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Do relational and structural characteristics of negative school environments independently predict immigrant adolescents' academic achievement?

Moosung Lee[1] · Yeonjeong Kim[2] · Na'im Madyun[3]

Abstract A critical issue facing the majority of immigrant adolescents in U.S. public schools is persistent academic underperformance. Using data from the Children of Immigrants Longitudinal Study, this study investigates the extent to which negative social environments in U.S. public schools predict the academic achievement of immigrant adolescents. Importantly, we simultaneously examine the roles of both the relational (individual-level) and structural (school-level) characteristics of these negative social environments. Multilevel structural equation modeling revealed that immigrant students who are embedded in more negative relationships (e.g., having peers who discriminate against them) have lower levels of academic achievement. These predictive effects of individual-level negative social environments on academic achievement are mediated by both perceived school safety and educational expectations. Furthermore, we find double mediation effects (i.e., three-pathway mediations) via perceptions of school safety and educational expectations. The existence of these double mediation effects implies that relational characteristics strongly predict immigrant adolescents' perceptions, attitudes, and school outcomes. Finally, we find that structural characteristics of negative social environments in U.S. public schools (i.e., total student enrollment and school-level dropout rate) also negatively predict immigrant adolescent achievement. We discuss

✉ Moosung Lee
MooSung.Lee@canberra.edu.au

Yeonjeong Kim
yeonkim@mit.edu

Na'im Madyun
madyu002@umn.edu

[1] Faculty of Education, University of Canberra, Canberra, Australia

[2] Sloan School of Management, Massachusetts Institute of Technology, Cambridge, MA, USA

[3] College of Education and Human Development, University of Minnesota, Minneapolis, MN, USA

the implications of these findings for improving immigrant adolescents' achievements in U.S. public schools.

1 Introduction

A body of research has documented the problem of academic underachievement of immigrant adolescents across different regions such as Europe (Heath et al. 2008; Vaquera and Kao 2012) and Asia (Tsung and Gao 2012; Pong 2009). Likewise, a critical issue facing the majority of immigrant adolescents in U.S. public schools is persistent academic underperformance. As the population of immigrant youth in the U.S. has steadily increased over the last decades, improving the academic achievement of immigrant students and closing the achievement gap between immigrant and non-immigrant students have been growing national concerns. During the 1960s, immigrant children, including Latino, Asian, and multi-ethnic children, accounted for only 6% of all U.S. children, whereas today that proportion has increased to almost 30% (Passel 2011). A critical issue emerging from this substantial demographic change is that a majority of immigrant students are placed in various conditions of disadvantage that can hinder educational success—e.g., limited English proficiency (Lee and Madyun 2008; Portes and Rumbaut 2002), low family socioeconomic status (Crosnoe and Turley 2011; Glick and White 2003; Harris et al. 2008; Kao 1995; Portes and Rivas 2011; Portes and Rumbaut 2002; Reardon and Galindo 2007), living in disadvantaged neighborhoods (Lee et al. 2017b; Madyun and Lee 2010; Orfield and Lee 2006; Pong and Hao 2007), family conflict (Portes and Rumbaut 2002), ethnic stereotyping and discrimination (Bigelow 2008; Lee 2001; Lee and Lam 2016; Stone and Han 2005; Valenzuela 1999), and legal status issues (Menjívar 2008), just to name a few. These disadvantaged conditions impede educational attainment across a wide range of immigrant student groups, from low-performing ones to high-performing ones such as Asian immigrant students[1] (Portes and Rumbaut 2002).

This research focuses on one type of disadvantaged condition: the negative characteristics of the public schools that immigrant adolescents are embedded in. In particular, this research makes two main contributions. First, we distinguish negative relational (individual-level) school characteristics from negative structural (school-level) school characteristics, and we investigate the extent to which these two types of characteristics independently predict immigrant adolescents' academic achievement. Second, this research sheds light on the mechanisms by which

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[1] At the same time, we note that Asian immigrant children are not a monolithic entity. Polarization in terms of educational attainment within Asian immigrant students has been evidenced. For example, Southeast Asian ethnic groups lag far behind East Asian ethnic groups (Lee and Madyun 2008; Portes and Rumbaut 2001, 2002).

immigrant students' individual-specific negative social environments embedded in public schools influence their academic achievement. We identify two important mediating variables underlying this link: perceived school safety and educational expectation. Our hypothesis is that negative social environments foster a belief among immigrant adolescents that schools are not safe for them. These negative school safety perceptions, in turn, lead them to lower their expectations regarding the level of education they can realistically attain. Together, negative perceptions about school safety and lowered levels of educational expectations impede these students' academic achievement. The next few paragraphs describe the structural and relational characteristics of negative school environments being examined in this paper, and explain why perceived school safety and educational expectation might function as mediators underlying the association between negative school environments and underperformance.

Clearly, the structural characteristics of schools impact academic achievement. We focus on two such characteristics: student body size and dropout rate. Having a large student body and a high dropout rate can both be considered negative structural features (Hao and Pong 2008). With regard to the former, research shows that student body size "operates as an ecological feature of the school structure" since it forms different conditions for how students interact with peers and teachers (Lee et al. 2002, pp. 4–5), which in turn influence their educational outcomes (Lee and Friedrich 2007; Lee et al. 2002; Leithwood and Jantzi 2009). Regarding the latter, research also shows that high dropout rates have negative effects on the educational outcomes of at-risk students, including immigrant students in U.S. public schools (Ellenbogen and Chamberland 1997; Lee 2009).

Beyond school-level factors, the individual-level relational characteristics of negative school environments can also independently influence immigrant adolescents' academic outcomes by shaping their perceptions and expectations related to school and education. For example, previous research found that having non-academically oriented friends (i.e., friends who drop out of school or who have no plans to attend college) and/or lacking academic supporters (e.g., Ellenbogen and Chamberland 1997; Lee 2009; Lee and Lam 2016) negatively impacts academic achievement.

