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A MICROECONOMIC MODEL OF SOCIOMETRIC CHOICE

by

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ABSTRACT

A Microeconomic Model of Sociometric Choice

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The behavior of a person selecting a set of friends from a larger set of acquaintances can be analyzed as a consumer choice problem. The person can be regarded as a consumer allocating his income among a set of goods which he must purchase in quantities which will maximize his utility. An increase in utility can come either from an increase in expenditure or from a better allocation of resources. Results of an unlimited-choice sociometric questionnaire administered to 1204 boys at eight junior high schools showed that well-liked boys received the same number of choices as others, but had a higher proportion of reciprocated responses. It appears that social success results from lower costs of obtaining information about potential friends and better allocation of effort, rather than from making contact with more people.

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A Microeconomic Model of Sociometric Choice [1,2]

One consensus of research on adolescence is that adolescents tend to run in packs, and that the peer group exerts a strong influence on adolescent socialization and psychological development. In this paper, a model of consumer choice is used to explain some sociometric results concerning peer structures among junior high school boys.

A consumer choice model has three main components: a set of choices, a function relating a set of choices to a level of utility for the consumer, and a set of constraints. It has not been found either necessary or possible to express the value of the utility function in "utiles." Instead, consumer choice models can be constructed using comparisons between relative utilities, rather than their actual values. An axiom of such models is that a fully rational consumer will, by definition, choose from the available sets of goods so as to maximize his utility, and that he will be indifferent between two sets of goods which yield the same utility. Consumer choice models, both in their strictly economic contexts and in the present use, describe strategies of choice rather than the internal processes which result in particular choices. The definition of a utility function assumes that the consumer has a set of preferences and that these preferences are internally consistent, but makes no assumption about the content of such preferences. Microeconomic models should therefore be consonant with any model of interpersonal choice or attraction.

A junior high school boy can be viewed as having a budget of time or effort which he invests in learning about and associating with his peers. This paper will discuss some factors which determine the size of the set of peers from which a boy chooses his friends, and a consumer choice strategy which describes a more successful selection by some boys.

The adolescent, the peer group, and the school. Reports of research on adolescent peer relations are consistent in stating that peer influence is at its strongest during adolescence. There is also a consensus that adolescents view the school primarily as a place for interacting with peers, rather than for developing relations with adults. However, there is some disagreement among results regarding the nature and effect of the peer group on the individual adolescent.

Coleman (1961) found that self-esteem was closely linked to peer group membership and to social status. The values of "leading cliques" centered far more on athletic and social skills than on academic excellence. Indeed, the label "brilliant student" was often applied to low-status individuals outside the leading cliques who were not necessarily the best students, but who had failed to distinguish themselves in areas more important to their peers. Coleman suggested that students may try to gain status by joining high-status activities and by attempting to become members of high status cliques.

Roistacher (1972) obtained similar results in an investigation of 575 boys at four junior high schools. Members of larger than average cliques reported significantly more participation in athletics than did boys in smaller cliques. In addition, the grade point averages of large-clique members were significantly higher than those of non-members. The congruence between school norms and the norms of leading cliques was indicated by the fact that members of large cliques in the four schools rated participation in school activities as conferring more status than did non-members. This was true even for large-clique members who did not take part in such activities.

Peer groups thus provide standards for evaluation and behavior to their members. It can be inferred that the peer group also provides social support for approved behavior from a reference group whose members share similar standards. However, allegiance to the peer group incurs costs as well as yielding benefits.

Douvan and Adelson (1966) reported that the adolescent peer group did not support the testing of new identities, but pushed for conformity and hindered the differentiation of self. Long, Ziller, and Henderson (1968) found that dependency, (seeing one's self as a part of the group rather than as a separate entity), increased until the ninth grade and then decreased.

From a microeconomic perspective, an individual's membership in a peer group can be viewed as a choice from a set of alternative compositions of peer groups, a choice which incurs costs to and confers benefits on the chooser. Some patterns of costs and benefits may be idiosyncratic to the individual, but others may be functions of social structures and choice strategies which determine the individual's place in a social structure.

Large scale sociometric research. There has been much sociometric research on patterns of social choice in schools, but most of it has been on relatively small groups such as individual classrooms. In many cases, the size of the sociometric group was too small to allow school-wide patterns of choice to emerge. Sociometric investigators have generally constrained either the size of the group or the number of choices a respondent is allowed to make because sociometric data sets tend to grow unmanageably large as either parameter is allowed to increase. [Davis

(1970), Foster and Horvath (1971)]

The research reported here combines a sociometric assessment of interpersonal choices among a large population of junior high school boys with a microeconomic assessment of the choice strategies used by boys at various levels of social success.

