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# The Social Economics of Adolescent Behavior and Measuring the Behavioral Culture of Schools

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## Abstract

**Objectives** Schools are thought to have an important impact on adolescent behaviors, but the mechanisms are not well understood. We hypothesize that there are measurable constructs of peer- and teacher-related extrinsic motivations for adolescent behaviors and sought to develop measures of school culture that would capture these constructs.

**Methods** We developed several survey items to assess school behavioral culture and collected self-reported data from a sample of adolescents age 14–17 attending high school in low income neighborhoods of Los Angeles. We conducted exploratory and confirmatory factor analysis to inform the creation of simple-summed multi-item scales. We also conducted a cultural consensus analysis to identify the existence of shared pattern of responses to the items among respondents within the same school.

**Results** From 1159 adolescents, six factors were identified: social culture regarding popular (Cronbach's alpha = 0.84) and respected (alpha = 0.83) behaviors, teacher support (alpha = 0.86) and monitoring of school rules (alpha = 0.85), valued student traits (alpha = 0.67) and school order (alpha = 0.68). Cultural consensus analysis identified a shared pattern of responses to the items among respondents at 8 of the 13 schools. School academic performance, which is based on standardized test results, is strongly correlated with social culture regarding popular behaviors (Pearson's correlation coefficient  $r = 0.64$ ), monitoring of school rules ( $r = 0.71$ ), and school order ( $r = 0.83$ ).

**Conclusions** The exploratory and confirmatory factor analyses did not support a single, overall factor that measures school culture. However, the six identified sub-scales might be used individually to examine school influence on academic performance and health behaviors.

**Keywords** School culture · Social networks · Behavioral economics · Academic performance · Risky behaviors

Behavioral economics is an increasingly popular framework for understanding and changing behavior, focusing on financial and non-financial motivators, and on the social, emotional and psychological factors that influence rational decision making (Mogler et al. 2013; Volpp and Asch 2017). More recently, several large scale studies have tried

to apply this theory in over 200 schools to improve academic achievement, but disappointingly found that financial incentives paid to students for better academic performance had little to no effect (Fryer 2011). One possible explanation is that children and adolescents have incomplete brain development (Dahl 2008; Somerville et al. 2017) and thus lack the maturity, impulse control, and rational decision-making skills to respond to financial incentives. Alternatively, it may be that children are capable of making rational decisions, but money is a weak or suboptimal incentive. This raises the question about whether other, non-financial incentives exist that more powerfully influence adolescent behaviors and can increase motivation to excel in school or avoid risky behaviors.

Deci and Ryan's (2000; Ryan and Deci 2000) Self-Determination Theory suggests that behavior can be intrinsically motivated by enjoyment, interest, or well-being or extrinsically motivated to obtain some other goal or

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objective. Financial rewards, which clearly represent an extrinsic motivation, not only appear to be a weak motivator for student achievement, but could also have a paradoxical effect of undermining performance by reducing intrinsic motivation (Murayama et al. 2010). Deci and Ryan (2000) categorized peer approval as a subset of motivators that they called “introjection”, placing it in the middle of the spectrum between intrinsic and extrinsic motivators. Because they are partially intrinsic motivators, peer and teacher approval may be potent drivers of adolescent behaviors. Both peer approval and the social gains associated with that approval may vary across social environments and might help explain individual behavior. We know that student achievement and engagement are shaped by school climate, which comprises several dimensions including school safety, rules and norms, instructional approaches, social-emotional environment and relationships with teachers and peers (Thapa et al. 2013). Among these many factors, relationships with peers and teachers may be particularly important in influencing academic achievement and delinquent behaviors (Dudovitz et al. 2017; Wentzel and Caldwell 1997), perhaps because of their role as both intrinsic and extrinsic motivators.

The effects of the school environment on adolescent behavior can be understood by incorporating perspectives from Self-Determination Theory, as well as behavioral economics and social network theory, into what we call “Social Economics.” This concept focuses on the potent effect of social networks on behavior and the perceived benefits or harms to social position and relationships. In contrast to financial motivators, non-financial motivators such as approval, acceptance, respect, prestige, and popularity derive from relationships with others. Specifically, the choice to behave in a certain way, such as being engaged in school or smoking marijuana, has potential consequences of loss or gains in peer approval, and these consequences influence and are influenced by the social network. Thus, obtaining peer approval depends on who is in one’s friendship network (network composition) or where one is in the social hierarchy of peers (network structure). Some adolescents, for example, might choose to underperform in school for fear of being labeled a “nerd” (Bursztyrn and Jensen 2015). Those who are less popular (lower social network centrality and hierarchy) may have greater desire to be popular and subsequently choose to engage in behaviors to gain access to certain friendship groups (Fletcher and Bonell 2013; Tucker et al. 2014). While previous studies have examined social norms about the prevalence and approval of specific behaviors like smoking and drinking, it is not clear if there is a measurable pattern of social norms of peer approval for a set of adolescent behaviors that includes school engagement and risky behaviors. If so, then the economics of peer approval and its effect on adolescent

behaviors may be a key domain of school climate that influence a school’s overall success and achievement.

In this study, we propose new measures of extrinsic motivations related to peer and teacher relationships. We evaluate their psychometric properties, estimate correlations between these measures, examine the consensus of these measures within schools, and estimate the associations of these measures with school-level academic performance. To measure the peer-derived motivators, we asked students to report how various behaviors, such as being a good student or using marijuana, would change the amount of respect or popularity they received from other students at their school. We also measured teacher-derived motivators by asking students to report how much teachers monitor school rules and how much emotional support teachers provide them. We hypothesize that the social culture of a school encompasses a wide range of behaviors that include school engagement and effort, as well as substance use and other delinquent behaviors. We also hypothesize that the social culture of the school is associated with teacher support, monitoring and control of the school environment. To examine this balance of control, we sought to measure the degree of chaos and organization on campus by adapting a measure of chaos in the home (Matheny et al. 1995) to apply to the school environment. We hypothesize that a more negative peer culture that associates respect and popularity with substance use or other delinquent behaviors is associated with schools in which teachers monitor behavior less closely and provide less support and schools that have more chaotic and disorganized environments.