Moreover, these relational characteristics of negative school environments likely operate via specific channels. In particular, they could cause downward assimilation whereby immigrant students either consciously or unconsciously reject the value of education, and thus end up locked into lower class positions (Hao and Pong 2008; Portes 2007). The prevalence of negative social relations (e.g., being regularly discriminated against by one's peers) and the absence of positive social relationships (e.g., not having access to academic helpers) could, for example, decrease both perceptions of school safety and educational expectations. This is important, since research has shown that perceived school safety and educational expectation function as important conduits between students' school-related engagement and effort on their academic outcomes (e.g., Cornell and Mayer 2010; Ripski and Gregory 2009). In the same way, these two variables might serve as conduits between the relational characteristics of negative school environments and academic

achievement. And yet, to the best of our knowledge, these potentially crucial pathways have not been examined.

Notably, although past research has studied relational- *or* structural-level predictors of academic achievement, few studies have considered them both simultaneously. Nor have studies studied the mediating factors linking relational predictors to academic achievement. As such, the existing literature fails to provide a comprehensive picture of immigrant adolescents' negative social environments and how these relate to their academic outcomes. We remedy this gap by analyzing data from the Children of Immigrants Longitudinal Study (CILS). In particular, we aim to address the following research questions:

- Do the relational and structural characteristics of negative school environments independently predict immigrant adolescents' academic achievement?
- Do perceptions of school safety and educational expectations mediate the relationship between the relational characteristics of negative school environments and immigrant adolescents' academic achievement?

2 Review of the literature

Before presenting the data and our analyses, we provide a brief review of the relevant literature. We first discuss the role of peers and institutional agents in shaping relational features of negative school characteristics. Next, we review evidence that allows us to develop our theoretical claim that relational characteristics of social environments in U.S. public schools impact immigrant adolescents' educational outcomes by lowering the perceptions of school safety and educational expectations. Finally, we discuss literature that links objective, school-level structural characteristics (i.e., student body size, dropout rate) to immigrant adolescents' academic achievement.

2.1 Negative influence of peer discrimination

As most sociologists and social-psychologists point out, unlike adults and children, adolescents tend to be more easily and substantially influenced by their peer group (e.g., Coleman 1961; Cotterell 2007). In this regard, peer groups are the most influential social actors conditioning adolescent development—either negatively or positively (Cotterell 2007). The negative influence of peer groups has been particularly salient in research focusing on juvenile delinquency (e.g., Cotterell 2007; Haynie 1999; Kandel 1978). Another line of research focusing on the negative influence of peer groups on adolescents' school life in general has been advanced by cultural-ecology perspectives. Willis' (1977) classic study illustrates certain cultural mechanisms whereby working-class students consciously or unconsciously reject schoolwork by forming a counterculture of mainstream ideology that eventually leads them to be locked into a lower socio-economic status. Following Willis' perspective, researchers equipped with an anthropologic lens transferred this

cultural mechanism to racial-ethnic minority students. For example, Fordham and Ogbu (1986) view peer pressure as functioning negatively for African Americans, accelerating an anti-school culture in U.S. public schooling contexts. Consequently, African American students who exhibit behaviors and characteristics that are not consistent with anti-school culture are perceived as not identifying with Black culture and thus "acting White." The academic achievement and orientation of these students who "act White" result in their being shunned and marginalized by their racially-identical peers (Fordham and Ogbu 1986). Although the literature is mixed regarding supporters (e.g., Fryer 2006; McWholter 2005) and challengers (e.g., Cook and Ludwig 1997; Tyson et al. 2005) to the concept of "acting White," the concept does show the negative impact of in-school peer networks on ethnic minority students' educational experiences and outcomes (Fryer 2006). Whether or not discrimination is made by peers of the same or different racial or ethnic background, it seems true that many immigrant students perceive discrimination by peers in schools. A study using the Children of Immigrants Longitudinal Study in 1995 indicated that approximately 28% of the sample immigrant students had experienced at least some discrimination by their peers (Lee and Lam 2016). An unfortunate, related problem is that immigrant youth who experience or perceive discrimination are more likely to have lower academic expectations (Perreira and Ornelas 2011). Similarly, Kim et al. (2011) report that discrimination by peers in U.S. middle schools led immigrant students to have increased symptoms of depression as high school students. In brief, given the importance of relationships with peers in schools, the impact of immigrant adolescents' experiences of discrimination from peers on school life is critical. Additionally, discrimination from peers can reinforce a negative school climate stemming from the experiences of unsafe school incidences (Ripski and Gregory 2009).

2.2 Negative impact of discrimination from institutional agents in school

One's peer group is not the only social factor impacting student outcomes. Together with peers, institutional agents within schools are viewed as critical for academic success: "social embeddedness within a supportive web of caretakers and agents appears to be key" for ethnic minority youth's healthy academic development (Stanton-Salazar and Spina 2000, p. 232).[2] As a matter of fact, there are many cases showing that supportive institutional agents often serve as a catalyst in promoting the chances of academic success and thereby social mobility (cf. Lee and Madyun 2012; Lee et al. 2014).[3]

Specifically, the relational benefit for lower class students connecting to institutional agents has been examined through social capital research in education. Because institutional agents in schools often serve as levers for the social mobility

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[2] Institutional agents are in general defined as adults who are affiliated with a school organization and can provide either academic support or non-academic care for the students. Thus, institutional agents include regular teachers, counselors, social workers, para-teachers, administrators, and volunteer aides, to name a few (see Stanton-Salazar (2011) for more categories of institutional agents).

[3] See the Academy of Achievement website. http://www.achievement.org/.

of disadvantaged ethnic minority students (Stanton-Salazar and Spina 2000), schools can also serve as a place where disadvantaged students can learn to navigate opportunities and attain social mobility (Conchas 2006; Gandara 1995) even though schools are often criticized as a place for class reproduction or maintaining class stratification (Althusser 1971; Willis 1977). In this regard, institutional agents may be the only "formal" channel through which poor immigrant students may surmount their lack of social opportunities and resources. According to McDonough (1997), working-class students also show upward mobility from working with counsellors in the absence of their parents. Similarly, Stanton-Salarzar and Dornbusch (1995) also identified that such institutional resources embedded in relationships with adults in schools are more critical for students with low-income backgrounds.[4] In summary, the presence of supportive, caring adults in a school is essential to the academic success of ethnic minority adolescents. Therefore, maintaining strong ties with institutional agents seems to be critical for immigrant students' academic development (Lee and Madyun 2012; Lee et al. 2014). Conversely, immigrant adolescents' academic development in schools is critically vulnerable to discrimination from institutional agents (Stanton-Salazar and Spina 2000). As such, discrimination from institutional agents is likely to have a negative relationship with immigrant adolescents' educational expectations and outcomes. In particular, the marginalization or discrimination of immigrant students in terms of relationships with institutional agents is identified as an exacerbating factor for their academic engagement and performance (Stone and Han 2005; Valenzuela 1999).