A sociometric questionnaire was administered to 1204 eighth grade boys at eight Detroit-area junior high schools. Each sociometric group, consisting of all eighth grade boys in a school, had from 128 to 202 members.

The questionnaire consisted of two booklets, each containing a roster of all eighth grade boys in a school. The booklets included a two-point scale indicating whether the rater felt he knew the ratee well or just a little. The booklets also contained two seven-point scales on which the ratee could be rated as liked or disliked by the rater, and as similar to or different from the rater. Boys were instructed to rate as many of their classmates as they wished and to skip the names of those they felt they did not know well enough to rate. In order to control for presentation order effects, half of the booklets in each school were alphabetized in ascending order and half in descending order. [3]

INSERT TABLE 1 ABOUT HERE

The booklets were designed so that choices could be made with a minimum of effort. It was hoped that boys would rate even those whom they did not know very well, since the discovery of best friends was to be accomplished by analyzing the rating scales, rather than by letting the respondents omit all but their best friends (and worst enemies). The result of using a roster, rather than a fill-in instrument was not only that boys made more choices, but that there was additional significance to the omission of a choice, since memory and fatigue factors were largely controlled. Boys filled out the booklets in special administration sessions held approximately two weeks apart.

The total number of choices received and median scores received on each of the scales were computed for each of the 1204 boys. The complexity and the developmental nature of the analysis made it impractical to obtain a full sociomatrix for each of the eight schools. Therefore, four of the schools were selected at random for a full analysis of choices given as well as choices received. [4] Since the original matrices ranged from 38 to 87 percent full, the matrices of two- and seven-point ratings were transformed into sparser matrices of ones and zeros representing "pair links."

First, the distribution of "liking" ratings each boy gave was normalized around its median value in order to control for individual tendencies to rate consistently high or low. Boys were considered pair-linked if each of them reported knowing the other well and if each rated the other above his median in liking. The normalizing and filtering process produced symmetric binary matrices which were from 11 to 15 percent as dense as the raw data matrices.

The binary pair-link matrix can also be considered as the adjacency matrix of an undirected graph of points representing boys, connected by lines representing relatively strong mutual choices. A sociometric clique was defined as a maximal complete subgraph, a completely linked set of boys which was not contained in a larger completely linked set. Since the set of pair-links was still relatively dense, the number of cliques in each school far exceeded the number of boys. All maximal complete subgraphs were extracted and each boy's largest clique was determined.

A number of indices of social connectivity were derived for each respondent in the four schools for which complete sociomatrices were constructed. These indices included the total number of choices a respondent gave and received, the proportion of raters who reported knowing a respondent well, the number of pair links and cliques of which a respondent was a member, and the ratio of pair links to choices given and received.

Criteria of social success. In most sociometric research, the criterion of an individual's social success has been "overchoice." The socially successful individual is defined as one who is liked or admired by a relatively large number of people. However, the results obtained from the diverse sample of schools surveyed here required that the definition of social success be extensively modified, because boys in the inner-city schools tended to choose and be chosen by only half as many of their peers as did boys in suburban schools. Comparison of tables 1 and 2 shows that the numbers of choices given and received were unrelated to eighth grade class size, and were roughly inversely related to total school size. In the four schools in which full results were obtained, the number of choices a respondent received correlated .741 with the number he gave.

Comparisons of socially successful individuals across schools required the definition of a measure which did not classify most boys in the suburban schools as more successful than most boys in the inner city schools. While it might be asserted that boys in the suburban schools are, in fact, more socially successful than boys in the inner-city schools, such an assertion cannot be made solely on the basis of raw numbers of sociometric choices given or received. It is valid to compare the absolute number of choices received by two members of the same group, or the standardized choice scores of members of two different groups. However, comparison of the absolute number of sociometric choices given or received by members of two disjoint groups is invalid in the same way that the interpersonal comparison of utilities has been deemed invalid. There is simply no way to compare absolute numbers of choices when there is no knowledge or control of intergroup differences in choice criteria.

A more appropriate measure of social sucess, and one which is comparable across schools, is a normalized index of how much a boy's acquaintances reported liking him. This index, its concommitants, and its implications, are discussed below.

