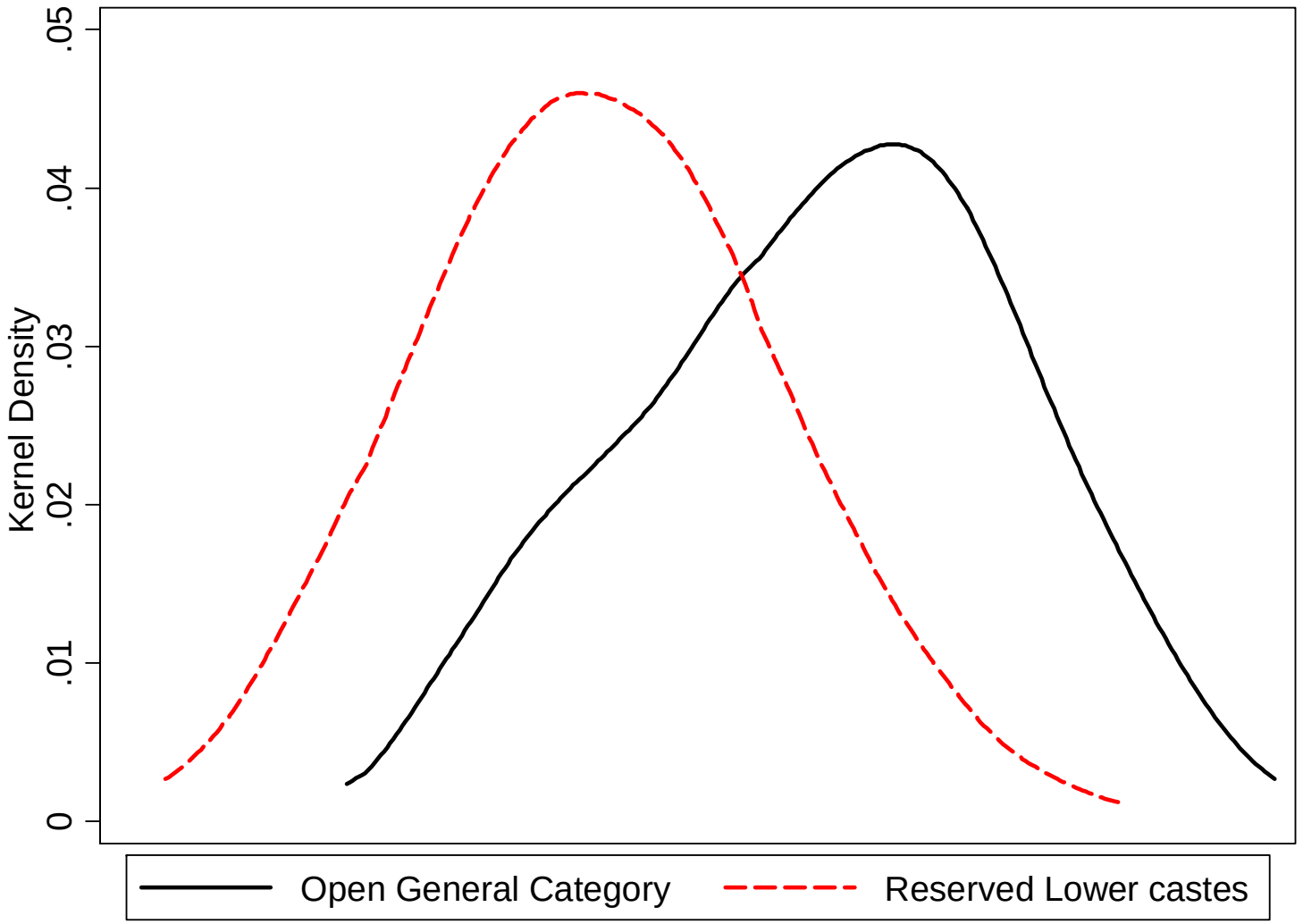

Figure I.a : Distribution of Scores on Senior Secondary School Examinations for Beneficiaries and Non-Beneficiaries of Affirmative Action