2.3 Presence of negative social relationships and absence of positive relationships

Consistent with the importance of peer relationships, there are a growing number of studies reporting that immigrant adolescents suffer academically from having non-academically-oriented peers. Several studies have found that students at-risk are more likely to have friends who dropped out of school (Ellenbogen and Chamberland 1997) and that immigrant students with low GPAs are more likely to have friends who do not plan to attend college (Lee 2009). Similarly, Ream and Rumberger's study (2008) using the National Education Longitudinal Study of 1988 identifies that the number of dropout friends had a significant impact on one's own likelihood to drop out of school. In fact, this was a commonly identified factor among both non-immigrant students and Mexican immigrant students in their study. Notably, Ream and Rumberger's (2008) study implies that having certain friendship groups such as dropouts and non-academically oriented friends may influence immigrant students' educational expectations (Ream and Rumberger 2008).

In addition, the discrimination research noted above further adds to the importance of academic supporters in education outcomes. Given the positive effects of immigrant students' peer social capital—i.e. resources embedded in peer

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[4] However, Harrington and Boardman (1997) reported that middle-class students are more likely to possess redundant social capital, meaning that in addition to their parents, they are connected with resourceful people who could provide sufficient academic support, encouragement, and role-modeling.

group networks—on their educational outcomes (e.g. Gandara 1995; Goldstein 2003; Ream 2005; Lee 2014; Stanton-Salazar 2004), it is important to consider whether there are academic supporters in the school contexts of immigrant students. While peer group influence can be often regarded as potentially negative in U.S. school contexts, Gandara (1995) does provide a counter-story. According to her study, low-income Mexican–American students who were placed into college-prep tracks tend to benefit from their peer group, which helped to facilitate their aspirations. This finding has an important implication: despite the White, middle-class school culture of many US schools, the opportunity for immigrant students to interact with positive, college-oriented peers could make a difference in their academic pathways.[5] Furthermore, Goldstein's (2003) ethnographic research illuminated how immigrant students, who were linguistically disadvantaged in one Canadian school, helped one another to achieve academic success.

Alongside positive peers, some ethnic minority youth purposively develop and utilize supportive relationships with institutional agents (e.g. teachers, counselors, social workers, etc.) called 'network orientation' in order to cope with structural forces impeding their healthy socialization in school (Stanton-Salazar 1997; Stanton-Salazar and Spina 2000; Stanton-Salazar et al. 2001). Similarly, a recent study using social network analysis showed that high-achieving immigrant adolescents tend to (1) have intimate relationships (i.e., strong ties) with institutional agents, (2) value institutional agents' expectation of their school performance, (3) focus more on relationships with institutional agents than peer relationships, and (4) activate institutional resources from institutional agents in a specific and strategic way for enhancing the chance of college attendance (Lee and Madyun 2012). In this regard, the absence of academic supporters appears to be an impediment that reduces immigrant adolescents' educational expectations, and thus, educational outcomes.

2.4 Linking relational characteristics, perception of school safety, and educational expectation

A perception that social relationships in school are molded by racial discriminatory elements can lead to a decrease in optimism regarding educational returns within opportunity structures and decreased sense of school safety (Ashburn-Nardo and Smith 2008). Furthermore, research has shown perceived school safety to be an important variable in predicting academic and behavioral outcomes (Cornell and Mayer 2010). For example, Ripski and Gregory (2009) multilevel analysis of school safety's impact on academic outcomes shows that both perceived hostility and

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[5] One relevant question here is "who should be the positive reference group?" More often than not, the positive reference peer group refers to middle-class White students. However, the classifying of racial-ethnic minority students' assimilation and acculturation to White middle-class standards or ideals as "success" needs to be revisited. When minority students are equipped with "positive racial self-conception," they can "situationally and strategically racialize and deracialize achievement and the task of achievement as a form of academic motivation and self-preservation" (Carter 2005, p. 267). As long as minority students have positive ethnic identities, certain ethnically homogenous minority peer groups could serve as positive reference groups (Lee 2009).

victimization predicted lower levels of math and reading achievement. Additionally, students reporting higher levels of victimization tend to be less engaged with teachers, which adds importance to the perception of school safety given the relationship between teacher perceptions of student capacity and the performance of marginalized students (Rist 1970). Research also shows that students are more distracted, less motivated, and less likely to attend school when they perceive that school context is not safe (Chen 2007). This implies that although adolescents' educational expectation is substantially influenced by parents' educational expectation or support, their educational expectations can also be influenced by their perceived level of school safety.

In addition to this possible link between perceived school safety and educational expectation, research exploring social relationships of adolescents and particularly social capital research consistently indicates that positive social relationships are predictive of educational aspirations and expectations (Dika and Singh 2002). This is also true for immigrant students. As noted above, some immigrant students placed into college-prep tracks tend to benefit from peer relationships, helping to facilitate their educational expectations and outcomes (Gandara 1995). Similarly, social ties with intuitional agents could function as "a conduit for transmitting the high educational expectations of immigrants to children" (Crosnoe and Turley 2011, p. 134).[6] Conversely, immigrant youth who experience or perceive discrimination are more likely to have lower academic expectations (Perreira and Ornelas 2011). In particular, the experience of marginalization or discrimination among immigrant students by institutional agents is identified as a factor negatively affecting their academic engagement and performance (Valenzuela 1999). There is also consensus in the literature that educational expectations are positively correlated with academic performance in that an increase in educational expectations based on perceptions of opportunity may lead to an increase in academic related effort and orientation.[7]

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[6] Educational expectations here refer to beliefs regarding future academic performance based on more realistic self-assessments, whereas educational aspirations may indicate some level of hopefulness of future academic performance beyond one's realistic expectation (Kao and Tienda 1998; Mickelson 1990; Portes and Rumbaut 2001; Szalacha et al. 2005).

