BOWLING ALONE, REVISITED: SOCIAL CAPITAL AND SKILL ACQUISITION*

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ABSTRACT

This paper uses micro-level data on friendship networks in middle and secondary schools to estimate effects of social capital (as measured by connections to and from other agents) on skill acquisition outcomes and to investigate the association between ethnic fractionalization and connectedness. The analysis addresses concerns about endogeneity of social capital by using grade-cohort connectedness as an instrument for individual connectedness. Identification derives from within-school variation between grade cohorts. Results include 2 main findings: 1) Being part of a more connected cohort within a given secondary or middle school is associated with a significantly higher probability of attending college, 7 years later. 2) Being part of a more racially heterogeneous grade cohort, within a given school, is associated with significantly lower levels of social capital—rare micro-level evidence to augment existing cross-region evidence on heterogeneity and disconnectedness.

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I. INTRO9087DUCTION

Robert Putnam's "Bowling Alone" popularized the idea that trust and connectedness—social capital—contribute to a community's economic productivity and social wellbeing. Does connectedness also influence long-run skill acquisition? Empirical evidence in this paper, based on micro data in the National Longitudinal Survey of Adolescent Health (Add Health), will support an affirmative answer to the question. The micro-level evidence will also suggest that ethnic fractionalization influences connectedness.

Economists have long been aware that social connections have a significant role to play in explaining economic outcomes. Douglas North has maintained that the set of formal and informal ground rules in a community—the institutional environment—facilitates production and exchange. Moreover, the shared perception of social norms may reduce free-rider problems in the provision of public goods. A number of economists have found empirical evidence that in more racially heterogeneous cities, public goods provision is lower. This paper contributes to the existing research on social capital in two ways. Firstly, it extends the discussion to the skill acquisition setting. If social capital impacts production of goods in a community, it may also influence an individual's capacity to produce human capital. An account of skill acquisition that emphasizes social capital sheds light on puzzles not easily explained by other mechanisms, adding to the policy debate on controversial education issues. Secondly, though much existing research on social capital finds heterogeneity of race, language or culture to be associated with reduced levels of trust in communities, the evidence derives mainly from cross-region and cross-country studies[1] or from experimental data. As there exist many unobserved region or country-specific factors that could be confounded with ethnolinguistic fractionalization, it may be difficult to interpret the correlations that appear in cross-region studies and to draw valid inferences. What

[1] See Alesina and La Ferrara [2004] for a survey of the empirical literature.

has been needed, arguably, is a systematic study of social capital using field data at the micro-level. The second purpose of this paper is to fill that gap.

The peer effects literature provides a point of departure. While most recent studies find that an influx of high performing peers improves an individual's performance on standardized tests (Betts, Zau, and Rice [2003]; Hoxby [2000]; Hanushek, Rivkin, Markman, and Kain [2002]), the specific mechanism has not been clearly identified. How do peers influence one another? Do they teach each other? Do they imitate each other's effort choices? Do they create production externalities by disrupting the attention of others? Putting aside the question of the causal mechanism, one could also ask precisely which students influence which other students? Though relevant to policy implications, these questions have been difficult to answer in the empirical literature. The standard technique in recent studies has been to estimate the mean response by individuals to small exogenous changes (e.g., from students migrating in and out of specific schools, or from natural variations in gender composition by cohort) in the mean performance of their peers. There are indications, however, that mean peer performance does not tell the whole story. Angrist and Lang [2002] find that busing minority students into Boston public schools did not significantly alter the performance of white peers in the receiving schools but that the performance of minority third graders did appear to be affected. Hanushek, Rivkin, and Kain [2004] find that a higher proportion of black students has an adverse effect on the performance of black students in Texas schools. The effect of racial composition appears larger for high achieving blacks than for previously low achieving black students or whites. All peers, it would seem, are not equal. There exists evidence, in short, that the degree of similarity between a student and a set of peers may determine the magnitude of his or her response, or even the direction of that response, to peer behavior. A number of current policies derive from the assumption that adding high-performing peers to low-performing schools or classrooms will benefit low-performers, unambiguously. This may not be the case.

The Add Health dataset contains detailed information about explicit friendship networks. This provides a distinct advantage over many existing studies of social capital that rely on self-reported measures of how much trust or connectedness an individual feels toward her community. Using this data, it is possible to see the individual student's friendship network when she was in school, to examine skill-related outcomes 7 years later, and also to analyze correlations between school or grade-cohort characteristics and observed levels of social capital. This allows for a more "micro"-based approach to social capital than has been possible in cross-city, cross-state or cross-country studies. New questions may be posed, strict quantitative methods applied, and the skill acquisition decision problem addressed from an uncommon perspective.

Main empirical findings include the following: Higher social capital in middle or high school is associated with positive long-run skill-related outcomes. Being part of a more connected cohort within a given secondary or middle school is associated with higher levels of schooling attained and higher probabilities of having attended college, 7 years later. Further, being part of a more racially heterogeneous cohort within a given school is associated with significantly lower levels of social capital. The paper is organized as follows: Section I motivates the inquiry; Section II presents a model of skill acquisition; Section III describes the data; Section IV analyzes empirically the relationship between measures of social capital and measures of long run skill acquisition; Section V explores racial heterogeneity as a determinant of connectedness; and Section VI summarizes and draws conclusions.

II. CONCEPTUAL FRAMEWORK

A. A Model of Skill Acquisition Decisions

This paper focuses on education as consumption good. In the standard model, forward-looking agents acquire skills as long as the opportunity cost of lost wages is offset by the increased future wages made possible by the incremental human capital acquired. Myopic agents, in contrast, acquire skills as long as the immediate utility they derive from doing so exceeds the utility derived from some outside option (e.g., dropping out). There is evidence that adolescents are less patient than adult agents.[2] If this is the case, then immediate consumption benefits may explain effort choices in skill acquisition as well or better than projected lifetime earnings. Consider a model in which agents value both academic rewards and the social rewards of school attendance, and individuals vary in their academic and social abilities. Agents maximize:

$$
\begin{aligned}
&\mathrm{Max}_{e_a, e_s} U(A,S) \\
&\text{s.t. } e_a + e_s = 1 \\
(1) \qquad &e_a \geq 0, e_s \geq 0 \quad . \\
&A = f(e_a, \theta_a) \\
&S = g(e_s, \theta_s)
\end{aligned}
$$

A is the utility due to academic accomplishment. *S* captures utility associated with social interactions. Effort may be directed toward production of academic accomplishment, e_a, or toward the production of social rewards, e_s. Agents are heterogeneous in their ability endowments, θ_a, θ_s, and production increases with effort input ($f_{e_a} > 0, g_{e_s} > 0$). Here, θ_a and θ_s raise the agent's production for the (internally produced) commodities *A* and *S*, respectively ($f_{\theta_a} > 0, g_{\theta_s} > 0$). If there is an interior solution, the utility gained from a marginal unit of effort devoted to producing the academic consumption good must equal the marginal benefit associated with effort directed toward producing the social consumption good:

$$(2) \qquad U_A f_{e_a} = U_S g_{e_s} \ .$$

$\underline{U}$ is the utility derived from the outside option—dropping out of school and taking a low skill job. (In general, $\underline{U}$ may depend on θ_a, θ_s, as abilities and tastes for activities in school may relate to abilities and tastes in the workplace.)

[2] See Babcock [2004], Bowdoin [2002], Nurma [1991].