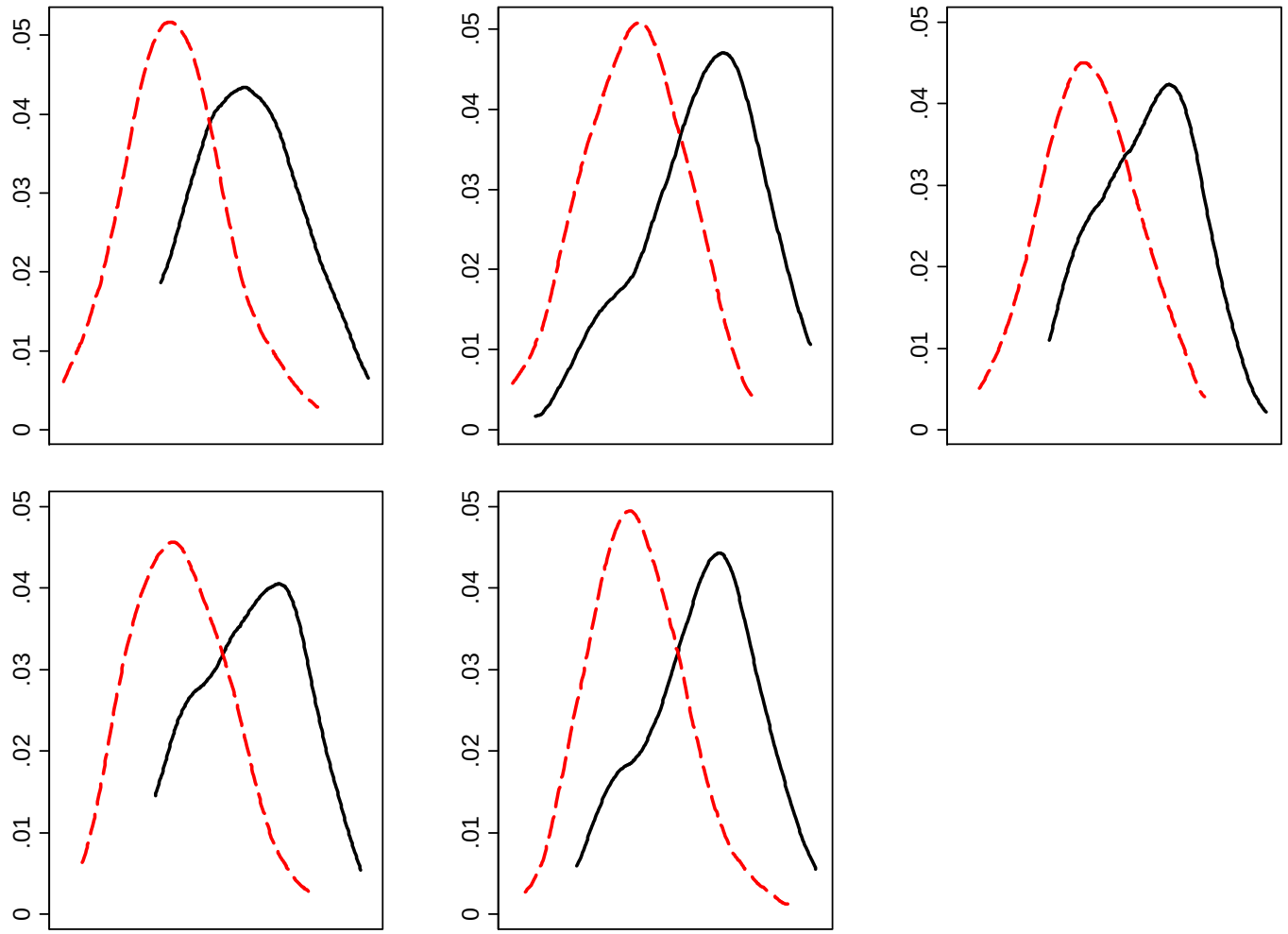

Figure I.b : Distribution of Scores on Senior Secondary School Examinations for Beneficiaries and Non-Beneficiaries of Affirmative Action for each of the 5 Admission years in the sample