## Method

### Participants

For this study, we examined 1159 (91%) subjects who completed the 10<sup>th</sup> grade survey of the RISE Up Study. Demographics of the sample are shown in Table 1. About

**Table 1** Demographics of study sample

	% (n)
<i>Student characteristics</i>	
Latino ethnicity	90.2 (1045)
Male gender	46.9 (544)
US Born	87.2 (1011)
Native English speaker	40.2 (463)
<i>Parental characteristics</i>	
At least one parent is U.S. born	25.5 (295)
At least one parent is a high school graduate	54.8 (603)
At least one parent is employed full time or part time	88.0 (1017)

**Table 2** Characteristics of student body in schools attended by study participants<sup>a</sup>

School	Total enrollment ( <i>n</i> )	African American (%)	Latino (%)	White (%)	Socioeconomic disadvantaged (%)	Number of RISE Up participants (%)
A	2127	13.4	76.0	1.9	86	59 (5.1)
B	2241	13.2	75.9	1.8	84	28 (2.4)
C	633	12.8	85.8	0.2	94	61 (5.3)
D	524	11.6	72.5	4.8	83	26 (2.2)
E	625	1.3	97.4	0.2	96	73 (6.3)
F	613	0.8	97.4	0.3	91	22 (1.9)
G	541	1.3	87.1	3.1	90	90 (7.8)
H	558	0.4	98.7	0.2	96	21 (1.8)
I	1829	19.3	67.9	1.7	84	96 (8.3)
J	620	0.0	99.5	0.2	95	105 (9.1)
K	622	26.5	61.6	0.0	92	44 (3.8)
L	312	0.3	93.3	5.4	98	97 (8.4)
M	1847	1.6	79.6	5.8	84	24 (2.1)

<sup>a</sup>Limited to schools with at least 20 study participants enrolled

half (47%) were male, 90% were Latino, 5% were African American, 87% were born in the U.S., and 40% were native English speakers. We also asked students about their parents, and 26% reported that at least 1 parent was born in the U.S., 55% reported that at least 1 parent graduated from high school, and 88% reported that at least 1 parent was working full-time.

The 1159 study participants included in the current study attended 157 different high schools at 10<sup>th</sup> grade, including 88 traditional public schools, 41 charter public schools, 21 private or parochial schools, 5 alternative education schools (including home school), and 2 schools outside of the Los Angeles area.

The cultural consensus analysis described below was limited to schools with more than 20 study participants enrolled at the same school. Sixty-four percent (748/1159) of the sample attended one of 13 high schools with at least 20 other study participants. Based on school-level data from the California Department of Education, the demographics of the student body at these schools were similar to that of our study population. (Table 2) Students were primarily Latino, ranging from 62% in School L to 99% in School K. The proportion of African Americans in these schools ranged from 0% at School K to 26% at School L and the proportion of whites was 6% or lower in all schools. The proportion of the students who were from socioeconomically disadvantaged families ranged from 83% at School D to 98% at School M. Socioeconomic disadvantaged is defined as receiving free- or reduced-lunch benefits, which is a federally mandated program for low-income families. Eligibility is determined by family's self-reported household income and commonly used to estimate

the proportion of families in schools that are disadvantaged. (Cullen et al. 2006; Sanbonmatsu et al. 2006)

## Procedure

For this study, we analyzed data from the Reducing Inequities through Social and Educational change follow-up (RISE Up) Study, which is a longitudinal natural experimental study that was originally designed to examine the impact of attending a high performing public school on risky health behaviors. Additional details of the original study design and sampling are provided elsewhere (Dudovitz et al. 2018; Guerrero et al. 2016). The human subjects research review board approved all research activities (IRB#16-001512). Written informed consent from parents and informed assent from students was obtained before study participation.

Bilingual research assistants conducted a face-to-face, computer-assisted survey with students at the end of 8<sup>th</sup> grade or the summer before 9<sup>th</sup> grade (baseline), during 10<sup>th</sup> grade and during 11<sup>th</sup> grade. Subjects could complete the surveys in Spanish or English, but all students chose to complete the English version. Surveys, which took 60–90 min, were completed in the community, including at the school, in the home or other community settings in which a private interview could be conducted. Bilingual research assistants were available to answer questions, as needed. Survey data collected information on parent and student demographic information, academic and social culture of their school, social networks, and engagement in substance use and other risky behaviors. Public-use demographic data on student enrollment at the school level was

obtained from the California Department of Education (<https://dq.cde.ca.gov/dataquest/>).

## Measures

Details of the school culture measures are shown in Table 3. We created two measures of teacher-related motivation that are analogous to the strictness and support scale developed by Lamborn et al. (1991) to measure Baumrind's (1966) framework for categorizing parenting style into four groups: authoritative, authoritarian, indulgent and neglectful. Teacher support was measured by adapting the 7 warmth items from the parent involvement subscale of the Lamborn et al. (1991) parenting measure. Instead of using the word "parent", the word "teachers" was substituted. For example, students were asked to respond to the statement, "my teachers praise me," and report how often this occurred: "none of the time," "some of the time," "most of the time," or "all of the time."