Figures IA and IB show the feasible consumption set and indifference curves for high-θ_s agents and high-θ_a agents respectively. The figure depicts a situation in which academic utility and social utility are perfect substitutes. (Linear utility in the figure is for simplicity of exposition.) One could imagine a change in the composition of schoolmates that altered the opportunity cost of making friends or of academic rewards. The usual assumption in peer effects literature is that high-endowment classmates make it easier for teachers to teach effectively and for low-endowment students to learn. An influx of new students with high parental education endowments (high θ_a, as a result) would raise f_{e_a} at every level of effort for their peers. (Marginal gains in academic accomplishment require less effort.) Evidence in section V will indicate that students may acquire friends more easily when the school or grade-cohort population is more homogeneous. An influx of new students that reduces homogeneity might then lower g_{e_s}, as more effort is required to make and keep friends. It is not hard to imagine both these changes occurring simultaneously, as depicted in Figure IC and ID. The marginal rate of transformation of academic utility for social utility falls. As drawn in IC, the decrease in g_{e_s}/f_{e_a} lowers total utility for the low-θ_a individual to an amount below the level of the outside option, $\underline{U}$. Low-θ_a types (who would have stayed in school initially) drop out. As drawn in Figure ID, high-θ_a types who initially would have dropped out experience an increase in utility and stay in school.[3]

It is possible to draw the production sets so that these outcomes do not obtain. Stronger assumptions on functional forms are needed to generate the effect unambiguously. If $c_1\theta_a$ and $c_2\theta_s$ are the constant marginal products f' and g', respectively, then the production set of internally produced commodities is nonconvex and agents will specialize (in the case that utility is linear).

[3] One could argue that having higher social ability raises rewards both at school and in the workplace (i.e., that $\underline{U}$ varies positively with θ_s). An agent with high social ability would not necessarily then be more likely to stay in school. However, any exogenous change that made the individual more productive at acquiring friends in school while leaving unchanged the individual's capacity to acquire friends out of school would increase the likelihood that the individual stayed in school. It is institutional changes of this type that motivate the model and the empirical investigation.

Here c_1 and c_2 are meant to be suggestive of institutional factors that influence the ease with which academic and social utility are produced. In Figure IE and IF, $f= e_a c_1 \theta_a + d_1$ and $g= e_s c_2 \theta_s + d_2$. Because the starting point is an all-social utility corner solution in Figure IE, a marginal increase in c_1 (which increases the marginal product of effort for academic utility), will not cause substitution into academic effort and will not increase utility, whereas a marginal decrease in c_2 (which decreases the marginal product of effort for social utility) will reduce utility, unambiguously. High-θ_s, low-θ_a types, in this example, are made worse off when c_1 rises and c_2 falls, while high-θ_a, low-θ_s types (Figure IF) are made better off. The assumptions used in this example would seem rather strong; however, linear utility and constant marginal products were not strictly necessary. More generally, non-convexity of the production possibility set may lead to specialization by some agents, if there is strong substitutability between *A* and *S*.[4]

B. Stylized Predictions

My measure of *S* will be the number of friends the individual nominates (or is nominated by.) If production of *S* rises, holding *A* constant, utility stays the same or rises. (This holds for convex or non-convex production sets). If utility rises then the probability that the individual stays in school also rises.[5] Several stylized predictions, suggested by the modeling exercise, can be taken to the data:

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[4] It is also possible that *A* and *S* could be complements. Academic accomplishment could make one popular. Social accomplishment could boost academic achievement by giving the agent friends from whom to receive tutoring. But because time must ultimately be divided between social and academic activities, and because of the large body of sociological evidence on identity and social groups in school settings, the account here will emphasize results that obtain if *A* and *S* are substitutes. Sociological evidence would seem to imply that agents face a choice between defining themselves as academic utility producers and social utility producers, as peers impose punishments for effort choices that deviate from group norms associated with these types. See Akerlof and Kranton [2002] for a summary of this evidence.

[5] This assumes that observed *S* is not positively correlated with the value of the outside option. If a high observed *S* indicates that an indivdual forms friendships easily, then this could indicate the individual would derive high utility from low-skilled work, as well (social interactions being a component of most work settings) and raise the value of the outside option. I assume here that the marginal beneft of increased social ability in school (where the agent would typically be exposed to hundreds of potential friends, long periods of time devoted solely to socializing, dances, proms, athletic events, and numerous clubs and organizations) is larger than in a low-skill job.

1) Agents with higher *S* will stay in school longer (controlling for *A*). In addition, if "seat time" confers benefits or skills independent of academic performance, these agents should have labor market outcomes indicative of higher skill.[6]

2) If greater connectedness in an institution increases g_{e_s} (i.e., reduces the effort required to produce social utility), then agents in connected institutions should stay in school longer.[7]

3) If there is specialization, production of *S* will generally determine the utility of low-θ_a types. Factors that hinder the production of *A* will not generally alter utility or influence the decision to stay in school. (This prediction is more fragile, as described above.)

III. DATA

A. Overview

The Add Health survey, conducted by the Carolina Population Center from 1994 to 2002, consists of data on adolescents in 132 schools across the country, grades 7-12. The in-school portion of the Wave 1 survey, conducted in 1994-1995, contains cross-section data on about 90,000 adolescents. Also, school administrators filled out questionnaires describing characteristics and policies of the schools in the sample. A subset of the initial sample, about 20,000 subjects, was selected for the in-home portion of Wave I. This second and more extensive set of interviews with students and parents took place in 1994-1995. The Carolina Population Center interviewed the in-home subjects again in 1995-1996 (Wave II), and again in 2001-2002

[6] Empirical work by Bowles, Gintis, and Osbourne (2001) suggests that schooling may indeed confer skills valued by the labor market that are not explained by measures of academic performance or cognitive skill.
[7] Some agents in some situations—those occupying an all academic effort corner solution—are unaffected. The prediction applies to agents at an interior optimum or an all social-effort corner solution.

(Wave III). When appropriate weights and cluster coefficients are used, regressions on data from each of the surveys, or from merged samples, yield results representative of the U.S. population.[8] Wave III measures of skill acquisition include years of schooling, college attendance and labor force participation about 7 years after the original Wave I surveys. These will be the dependent variables in the regressions that follow.

The most interesting aspect of the Add Health Survey, for the purpose at hand, is the data on friendship networks. Respondents in the in-school survey nominated up to 10 friends from the school roster, 5 male and 5 female.[9] The analysis here will be limited to the 113 schools in which at least 50% of the total student population filled out in-school questionnaires. For most of these schools, 75% or more of the entire student population filled out questionnaires. Thus, it is possible to see the general size and structure of friendship networks in these institutions. Figure II depicts as a directed graph the friendship network for one such school. UCInet and Netdraw were used to create this diagram. Netdraw adjusts the shape of the diagram so that the physical distance between the nodes, as displayed, rises with the number of links on the shortest path between the nodes. Nodes far apart on the graph tend to have higher degrees of separation. Clustering of nodes in the diagram, then, indicates clustering in the network. In Figure II, the colors represent different races. The startling feature of this graph is the extreme clustering of connections along racial lines. Very few links connect members of different racial enclaves. Though this is an extreme case, it offers a first hint that mean responses to mean peer performance could be misleading.

[8] In the following calculations, observations are weighted and errors are clustered at the school level—as recommended by designers of the Add Health survey. See Chantala and Tabor, 1999.
[9] Some nominees were from a sister school. All school connectedness measures were constructed from same school nominations only.