[7] However, we note that the opposite method of influence is possible—i.e., high academic performance reinforces high educational expectation. Since our research is based on cross-sectional analysis, it is a daunting task to posit which causes which (Portes and Rivas 2011). As such, our final model examined the impact of educational expectation on academic achievement based on comparing the overall model fit between our final model (Fig. 1) and the competing model representing the inverse impact of academic achievement on educational expectation. The result indicated that the competing model did not fit the data better than the proposed model in our study. Furthermore, we checked a non-recursive model between educational expectation and GPA. However, since GPA's effect on educational expectation turned out to be negative, indicating certain irrationality in terms of interpretation, we maintained the proposed model in this study as the final model. In similar logic, one may raise the question whether the model might fit better when the model uses educational expectation as a predictor of the five exogenous variables. In this case, the model fit turned out to be the same because the model is mathematically identical to the final model. Based on our literature review, however, we believe that the exogenous variables are predictive of educational expectation. In other words, psychological constructs such as educational expectations are more likely to be attributed to social contexts such as negative school environment in terms of time sequence.
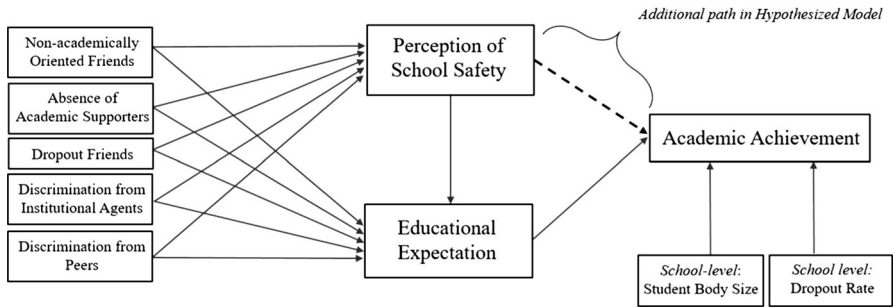
Fig. 1 The hypothesized and alternative models. *Note* Non-academically oriented friends' refers to friends who do not plan to attend college. 'Dropout friends' refers to friends who dropped out of school. Covariance between exogenous variables are omitted for the simplicity. The dashed line represents the difference between the hypothesized model (the dashed line is present: partial mediation) and alternative model (the dashed line is absent: full mediation)

2.5 Structural characteristics of negative school environments

In this study, we focus on two distinctive school-level characteristics that play a negative role in public school context—i.e., large student body size and high dropout rate. Research highlights student body size as an important school context in forging particular social relations and learning environments for students. The big question in this line of research is whether a smaller student body size is better (Lee et al. 2002). In examining the effect of school social organization on student academic success, a majority of research has consistently found small schools outperforming large ones by making notable improvements in student achievement (Howley 1994; Lee and Smith 1995; Stiefel et al. 2000) and academic equity (Howley et al. 2000; Stiefel et al. 2000). Because schools with smaller body size tend to place a greater emphasis on enhancing the social ties of all school community members, their effectiveness could very well be manifested in the students' lived experiences in ways that exceed the capacity of current standardized achievement tests to measure (see Leithwood and Jantzi 2009 for review of school size). However, as Cotton (2001) points out, there is a "lack of explicit dialogue on race" in the small school research because "the vast majority of small schools are led by Whites, and while these school leaders may operate with the best of intentions, they set the agenda and tone for their schools" (p. 49). Small schools that boost White children's achievement cannot meet the same standard for ethnic minority students, as Perry (2003) notes regarding small schools in Boston and Cambridge, Massachusetts. This suggests that although previous research tends to show consistently positive effects of small schools on raising student achievement and closing racial achievement gaps in general (cf. Lee and Friedrich 2007), it is still necessary to examine whether small schools also contribute positively to immigrant student achievement. Conversely, it is also necessary to explore whether large school size plays a negative role in immigrant students' academic achievement.

Additionally, we investigate the predictive power of school-level dropout rates on immigrant students' achievement across schools. Previous research highlights that certain ecological contexts created by the composition of the student body, such as high proportion of dropout students, may generate negative effects on the educational outcomes of at-risk students.

Since empirical research on the impact of school-level dropout rates on immigrant adolescents' achievement is still relatively thin, we employ this variable in our model to test its predictive power across U.S. public schools.

3 Present study

In summary, this research hypothesizes that structural and relational characteristics of negative school environments independently predict immigrant adolescents' academic achievement. Furthermore, we hypothesize that the relational characteristics impact academic achievement via two mediators (i.e., double mediation); namely, perceived school safety and educational expectation.

Before testing these hypotheses, we conduct a series of statistical analyses to check the validity of the theoretical model. First, we conduct a confirmatory factor analysis for the perception of school safety (which was measured via four items) to confirm its construct validity. Next, we conduct a formal model comparison of two possible mediation patterns, which are illustrated in Fig. 1. One model—the full mediation model—assumes that the effect of perceived school safety on academic achievement is fully mediated by educational expectation (i.e., it only has an indirect effect); the other model—the partial mediation model—assumes that perception of school safety has both indirect and direct effects on academic achievement. Accordingly, the direct path from perceptions of school safety to academic achievement is only present in the partial mediation model (see Fig. 1). Therefore, the existence of a significant direct effect would imply that the impact of perceived school safety on academic achievement goes beyond the indirect effect that is transferred through educational expectation. We conduct multilevel structural equation model analyses of the full and partial mediation models, and compare their model data fits. As we explain below, the results of these analyses favor the partial mediation model, implying that the effect of perceived school safety on academic achievement is not fully mediated by educational expectation.

Having established the validity of our theoretical model, we test our main hypotheses regarding (1) the independent effects of structural and relational characteristics of negative school environment on academic achievement and (2) the indirect effects of the relational characteristics via perceived school safety and educational expectation. Reflecting our literature review, we test double-pathway mediations (e.g., discrimination from institutional agents → perception of school safety → educational achievement) as well as triple-pathway mediations (e.g., discrimination from institutional agents → perception of school safety → educational expectation → educational achievement).