To measure teacher control and strictness, two different measures were constructed that assessed the amount of chaos in the school environment and how much teachers monitor school rules and behaviors. The 9 items of the chaos measure were adapted from the Confusion, Hubbub, and Order Scale (CHAOS) developed by Matheny et al. (1995). For 3 of the original 15 items, we simply substituted the word "school" for the word "home", for example, "it is a real zoo at my school." For another 3 items of the school chaos measure, we modified the wording to be applicable to the school environment or to lower the literacy level. We also created 3 new chaos items to more fully capture school order: "Students do whatever they want in school", "No one is in control at our school", "When someone breaks the rules at school, the adults look the other way." These items were administered using the "none of the time" to "all of the time" response options described earlier. Monitoring of school rules was assessed by asking participants to report how often adults at their school make sure students are following the rules. This was asked regarding 7 school settings: in class, in the hallways during passing period, during lunchtime, in the locker rooms and bathrooms, at school-related events, and before and after school starts. Students responded to these items using the "none of the time" to "all of the time" response scale.

To measure the social culture of the school, participants were asked to report how various behaviors and attributes would affect their respect or popularity among their peers at school. Subjects were also asked about 12 behaviors and attributes, such as being a good student, being tough, fighting, disrupting class, and using alcohol or marijuana. For each attribute and behavior, participants were asked about its impact on respect and, in a separate set of questions, its impact on popularity. The 5 response options were,

"decreases a lot," "decreases a little," "no change," "increases a little," and "increases a lot."

## Data Analyses

For all analyses, we examined data from the 10<sup>th</sup> grade survey, which was the first wave that included all of the items examined for this study. We first conducted exploratory factor analysis (EFA), including parallel analysis and a scree plot to suggest the number of potential factors. We estimated the factor solution allowing for correlations among factors using a PROMAX (oblique) rotation (Hendrickson and White 1964). We used a cutoff of 0.30 for factor loadings to identify items representing each factor. We then conducted confirmatory factor analysis (CFA). We estimated models that kept as many items suggested by EFA and met as many of the following 3 criteria for goodness of fit: root mean square error of approximation (RMSEA)  $\leq$  0.06, comparative fit index (CFI)  $\geq$  0.95, and standardized root mean residual (SRMR)  $\leq$  0.08 (Hu and Bentler 1999). We examined modification indices using Lagrange multiplier tests to identify noteworthy residual correlation among pairs of items. Starting with the pairs with the highest residual correlations, we dropped one of the pairs randomly from the measure one at a time until all 3 of the goodness of fit criteria were met.

Based on the item loadings in the final CFA models, we created simple-summed multi-item scales, and estimated the internal consistency reliability and product-moment correlations among the scales. Finally, we obtained item information and test information curves from an item response theory (IRT) grade response model (Samejima 1969).

We conducted a cultural consensus analysis to test if the students who shared the same school agreed with each other about their school's environment enough to conclude that there was one dominant culture for that school (Weller 2007). Specifically, we used the formal CCA model using all items of the final solution from the CFA. The raw items were used such that items were not reversed to conform to a uniform direction to assure a mix of both positive and negative responses (Weller 2007). There is no standard cutoff for how many students per school are needed for CCA. We tested different cutoffs (i.e. 5, 10, 15, 20, 25, 30 students per school) and chose 20 since the results were stable at that cutoff. We used the software UCINET to estimate the eigenvalue ratio of the first two factors and the range of respondent competence scores. The factor analysis of a CCA is based on a factor analysis of a dataset transposed from its usual structure so that the questions become the units of analysis (the rows) and the people are the variables (the columns). Thus, in contrast to the EFA and CFA results reported here which describe variability and

**Table 3** Exploratory factor analysis loadings for the school culture and environment items

Item	Factor					
	1	2	3	4	5	6
<i>How do the following behaviors affect popularity in your school?</i>						
1	Being a good student	-- <sup>a</sup>				
2	Being respectful to teachers	-0.26 <sup>b</sup>				
3	Smoking marijuana or drinking alcohol	0.63				
4	Looking good or dressing a certain way					0.55 <sup>†</sup>
5	Being tough					0.44
6	Physical fights	0.66				
7	Making jokes					0.51 <sup>†</sup>
8	Disrupting class	0.64				
9	Making fun of or embarrassing classmates	0.67 <sup>c</sup>				
10	Bringing a weapon to school	0.76 <sup>c</sup>				
11	Bringing alcohol or drugs to school	0.81				
12	Having sex	0.66				
<i>How do the following behaviors affect getting respect in your school?</i>						
13	Being a good student					-0.60 <sup>†</sup>
14	Being respectful to teachers					-0.65
15	Smoking marijuana or drinking alcohol					0.50
16	Looking good or dressing a certain way					0.57
17	Being tough					0.53
18	Physical fights					0.59
19	Making jokes					0.55
20	Disrupting class					0.68
21	Making fun of or embarrassing classmates					0.70 <sup>c</sup>
22	Bringing a weapon to school					0.64 <sup>c</sup>
23	Bringing alcohol or drugs to school					0.66
24	Having sex					0.51
<i>Regarding teachers in your school...</i>						
25	I can count on at least one to help me out, if I have a problem					0.75
26	I feel supported to do my best in whatever I do					0.83
27	I feel supported to think independently					0.76
28	I can get help with my school work if I don't understand something					0.71
29	When they want me to do something, they explain why					0.65 <sup>c</sup>
30	My teachers encourage me to try harder when I get a poor grade					0.62
31	When I get a good grade in school, my teachers praise me					0.54 <sup>c</sup>
<i>Adults at your school make sure students are following the rules when students are...</i>						
32	in class					0.40
33	outside of class in the hallways during class time					0.63
34	during lunch or passing periods					0.71
35	in the bathroom or locker room					0.67
36	before and after school on school campus					0.69
37	at school-related events (dancers, sports)					0.53
38	around the school but not at school					0.66