B. Connectedness

The argument presented in section 2 was that connectedness lowers the effort cost of acquiring skill. It is in this sense that the connectedness of an individual to a set of peers at an educational institution is viewed as "capital." Sociologists have constructed numerous measures of network centrality and connectedness. I focus here on the simplest. An agent's social capital is the number of friends she has. Three different measures will be used. The in-degree of a student is the number of friendship nominations she received from other students in the school. In Figure II, a student's in-degree is visible as the number of arrows pointed toward her node. A student's out-degree is the number of students she nominated as friends. This is the number of arrows from her node to other nodes. The size of the student's send-receive network is the number of friends to whom she is connected by nominations in either direction.[10]

Table I shows descriptive statistics of measures that will be used as right-hand variables in regressions of long-run skill on social capital. The mean size of the send-receive network for all students in the sample is 7.007 friends. The third column indicates that in an average school, the mean number of friends per student is 7.941. The lower portion of Table I contains measures from the Add Health dataset that will be used as control variables. Covariates at the individual level include age, sex, parental education, parental income, and score on the Add Health vocabulary test. Recent work by Alesina and LaFerrara [2003] and others motivates a focus on measures of heterogeneity in discussions of connectedness, in particular racial heterogeneity at the school level. The heterogeneity variable used here is a Herfindahl index subtracted from 1:

(3) $$Het_S = 1 - \sum r_i^2$$

[10] Note that this not the sum of the in-degree and out-degree. Some nominated friends (specifically, those who reciprocate) are in both sets. Here, unlike the designer's of the Add Health survey, I choose not to include the student herself when denoting the size of the send-receive network. The size of the send-receive network is used in this paper as a measure of social capital—an input to the skill production process. A student's automatic friendship with herself would not seem relevant to skill production.

where r_i is the fraction of the population of race i and the racial categories are White, Black, Asian, American Indian, and Hispanic. Covariates at the school level also include average parental education, school size, class size, PTA participation rates, teacher characteristics, standard deviation of parental education, and a breakdown of the school's population by race. Covariates at the county level include racial heterogeneity (a Herfindahl index, as for schools), median income, standard deviation of income, crime rate, and a breakdown of population proportions by race. State minimum wage may be a measure of the attractiveness of the outside option (dropping out of school) and has been included as well.

IV. SOCIAL CAPITAL AND LONG-RUN OUTCOMES

A. School-Level Results

Is connectedness correlated with skill acquisition? Table II displays findings from a regression of long-run skill related outcomes on social capital and covariates. I use the size of the send receive network as the measure of social capital in this and subsequent regressions. (When In-degree or Out-degree is used, results are very similar). Results from OLS and Probit regressions of years of schooling, college participation and labor force participation[11] on social capital and controls appear in columns 1, 2 and 3 of Table II. Estimates of the coefficient on social capital are positive. Other coefficients have the expected signs; higher family income leads to higher skill-related outcomes, as do higher parental education and higher scores on the Add Health vocabulary test.

It could be that a person who reports having numerous friends defines friendship in a less restrictive way than does a person who reports few friends. The willingness to nominate friends could be associated with advantageous personal traits such as optimism and confidence. These traits may drive the observed correlation with measures of long-run skill. To test for this, I ran the

[11] Some respondents were still in school at the time of the Wave III surveys. Labor force participation regressions include only those repondents who were not still in school at the time of the Wave III surveys.

regressions using In-degree—the number of friendship nominations received—as the dependent variable. The results were qualitatively very similar—a strong indication that subjective definitions of friendship do not drive the correlation.

It might still be the case, however, that innately gregarious or charismatic individuals experience long-run outcomes indicative of higher skills because social ability is, itself, an important skill. These agents could value education more because of enjoyment derived from interacting with teachers, or they could foresee greater benefits to high effort choices. In order to disentangle the effects of individual social ability from the influence of connectedness on individuals, I will use school-level connectedness as an instrument for individual connectedness. Individuals attending a friendlier institution may be more apt to form friendships, regardless of their gregariousness or charisma.

Consider a school with n students. The measure of school connectedness for individual i is

$$S_i = \frac{\sum_{j \neq i, k \neq i} X_{j,k}}{10(n-1)}, \tag{4}$$

where X is an n X n matrix, $X_{j,k}=1$ if j nominated k as a friend and 0 otherwise. The numerator contains the actual number of links in the network minus the number of links to or from node i. Because students may nominate a maximum of 10 friends, the maximum number of links in the network is $10n$. If we imagine removing one student from the network, the maximum number of links would be $10(n\text{-}1)$.[12] S_i, then, measures the connectedness of the network, absent i's links.[13]

[12] The maximum of 10 allowed friendship nominations was not so low as to make the data uninformative. Only about 13% of the respondents nominated 10 friends. For the vast majority of respondents, the restriction did not bind.

[13] One could argue that S may be biased toward large schools. Agents attending large schools, having more friends from which to choose, might be expected to have more friends, on average. I have included school

At the bottom of Table II, we see from the first stage regression results that connectedness of the school is highly correlated with individual social capital. The validity of the instrument relies on an assumption that friendliness varies exogenously between schools, that divergent school policies or some set of historical accidents created variance in friendliness across institutions. Families select into schools, of course, so it is possible that selection undermines this assumption. It could be the case that parents of gregarious types select into friendly schools. But parents of antisocial types would seem to have as much or more to gain from choosing friendly schools to compensate for the social difficulties their children suffer.

When school-level connectedness instruments for individual social capital (columns 4,5,6) coefficients rise and remain significant in all three regressions. If friendship nominations are a noisy measure of social capital, and if the instrument is correlated with the informative portion of the measure but not with the noise, then one would expect IV coefficients to be larger than OLS coefficients, as here. The mean population-weighted marginal effect of connectedness on the probability of attending college appears in brackets in columns 5 and 6. For the IV regression, 1 additional friend is associated with a 3.2 percentage point increase in the probability of attending college. Because the standard deviation of number of friends is 4.4, this means that a 1-standard deviation change in the number of friends would be associated (in the IV specification) with a mean increase of 14.1 percentage points in the probability of college attendance. Similarly, it would equate to a mean increase of .65 years in attained schooling, and an increase of 6.6 percentage points in the probability of being employed, conditional on not being in school. These effects, if causal, would seem large enough to be of interest to policy makers.

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size in the regressions that follow to account for this possibility. Moreover, the data will indicate that students in large schools appear not to have more friends than students from small schools. (See Table VI).

B. Robustness Tests and Distance

The Add Health network data pertains to schools. It does not contain characterizations of neighborhood friendship networks. It could be that school friends and neighborhood friends are not identical. If neighborhood characteristics influencing long-run outcomes are correlated with an individual's propensity to form neighborhood ties (as opposed to school friendship ties), then the coefficient on school friends in Table II could be biased upwards. A story about disadvantaged students being bused to distant schools captures the intuition. If disadvantaged students make fewer friends at school because they live far away from their schoolmates, then the number of school friends could be proxying for unobserved disadvantage in the regressions of Table II.

The Add Health data contain information on spatial relationships between respondents. Figure III shows the relative locations of residences for students attending School 77. From this data, I computed the average distance between each student and all of her schoolmates. If distance captures in part the student's propensity to form in-school friendships as opposed to neighborhood ties, and if there exists a systematic correlation between distance and disadvantage, then including distance in the regressions should pull down the coefficient on school friends. Table II regressions already include this distance measure, and it is not statistically significant in the IV regressions.

But one could go further. In Table III, Panel C, the sample has been restricted to students who live close to their classmates (average distance < 6 km). This could help reduce the possible correlation between unobserved neighborhood factors and the number of school friends. If your schoolmates live in your neighborhood, and your neighborhood friends attend your school, then there is little reason to worry about the difference between school and neighborhood friends. Panel C indicates that the correlation between the number of school friends and high-skill outcomes remains positive and significant. There is no evidence for the busing story here.

C. Grade Cohorts

The last and perhaps most convincing set of long-run outcome regressions is reported in Table IV. These regressions include school dummy variables. Thus, the coefficient on social capital is the result of within-school variation between students. In columns 4, 5, and 6, I use grade-cohort connectedness as the instrument instead of school connectedness (the latter having been captured by the school dummy).[14] Though the effect of connectedness on employment goes away in this specification, the positive correlation between connectedness and education outcomes persists. Having been part of more connected grade cohort within a given school is associated with higher levels of schooling attainment and greater probabilities of attending college in the long run. This would seem to rule out school and neighborhood specific unobservables (though not grade-specific unobservables) as the source of correlation between connectedness and observed education outcomes.

The first prediction from Section II appears to hold: More connected individuals (whose production of social utility is presumed higher) stay in school longer. How robust are the results to remaining sources of endogeneity?