4 Method

4.1 Data

We used the Children of Immigrants Longitudinal Study (CILS) for the study, one of a few large datasets focusing entirely on the children of immigrants in the U.S. The CILS survey consists of three Waves. We employed Wave 2 (gathered in 1995) of the CILS to conduct our analyses since Wave 2 data includes various measures of social and school contexts surrounding immigrant students and key educational outcomes such as academic achievement. Wave 2 includes 4286 immigrant students. We created a school ID variable by utilizing all school record variables in Wave 2. That is, students who showed the same school level information such as dropout rate and total enrollment were re-matched within their own school groups. In this way, we identified 3615 students enrolled in 44 public schools. This means that 671 out of the 4286 students were excluded in the final analysis mainly because of missing or inconsistent information. Preliminary statistics demonstrated that there was no significantly systematic difference between the excluded and the included students in terms of GPA, the dependent variable of our analysis.[8]

4.2 Measures

4.2.1 Exogenous variables

The relational characteristics of negative social environments this study focused on included (a) the presence of friends who do not plan to attend college, (b) the presence of friends who dropped out of school, (c) the absence of academic supporters, (d) discrimination experienced from institutional agents, and (e) discrimination experienced from peers. Consistent with our review of the literature, these variables were employed as antecedent predictors on the perceptions of school safety and educational expectation in the model. We employed two school-level structural variables: dropout percentage and student body size. These two variables were used as the predictors in the between-school level. More details about these variables (e.g., item contents and descriptive statistics) are presented in Table 1.

4.2.2 Mediating variables

We used perceptions of school safety and educational expectations as mediating variables (see Table 1). For the former variable, we identified a latent factor using four items measured on a 4-point Likert scale.[9] The latter variable was measured using a single item rated on a 5-point Likert scale available from the CILS data (see Table 1).

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[8] The GPA of the excluded group was 2.57 while that of the included group was 2.53: $t(899.4) = -1.04$, $p = .297$.

[9] See Yuan and Bentler (2000) for details about this robust method.

Table 1 Description of the variables used in the SEM analysis

Variable name	Description	M	SD
Dependent variable			
Academic achievement	Grade point average as of 1995	2.54	.94
Exogenous variables (individual-level)			
Presence of non-academically oriented friends	Respondents indicated whether they have friends without any plans for college attendance: 1 = *none*, 2 = *some*, 3 = *many*	1.67	.62
Presence of friends dropping out of school	Respondents indicated whether their friends dropped out of school: 1 = *none*, 2 = *some*, 3 = *many*	1.52	.58
Absence of academic supporters	Respondents indicated persons who help most with homework. Responses were recoded: 0 = *at least one helping person*, 1 = *no helping person*	.66	.47
Discrimination from institutional agents	Discrimination experiences by teachers or counselors: 0 = *no*, 1 = *yes*	.55	.50
Discrimination from peers	Discrimination experiences from peers: 0 = no, 1 = yes	.28	.45
Mediating variables			
Perception of school safety	A confirmatory factor analysis based on four items on a 4-point Likert scale (reversely coded); higher values indicate a stronger sense of school safety		
	Something stolen at school	3.45	.64
	Offered drugs at school	3.61	.69
	Threatened at school	3.79	.48
	Got in a fight at school	3.81	.41
Educational expectation	The education level that respondents think is realistically attainable measured on a 5-point Likert scale (high values indicate high expectations)	4.19	.90
Exogenous variables (school-level)			
School level dropout	The annual dropout rate in 1995	5.47	3.76
Student body size	The total student enrollment level	2.96	.88

Note 1 We note that the measures and the analytical model in the study are the same as the ones in our previous work (Lee et al. 2017a) as both studies utilized the same secondary dataset. Unlike the present study, Lee et al.'s (2017a) research paid special attention to Latino populations

Note 2 The mean for binary measure variables indicates the proportion. For example, the mean value of presence of academic supporters for homework is .66, which indicates that 66% of the sample students indicated that they have academic supporters

4.2.3 Dependent variable

Recent studies indicated that high school GPA has the highest impact on determining both occupational attainment and upward assimilation of immigrant youths in early adulthood (e.g., Portes et al. 2009; cited in Portes and Rivas 2011). Therefore, we used GPA to measure immigrant adolescents' academic achievement.

4.3 Analysis

We used multi-level structural equation modeling (MSEM) to simultaneously investigate the relational (individual- or within-level) and structural (school- or between-level) effects of negative social environments on academic achievement. With respect to the multivariate normality assumptions of the structural equation modeling, we checked kurtosis and skewness of all the variables in the model by following a widely-used guideline of normality (Curran et al. 1996). Although most of variables were satisfied with the criterion of skewness (< 2) and kurtosis (< 7), two indicator variables used for the school safety construct turned out to violate the normality assumption to some extent; thus, we used an estimator that are robust to non-normality of data.[10] Standard errors were calculated using a sandwich estimator. Chi-square statistics that are asymptotically equivalent to Yuan-Bentler *T2* test statistics were used in obtaining model fit indices (Muthén and Muthén 1998–2010; Yuan and Bentler 2000).

The amount of missing values of the variables we used is insignificant (i.e., 11 variables in the analyses have $< 1\%$ missing ratio). Nonetheless, we used a multiple imputation approach since it produces less biased estimates and better standard errors compared to other missing data techniques (Graham 2009; Schafer and Graham 2002; Newman 2003). Twenty data sets were generated and all results from each data set were combined and presented.

Several key indices were used to assess model fit. These included Chi-square test statistics, root-mean-square-error of approximation (*RMSEA*), the Tucker–Lewis Index (*TLI*), and comparative fit index (*CFI*). We relied on standard cutoff recommendations for the *RMSEA*, *TLI*, and *CFI* (Fan and Sivo 2007; Hu and Bentler 1999) in assessing model-data-fit rather than Chi-square statistics, which is sensitive to sample size (Bentler 1990). For the *RMSEA*, values less than .05 and .08 suggest a good model fit and an acceptable model fit, respectively. For the *TLI* and *CFI*, values greater than .95 and .90 indicate goodness of fit and acceptable fit, respectively.