School population differences. The inner-city schools differed from the suburban schools in location, racial composition, socioeconomic status, and turnover rate, but only the latter characteristic significantly affected choice patterns. A two-way analysis of variance showed that in the two schools in which there was a significantly racially mixed student population, black and white students received the same mean number of choices, indicating that racial composition alone did not explain the difference in choice patterns.

A set of partial correlations showed that when the correlations between school and socioeconomic status and between school and mobility were partialed out, there was no significant relation between a student's socioeconomic status (as measured by Duncan's (1961) index), or his relative mobility (as measured by the number of schools he had attended) on any of the indices of social connectivity. Students who had spent their entire junior high school careers in a single high-turnover school had about the same number of acquaintances as did students in the same school who had attended two or more secondary schools. Highly mobile students in low turnover schools tended to know and be known by about the same number of others as did other boys in these schools.

INSERT TABLE 2 ABOUT HERE

A consumer choice model of friendship selection has four parts:

1. A set of acquaintances from whom the individual will choose his friends.

2. A utility function relating the total satisfaction received from associating with a particular person to the total amount of time spent in associating with him.

3. A set of costs of information about the set of utility function described in (2).

4. A set of constraints on the amount of resources (which, in the lack of better knowledge, will be called time and effort) available to the person for forming friendships.

<u>The utility function.</u> Assume that a boy, p, is faced with the task of selecting a set of friends from a larger set of schoolmates. For each schoolmate, q, there is a function, $u[T(p,q)]$, which relates a total amount of p's investment of time, $T(p,q)$, to p's total amount of utility from that level of time invested. It is possible to expand the utility function $d[T(p,q)]$ into several functions, some of which decrease over time, i. e., into utilities and disutilities. A disutility is not the same as a cost. Costs provide a rate of exchange between choices, while disutilities relate only to particular choices. Time spent in interacting with another person is a cost, because the time could have been spent in some alternative way. Exposure to the friend's bad breath is a disutility, since it is part of the return from the interaction, rather than something which could be invested in some alternate choice.

The use of a model based on the order of utilities rather than on their numerical values solves the problem of multiple (and possibly multidimensional) utilities. By definition, the consumer chooses the alternative with the highest utility. If he chooses alternative a over alternative b, then by definition, $u(a) > u(b)$, and if he cannot choose between them, then by definition, $u(a) = u(b)$.

A student, p, invests an amount of time, $T(p,q)$, in interacting with q and receives $u(p,q) = u[T(p,q)]$ as a return for his total amount of effort. Where p is not forced to associate with q, u will be at least weakly monotone increasing, since p would no longer associate with q if he received no utility from the association. Rationality dictates that p act so as to maximize $U(p)$, his total utility, where

$$(4) \qquad U(p) = \mathrm{SUM}(i=1,k)\ u(p,i)$$

the total amount of liking he receives from k others as a result of investing effort in knowing them.

A person's choice behavior at time s is determined not by the value of $u[T(p,q)]$ but by its marginal value, $d[T(p,q)]$, i. e., its derivative at s. According to the usual criteria of economic "rationality," p should be interested in spending time and effort in interacting with the person, q, for whom the marginal value of d is presently greatest. That is, at a single point in time, p should want to interact with the other person who will yield the greatest increment of satisfaction for the next increment of effort.

Obviously, people do not associate with each other in a vacuum, but must be engaging in some activity (including the null activity) together. The question therefore arises as to how the utility of associating with a person can be separated from the utility of engaging in a particular activity with that person. The chooser is really selecting from a set of alternative person-activity pairs, and it is the person-activity pair whose marginal utility governs the chooser's behavior. Thus, a person, p, might have the option of choosing to associate with person q in activity a or with person q in activity b. While some activities are obviously valued for reasons other than that they allow associating with friends, the investigation of the utility of activities in themselves lies outside the scope of a model of friendship choice. If a valued activity is consistently associated with a particular person, then the utility of that activity contributes to the marginal utility of associating with him.

The set of person-activity alternatives available to a chooser is well defined in Barker's (1968) concept of the behavior setting. According to Barker, a behavior setting is a standing pattern of behavior-and-milieu, such as "Eighth-grade English class" or "intramural baseball game."

A behavior setting is well defined in terms of time, place, and appropriate roles and activities. A person's participation in a behavior setting determines both the activities and persons constituting the set of available alternatives, and the amount of time available for participation in the chosen alternative.