An obvious concern is the validity of the instrument. If connectedness of the institution or of the grade cohort influences college attendance in some direct way and not exclusively through the connectedness of the individual, then the instrument is not valid. The individual may, for example, derive greater utility from attending a more connected institution, even if the individual does not acquire more friends herself. If this were the case, it would be appropriate to regress the outcome variables directly on the instrument (school or grade-cohort connectedness), and to

[14] The grade cohort connectedness measure used in these regressions is the average number of links to or from agents in *i*'s grade (other than *i*). As an alternative measure, one could count only the links for which both parties, the nominee and the nominater, were in *i*'s grade cohort, therby ignoring all between-grade friendships. The coefficient on social captial is not statistically significant in this alternative specification. This may suggest that links between grades are useful and important—a non-negligible component of connectedness.

remain agnostic on exactly how connectedness of the institution influences individual outcomes. As expected, given the tight fit in the first stage regression, this second approach yields results very similar to what has been presented. Regressions of long-run outcomes directly on the instruments support the second prediction in Section II: that because connectedness lowers the effort required to produce social utility, agents in connected institutions or cohorts will attend school longer and acquire more skill. Thus, even if the instrument is not valid, a main result survives: Cohort connectedness appears to influence skill acquisition (either through the individual's friendship ties or through some other unspecified channel).

A second concern is that a friendly agent may influence the friend-making behavior of the grade cohort. Agent *i*'s friendliness may cause others in her school or cohort to form more friendships with third parties. If this were the case then *i*'s social capital would explain, in part, the behavior that is presumed to explain *i*'s social capital.[15] Individual charisma could then be driving the correlation between grade cohort connectedness and long-run skill acquisition. In order to account for this possibility, I excluded small schools from the sample. If there are only 3 students in *i*'s school then *i*'s charisma could plausibly influence the average number of friendships *i*'s schoolmates form with third parties. If there are hundreds of students in *i*'s school, then it would seem less plausible that *i*'s friendliness influences significantly the number of ties between *i*'s schoolmates and third parties. Results were robust to the exclusion of small schools and schools with small grade cohorts. Moreover, the coefficient on social capital did not fall as small schools were excluded. Results in Tables II, III, and IV derive from samples that excluded schools with less than 50 students.

A third concern is that connectedness might be a proxy for peer quality. If more connected grade cohorts contain unobservably "better" peers, then the higher observed college attendance in connected cohorts might be the result of students having had better peers to learn from or imitate. Peer effects would then have been confounded with the hypothesized mechanism

[15] This is the "reflection problem," as formalized in Manski (1993).

(a decrease in the cost of producing social rewards in the education setting.) The regressions above include some peer characteristics as covariates (e.g., mean peer parental education at the school-grade level) [16], but there may be peer unobservables that differ across grade cohorts. I address this concern in detail in the next subsection.

D. Academic vs. Social Rewards

To separate peer effects from the effects of connectedness, I explore a setting in which the two effects would work in opposite directions. If the results in Table IV are driven by peer effects, one would predict that having more low-performing peers would be worse than having fewer low-performing peers. If it is the **ability** of peers that drives skill acquisition outcomes, rather than the **quantity**, then having more "bad" peers (a larger number of bad examples to imitate) would lower academic performance and skill-related outcomes. If, on the other hand, connectedness to one's schoolmates drives skill acquisition outcomes, then having more peers (even "bad" ones) raises social utility relative to the outside option and keeps one in school.[17]

Panel A of Table V restricts the Wave III sample to respondents whose nominated friends had an average GPA lower than the school's average GPA. These students, then, had low-performing peers. Column 1 indicates that having more friends of this type was associated with having earned a lower GPA. This would be the expected peer effect (or the result of selection by low-effort types into low-performing peer groups, as described below.) Panel B, Column 1 indicates that if one's peers were high academic performers, having more peers increased one's own academic performance (or was a stronger indicator that one was a high performer to begin with).

[16] Findings are also robust to the inclusion of a grade-cohort peer GPA covariate.
[17] For the above interpretation to hold, it would need to be the case that social ability had a relatively minor effect on utility in the workplace, but a large effect on utility in school.

Panel A, Columns 2 and 3, flesh out the story in a provocative way. Even if one's peers are low performers, having more of them is strongly associated with a higher probability of finishing high school and going on to college. The result obtains in spite of the significant negative effect on GPA. (The same story holds when the dependent variable is years of education.) There would seem to be more than one set of motivations for staying in school. In the model of section II, students derive utility from internally produced social rewards. These raise the utility of education as consumption good, relative to the outside option, and increase the likelihood that the agent will continue on in school. The peer effect exerts a downward pressure on GPA, but increased utility associated with social rewards leads to higher levels of skill acquisition. The evidence would suggest that connectedness dominates the peer effect.

Moreover, it is likely that the peer effect is smaller in magnitude than might be inferred from Table V. Low-performing students select low-performing friends. Having more low-performing friends is then a stronger indicator that one was a low performer to begin with. Despite the effects of selection, students with more low-performing friends stay in school longer. Evidence suggests that the effects of connectedness dominate **both** the peer effect and the selection effect. The results in Table V do not seem consistent with the notion that connectedness is a proxy for peer quality.

This section also tests the third prediction of Section II: Factors that hinder the production of academic rewards but facilitate the production of social rewards will not generally influence the decision to stay in school for types with low academic ability. The intuition is that agents with low academic ability would have been consuming more social rewards and fewer academic rewards in the first place. Thus, an increase in the effort cost of academic rewards does little harm, whereas a decrease in the effort cost of social rewards benefits them. The starkest example involves specialization. If agents specialize in the type of rewards they produce (if, say, they define themselves as social reward producers—members of an "in crowd"—or as academic reward producers—"nerds"[18], then the all-social-rewards corner solution will contain those agents endowed with low academic ability relative to their social ability, as depicted in Figure IE. Low-performers who specialize derive no utility from academic rewards. If they choose to stay in school, they do so for other reasons. In spite of lower GPAs, agents with more low-performing friends consume more education, because social rewards are the dominant component of utility for low-performers. The pattern of empirical results in Table V, though somewhat counterintuitive, is consistent with the model.

V. DETERMINANTS OF SOCIAL CAPITAL

A. Connectedness and Heterogeneity

Connectedness appears to be associated with skill acquisition. What institutional factors, then, are associated with higher or lower levels of connectedness? Much recent work suggests that heterogeneity influences connectedness. Glaeser, Laibson, Scheinkman, and Soutter [2000] offer evidence from experiments using Harvard undergraduates that racial differences reduce trust and trustworthy behavior in games that yield a social surplus for cooperation. The same relationship has been documented in adult communities. Numerous researchers, including Poterba [1997], Alesina, Baquir, and Easterly [1999], and Goldin and Katz [1999] find racial heterogeneity to be associated with lower provision of public goods. Empirical work by Alesina and La Ferrara [2002] indicates that levels of trust and cooperation in U.S. communities are highest in racially homogeneous neighborhoods. Robert Putnam has reached similar conclusions. The evidence, however, derives mainly from cross-region and cross-country studies. Skeptics suggest that unobserved region or country-specific factors have been confounded with ethnolinguistic fractionalization. Are the findings robust to micro-level analysis? And do apparent

[18] The language here is taken from Akerlof and Kranton (2002). The authors posit a model in which students choose to define themselves as "nerds," "burnouts," or members of the "in crowd" to maximize utility based on their endowments.

findings about connectedness in racially homogeneous communities generalize to the realm of adolescence and early skill acquisition?