Table 1.A: Summary Statistics

Variable	Proportion	Mean	Std. Dev.
Gender			
Male	0.47	---	---
Residence Indicator			
Rural	0.126	---	---
Father's Occupation			
Agriculture	0.05	---	---
Business	0.3	---	---
Govt. Employee	0.09	---	---
Labor	0.11	---	---
Professional	0.04	---	---
Service	0.3	---	---
Senior Secondary Board			
PSEB	0.72	---	---
Percentage Marks			
Arts	---	66.7	8.5
Commerce	---	76.1	9
Science	---	66.24	9.24
Age	---	18.01	0.84
Final Composite Marks			
Liberal Arts	---	1425.86	173.58
Commerce	---	874.16	101.1
Science	---	1289.2	188.7

Table 1.B : Summary Statistics for Beneficiaries and Non- Beneficiaries of Affirmative Action

	Beneficiaries			Non- Beneficiaries		
Variable	Proportion	Mean	Std. Dev.	Proportion	Mean	Std. Dev.
Gender						
Male	0.47	---	---	0.48	---	---
Residence Indicator						
Rural	0.216	---	---	0.09	---	---
Father's Occupation						
Agriculture	0.02	---	---	0.06	---	---
Business	0.11	---	---	0.36	---	---
Govt. Employee	0.14	---	---	0.08	---	---
Labor	0.3	---	---	0.04	---	---
Professional	0.03	---	---	0.04	---	---
Service	0.32	---	---	0.3	---	---
Senior Secondary Board						
PSEB	0.93	---	---	0.64	---	---
Percentage Marks						
Arts	---	61.5	7.15	---	68.83	8.07
Commerce	---	63.74	8.1	---	79.42	5.72
Science	---	59.8	8	---	67.7	9.47
Age	---	18.11	0.95	---	17.97	0.82
Final Composite Marks						
Liberal Arts	---	1363.1	173.58	---	1451.4	177
Commerce	---	795.82	99.85	---	895.2	90.62
Science	---	1233.3	168.14	---	1302	190.95

Table 2: Example Variation in the Groups Identified by Stream, Year of Admission, and College

1998

Group	Mean	Std Dev.	Caste group Gap	Min	Max
#1	59.7	6.6	6.24***	42	76
#2	73.1	9.4	18.28***	48.6	89.8
#3	58.2	7.7	-4.1	33.8	70
#4	79.64	7.27	12.96***	58.6	89
#5	71.44	8.7	12.51***	54.8	89.6

2002

Group	Mean	Std Dev.	Caste group Gap	Min	Max
#6	61.4	6.37	5.05***	46	89.6
#7	75.03	10.37	17.56***	45.7	87.6
#8	67.03	8.06	7.05***	49.1	86.4
#9	78.36	9.5	16.4***	57	90.6
#10	71.7	7.4	8.6***	56	85.6

Table 3: OLS Estimates of Reduced Form Peer Effects in Colleges on Beneficiaries of Affirmative Action

	Dependent Variable: College Exit Test Scores for Lower Caste Students			
	(i)	(ii)	(iii)	(iv)
Overall Peers	93.38***	92.01***		
	(5.3)	(5.14)		
Peers of Own caste			124.11***	127.7***
			(13.7)	(13.77)
Peers of Opposite Caste			-34.37***	-33.68***
			(1.3)	(1.37)
Field by Admission Year Fixed Effects	No	Yes	No	Yes
Obervations	909	909	909	909
R-sqaured	0.52	0.54	0.7	0.71

*** indicates significance at 1% level, ** indicates significance at 5 % , and * indicates significance at 10 % level.

Note: Each column reports results from a separate regression with additional controls for the students characteristics including age, age squared, gender, place of residence (urban or rural), father's occupation, board of education for Senior Secondary School exams, and the individual student's Senior Secondary School Exam test scores. Excluded category for father's occupation is governemnt service. Robust standard errors are reported in parentheses. The sample used in the estimation is described in the Data Appendix.