Since a statement of the relative marginal utilities of each of a set of alternatives at a given time, s, is exactly equivalent to a statement of the chooser's behavior at time s, the criterion of maximizing marginal utility includes both long and short term utilities, and both continuous and segmented interaction with others. The rate of decrease in the marginal utility of interaction with another person determines the degree of continuity or segmentation of the interaction. If the utility to p of interacting with q is relatively high, and if the marginal utility of the interaction decreases relatively slowly, then p's interaction with q will continue for a relatively long time before its marginal utility to p is exceeded by the utility of interacting with someone else. When there is no very dominant alternative and when marginal utilities decline relatively rapidly, a person will tend to segment his associations, because the marginal utility of the current choice will soon be exceeded by that of another alternative. It can be shown that, once the value of d[T(p,q)] is known for all q and for all levels of T(p,q), there is a strategy which will maximize U(p) for any total amount of effort invested.

<u>Constraints on time and effort.</u> Just as a set of utility functions describes the consumer's motivation to choose among alternatives, a set of constraint inequalities describes the limitations on his ability to consume. As in the case of the utility function, the specification of constraints may be more or less elaborate, depending on the available data, or on the relation between various constraints. For example, a researcher might be informed that he could have only so many man-months of research assistance and only so much lab space. If there were no rate of exchange between lab space and personnel time, the researcher would be subject to two separate constraints. However, if there were some tradeoff allowable between laboratory space and personnel time, then the researcher would be subject to only a single constraint inequality, whose terms included both space and personnel.

While it might be possible to postulate numerous constraints on social choice, only three constraint inequalities will be considered here. One reasonable constraint on p is that his supply of time is limited, i. e.,

(5) SUM(i=1,K) T(p,i) <= 1

where t is the proportion of p's available time spent on interacting with each of K person-activity alternatives in a particular behavior setting. If the data were available for a particular individual, the inequality could be written in terms of the number of hours or minutes available to him in a particular behavior setting. In the absence of such information, the constraint can be written in the normalized form shown in (5) above. Conceptually, the use of a simple time constraint is not very satisfactory. Time is a measurable, but somewhat squishy, metric for effort or attention. Obviously five minutes spent in the company of a lover may represent a far greater total investment of effort or attention than an hour of sitting next to a stranger. A better set of constraints would be a time inequality, and an inequality limiting effort-per-unit-time over time. In the absence of any way to measure either the amount of effort-per-unit-time available to boys or their expenditure of such effort, the simplifying assumption was made that such expenditure could be approximated by a constant. Thus, the time inequality would over the long run, simply be multiplied by a constant. Since the time constraint inequality has already been normalized, the value of the unknown effort constant might as well be set to 1, thus bringing the time constraint back into its original form.

Constraints on the number of acquaintances. The data, however, indicate that p must meet an additional constraint, that of knowing and being known by K* other boys in the school, where K* is a function of the school's rate of student turnover. The data show that the turnover rate in a school plays a large part in determining the number of sociometric choices a student makes and receives. The average length of time a student is exposed to the company of another person is inversely related to the school's turnover rate. It seems safe to assume that if two strangers are constrained to spend a length of time in the same place together, the norms of social interaction will dictate that they acknowledge each others' presence to an increasing degree. At the beginning of their time together, the failure of one to respond to a remark or greeting of the other's may be regarded as a tolerable degree of reticence. At a later time, the same failure to respond may be regarded as hostile or rejecting. A school's turnover rate determines the number of others, K, who will remain in the average student's social environment longer than this maximum time. Most of an individual's friends are drawn from this set of K others . The set of K potential friends is decreased by the subtraction of those others whom p considers enemies or rejects. If p rejects R of the K others, then the $K^* = K - R$ boys remaining constitute a constraint on his available time for choosing friends, since he must allocate some time to each of them if he is to remain on reasonable terms with them.

Thus, p's problem is to maximize $U(p)$ by choosing some number of friends, F, subject to the constraint of inequality (5) and the additional constraint that he monitor the $K^* - F$ others with whom he is on friendly terms. Although there may be some boys who are universally liked, it is probable that the average boy will have to make contact with people who either do not like him well or who actively dislike him in the course of satisfying the constraint.