Results from OLS regressions of individual social capital on individual, school, and neighborhood covariates appear in Table VI. Because the dependent variable is not a Wave III long-run outcome variable, these regressions take advantage of the larger Wave I In-school sample. What is striking about the regressions is that regardless of the measure used, school heterogeneity is negatively correlated with connectedness at high levels of significance.[19] After school level heterogeneity has been taken into account, however, increased county level heterogeneity appears to be associated with marginally higher connectedness. In addition, a high concentration of males and high crime levels are bad for connectedness, it would seem, whereas high parental education is associated with increased connectedness. Interestingly, school racial heterogeneity appears not to be a proxy for parental endowment heterogeneity or social class heterogeneity. Standard deviation of parental education (at the school level) appears to be positively correlated with individual social capital.[20]

Figure IV shows a scatterplot of average social capital and school racial heterogeneity. The measure used is the total number of friends (i.e., the size of the send and receive network). The pattern shown in the regressions is clearly visible in the raw data. To contrast different types of schools close up, compare the directed graphs in Figures II and V. School 77 in Figure II—high in heterogeneity and low in connectedness—resides in the lower right portion of the scatterplot in Figure IV, whereas school 146 in Figure V is from the upper left portion. School 77, with a heterogeneity index of .68, is more diverse than school 146, at .37. The number of friends

[19] The negative correlation between heterogeniety and connectedness also appears in the Wave III sample. But because the Wave III sample is much smaller, the coefficient is imprecisely estimated. Thus, heterogeneity was not included as an instrument in the earlier regressions of long-run outcomes on connectedness because of problems associated with weak instruments.

[20] The positive correlation is not robust to the school fixed effects specification that follows (in Table VIII). Standard deviation of parental education at the grade level, within school, is not significantly correlated with individual social capital. Neither table would seem to contain evidence that heterogeneity of race is a proxy for heterogeneity of parental endowment in these regressions.

per student in school 77 is 4.87, whereas in school 146, students have an average of 7.16 friends each, nearly 50% higher.

Homogeneity is associated with connectedness, but how robust is this association? It may be that different subgroups respond in different ways to heterogeneity. Table VII displays regression results for various subsamples of the population. When the sample is restricted to blacks, the negative correlation between heterogeneity and social capital persists; for whites, the coefficient remains negative, but is imprecisely estimated. The negative correlation persists for the sample respondents with low parental education. Interestingly, when the sample is restricted to students whose racial group constitutes a minority (<20%) of their school population, the coefficient remains negative, though imprecise. But neighborhood effects may drive the results above. Unobservably advantaged families may select into homogeneous schools.

The most convincing set of regressions is summarized in Table VIII. To account for neighborhood effects, I include school dummies in the regressions of Table VIII and analyze social capital as a function of racial heterogeneity at the grade level. Grade cohort racial heterogeneity is negatively correlated with connectedness at significant levels for all measures. Being part of a more racially heterogeneous grade cohort within a given school is associated with having significantly fewer friends.

In summary, the relationship between racial heterogeneity and low levels of social capital observed in cross-country and cross-region studies extends to the realm of early skill acquisition. In many existing studies, it is difficult discern whether unobserved characteristics at the country or regional level have been confounded with racial heterogeneity. Studies based on cross-region and cross-country variation in racial heterogeneity would seem more susceptible to criticisms this type than would a study based on within-school variation in racial heterogeneity between grade cohorts. The analysis here attacks the problem at a much lower level of aggregation. As such, it may have advantages.

B. Magnet Schools

Magnet schools were intended, in part, to attract advantaged students to schools in disadvantaged areas so that positive peer effects would benefit disadvantaged students. The consequences with respect to connectedness may not have been fully appreciated. Anecdotal accounts indicate that advantaged students in magnet schools often do not mingle with disadvantaged students. Is there systematic evidence of lower connectedness at magnet schools?

Fifteen magnet schools were surveyed in the Add Health sample. Table IX shows the mean level of social capital in magnet schools to be almost a standard deviation lower than in non-magnet schools. There is some evidence, then, of systematic disconnectedness in magnet schools.

The model of specialization in section II suggests that for disadvantaged students, the cost of making connections may be a crucial component of the education consumption decision, offsetting benefits associated with advantaged peers. It is possible that programs designed to raise skill acquisition outcomes by grouping students heterogeneously may have unintended consequences. The evidence here, though not conclusive, is suggestive of limits to the benefits that can be extracted by shuffling students around. Ultimately, there may be no good substitutes for improving the schools disadvantaged students attend.

More generally, it could be the case that women's colleges, black colleges, and other institutions that appeal to individuals with common cultural bonds may generate positive outcomes by harnessing connectedness.

VI. SUMMARY AND CONCLUSION

The evidence indicates that long-run skill acquisition increases with social capital. Years of schooling, college attendance, and labor force participation are found to be positively correlated with an individual's social capital, 7 years earlier. The correlation between college attendance and connectedness persists when cohort connectedness is used as an instrument for individual connectedness and when school-level fixed effects are included. Being part of a more connected cohort within a given secondary or middle school is associated with higher levels of schooling attained and higher probabilities of attending college. In addition, being part of a more racially heterogeneous cohort within a given school is associated with having significantly fewer links to and from schoolmates.

A research agenda that focuses on test scores and peer effects may lead policy makers to overlook the effects of connectedness on skill investment decisions, effects that may be quite large. Evidence in section V showed that connectedness varies with school or grade cohort heterogeneity. The evidence is consistent with a growing body of research on heterogeneity in adult communities. This is not to suggest that people cannot learn to cooperate within diverse populations over the long haul, but it does suggest there may be hidden costs in the short to medium run. These costs may be worth knowing, so that they may be balanced against the clear, long-run benefits of greater diversity—or so that institutions and policies that promote connectedness may be developed and tested.

Collection and analysis of network data in a controlled setting (with random school or classroom assignment) may be warranted. More generally, it is possible that the collection of network-type data in college or labor market settings, and the subsequent application of the economist’s statistical toolkit to this data, could yield new and useful insights. These are subjects for future research.

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Table I
Descriptive Statistics

	By Indiv		By School	
	mean	st. dev	mean	st. dev
Send/Receive	7.01	4.38	7.94	2.10
Out Degree	4.36	3.05	5.11	1.59
In Degree	4.38	3.70	5.11	1.59
Age	14.86	1.78	14.09	1.24
Parental Ed	13.01	2.37	12.97	.82
Parental Incom (1000s)	35.84	44.62	32.67	12.40
AH Vocab Test	97.62	25.52	97.82	8.04
Distance (ave. km, peers)	7.12	6.54	7.65	4.99
White	.57	.50	.63	.29
Black	.20	.40	.17	.27
Asian	.04	.19	.02	.05
Amer. Ind.	.04	.19	.05	.04
Hisp	.12	.33	.09	.13
Male	.51	.50	.49	.05
Het. Race (sch)	.39	.19	.33	.19
Par. Ed. (sch)	12.96	.81	12.97	.82
Std. Dev. Par. Ed. (sch)	2.23	.26	2.15	0.35
Class size(sch)	25.48	5.04	22.56	6.69
Size (sch)	994.60	747.89	423.89	489.69
% Teachers M.A.(sch)	9.91	14.73	9.24	11.32
% New Teachers(sch)	50.93	24.97	41.75	24.66
% PTA Part.(sch)	23.45	22.25	25.87	21.76
Juv. Crime (per 100K, cnty)	341.52	171.96	285.05	207.29
Het. Race (cnty)	.29	.18	.24	.19
Med. Income (cnty: in 1000s)	29.22	7.85	27.15	7.74
Std. Dev. Income (cnty)	2.90	5.34	26.96	5.58
Min Wage (state)	4.28	.16	4.27	.11
Crime Rate (per k, state)	51.54	11.16	49.41	11.00

Covariates also include grade dummies.