Table 4: OLS Estimates of Reduced Form Peer Effects in Colleges on Beneficiaries of Affirmative Action

Dependent Variable: College Exit Test Scores for Lower Caste Students

Percentiles	< 25th	25th - 50th	50th-75th	75th-100th
	(i)	(ii)	(iii)	(iv)
Peers of Own caste	89.68***	125.17***	169.34***	72.87***
	(28.5)	(25.97)	(22.8)	(38.34)
Peers of Opposite Caste	-31.195***	-33.01***	-32.42***	-47.3***
	(1.92)	(3.2)	(2.33)	(5.35)
Obervations	211	227	226	228
R-sqaured	0.7	0.7	0.78	0.71

*** indicates significance at 1% level, ** indicates significance at 5 % , and * indicates significance at 10 % level.

Note: Each column reports results from a separate regression with additional controls for the students characteristics including age, age squared, gender, place of residence (urban or rural), father's occupation, board of education for Senior Secondary School exams, and the individual student's Senior Secondary School Exam test scores. Excluded category for father's occupation is government service.Each regression includes field by admission year fixed effects. Robust standard errors are reported in parentheses. The sample used in the estimation is described in the Data Appendix.

Table 5: OLS Estimates of Peer Effects in Colleges on Beneficiaries of Affirmative Action

Dependent Variable: College Exit Test Scores for Lower Caste Students

	Women	**Men**
	(i)	(ii)
Peers of Own caste	117.55***	74.7***
	(20.3)	(23.77)
Peers of Opposite Caste	-48.65***	-29.51***
	(2.95)	(1.7)
Field by Admission Year Fixed Effects	Yes	Yes
Obervations	481	428
R-sqaured	0.68	0.728

*** indicates significance at 1% level, ** indicates significance at 5 % , and * indicates significance at 10 % level.

Note: Each column reports results from a separate regression with additional controls for the students characteristics including age, age squared, place of residence (urban or rural), father's occupation, board of education for Senior Senior Secondary School exams, and the individual student's Senior Secondary School Exam test scores. Excluded category for father's occupation is governemnt service. Robust standard errors are reported in parentheses. The sample used in the estimation is described in the Data Appendix.

Table 6: OLS Estimates of Reduced Form Peer Effects in Colleges on Beneficiaries of Affirmative Action

Dependent Variable: College Exit Test Scores for Lower Caste Students

	Women		**Men**	
	Below Mean (i)	Above Mean (ii)	Below Mean (iii)	Above Mean (iv)
Peers of Own caste	124.18***	28.16	96.08***	24.44
	(20.95)	(68.6)	(28.62)	(34.66)
Peers of Opposite Caste	-47.9***	-62.86***	-29.94***	-30.12***
	(3)	(7.32)	(1.79)	(3.42)
Obervations	428	47	302	126
R-sqaured	0.67	0.86	0.72	0.81

*** indicates significance at 1% level, ** indicates significance at 5 % , and * indicates significance at 10 % level.

Note: Each column reports results from a separate regression with additional controls for the students characteristics including age, age sqaured, place of residence (urban or rural), father's occupation, board of education for Senior Secondary School exams, and the individual student's Senior Secondary School Exam test scores. Excluded category for father's occupation is governemnt service. Each regression includes field by admission year fixed effects. Robust standard errors are reported in parentheses. The sample used in the estimation is described in the Data Appendix.

Table 7: OLS Estimates of Peer Effects in Colleges on Non-Beneficiaries of Affirmative Action

Dependent Variable: College Exit Test Scores for High Caste Students

	(i)	(ii)	(iii)	(iv)
Overall Peers	83.54***	81.58***		
	(2.75)	(2.27)		
Peers of Own caste			111.2***	106.63***
			(3.4)	(3.37)
Peers of Opposite Caste			-20.12***	-22.34***
			(1.32)	(1.28)
Field by Admission Year Fixed Effects	No	Yes	No	Yes
Obervations	2586	2586	2586	2586
R-sqaured	0.58	0.6	0.61	0.63

*** indicates significance at 1% level, ** indicates significance at 5 % , and * indicates significance at 10 % level.

Note: Each column reports results from a separate regression with additional controls for the students characteristics including age, age squared, gender, place of residence (urban or rural), father's occupation, board of education for Senior Secondary School exams, and the individual student's Senior Secondary School Exam test scores. Excluded category for father's occupation is governemnt service. Robust standard errors are reported in parentheses. The sample used in the estimation is described in the Data Appendix.