**Table 3** (continued)

Item	Factor					
	1	2	3	4	5	6
<i>How true are the following statements about your school?</i>						
39					-- <sup>a</sup>	
40					0.36 <sup>†</sup>	
41					0.57	
42					-- <sup>a</sup>	
43					0.58	
44					-0.39	
45					0.48	
46					0.46	
47					0.51	
Correlation matrix of PROMAX rotated common factors						
Factor 1	1					
Factor 2	0.51	1				
Factor 3	0.19	0.25	1			
Factor 4	0.23	0.19	0.50	1		
Factor 5	-0.16	-0.21	-0.39	-0.30	1	
Factor 6	0.38	0.33	0.09	0.07	-0.13	1

<sup>a</sup>Factor loadings with an absolute value greater less than 0.30 are not shown

<sup>b</sup>Factor loading for Item 2 was below the cutoff of 0.30 but was included in factor 1 in final solution

<sup>c</sup>Items not included in final factor solution based on confirmatory factor analysis

correlation between survey items within factors, CCA describes variability and correlation among the responses of individuals within schools. A dominant culture is suggested if the first factor eigenvalue is 3 times or greater than the second factor, and there are no respondents with negative factor loadings (referred to as cultural competence scores in CCA) or only 1–2 with negative scores close to 0 (Weller 2007).

We estimated the Pearson product-moment correlations between the measures with student as the unit of analysis. In addition, we estimated correlations between the California 2013 Growth Academic Performance Index (API) and the school culture measures averaged across respondents at the school-level. The API score is a school-level metric ranging from 200–1000 and summarizes a school's performance on the California Standardized Testing and Reporting (STAR) Program and the California High School Exit Examination (CAHSEE) tests.

There were no missing values for any of the items in our measures, thus imputation of missing data was unnecessary. We used Stata version 14 for the EFA and CFA, and we used UCINET for the cultural consensus analysis (Borgatti et al. 2014; StataCorp, 2018).

## Results

The parallel analysis and scree plot suggested 6 factors. Results of the 6-factor exploratory factor analysis solution (PROMAX rotation) are shown Table 3. Only factors loading for each item equal to or above an absolute value of 0.30 are shown, with the exception of items 1 and 2. We included these items in Factor 1 for the final solution even though the factor loadings did not meet the cutoff criteria because these items represented important constructs that paralleled items included for Factor 2. The identified items strongly conformed to our a priori constructs of social culture, school order/chaos, teacher monitoring, and teacher support. However, 6 items from the social culture-respect and social culture-popular items represented a 6<sup>th</sup> factor. These 6 items related to the perceptions of looking good, being tough and making jokes on influencing respect and popularity. These are potential valued traits, rather than behaviors, and do not necessarily relate to following school rules. In contrast, the remaining items designed to measure social culture are behaviors that directly relate to alignment with school rules, such as being respectful of teachers,

**Table 4** Goodness of fit of the final solutions for 6 factors from the exploratory factor analysis

Factor	1	2	3	4	5	6
Construct	Popular	Respect	Support	Monitor	Order	Trait
RMSEA	0.049 (0.032, 0.067)	0.089 (0.073, 0.106)	0.064 (0.043, 0.088)	0.087 (0.074, 0.1)	0.074 (0.058, 0.091)	0.078 (0.045, 0.115)
CFI	0.989	0.965	0.991	0.958	0.939	0.981
SRMR	0.016	0.028	0.016	0.033	0.035	0.024

RMSEA root mean square error of approximation, CFI comparative fit index, SRMR standardized root mean residual

**Table 5** Cronbach's alpha and Pearson's correlation between simple-summed scale measures of school culture and environment

	Factor 1 Social culture- respect	Factor 2 Social culture- popularity	Factor 3 Teacher support	Factor 4 Adult monitoring	Factor 5 School order	Factor 6 Valued traits
Cronbach's Alpha	0.83	0.84	0.86	0.85	0.68	0.67
<i>Pearson correlation</i>						
Factor 1	1					
Factor 2	0.592	1				
Factor 3	0.185	0.232	1			
Factor 4	0.235	0.207	0.481	1		
Factor 5	0.147	0.203	0.334	0.338	1	
Factor 6	0.471	0.546	0.107	0.142	0.078	1

disrupting class, making fun of other students, and engaging in substance use or other delinquent behaviors. It is important to note that the six identified factors are separate constructs and that the exploratory factor analysis did not suggest the presence of a single, overall factor. Thus, the six factors were not combined into a total social culture of schools score.