Table II
Social Capital and Long Run Outcomes

	Dependent Variable:					
	Yrs Schooling (OLS)	College (Probit)	Employed (Probit)	Yrs Schooling (IV)	College (IV-Probit)	Employed (IV-Probit)
	1	2	3	4	5	6
Social Capital(friends)	.0599***	.046***	.0192***	.148***	.102***	.0510*
	(.00533)	(.00452)	(.00691)	(.0339)	(.0282)	(.027)
		[.014]	[.0056]		[.032]	[.015]
Family Income: 1000s	.00265***	.00492***	.00073	.00203***	.00466***	.000583
	(.000767)	(.00118)	(.00089)	(.000756)	(.00129)	(.000910)
Parental Ed	.153***	.119***	.0101	.138***	.108***	.00501
	(.013)	(.0103)	(.0136)	(.0146)	(.0122)	(.0141)
AH Vocab	.0236***	.0197***	.0046**	.0217***	.0182***	.00414**
	(.00158)	(.00162)	(.00177)	(.00179)	(.00173)	(.00177)
Distance (ave. km., peers)	-.00251	-.0052*	-.00128	-.001	-.00403	-.000654
	(.00396)	(.00291)	(.00351)	(.00415)	(.00301)	(.00341)
Het(sch)	-.318	-.157	-.278	-.208	-.0788	-.229
	(.247)	(.203)	(.182)	(.24)	(.201)	(.19)
Ave. Class Size(sch)	-.00878	-.00907	-.00488	-.00544	-.00706	-.00387
	(.00812)	(.00642)	(.00663)	(.00744)	(.00615)	(.00671)
School Size(100s)	.000309	-.0046	.00186	.00199	-.00358	.0026
	(.00685)	(.00539)	(.00459)	(.00691)	(.00531)	(.0047)
Income: 1000s (cnty)	-.0103	-.0144**	.0228***	-.0142*	-.0172**	.0212**
	(.00811)	(.00726)	(.00844)	(.00824)	(.0075)	(.00883)
Het(cnty)	-.33	-.176	.0358	-.359	-.199	.0192
	(.328)	(.332)	(.276)	(.333)	(.324)	(.271)
Min wage(state)	.223	-.0106	.0589	.223	-.0181	.0604
	(.165)	(.156)	(.176)	(.17)	(.165)	(.173)
Obs	10090	10090	7098	10090	10090	7098
					First Stage (Dep. Var. : Social Capital)	
Network Density (sch)		NA		12.81***	12.81***	12.05***
				(.707)	(.707)	(.770)

Standard errors in parentheses. Weighted population mean of marginal effects in brackets.
* significant at 10%; ** significant at 5%; *** significant at 1%

Table III
Social Capital and Long Run Outcomes
(Distance Checks)

	(Dep Var: Yrs Schl)		**(Dep Var: College)**		**(Dep Var: Employed)**	
Specification:	SoCap (Probit)	SoCap (IV-Probit)	SoCap (Probit)	SoCap (IV-Probit)	SoCap (Probit)	SoCap (IV-Probit)
A. With Distance (Baseline)	.0599***	.046***	.0192***	.148***	.102***	.0509*
	(.00533)	(.00452)	(.00691)	(.0339)	(.0282)	(.0264)
B. No Distance	.0600***	.145***	.0461***	.101***	.0192***	.0545**
	(.00533)	(.0347)	(.00453)	(.0281)	(.00695)	(.0272)
C. Distance<6 km	.0512***	.195***	.0357***	.0908**	.0239***	.135***
	(.00835)	(.0494)	(.00693)	(.0416)	(.00862)	(.032)

Standard errors in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%

Social Capital and Long Run Outcomes (School Fixed Effects)

	Dependent Variable:					
	Yrs Schooling (OLS)	College (Probit)	Employed (Probit)	Yrs Schooling (IV)	College (IV-Probit)	Employed (IV-Probit)
	1	2	3	4	5	6
Social Capital(friends)	.0561***	.0452***	.0175**	.195***	.0896**	-.00172
	(.00563)	(.00463)	(.00749)	(.0428)	(.0432)	(.0553)
		[.013]	[.0052]		[.027]	[-.00048]
Family Income: 1000s	.00283***	.00529***	.00094	.00193**	.0051***	.001
	(.000762)	(.00126)	(.000909)	(.00076)	(.00137)	(.000925)
Parental Ed	.153***	.122***	.0095	.133***	.113***	.0121
	(.0127)	(.0109)	(.0141)	(.0138)	(.0136)	(.0155)
AH Vocab	.0227***	.0197***	.00471**	.0201***	.0184***	.00509***
	(.00162)	(.00169)	(.00189)	(.00196)	(.00193)	(.00188)
Distance (ave. km., peers)	-.00668*	-.00943***	-.00141	-.00244	-.00779**	-.002
	(.00399)	(.00332)	(.00414)	(.00439)	(.00344)	(.00425)
Het(grade)	-.119	.21	.405	-.276	-.000225	-.515
	(.487)	(.418)	(.535)	(.694)	(.628)	(.667)
Grade Size	-.000606	-.00156*	.000647	-.000511	-.00121*	.00049
	(.00103)	(.000816)	(.000579)	(.000801)	(.000735)	(.00058)
Obs	10090	10090	7098	10090	10090	7098
					First Stage (Dep. Var. : Social Capital)	
Network Density (grade cohort)		NA		.514***	.514***	.499***
				(.059)	(.059)	(.062)

Standard errors in parentheses. Weighted population mean of marginal effects in brackets. Covariates include grade-level analogs of school-level variables in Table I, except for %Teachers M.A., %New Teachers, %PTA participation. (Teacher and PTA participation measures were available at the school level only.)

Table V
Social Capital, GPA, and Education Attainment

	Dependent Variable:		
	GPA (OLS) 1	Grad HS (Probit) 2	College (Probit) 2
A. Ave. GPA (Peers) < Ave. GPA (School)			
Socap	-.0104***	**.0356*****	**.0223*****
	(.0039)	(.00974)	(.00763)
Ave. GPA (Peers)	.595***	.271**	-.100
	(.0481)	(.113)	(.13)
Obs	2955	2955	2955
B. Ave. GPA (Peers) > Ave. GPA (School)			
Socap	.0258***	.0342***	.0458***
	(.00357)	(.0128)	(.00834)
Ave. GPA (Peers)	.753***	.27*	.00576
	(.0536)	(.145)	(.135)
Obs	3378	3378	3378

Standard errors in parentheses. Weighted pop. mean of marginal effects in brackets.
Regressors include the full set of covariates in Table 1.

* significant at 10%; ** significant at 5%; *** significant at 1%

Table VI
Determinants of Social Capital

	Dependent Var:		
	Send/Rec	Out	In
Het. Race (sch)	-1.66**	-1.21***	-1.13**
	(.735)	(.462)	(.469)
Prop. Black (sch)	-1.62***	-.959***	-1.16***
	(.488)	(.311)	(.306)
Prop. Asian(sch)	-2.61	-1.68	-2.15*
	(1.99)	(1.31)	(1.27)
Prop. Amer. Indian (sch)	-.0698	.113	.107
	(1.44)	(.92)	(.885)
Prop. Hisp (sch)	-.166*	-.0977	-.0841
	(.0986)	(.065)	(.0663)
Prop. Male (sch)	-6.69***	-3.92***	-4.21***
	(1.04)	(.68)	(.656)
Size (sch: in 1000s)	-.0149	-.0128	-.0184
	(.0177)	(.0113)	(.0112)
Ave. Parental Ed. (school)	.0581	.0525	.0146
	(.162)	(.106)	(.107)
Std. Dev. Parental Ed. (school)	1**	.682**	.726**
	(.487)	(.308)	(.303)
Het. Race (cnty)	1.31	1.02	.969
	(1.14)	(.724)	(.727)
Med. Income (cnty: in 1000s)	.0084	.00546	.00868
	(.0297)	(.0188)	(.019)
Std. Dev. Income (cnty)	-.0863*	-.0454	-.0507*
	(.0466)	(.0295)	(.0296)
Juv. Crime (cnty:per 1000)	-.168**	-.108**	-.106**
	(.066)	(.0418)	(.0419)
Parental. Education (ind)	.166***	.0865***	.144***
	(.0147)	(.00852)	(.0131)
Black (ind)	-.607***	-.681***	-.435***
	(.128)	(.0778)	(.0873)
Asian(ind)	-.492***	-.379***	-.266**
	(.138)	(.0936)	(.103)
Amer Indian (ind)	-.549***	-.372***	-.552***
	(.107)	(.084)	(.0841)
Hispanic(ind)	-.268**	-.371***	-.154*
	(.119)	(.0844)	(.08)
Male(ind)	-.335***	-.482***	-.33***
	(.0504)	(.0465)	(.041)
	66233	66233	66233
Obs	66233	66233	66233