Finally, we tested the single and double mediating effects of perceived school safety and educational expectation. Considering that normality cannot be assumed in testing indirect effects, we tested the significance of these mediating effects using the credible intervals obtained from Bayes estimator—non-informative prior is used to minimize the impact of prior on posterior distribution—rather than using standard errors calculated based on multivariate delta methods.

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[10] While one may raise a concern about whether some of the exogenous variables might fit just as well as indicator variables in the School Safety construct, we wish to note that there are substantial differences in scales between the exogenous variables and the four indicator variables regressed on the School Safety construct. Also, we think that the perception of safety is substantively different from the perception of discrimination, even though they could be conceptually associated with each other. Finally, one may suggest that school safety could be conceptually modeled as a school-level variable. While this might be another competing model, we used school safety as an individual level because the data do not provide school-level measures on school safety.

5 Results

5.1 Descriptive statistics

Table 2 presents the correlation matrix of variables used for the final analysis. The negative relational and structural characteristics of school environment were negatively associated with educational expectation and achievement. In particular, having friends who do not plan to go to college and/or who dropped out of school, tended to show lower both educational expectations and achievement among immigrant students. In a similar vein, students without academic supporters tended to show lower educational expectation and achievement. All the negative relational characteristics in school were also negatively associated with students' perception of school safety—i.e., the greater the degree to which they are embedded in negative relational characteristics, the less they feel a sense of school safety. The two school-level variables (dropout percentage and total enrollment level) were negatively associated with achievement—i.e., students were likely to show lower achievements, especially when they were placed in large student bodies or high dropout rates. Perceived school safety, educational expectation and achievement were positively associated with one another.

5.2 Multi-level structural equation model of school environment, perceived school safety, educational expectation and achievement

Before conducting MSEM analyses, we checked the reliability and validity of the perceived school safety construct. The four items showed good internal consistency (Cronbach's α = . 75). The confirmatory factor analysis revealed a good model-data fit (χ^2 (2) = 7.95, $RMSEA$ = .03, TLI = .98, CFI = .99) and the four indicator

Table 2 Correlation matrix of variables used for the final analysis

	1	2	3	4	5	6	7	8	9
2	− .12**								
3	.53**	− .10**							
4	.04*	− .03	.03						
5	.02	− .06**	.07**	.49**					
6	− .22**	.09**	− .23**	− .09**	− .06**				
7	− .23**	.10**	− .21**	.01	− .04*	.11**			
8	− .24**	.09**	− .25**	.04**	− .05**	.21**	.36**		
9	.08**	− .07**	.13**	− .05**	.00	− .05**	− .08**	− .21**	
10	− .01	− .03	.05**	− .10**	− .04**	− .09**	.17**	− .18**	.20**

Note 1 Non-academically oriented friends (i.e., friends who do not plan to attend college), 2: academic supporters, 3: dropout friends (i.e., friends who dropped out of school), 4: discrimination from institutional agents, 5: discrimination from peers, 6: perception of school safety (by a composite score), 7: educational expectation, 8: achievement, 9: school level upon dropping out, 10: total student enrollment level

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

variables loaded significantly onto the school safety factor. The MSEM estimates for the partial and full mediation models, which are presented in Table 3, show that the partial mediating model provided good absolute, and better relative, fits of the data.

Table 4 and Fig. 2 present MSEM results of the partial mediation model. The results indicate that relational characteristics were predictive of immigrant students' perception of school safety. Having friends who do not plan to attend college was negatively associated with students' perception of school safety (− .07***). In a similar vein, the absence of academic supporters (− .04***) and the presence of dropout friends (− .09***) were also predictive of reducing the level of perceived school safety. Discrimination experienced from institutional agents in schools was negatively associated with the perception of school safety (− .04***), whereas discrimination experienced from peers had no significant relation with students' perception of school safety. Having friends who dropped out of school (− .14***) and having friends who do not plan to attend college (− .22**) were both negatively associated with the educational expectation of immigrant students. Absence of academic supporters was also predictive of lower levels of educational expectation (− .11**). A somewhat unexpected finding was that discrimination experiences from teachers, counselors, or peers did not have a significant relation with educational expectation. Finally, perceived school safety was positively associated with educational expectation (.33**). Moreover, both perceptions of school safety (.88***) and educational expectation (.36***) had significantly positive association with achievement. Together, relational characteristics, perceived school safety, and educational expectations explained a total of 22% of the variance in individual students' achievement.

The mean level achievement of immigrant students among schools varied significantly, and this variation was explained by school-level dropout rate and school size. Students in public schools with large student body (− .22***) or higher dropout rates (− .02***) were likely to show lower achievement. Together these two variables explained a total of 63% of school variance in achievement.

5.3 Indirect effects of relational characteristics of negative social environment on achievement

One of our primary research questions was to examine the indirect effects of relational characteristics of negative social environments on academic achievement with two mediating variables: perceived school safety and educational expectation. We tested the significance of indirect effects with 95% Bayesian credible intervals (CI) and the results are presented in Table 5.

Table 3 Model comparison

Model	Chi-square statistics	Degree of freedom	CFI	TLI	RMSEA
Partial mediating model	234.19	28	.95	.90	.05
Full mediating model	346.67	29	.92	.84	.06

Table 4 Parameter estimates of the final structural model

	Parameter estimates	Standard errors	t
Within level			
Perception of school safety ← non-academically oriented friends	− .07	.01	− 6.97***
Perception of school safety ← absence of academic supporters	− .04	.01	− 3.57***
Perception of school safety ← dropout friends	− .09	.01	− 8.48***
Perception of school safety ← discrimination from institutional agents	− .04	.01	− 3.75***
Perception of school safety ← discrimination from peers	− .01	.01	− 0.24
Educational expectation ← perception of school safety	.33	.10	3.17**
Academic achievement ← perception of school safety	.88	.11	8.21***
Educational expectation ← non-academically oriented friends	− .22	.04	− 5.90***
Educational expectation ← absence of academic supporters	− .11	.03	− 3.21**
Educational expectation ← dropout friends	− .14	.03	− 4.50***
Educational expectation ← discrimination from institutional agents	.08	.04	1.85
Educational expectation ← discrimination from peers	− .09	.05	− 1.59
Academic achievement ← educational expectation	.36	.02	16.08***
Between level			
Academic achievement ← school level dropout rate	− .02	.01	− 4.63***
Academic achievement ← total student enrollment level	− .22	.03	− 7.90***
Intra class correlation			
Academic achievement	.09		