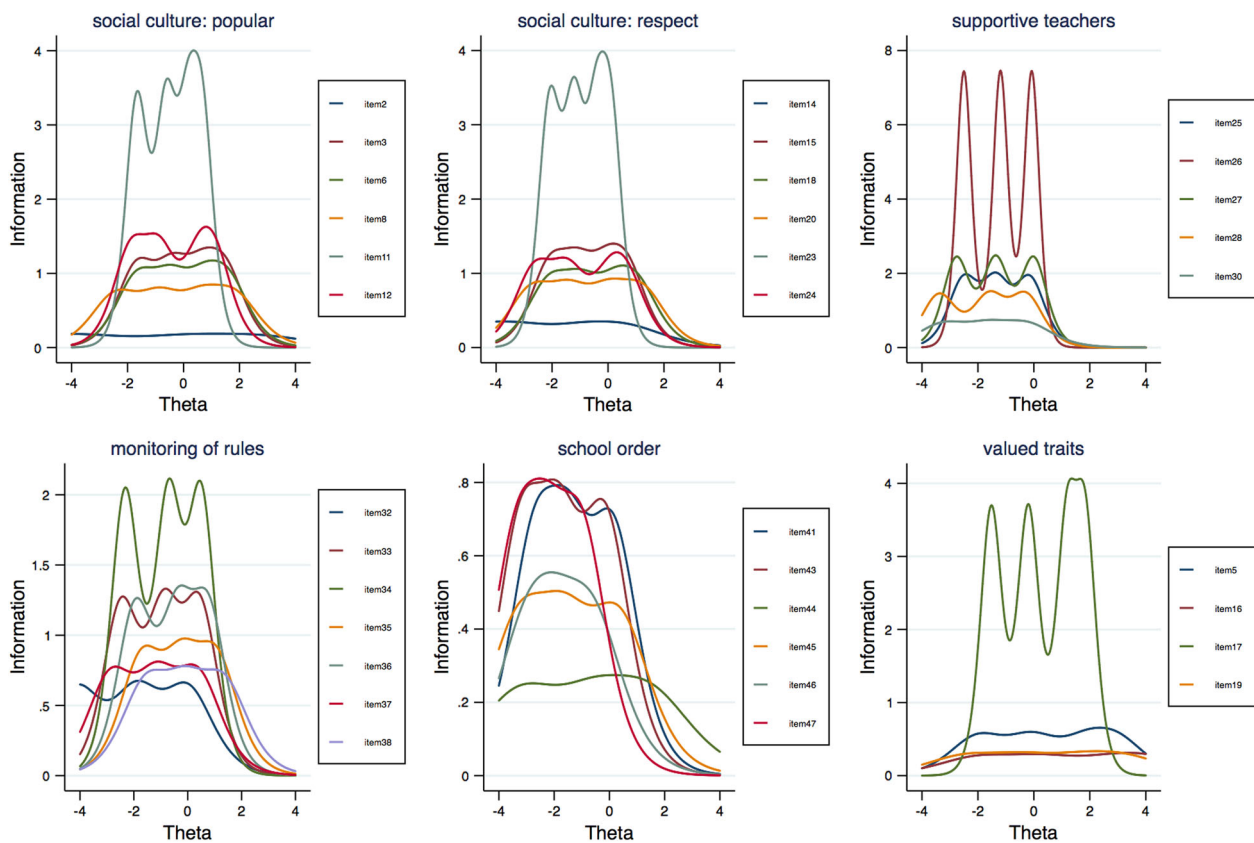
The goodness of fit statistics for the final solutions from the confirmatory factor analyses are shown in Table 4. Initial goodness of fit statistics did not meet standardized cutoffs due to high ( $\geq 0.20$ ) residual correlations between specific pairs of items. Starting with the highest residual correlations between pairs of items, we then randomly picked one item from the pair, and dropped it from the measure. We repeated this until the goodness of fit indices were adequate. The items included in the final solution for each factor is shown in Table 3. Items that were dropped from the final factor solution included items 17, 19, 25, 26, 28 and 40.

Coefficient alphas and correlations among simple-summed factors are shown in Table 5. Alphas ranged from 0.67 for Factor 5 (valued traits) to 0.86 for Factor 3 (teacher support). All the correlations between factors were positive and consistent with the expected direction of these measures. The highest correlation was 0.59 between Factor 1 (social culture-popularity) and Factor 2 (social culture-respect), which is not surprising given the similar construct for these two measures. Aside from this

expected high correlation, the next highest correlation was 0.50 between Factor 3 (teacher support) and Factor 4 (adult monitoring).

Figure 1 plots the amount of information from each item against the latent trait (i.e. the underlying characteristic that the items are measuring). Steeper curves indicate that the corresponding item provides more information about the underlying trait. The location of the peak of the curve, relative to theta, indicates how well the item discriminates at different values of theta. For Factor 1 (social culture-popular), item 11, which asks whether bringing alcohol or drugs to school would increase popularity, provides the most information about the latent trait. Note that for items 3, 6, 8, 11, 12, the direction of the responses was changed so that a higher score on the underlying trait indicates a more positive or healthier culture. For Factor 2 (social culture-respect) item 23 is the most informative item and is similar to item 11 in that it asks about the impact on respect of bringing alcohol or drugs to school. For Factor 3 (supportive teachers), item 26 was the most informative; it asks whether teachers make them feel supported to do the best in whatever they do. For Factor 4 (school monitoring), asking participants how often teachers make sure students follow the rules during lunch or passing periods (item 34) was most informative. For Factor 5 (school order), items 41 ("it's a real zoo in our school"), 43 ("it's so noisy, you can't hear yourself think in our school"), and 47 ("when someone breaks the rules at our school, the adults look the other





**Fig. 1** Item information functions for each school culture scale. Item information functions show the amount of information from each item against the latent trait (theta). Item numbers refer to items listed in Table 1

way”) were most informative. For Factor 6 (valued traits), being tough (item 17) was the most informative.

Figure 2 shows the test information functions (TIF), which plots the scale information and standard errors against the latent trait. This conveys at what level of the latent variable the scale provides the most information about a person. Reliability and test information are related as follows:

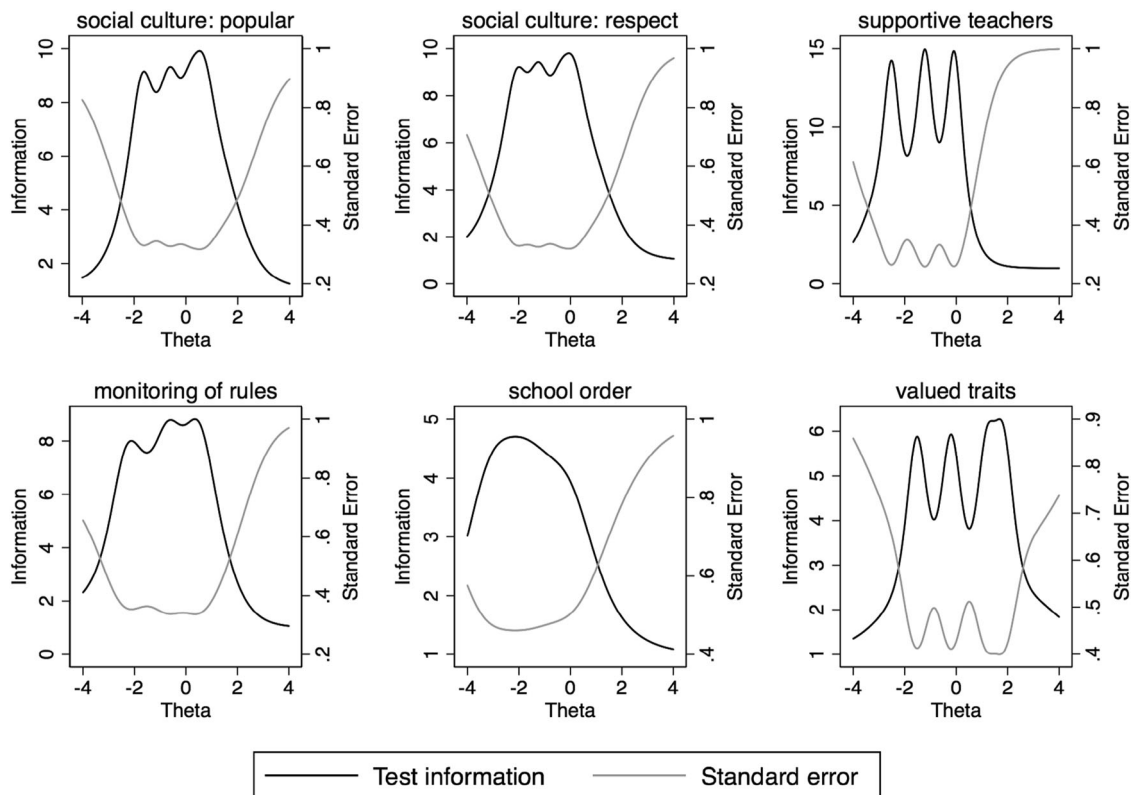
$$\text{Reliability} = (\text{Information} - 1) / \text{Information}.$$

Thus, information of 5 is equivalent to reliability of 0.80, while information of 2 is equivalent to reliability of 0.50. Figure 2 indicates that the social culture-popular scale and value traits scale provide the most information around a theta of zero (mean score for the sample). In contrast, the remaining scales provide the most information and greater reliability when theta is generally between  $-2$  and  $0$ .

For the cultural consensus analysis, we limited the analysis to the 13 schools that had more than 20 respondents, which is the minimum sample size necessary to identify the cultural alignment of item responses assuming the respondents have an average cultural competency of 0.50 (Weller 2007). The number of respondents per school ranged from

22 to 105, and the total number of respondents for this analysis was 749 (65% of the sample). The main criteria for evaluating whether there is enough of a shared pattern of responses to the items among respondents to consider them to share a culture is a ratio of eigenvalues for the first and second factors greater than or equal to 3 and all respondents either scoring positively on the first factor or a negligible number of respondents (1–2) with negative scores close to zero. Of the 13 schools, 7 of the schools met these criteria and one school had a ratio of 2.9. The demographics of these 8 schools is shown in Table 2. The remaining 5 schools had an eigenvalue ratio less than 3 (ranging from 1.6–2.2).

Figure 3 shows the scatterplot of the school-level academic performance using the 2013 Growth API score and the various measures aggregated at the school. This analysis was limited to the 8 schools for which there was adequate or close consensus based on the CCA. API scores were most strongly correlated with school order (0.83), followed by monitoring of the rules (0.71), and the popular social culture scale (0.64). Supportive teachers had the lowest correlation with API scores (0.18). Among the 8 schools shown in Fig. 3, school A is the worst performing school on API score and consistently ranks at or near the bottom on each of the



**Fig. 2** Test information functions for each school culture scale. Test information function plots the scale information and standard errors against the latent trait (theta). Reliability =  $(\text{Information} - 1)/\text{Information}$ .

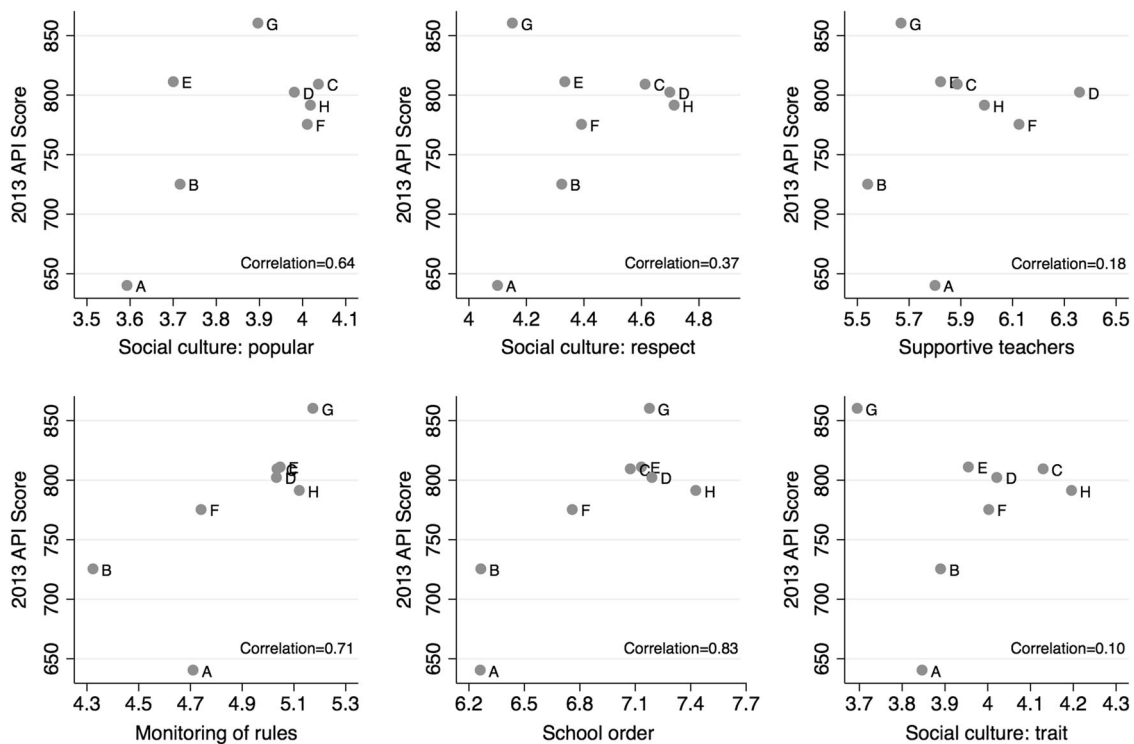
6 scales. school G is the top performing school on API score, but it also seems to be an outlier in some of the scatterplots (respect social culture, supportive teachers, and trait social culture scales). Aside from school G, schools C, D, and H are high performing schools on API scores and also consistently near the top of each scale, with the exception of the supportive teacher scale.