<u>Information costs.</u> A third constraint is that there is a non-trivial cost to p in time for learning the shape and values of $u[\tau(p,q)]$, i. e., for monitoring the set of $K^* - F$ others to determine their potential as new friends. It seems safe to assume that no one has so much time that there are no constraints on his ability to make friends. The minimum amount of time, say $M(p,q)$, needed for p to determine the form, or at least the marginal value of $u[\tau(p,q)]$, will vary over individuals p and q. However, when inviduals are selecting friends from the same group, it can be assumed that $M(p,q)$ averages out across the other individuals in the group and is thus a function only of p, the chooser. Call this minimum time $M(p)$.

In order to establish a social niche in his school, a boy must invest (K*)(M(p)) in making required social contacts before he can begin to develop a set of friends. Thus, whatever system he uses to allocate his investment in friends, a lower value of M(p) leaves more time available to be invested in friendship.

The process of investigating potential friends is obviously not a one-way affair, since the activities which convey information about q to p also convey information about p to q. However, where M(p) is much smaller than M(q), it is possible for p to become sufficiently informed about q without the reverse being true.

Strategies of friendship choice.

Under the consumer choice model outlined here, a boy's social goal in school is to maximize

(6) U(p) = SUM(i=1,F) u(p,i) = SUM(i=1,F) u[T(p,i)]

subject to the constraints that he spend (K*)(M(p)) time on maintaining at least minimal contact with K* friends and acquaintances, and that he not exceed his total time budget. The model suggests several strategies for maximizing U(p). A boy, p, is exposed to the company of K others through a process which is largely dependent on the school's turnover rate. The boy rejects R of this set of K others, leaving K* as his effective number of potential friends. The boy makes

F friends, who report knowing him and liking him well, by approaching F + N other boys. The N boys who did not become p's friends report knowing him well, but are at best neutral toward him. (The problems associated with making enemies, cherishing one's feuds, and the utilities and disutilities of social enemity are far too baroque to be considered in this relatively simple model, which ignores interactions between enemies.)

The K^* boys in p's effective social environment are thus partitioned into F friends and N neutral boys who report knowing p well, and $A = K^* - F - N$ acquaintances who report knowing p a little or not at all. When p is not exploring the possibility of new friendships, his time constraint is

$$(7) \qquad \mathrm{SUM}(i=1,F)\ T(p,i) \le 1-(F+N+A)\ (M(p))$$

since he must spend $(K^*)(M(p))$ on maintaining nominally friendly relations with everyone in $\{K^*\}$.

If p wishes to attempt to make C new friends, then his time constraint is

$$(8) \qquad \mathrm{SUM}(i=1,F)\ T(p,i) + \mathrm{SUM}(j=F+1,F+C)\ T(p,j) \le 1-(F+N+A)\ (M(p))$$

where the additional summation is over the C prospective new friends.

The model allows two major strategies for maximizing utility. A boy might be reported as well liked because he has restricted his social environment to include only those who like him well. A boy with F friends might choose to minimize his overhead costs by minimizing N+A and maximizing R. If this were the usual strategy, well-liked boys would give and receive fewer sociometric choices than others. Another possible strategy is to attempt to increase F by making new friends among the A others whom one does not yet know well. If this strategy is chosen, then a boy's efficiency in judging the payoff from an exploration of a potential friendship becomes a crucial variable. Suppose that the proportion of the A potential friends who would become friends with p is a. If p made C choices at random, his expected number of new friends would be aC. If p were perfectly accurate in determining who would be a satisfactory new friend, then he would make C new friends from C choices. His efficiency in choosing friends is thus

$$(9) \qquad E = \Delta F/C, \; a <= E <= 1$$

where a is the proportion of the A acquaintances who would become p's friend. To the extent that well-liked boys use a strategy of attempting to make friends among their acquaintances, well-liked boys should make more choices than others. To the extent that choice efficiency is important in being well-liked, successful boys should show a higher ratio of success in making friends.

It should be noted that greater efficiency in choosing new friends implies that M(p) should also be lower for efficient boys, who should also be more efficient in maintaining nominal relations with others. The sociometric data presented here allow an empirical comparison of these two strategies of friendship choice in a population of junior high school boys.

<u>Friendship choice strategies of successful boys.</u> An analysis of variance showed that at each of the four junior high schools, boys who were rated above the school median on the liking scale tended to receive approximately the same number of choices as did boys who were less well liked by their peers. Table 3 shows that the number of choices a boy gives is positively associated with his being reported as well liked. However, tables 4 and 5 indicate that the degree to which a boy is liked is far more strongly associated with the number of pair links he forms, both in absolute numbers and as a proportion of the choices he gives. The school norm concerning how many others a boy should know has progressively less effect in tables 3, 4, and 5, while the degree to which he is liked has progressively more effect. There is no large interaction term in any of the three analyses, indicating that the effect is much the same in all of the four schools.