Note 'Non-academically oriented friends' refers to friends who do not plan to attend college. 'Dropout friends' refers to friends who dropped out of school

*p < .05; **p < .01; ***p < .001
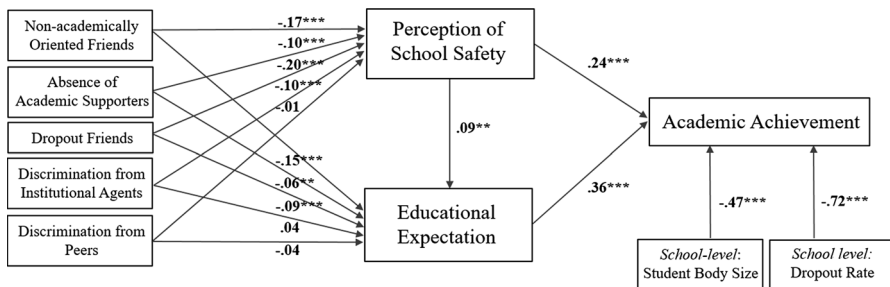
Fig. 2 The standardized estimates of the structural model. *Note* Non-academically oriented friends' refers to friends who do not plan to attend college. 'Dropout friends' refers to friends who dropped out of school. **p < .01; ***p < .001

Table 5 Indirect effects of social environments on academic achievement

Indirect effect	Parameter estimate	Posterior SD	95% credible interval
Non-academically oriented friends → perception of school safety → academic achievement	− .05	.01	(− .07, − .04)*
Absence of academic supporters → perception of school safety → academic achievement	− .03	.01	(− .05 − .01)*
Dropout friends → perception of school safety → academic achievement	− .07	.01	(− .09, − .05)*
Discrimination from institutional agents → perception of school safety → academic achievement	− .07	.01	(− .09, − .05)*
Discrimination from peers → perception of school safety → academic achievement	.01	.01	(− .01, .03)
Non-academically oriented friends → educational expectation → academic achievement	− .08	.01	(− .10, − .06)*
Absence of academic supporters → educational expectation → academic achievement	− .04	.01	(− .06, − .02)*
Dropout friends → educational expectation → academic achievement	− .05	.01	(− .07, − .03)*
Discrimination from institutional agents → educational expectation → academic achievement	.02	.01	(− .01, .04)
Discrimination from peers → educational expectation → academic achievement	− .04	.01	(− .06, − .01)*
Non-academically oriented friends → perception of school safety → educational expectation → educational expectation	− .01	.01	(− .01, − .01)*
Absence of academic supporters → perception of school safety → educational expectation → educational expectation	− .01	.01	(− .01, − .01)*
Dropout friends → perception of school safety → educational expectation → educational expectation	− .01	.01	(− .02, − .01)*
Discrimination from institutional agents → perception of school safety → educational expectation → educational expectation	− .01	.01	(− .02, − .01)*
Discrimination from peers → perception of school safety → educational expectation → educational expectation	.01	.01	(− .01, .01)

Note 'Non-academically oriented friends' refers to friends who do not plan to attend college. 'Dropout friends' refers to friends who dropped out of school

*$p < .05$; **$p < .01$; ***$p < .001$

5.3.1 Indirect effects through perceived school safety

The results revealed that perceptions of school safety mediate the negative effects of having friends who do not plan to attend college (95% CI − .07, − .04), the absence of academic supporters (95% CI − .05, − .01), having friends who drop out of school (95% CI − .09, − .05), and discrimination from institutional agents (95% CI

− .09, − .05), on academic achievement. By contrast, discrimination by peers was not significantly mediated by perceptions of school safety.

5.3.2 Indirect effects through educational expectation

Educational expectation mediates the effects of having friends who do not plan to attend college (95% CI − .10, − .06), the absence of academic supporters (95% CI − .06, − .02), having friends who drop out of school (95% CI − .07, − .03), and discrimination from peers (95% CI − .0.6, − .01) on academic achievement. Discrimination of institutional agents did not show significant indirect effect on achievement via educational expectation.

5.3.3 Indirect effects through perceived school safety and educational expectation

The double-mediation analyses revealed significant indirect effects of relational characteristics on academic achievement through perceived school safety and education expectation: having friends who do not plan to attend college (95% CI − .01, − .01), the absence of academic supporters (95% CI − .01, − .01), having friends who drop out of school (95% CI − .02, − .01) and discrimination from institutional agents (95% CI − .02, − .01). The triple-pathway mediations from discrimination by peers to achievement was not significant.

6 Discussion

The results of our analyses show that the persistent academic underperformance of many immigrant students in the U.S. is significantly associated with both relational and structural barriers of school environments. The following negative school characteristics were predictive of achievement directly or indirectly: (1) discrimination from institutional agents, (2) absence of helpful relationships (i.e., academic supporters), (3) presence of harmful social relationships, (4) perceptions of school safety, and (5) school-wide characteristics (i.e., student body size and dropout ratio).