## Discussion

Behavioral economics primarily focuses on the psychological processes of decision making, but less on the nature and source of the intrinsic and extrinsic motivators that drive behavior. Meanwhile, social network theory focuses on the social connections that create intrinsic and extrinsic motivators for behaviors, but less on the psychological processes of decision making. By combining these two perspectives, this paper applies what we call “social economics” to understand adolescent behavior and construct measures of the intrinsic and extrinsic motivators derived from the adolescent’s network of teachers and peers. We identified six factors that include the culture regarding popular and respected behaviors, teacher support of students, teacher monitoring of school rules, valued student

traits and school order. Multi-item scales created based on these identified factors had adequate internal consistency reliability. Also, the correlations between the factors were consistent with our a priori hypotheses about academic and social culture, which provides support for the construct validity of our measures. Specifically, students who report a more positive social culture around behaviors also report that teachers provide more monitoring and support. When students report that teachers monitor the rules more frequently in a variety of school settings, students also report that the school is less chaotic and more orderly. Furthermore, several factors are correlated with school-level achievement.

Existing school climate measures have included some of these domains, such as teacher support and monitoring (Thapa et al. 2013). However, measures of peer-related motivators and school chaos had not been fully developed previously. Prior studies have examined peer norms by asking adolescents to report their perception of the prevalence, acceptance, and disapproval of a couple of behaviors, such as smoking or drinking, among their peers (Bailey et al. 2016; Keyes et al. 2011). For example, the Ed School Climate Surveys ask students whether students at school “think it is okay” to try drugs, get drunk, or smoke cigarettes (“Ed School Climate Surveys,” n.d.). We



**Fig. 3** Scatterplot of each school culture scale vs. school-level academic performance (API). Analysis is limited to schools A-H, each with more than 20 study participants enrolled and with adequate cultural consensus (ratio of eigenvalues for the first and second factors

from cultural consensus analysis of 2.9 or greater). API=Academic performance index (range 200–1000) with higher score indicating better performance

specifically asked about a wider range of behaviors that includes academic effort and various delinquent behaviors including substance use at school, bringing a weapon to school, getting into fights, making jokes, being tough, disrupting class, embarrassing classmates, and having sex. Furthermore, we asked how these behaviors would influence their popularity or respect, which more directly connects engagement in the behavior with the perceived extrinsic benefit of peer acceptance that they would receive. Psychometric testing of these items indicates that responses to almost all of these behaviors are strongly correlated and suggests that an underlying construct of a social culture across adolescent behaviors exists. All the behaviors in this measure fit well into a single factor based on exploratory factor analysis, indicating that academic behavior (i.e. being a good student) and delinquent behavior are part of a single continuum. This finding is consistent with other research that has shown that academic self-concept and behavioral self-concept are related and that school-related adult and peer networks are likely to impact both (Dudovitz et al. 2017). Confirmatory factor analysis shows that a subset the adolescent behaviors (being respecting teachers, disrupting class, fighting, using marijuana or alcohol at school, bringing drugs or alcohol to school, and having sex) can be formulated into a more concise measure. These shared perceptions may reflect a social culture about peer

acceptance and rejection that motivates adolescent behaviors in school. Future studies will need to examine whether our measures of the social culture predict academic performance and delinquent behaviors and how they compare with previous measures of social norms.

We also asked about teacher-related motivators, which is similar to prior school climate measures of teacher support and rules monitoring (Thapa et al. 2013). These two measures together are analogous to Baumrind's framework for categorizing parenting style. We found strong psychometric properties for each scale of monitoring and support. Furthermore, we have shown in a previous study that these two teacher scales can be combined into the traditional categories of authoritative (high support and monitoring), authoritarian (low support and high monitoring), permissive (high support and low monitoring) and neglectful (low support and monitoring) (Lau et al. 2017). In that study, we found substance use, bullying, and depressive symptoms are most common among students who report more neglectful teachers while these outcomes were least common among students who reported having authoritative teachers.