The omega squared statistics indicate that school and liking effects explain relatively little variation in the data, a fact which is not surprising in view of the complexity of the social system and the noisiness of the data. However, the analyses in tables 3, 4, and 5 show that liking is more than eight times as effective an indicator of a boy's strong and mutual choices as it is of the overall number of choices he gives or receives.

INSERT TABLE 3 ABOUT HERE

INSERT TABLE 4 ABOUT HERE

INSERT TABLE 5 ABOUT HERE

Table 6 indicates that the median liking rating a boy received was also positively associated with the size of his largest clique, and that the "liking" rating explained almost three times as much of the variation in the size of a boy's largest clique as did the school he attended. The effect of the "liking" rating is so strong because the number of pair-links required to connect a clique of n boys increases as a quadratic function of n. Classifying boys on the basis of the size of their largest clique tends to select for boys with increasingly larger numbers of pair-links as the size of the largest clique increases by one.

INSERT TABLE 6 ABOUT HERE

Although well-liked boys were members of larger cliques, these cliques represented a relatively small proportion of the others to whom they were pair linked. A boy's "concentration" was defined as the number of others in his largest clique divided by the total number of his pair links. In three out of the four schools, a boy's median liking rating was negatively associated with his concentration index.

Most of the indices of connectivity are higher for well-liked boys, who make more reciprocated choices, and who are members of more and larger cliques. Table 7, however, shows that as a boy's median liking rating increases, the proportion of raters who report knowing him well decreases. Well-liked boys receive no more choices than do others, but reciprocate a higher proportion of those choices. The number of choices any boy gives and receives is far greater than the number of pair links he forms. The majority of those who rate a given well-liked boy, who does not return their choices, report knowing him less well than they report knowing others who do not reciprocate their choices.

INSERT TABLE 7 ABOUT HERE

Discussion

The data indicate that boys who are reported as especially well liked use a strategy of efficient friendship selection, rather than one of restricted acquaintance or of random friendship selection. Table 3 showed that relatively successful boys tended to make slightly more choices and to receive about the same number of choices as do other boys in the school. Thus, it cannot be said that well-liked boys restricted their set of acquaintances to a few close friends. The somewhat greater number of choices and far greater efficiency of choice shown by well-liked boys is consonant with a hypothesis of a relatively efficient exploration of potential friends resulting from lower information costs.

In order for p to receive a return from knowing q, it is necessary that q like p, and sufficient that p spend time associating with q, whom he likes. The data show that a higher proportion of the peer relations of well-liked boys meet these criteria <u>a forteriori</u> by qualifying as pair links. Tables 3, 4, and 5 show that better-liked boys had a higher rate of return on their investment of effort in peer relations by having a larger number of pair links, both absolutely and as a proportion of choices given and received.

Table 7 shows that the median liking rating a boy receives is inversely related to the proportion of raters who report knowing him well, a result related to the lower information costs incurred by well-liked boys. According to the model, the well-liked boy forms more pair links but is reported as known well by a smaller proportion of his acquaintances because he has been more successful in identifying those other boys who will like him especially well. The well-liked boy concentrates his effort on relating to a selected set of peers rather than diffusing his effort more widely across his set of acquaintances.

<u>The transitivity of accurate evaluations.</u> Well-liked boys' membership in larger cliques indicates that their liking relationships tend to be more transitive than is the case for boys who are less well liked. If a well-liked boy, p, likes boys o and x, then o and x tend to like each other more than is the case where p is less well-liked. One possble reason for this increased transitivity is that well-liked boys, by concentrating their effort on boys who like them, serve as links between boys who tend to like each other.

Conclusions

The theory of consumer demand provides a useful strategic model for investigating friendship choices in large groups. It is especially interesting that one of the model's major parameters, the set of choices, is so heavily constrained by group rather than individual factors. The consumer choice model, in both economics and in the current context, is a strategic model rather than a model of internal processes in the individual. The utility function $u[t(p,q)]$, assumes the existence of a set of preferences by the consumer, but says nothing at all about the form or content of his preferences. The model should therefore be consonant with any model of interpersonal attraction. The process by which boys choose friends is one of interpersonal attraction, but the strategies by which more successful boys choose are describable in microeconomic terms.