Standard errors in parentheses. Regressions include the full set of covariates from Table 1
* significant at 10%; ** significant at 5%; *** significant at 1%

Table VII
Determinants of Social Capital: Grouped by Demographic and School Characteristics

Dependent Var: Social Capital (Send/Receive)	Het. Race (sch)	Prop. Black (sch)	Prop. Asian (sch)	Prop. Hispanic (sch)	Par. Ed. (sch)	Med. Income (cnty)	Std. Dv. Income (cnty)
A. All	-1.66**	-1.62***	-2.61	-.166*	.0581	.0084	-.0863*
(Obs = 66233)	(.735)	(.488)	(1.99)	(.0986)	(.162)	(.0297)	(.0466)
B. Blacks	-3.26***	-1.4**	3.58	-.108	.354	.0833*	-.237***
(Obs = 13254)	(1.2)	(.676)	(3.34)	(.201)	(.256)	(.0488)	(.0763)
C. Whites	-.212	-3.62***	-7.42***	-.0284	-.119	-.0147	-.0403
(Obs=37095)	(1.12)	(.749)	(2.62)	(.511)	(.179)	(.0302)	(.0459)
D. Low Parental Education	-2.09**	-2.43***	.802	-.126	-.276	-.0154	-.0356
(Par. Ed <12. Obs=9042)	(.853)	(.554)	(2.62)	(.129)	(.225)	(.0356)	(.06)
E. School Minority	-.704	-.964	-1.01	.118	.00665	.0186	-.0877*
(Racial Group <%20. Obs=9638)	(1.18)	(.646)	(2.15)	(.196)	(.192)	(.0324)	(.0521)

Standard errors in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%

Table VIII
Determinants of Social Capital
(School Fixed Effects)

	Dependent Var:		
	Send/Rec	Out	In
Het. Race (grade)	-2.49**	-2.29**	-1.92**
	(1.2)	(.896)	(.828)
Prop. Black (grade)	2.73*	2.02*	1.56
	(1.48)	(1.13)	(1.17)
Prop. Asian (grade)	3.99**	2.91**	2.2*
	(1.88)	(1.34)	(1.31)
Prop. Amer. Indian (grade)	5.07*	2.8	2.87
	(2.82)	(1.91)	(1.93)
Prop. Hisp (grade)	-1.4	-.536	-1.01
	(1.58)	(1.2)	(1.12)
Prop. Male (grade)	-.806	-.432	-.607
	(1.02)	(.699)	(.715)
Size (grade)	-.0000134	-.0000804	-.000753
	(.000989)	(.000623)	(.000725)
Ave. Parental Ed. (grade)	.21	.193	.099
	(.19)	(.129)	(.127)
Std. Dev. Parental Ed. (grade)	-.239	-.139	-.301
	(.295)	(.204)	(.217)
Obs	66233	66233	66233

Standard errors in parentheses. Regessions include grade level analogues of school level covariates in Table 1, except for %Teachers M.A., %New Teachers, %PTA participation. (Teacher and PTA measures were available at the school level only.)

* significant at 10%; ** significant at 5%; *** significant at 1%

Table IX

	SoCap Mean
Magnet schools	6.13 (1.62)
Non-magnet Schools	8.15 (2.06)

Figure I

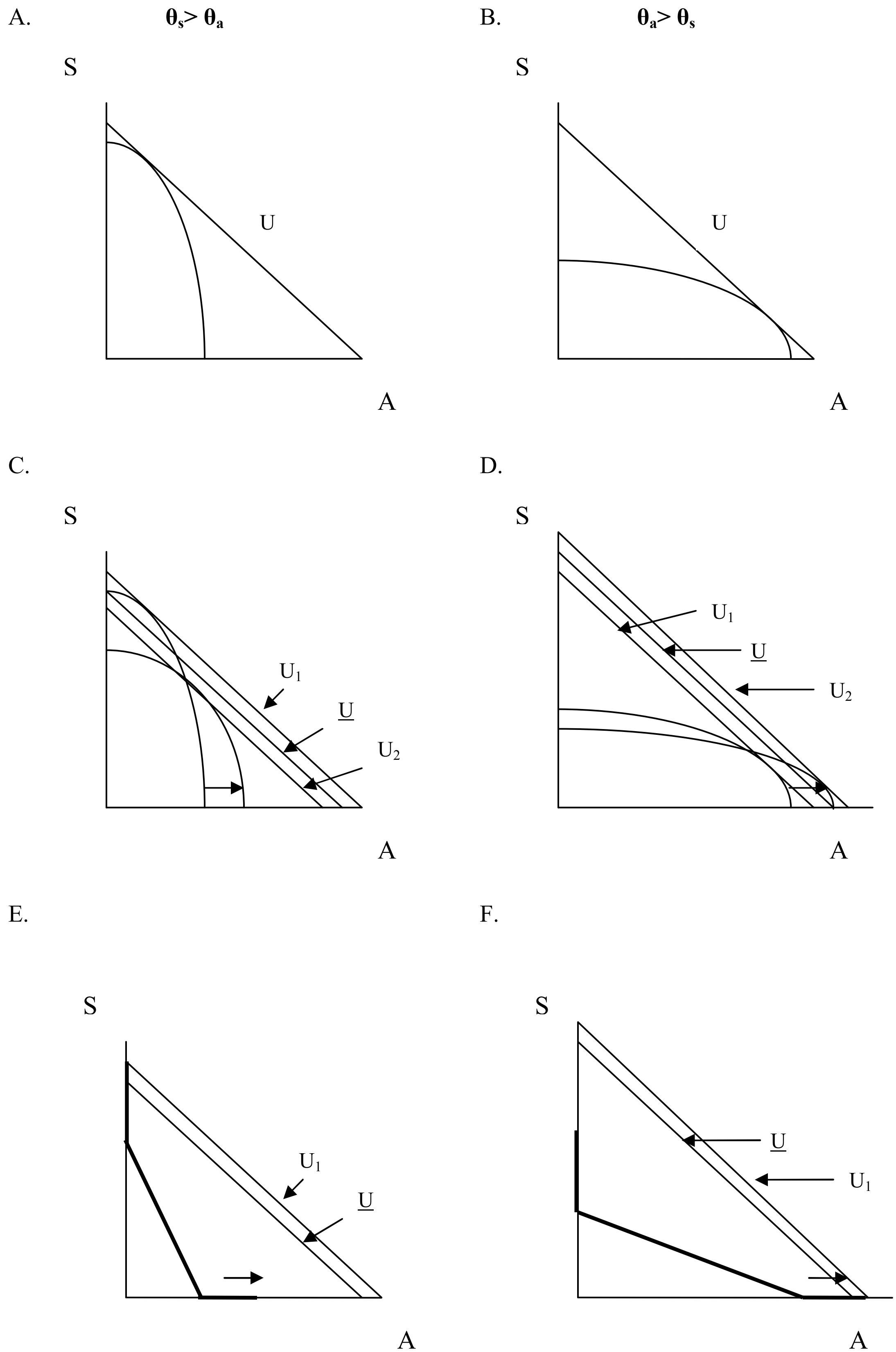
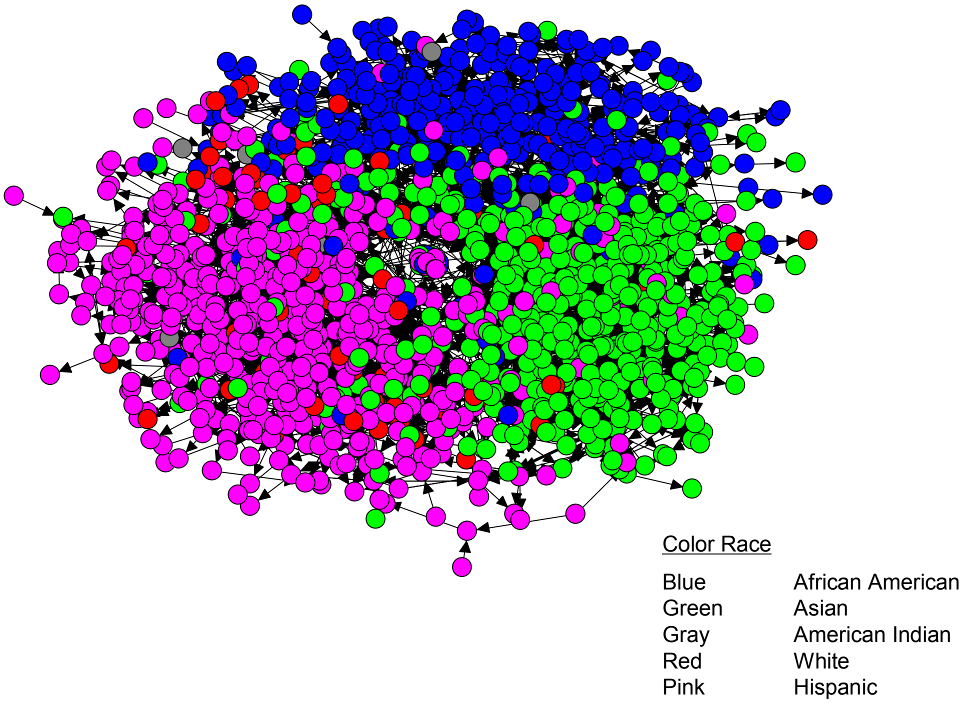