6.1 Discrimination from institutional agents

Our findings demonstrate that immigrant adolescents are more likely to be vulnerable to discrimination by institutional agents than by their peers. It appears as though negotiating an uncomfortable and/or unfair climate for immigrant adolescents is difficult socially, but not necessarily academically when that discomfort and discrimination can be attributed to their peers. However, when the perceived discriminatory social environment is attributed to individuals with more power, academic achievement is more likely to suffer. Teachers, counselors, social workers and other institutional agents are more likely to function as important connectors to newer and desired experiences offered within the school. Therefore, reducing perceived discrimination stemming from institutional agents and leveraging their support appears to be critical for improving immigrant adolescents' educational

outcomes. Indeed, previous research shows that positive social relations of immigrant students with institutional agents promote both their pro-school perceptions (Lee and Lam 2016; Lee and Madyun 2012) and school performance (Monzó and Rueda 2001) even though they may be placed in less integrated schools (Goldsmith 2004). Therefore, the role of institutional agents in boosting the academic engagement and achievement of immigrant students is crucial. In relation to this, as Stanton-Salazar and Spina (2000) point out, it is rare that the institutional social ties with the students develop into mentor–mentee relationships although many institutional agents may attempt to assist immigrant students. They explain that this, on the one hand, is due to both students' low trust of their social ties with institutional agents, especially among those who are from different racial-ethnic groups, and, on the other hand due to a dearth of cultural sensitivity by institutional agents. As such, more often than not, a majority of ethnic minority students have some difficulty finding supportive and helpful institutional agents within public schools. If this is the case, culturally relevant pedagogical practices in public school classrooms should be more encouraged and supported (Ladson-Billings 1995). Also, public schools getting assistance from other types of institutions such as ethnic cultural centers or religious organizations could be a way to complement institutional resources with academic support and adult mentors (Noguera 2008; Portes 2007).

6.2 Presence of negative relationships or absence of positive relationships

Presence of negative relationships and absence of positive relationships in school both had significantly negative associations with academic achievement through educational expectation. A high number of non-academic peers, and the absence of academic supporters led to a decrease in educational expectation. Furthermore, through educational expectation, negative relationships had an impact on academic achievement. This suggests that underachieving networks are a concern for adolescent immigrants' outcomes. Particularly concerning is the absence of a critical mass of academically-oriented or supportive peers for immigrant adolescents in the schools. This absence adds further significance to factors influencing an academic orientation and expectations. Indeed, this would mean that U.S. public schools may not function properly in supporting adolescent immigrants. In response, there is a significant need for empowering immigrant adolescents. Empowering immigrant students can be facilitated through a critical mass, which is characterized as the presence of academic supporters and academically-oriented friends in immigrant adolescents' networks in school. As a constructive example, a study by Caldero'n et al. (2011) demonstrated how a cooperative group learning program created an accommodating learning context that encouraged Latino students to improve their English language skills and empowered them to engage in learning activities. This study shows the importance of empowering immigrant students through providing a critical mass for immigrant students' learning. Future research should explore this possible link between perceived power/control and educational outcomes for immigrant adolescents.

6.3 Perceived school safety and school-level structural characteristics

All these negative dimensions of social relationships surrounding immigrant students in school seemed to exacerbate their negative experience of the school environment such as school unsafety (e.g., being threatened, being robbed, getting into a fight, or being offered drugs at school). Perceived school safety was associated with both educational expectation and academic achievement. That is, the perception of school safety seems to impact how immigrant adolescents view their educational trajectory and also their immediate performance.

Finally, it is noteworthy that school-level structural characteristics predict immigrant adolescent' achievement substantially (i.e., approximately 63% of the between-school variance in academic achievement). This result suggests that the negative school characteristics facing immigrant students stem from not just micro-social relationships but are also generated from school-wide structural characteristics.

7 Conclusion

This study illuminates the importance of negative school environments in which immigrant adolescents are embedded in U.S. public schools in predicting their academic success. Therefore, educators and policymakers involved in immigrant adolescents' education should pay greater attention to negative school characteristics such as discriminatory and unsupportive school social relationships that can undermine academic achievement. As identified in prior studies, discrimination based on race severely diminishes the opportunities of immigrant youths who are members of a disadvantaged minority group (Portes and Rivas 2011). It is possible that immigrant students internalize discrimination and other negative experiences from their schools during the critical period of adolescence. These accumulated negative internalizations may reinforce negative self-perceptions, primarily formulated by racial stereotypes in society; racial stereotyping functions to "justify" the negative self-perceptions for certain immigrant student groups in U.S. society (Tienda and Haskins 2011), with the logic being continuously reinforced through negative school social relations and structures during adolescence—a self-perpetuating cycle of deficit thinking and behaviors.

Furthermore, not only discrimination, but also other negative school characteristics such as the absence of academic supporters and presence of non-academically oriented friends, and perceptions of unsafe learning environments function to prevent immigrant adolescents from navigating opportunities embedded in public schools. In other words, all these circumstances seem to discourage immigrant adolescents from seeking and benefitting from the opportunity structures which may lead them to successful outcomes. Of course, the underperformance of immigrant students is not removed from any individual level accountability, but we must account for the struggles with the social conditions and labeling imposed upon them. Admittedly, a majority of immigrant students' lack of academic orientation, engagement or efforts may be related to their particular identity and culture. Yet, at

the same time, such identity construction or cultural reproduction of immigrant students is largely shaped and formed within schools where they experience various socialization and meanings of race, ethnicity, and immigrant status. That is, the formation and operation of individual immigrant students' academic orientation and efforts are inherently intertwined with various school social relations and structural barriers. The main point here is that the underperformance of many immigrant adolescents is also a structural issue. Therefore, the results of this study call for more attention to how to transform the negative social organization within public schools that supports immigrant students' opportunities to learn.

Finally, we admit the limitation that our analytical focus was on investigating the effects of negative school characteristics on the educational outcomes of overall immigrant student populations in the CILS dataset. Therefore, teasing out differences in educational outcomes among different ethnic groups is surely needed. To build on this, future research needs to address such diversity of immigrant students for providing more specific implications for different subgroups of immigrant populations.

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Moosung Lee is a Centenary Professor at the University of Canberra. His research areas are school improvement, international schools, educational experiences and outcomes of minoritized students, social capital, and lifelong learning.

Yeonjeong Kim is a postdoctoral associate at the MIT Sloan School of Management. She studies human judgment with a particular interest in forecasting unethical behaviors at both the individual and organizational level. Her other research streams investigate how teams manage conflict and perform diverse tasks.

Na'im Madyun is an associate professor and associate dean in the College of Education and Human Development at the University of Minnesota-Twin Cities. His research interests are in social factors explaining the outcomes of marginalized students and African American identity development.