The patterns of acquaintance in the inner city differ substantially from those in suburbia in ways which are explainable in "ecological" terms. Turnover rate, an easily measured but seldom used parameter, has a powerful effect on interpersonal relations throughout the school. The lower information costs of well-liked boys indicates that there is an important cognitive component to social success in the junior high school. The boy with the requisite cognitive skills will obtain a higher level of utility from his social relations, regardless of the size of his set of acquaintances. The junior high school boy can be thought of as surrounded by a network of friends inside a much looser "cloud" of acquaintances. The size of the cloud is heavily influenced by the rate of turnover in the high school's student body. The higher the rate of turnover, the fewer other boys are included in the cloud. Turnover in the student body affects the size of the individual's network of friends both directly by attrition, and indirectly by reducing the size of the population from which friends are selected.

The process of selecting friends is, of course, a mutual one. There is no such thing as an isolated active individual selecting friends from a passive set of acquaintances. However, this simplification of a complex process seems adequate to explain some of what is going on, and it would be possible to construct bilateral and multilateral versions of the choice model presented here.

These results raise some questions about the relation of population stability and its opposite to socialization and educational outcome. Junior high school boys are at a period in life when peer group orientation is at its highest. If population turnover in a school is very high, then boys in that school must spend extra effort to cope with the effects of such high turnover. It may be that one of the functions of the immediate peer group in a high turnover population is to insulate the individual from the results of such turnover. If educational and socialization outcomes can be improved by shielding the student from the effect of turnover, then school systems should attempt such shielding when possible. One step would be to keep students in the same school throughout a school year when their families have moved to a nearby school district. It is too early to make such a recommendation, but the evidence indicates that further investigation of the effects of population turnover is in order.

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NOTES

[1] This work was supported by Public Health Service Grant MH-15606 and by the Research Board of the University of Illinois.

[2] The manuscript for this paper is maintained as a file on a PDp-10 computer. Since some conventional mathematical notation is either difficult or impossible to write in the standard ASCII (American Standard Code for Information Interchange) character set used by the computer, some of the mathematical expressions in this paper have been written in ways more amenable to computer storage and processing. In particular, the capital sigma denoting a summation has been replaced by an expression of the form "SUM(i=1,n)," where i is the summation index which runs from 1 through n. Weak inequalities are indicated by ">=" for "greater than or equal to," and by "<=" for "less than or equal to." Subscripted variables are written with their subscripts in parentheses, e.g., X(1),...,X(n), for the elements of X, an n-vector.

[3] The usual instrument, on which a respondent is asked to write the names of his friends or the names of the members of a leading crowd, was not appropriate to such large groups. A pilot study had shown that boys either refused to give any serious consideration to a questionnaire which required large amounts of writing, or would give extremely stereotyped sets of responses, often by copying each other's lists of names.

Experience showed that a junior high school boy faced with a write-in questionnaire exhausts his patience long before he exhausts his list of acquaintances.

[4] Schools 5,6,7, and 8 were fully analyzed.

TABLE 1

Demographic Characteristics of Eight Junior High Schools.

School	Location	School Size	Eighth Grade Class Size	Number of Boys tested	Mean Duncan S.E.S.	% White	Missing After one Yr.
1	Suburban	842	284	128	34.23	100	4.3
2	Suburban	1000	275	152	35.94	100	22.
3	Urban	1483	430	202	29.90	35	36.
4	Urban	1214	256	124	32.56	6	42.
5	Urban	1461	562	133	27.36	1	32.
6	Urban	1563	555	151	25.76	0	39.
7	Suburban	983	320	168	50.12	100	7.4
8	Suburban	1045	319	147	47.59	100	4.5

TABLE 2

Number of Nominations
received by boys
at eight junior high schools.

School	N	%	Mean	S.D.(Est.)
1	127	10.6	88.827	14.724
2	152	12.6	91.599	17.348
3	202	16.8	42.668	15.321
4	124	10.3	56.226	14.180
5	133	11.1	53.744	17.457
6	151	12.6	49.093	15.151
7	168	14.0	104.060	20.459
8	145	12.1	109.614	15.668
Total	1202	100	73.820	30.551

Total Sum of Suqares = 1120973.
For 8 groups, ETA = .8584
Sum Squares Between = 796384.
Sum Squares within = 324589.
$F(7,1194)$ = 418.5
$p \ll .001$

TABLE 3

Effect of median liking rating and school on the number of nominations a respondent made.