Table 8: OLS Estimates of Peer Effects in Colleges on Non-Beneficiaries of Affirmative Action

Dependent Variable: College Exit Test Scores for Higher Caste Students

Percentiles	< 25th	25th - 50th	50th-75th	75th-100th
	(i)	(ii)	(iii)	(iv)
Peers of Own caste	61.2***	83.00***	80.64***	134.08***
	(7.7)	(7.88)	(8.67)	(6.63)
Peers of Opposite Caste	-1.2	-13.03***	-13.66***	-44.61***
	(2.4)	(3.18)	(3.67)	(2.54)
Obervations	654	550	648	648
R-sqaured	0.3	0.47	0.68	0.81

*** indicates significance at 1% level, ** indicates significance at 5 % , and * indicates significance at 10 % level.

Note: Each column reports results from a separate regression with additional controls for the students characteristics including age, age squared, gender, place of residence (urban or rural), father's occupation, board of education for Senior Secondary School exams, and the individual student's Senior Secondary School Exam test scores. Excluded category for father's occupation is government service.Each regression includes field by admission year fixed effects. Robust standard errors are reported in parentheses. The sample used in the estimation is described in the Data Appendix.

Table 9: OLS Estimates of Peer Effects in Colleges on Non-Beneficiaries of Affirmative Action

Dependent Variable: College Exit Test Scores for Higher Caste Students

	Women	**Men**
	(i)	(ii)
Peers of Own caste	120.8***	109.55***
	(4.2)	(7.57)
Peers of Opposite Caste	-34.93***	-12.4***
	(1.62)	(1.95)
Field by Admission Year Fixed Effects	Yes	Yes
Obervations	1370	1216
R-sqaured	0.58	0.55

*** indicates significance at 1% level, ** indicates significance at 5 % , and * indicates significance at 10 % level.

Note: Each column reports results from a separate regression with additional controls for the students characteristics including age, age squared, place of residence (urban or rural), father's occupation, board of education for Senior Senior Secondary School exams, and the individual student's Senior Secondary School Exam test scores. Excluded category for father's occupation is governemnt service. Robust standard errors are reported in parentheses. The sample used in the estimation is described in the Data Appendix.

Table 10: OLS Estimates of Peer Effects in Colleges on Non-Beneficiaries of Affirmative Action

Dependent Variable: College Exit Test Scores for Higher Caste Students

	Women		**Men**	
	Below Mean (i)	Above Mean (ii)	Below Mean (iii)	Above Mean (iv)
Peers of Own caste	59.31***	123.54***	77.61***	139.8***
	(8.4)	(6.09)	(8.6)	(13.07)
Peers of Opposite Caste	-2.02	-41.96***	1.22	-19.2***
	(4.2)	(2.1)	(2.4)	(3.34)
Obervations	683	687	591	585
R-sqaured	0.32	0.74	0.3	0.67

*** indicates significance at 1% level, ** indicates significance at 5 % , and * indicates significance at 10 % level.

Note: Each column reports results from a separate regression with additional controls for the students characteristics including age, age sqaured, place of residence (urban or rural), father's occupation, board of education for Senior Secondary School exams, and the individual student's Senior Secondary School Exam test scores. Excluded category for father's occupation is government service. Each regression includes field by admission year fixed effects. Robust standard errors are reported in parentheses. The sample used in the estimation is described in the Data Appendix.