It is possible that the six factors we identified are not measuring perception of school characteristics that are shared among its students, but instead are measuring attitudes of an individual or small peer group. To examine this, we performed a cultural consensus analysis of

the 13 schools with more than 20 respondents. In 8 out of the 13 schools, there appears to be a dominant culture based on the pattern of responses from students at the same school. Furthermore, in these 8 schools, several measures aggregated at the school-level (school order, monitoring of rules and the popular social culture) were strongly correlated with school-level academic performance, which further support the construct validity of these school culture measures. For the remaining five schools, there was not a dominant pattern of responses perhaps indicating a more heterogeneous school culture, and a weaker correlation between school-level culture measures and academic performance. We do not know what leads a school culture to be dominant or heterogeneous, but it may reflect the school's social network composition and structure. For example, a more heterogeneous culture could result from less centrality in social networks, more cliques, or fewer bridges between cliques. We also do not know the impact of a heterogeneous school culture on adolescent behavior but hypothesize that a more heterogeneous culture might allow students to exhibit a wider range of behaviors without social repercussions.

While prior theories have been very useful in describing school culture, it is not always clear how school culture might be changed or improved through specific interventions. The advantage of using a social economic perspective is that it may provide a framework for potential interventions. There is an extensive behavioral economics literature on changing incentives to promote behavior change. Thus, potential interventions that alter the broad array of extrinsic rewards and punishments derived from adults and peers might induce healthier behaviors. While financial incentives do not appear to improve attendance or academic performance (Fryer 2011), little to no research has been conducted to focus on peer response to behaviors, which may be a source for much stronger positive or negative extrinsic motivation. The closest research in this area relates to bullying, which is increasingly recognized as a serious problem with important consequences to adolescent health (Lantos and Halpern 2015). Research on bullying indicates that its primary function is to create social order among peers. Devoid of adult influence, peers will often exert physical and emotional pressure to embarrass a socially weaker student. We hypothesize that bullying is the most overt form of peer-derived motivations and relates to the exchange of power, prestige, respect and popularity. Focused efforts to change the perceived respect and popularity associated with various adolescent behaviors could be transformative in improving academic performance, decreasing bullying, and helping students avoid delinquent behaviors.

While research in social networks is growing rapidly, we still know little about how to use social networks to change

behavior. Valente has proposed an important framework for thinking about different types of social network interventions (Valente 2012), which might be applied in schools to improve adolescent behaviors. Bernstein argued that disengaged and alienated students are more likely to create friendships with similar students who reinforce negative attitudes and behaviors, forming a “vicious cycle” of worsening school performance and behavior (Bernstein 1977). Thus, school-based interventions to reduce delinquent behavior could be centered around disrupting the tendency for disengaged students to form friendships with each other, perhaps by not putting them all in the same class or through peer support interventions. Similarly, one might also consider how to create an environment in which high performing, engaged students are encouraged to connect with lower performing students in a positive way. For example, Advancement Via Individual Determination is a national school program that has shown some promise in improving academic outcomes (Mehan et al. 1997; Swanson 1989; Watt et al. 2009). The premise for this program is to take students who are not clearly successful or failing, but are at-risk, and to put them together with high-performing students in a structured support program, which creates a social bond, promotes academic success, and rewards positive behaviors. In another study, a randomized trial tested the impact of cooperative learning methods to increase the classroom connection between high and low-risk youth and found the intervention lowered rates of substance use. (Van Ryzin and Roseth 2017, 2018)

### Limitations and Future Research

Our sample was comprised mainly of Latino adolescents from low-income neighborhoods who applied to at least one high performing charter school and most attended public high schools, thus limiting generalizability of our findings. Future studies will need to determine the reliability and consistency of these measures in other, more diverse samples of students. Our analysis is cross-sectional, so it is not clear whether assessments of school culture are stable over time. There may be other aspects of school culture that we did not fully capture, and cultural consensus around these measures is likely to differ among subgroups of students within schools. For example, teachers and administrators might provide valuable insight. Students were interviewed between October and June of their 10<sup>th</sup> grade year. It is possible that the timing of the survey might have influenced their responses. Lastly, the cultural consensus analysis revealed a dominant culture in 8 of the 13 schools with more than 20 respondents. It is not clear whether the remaining 5 schools have a more heterogeneous culture or whether the measures were inadequate in identifying an underlying school culture.

While the six factors identified in our study should not be combined into a single overall construct, school culture can be measured by the six constructs that relate to the support, monitoring and control in the school environment and by the degree to which positive or negative behaviors are promoted by the social network of peers. Those behaviors not only include academic performance and engagement, but also delinquent behaviors. These constructs appear to be inter-related, suggesting that the academic culture may influence the social culture and vice versa. Bernstein theorized that a “vicious” cycle can occur when students reject the engagement in school. Disengaged students form friendships that encourage deteriorating performance and negative behaviors. We would add that this drives aspects of the school culture in the negative direction and affects additional students in the school. However, we hypothesize that a “virtuous” cycle can be achieved-- one in which supportive and orderly learning environments promote a sense of strong engagement and good citizenship; where positive peer interactions in the classroom promote respectful and healthy normative behaviors outside the classroom. This would, in turn, make it easier for teachers to create productive learning environments and facilitate student engagement.

Future studies will need to determine whether these individual measures of the behavioral culture of schools relate to academic outcomes, school engagement, and delinquency behaviors. It will also be important to establish a causal mechanism and determine if interventions that change these measures produce better academic and behavioral outcomes.

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**Author Contributions** M.D.W. designed and supervised the execution of the study, analyzed the data and wrote the paper. P.J.C. assisted in the study design and collaborated in the writing and editing of the final manuscript. R.D.H. provided assistance with the data analysis and edited the manuscript. D.P.K. assisted with the study design and data analyses and edited the manuscript. J.S.T. assisted with the study design and edited the manuscript. R.N.D. assisted in the study design and collaborated in the writing of the manuscript.

## Compliance with Ethical Standards

**Conflict of interest** The authors declare that they have no conflict of interest.

**Ethical Approval** The human subjects research review board approved all research activities (IRB#16-001512).

**Informed Consent** Informed written consent was obtained from the parents of the study participants and informed written assent was obtained from the adolescent participants.

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