A.
$\theta_s > \theta_a$
S
U
A
B.
$\theta_a > \theta_s$
S
U
A
C.
S
U_1
$\underline{U}$
U_2
A
D.
S
U_1
$\underline{U}$
U_2
A
E.
S
U_1
$\underline{U}$
A
F.
S
$\underline{U}$
U_1
A

Figure II

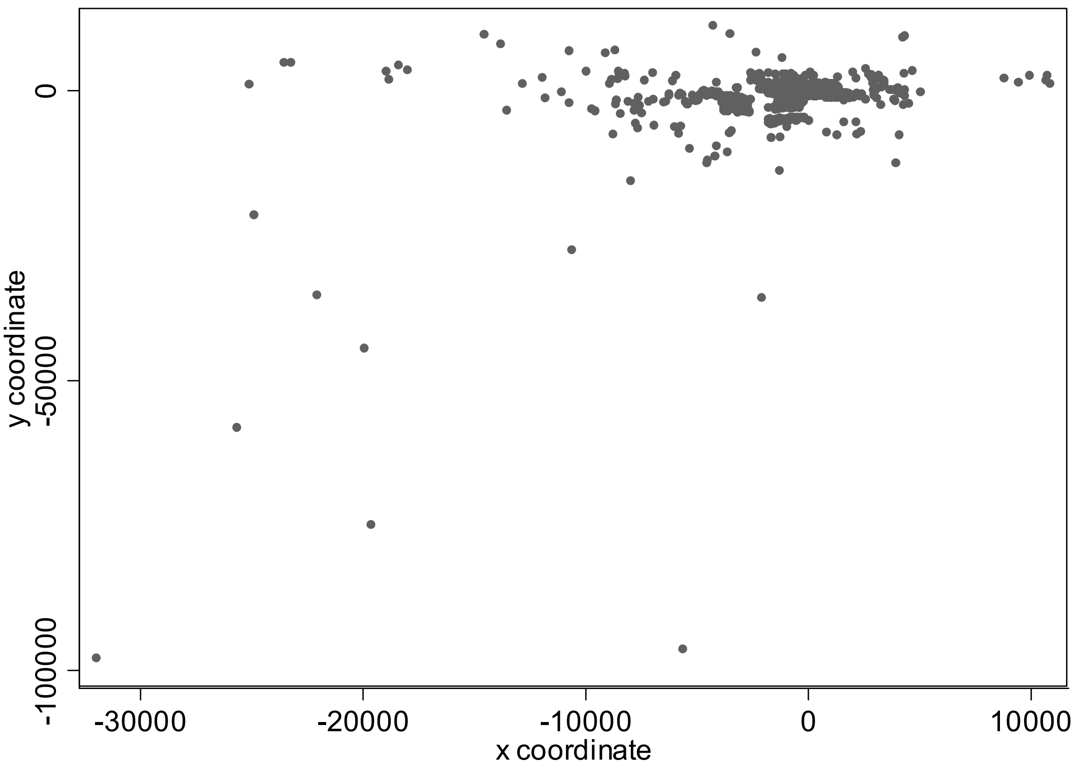
Sch 77: Het=.68 Social Cap Ave. =4.87



ce

Figure III

School Residences*



*x, y coordinates in meters

Figure IV

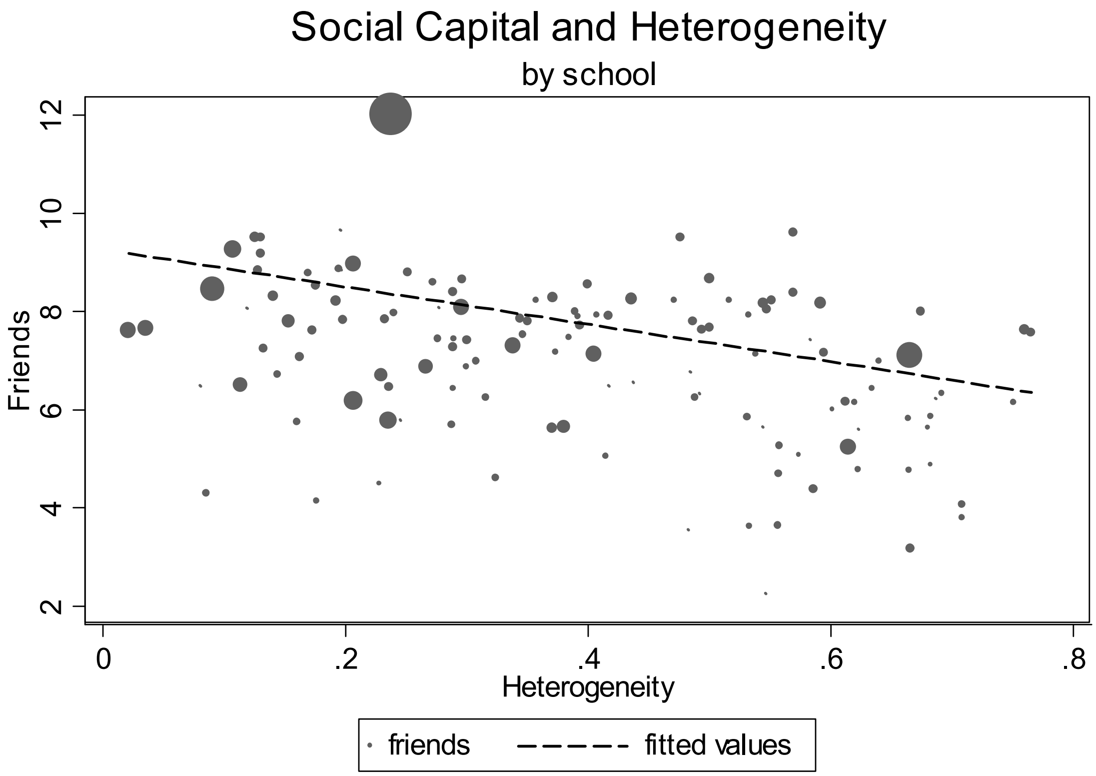

Social Capital and Heterogeneity
by school
12
10
8
6
4
2
Friends
0
.2
.4
.6
.8
Heterogeneity
friends
fitted values

Figure V

School 126 : Social Cap Ave. =7.16 Het=.37