Liking Median	School 5	6	7	8
Below School Median	62.3333 (9)	33.8000 (10)	104.2500 (24)	117.3333 (18)
At School Median	60.8970 (68)	50.5102 (59)	120.9848 (66)	126.1912 (68)
Above School Median	71.8837 (43)	65.2381 (63)	130.7758 (58)	132.3333 (45)

Source	DF	Sum of Squares	Mean Squares	F Ratio	Omega Squared
Liking median	2	9245.	4623.	6.306**	.00810
School	3	566500.	188800.	257.663**	.58740
Interaction	6	3698.	616.3	.841	
ANOVA error	519	380500.	733.1		
Totals	530	959943.			

** $p < .01$

TABLE 4

Effect of median liking rating and school on the number of pair links a respondent established.

Liking Median	School 5	6	7	8
Below School Median	14.3333 (9)	7.8000 (10)	18.6667 (24)	26.1111 (18)
At School Median	18.2647 (68)	12.8305 (59)	26.8485 (66)	37.1618 (68)
Above School Median	23.0465 (43)	17.6032 (63)	39.9828 (58)	47.2000 (45)

Source	DF	Sum of Squares	Mean Squares	F Ratio	Omega Squared
Liking median	2	10230.	5116.	29.49**	.06369
School	3	52450.	17480.	100.8**	.33463
Interaction	6	2297.	382.9	2.207*	.00811
ANOVA error	519	90040.	173.5		
Totals	530	155017.			

* $p < .05$; ** $p < .01$

TABLE 5

Effect of median liking rating and school on the number of pair links a respondent established as a percentage of the number of nominations he gave.

	School			
Liking Median	5	6	7	8
Below School Median	22.5625 (8)	21.0700 (10)	18.5208 (24)	22.8166 (18)
At School Median	29.5146 (68)	26.9711 (59)	22.4363 (66)	29.1587 (68)
Above School Median	32.4139 (43)	28.3552 (63)	30.4499 (58)	35.8043 (45)

Source	DF	Sum of Squares	Mean Squares	F Ratio	Omega Squared
Liking median	2	5821.	2910.	21.77**	.06922
School	3	2953.	984.4	7.363**	.03227
Interaction	6	877.9	146.3	1.094	
ANOVA error	518	69260.	133.7		
Totals	529	417600.			

** $p < .01$

TABLE 6

Effect of median liking rating and school on the size of the respondent's largest clique.

Liking Median	School 5	6	7	8
Below School Medan	5.1111 (9)	4.4000 (10)	5.2083 (24)	5.0556 (18)
At School Median	6.0147 (68)	5.4576 (59)	6.0758 (66)	7.0882 (68)
Above School Median	7.1860 (43)	6.7460 (63)	7.8276 (58)	8.2000 (45)

Source	DF	Sum of Squares	Mean Squares	F Ratio	Omega Squared
Liking median	2	347.6	173.8	35.32**	.11007
School	3	144.6	48.20	9.795**	.04231
Interaction	6	17.45	2.908	.591	
ANOVA error	519	2554.	4.921		
Totals	530	3063.65			

** $p < .01$

TABLE 7

Effect of median liking rating and school on the proportion of raters who reported knowing a ratee well.

	School			
Liking Median	5	6	7	8
Below School Medan	.3443 (9)	.3309 (10)	.5361 (24)	.4624 (18)
At School Median	.3191 (68)	.3105 (59)	.4721 (66)	.4130 (68)
Above School Median	.2467 (43)	.2807 (63)	.4014 (58)	.3208 (43)

Source	DF	Sum of Squares	Mean Squares	F Ratio	Omega Squared
Liking median	2	1.027	0.5136	72.18**	.07222
School	3	2.211	0.7371	103.663**	.15613
Interaction	6	.09162	.01527	2.146**	.00349
ANOVA error	517	3.679	.00712		
Totals	528	7.00862			

* $p < .05$; ** $p < .01$

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The behavior of a person selecting a set of friends from a larger set of acquaintances can be analyzed as a consumer choice problem. The person can be regarded as a consumer allocating his income among a set of goods which he must purchase in quantities which will maximize his utility. An increase in utility can come either from an increase in expenditure or from a better allocation of resources. Results of an unlimited-choice sociometric questionnaire administered to 1204 boys at eight junior high schools showed that well-liked boys received the same number of choices as others, but had a higher proportion of reciprocated responses. It appears that social success results from lower costs of obtaining information about potential friends and better allocation of effort, rather than making contact with more people.

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