Robustness Check : Randomly Assigned Peer Group

Table 11: OLS Estimates of Reduced Form Peer Effects in Colleges on Beneficiaries of Affirmative Action

Dependent Variable: College Exit Test Scores for Lower Caste Students

	(i)	(ii)	(iii)	(iv)
Overall Peers	-12.8	-11.3		
	(31.85)	(32.05)		
Peers of Own caste			-8.25	-8
			(48.1)	(48)
Peers of Opposite Caste			-8.8	-8.7
			(6.48)	(6.63)
Field by Admission Year Fixed Effects	No	Yes	No	Yes
Obervations	909	909	909	909
R-sqaured	0.24	0.24	0.24	0.24

*** indicates significance at 1% level, ** indicates significance at 5 % , and * indicates significance at 10 % level.

Note: Each column reports results from a separate regression with additional controls for the students characteristics including age, age squared, gender, place of residence (urban or rural), father's occupation, board of education for Senior Secondary School exams, and the individual student's Senior Secondary School Exam test scores. Excluded category for father's occupation is government service. Robust standard errors are reported in parentheses. The sample used in the estimation is described in the Data Appendix.

Robustness Check : Randomly Assigned Peer Group and Caste Status

Table 12: OLS Estimates of Reduced Form Peer Effects in Colleges on Beneficiaries of Affirmative Action

Dependent Variable: College Exit Test Scores for Lower Caste Students

	(i)	(ii)	(iii)	(iv)
Overall Peers	0.87	-0.84		
	(23.71)	(23.8)		
Peers of Own caste			15.7	12.4
			(32.11)	(32.7)
Peers of Opposite Caste			-0.7	-1.07
			(4.2)	(4.4)
Field by Admission Year Fixed Effects	No	Yes	No	Yes
Obervations	1746	1746	1746	1746
R-sqaured	0.3	0.3	0.3	0.3

*** indicates significance at 1% level, ** indicates significance at 5 % , and * indicates significance at 10 % level.

Note: Each column reports results from a separate regression with additional controls for the students characteristics including age, age squared, gender, place of residence (urban or rural), father's occupation, board of education for Senior Secondary School exams, and the individual student's Senior Secondary School Exam test scores. Excluded category for father's occupation is government service. Robust standard errors are reported in parentheses. The sample used in the estimation is described in the Data Appendix.

Robustness Check : Randomly Assigned Peer Group

Table 13: OLS Estimates of Peer Effects in Colleges on Non-Beneficiaries of Affirmative Action

	Dependent Variable: College Exit Test Scores for High Caste Students			
	(i)	(ii)	(iii)	(iv)
Overall Peers	-6.9	-7.31		
	(18.8)	(19)		
Peers of Own caste			-8.7	-9.12
			(31.26)	(31.5)
Peers of Opposite Caste			0.3	0.31
			(3.2)	(3.2)
Field by Admission Year Fixed Effects	No	Yes	No	Yes
Obervations	2586	2586	2586	2586
R-sqaured	0.37	0.37	0.37	0.37

*** indicates significance at 1% level, ** indicates significance at 5 % , and * indicates significance at 10 % level.

Note: Each column reports results from a separate regression with additional controls for the students characteristics including age, age squared, gender, place of residence (urban or rural), father's occupation, board of education for Senior Secondary School exams, and the individual student's Senior Secondary School Exam test scores. Excluded category for father's occupation is government service. Robust standard errors are reported in parentheses. The sample used in the estimation is described in the Data Appendix.

Robustness Check : Randomly Assigned Peer Group and Caste Status

Table 14: OLS Estimates of Peer Effects in Colleges on Non-Beneficiaries of Affirmative Action

	Dependent Variable: College Exit Test Scores for High Caste Students			
	(i)	(ii)	(iii)	(iv)
Overall Peers	-1.85	0.4		
	(23.3)	(23.5)		
Peers of Own caste			-57.6	-61
			(48)	(48)
Peers of Opposite Caste			8*	8.1*
			(4.1)	(4.2)
Field by Admission Year Fixed Effects	No	Yes	No	Yes
Obervations	1749	1749	1749	1749
R-sqaured	0.3	0.3	0.3	0.3

*** indicates significance at 1% level, ** indicates significance at 5 % , and * indicates significance at 10 % level.

Note: Each column reports results from a separate regression with additional controls for the students characteristics including age, age squared, gender, place of residence (urban or rural), father's occupation, board of education for Senior Secondary School exams, and the individual student's Senior Secondary School Exam test scores. Excluded category for father's occupation is government service. Robust standard errors are reported in parentheses. The sample used in the estimation is described in the Data Appendix.