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Acculturation Versus Cultural Retention: The Interactive Impact of Acculturation and Co-ethnic Ties on Substance Use Among Chinese Students in the United States

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Abstract Acculturation is often found to increase substance use among immigrants in the U.S., but such effect may depend on how immigrants are attached to their co-ethnic community. Meanwhile, the high socioeconomic status of some new immigrant groups also challenges the classical assumption that ties to co-ethnic community are associated with deviance. With a sample (n = 960) collected from a population of Chinese students in a large public university in the U.S., we tested how do the interplays between acculturation and co-ethnic ties affect substance use. This study establishes that: (1) different dimensions of acculturation have opposite effects on substance use; (2) acculturative stress does not explain the association between acculturation and substance use; (3) acculturation increases the likelihood of substance use only when one has weak attachment to their co-ethnic community. The findings are consistent for three dependent variables: smoking, drinking, and drunkenness, and for the different constructs of acculturation and co-ethnic ties. Ties to co-ethnic community may provide important social support for immigrants, while acculturation may alleviate the insular subculture that promotes at-risk behaviors. We encourage policy makers to consider the cooperative nature of acculturation and cultural retention for the improvement of health among this growing population.

Keywords Acculturation · Co-ethnic community · Drinking · Smoking · Acculturative stress · Chinese immigrant

Introduction

Many studies have discussed how acculturation negatively affects health behaviors among immigrants. It is a well-known phenomenon that, compared to their newly arrived or less acculturated counterparts, more acculturated immigrants show higher level of substance use, engage in more at-risk health behaviors, and have worse physical and mental health [13, 28, 42, 43, 62]. The classical understanding of acculturation assumed a linear and one-dimensional model, which views acculturation as a one-way flight in which foreigners are gradually assimilated into their host environment. However, most if not all immigrants need to rely on the cultural, financial, and social resources provided by their own ethnic compatriots for better adaptation to a new environment. A co-ethnic community is such a collection of ties that provides cultural familiarity, social capital, and resource support for people of the same racial and ethnic origin. If acculturation often leads to more at-risk health behaviors, and few immigrants start acculturation as a linear process without the lasting influences from their own ethnic community, how may such co-ethnic ties and acculturation interactively affect health behaviors among the immigrants?

As many have pointed out [28, 36, 40], the impacts of acculturation and co-ethnic ties on at-risk health behaviors are complementary. On the one hand, without co-ethnic ties, acculturation exposes immigrants, particularly young immigrants, to the substance-using peer culture in the mainstream society, and it also introduces greater level of

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stress and discrimination [16, 22, 50]. On the other hand, without acculturation, co-ethnic ties may promote at-risk behaviors among immigrants through depriving them of bridging ties and appropriate health information, and may create deviant subcultures as often seen in ethnic enclaves [15, 23, 65].

The interactive perspective on acculturation and co-ethnic ties is undervalued in the current literature on substance use among Asian immigrants. Meanwhile, the existing studies on acculturation and co-ethnic ties among Latino immigrants may not be directly generalizable for other immigrant groups such as East Asians. Like Latinos, Asian immigrants face institutional racism and discrimination against their perceived foreignness. For both, acculturation is a stressful process involving struggles between differential sources of social influences. But unlike Latinos, more contemporary East Asian immigrants are selected for their initial economic and educational advantages. Thus, their respective co-ethnic communities may employ different strategies to combat stress and peer pressure from the mainstream society. The goal of this study is to explore how acculturation and co-ethnic ties interactively lead to lower likelihoods of tobacco smoking as well as alcohol drinking and drunkenness among an immigrant youth population—Chinese international students. Built upon the current scholarship, we have tested the following theoretical formulations: Is acculturation associated with substance use, and can this association be mediated by acculturative stress? Are ties to co-ethnic community associated with higher likelihood of substance use? Does the impact of acculturation on substance use depend on the level of co-ethnic ties, i.e. is there an interactive effect between acculturation and co-ethnic ties?

Literature Review

Acculturation and Substance Use

The association between acculturation and health risk behaviors among immigrants in the U.S. has been revealed in a host of studies collectively known as the Hispanic Health Paradox [43], which found that, despite economic hardship and the lack of cultural capital, less acculturated or newly arrived immigrants have a health margin over their more assimilated racial compatriots.

Regarding substance use behaviors, acculturated immigrants drink alcoholic beverages more frequently [1, 18, 44, 57] and also tend to smoke more [14, 30, 40]. As for Asian Americans and Asian immigrants, a study shows that, across all five different Asian ethnicities, students who are integrated in the on-campus life and born in the U.S. reported higher level of alcohol consumption than their less-integrated and foreign-born counterparts [41]. Acculturation measured by English usage, length of stay, and birth place was associated with more frequent binge drinking among Asian American adolescents [27]. The level of acculturation also proves to be positively associated with tobacco use among Asian youths in the U.S. [42, 56].

How Acculturation Affects Substance Use

As shown above, acculturation often leads to higher level of substance use among migrants. There are two mechanisms rendering the positive association between acculturation and substance use.

First, migration as a physically and socially mobile process may introduce stressors to migrants [20]. Mobility events place individuals in an unfamiliar environment, forcing them to undergo stressful adaptations [6, 60]. Therefore, even after a migrant's socioeconomic standing has considerably improved, the subjugation to a new symbolic and cultural order can still thwart psychological wellbeing [48]. As acculturative stress has recently received considerable attention in the migration scholarship, it has been found to contribute to substance use and pro-drug attitudes [35]. Finch and Vega [22] showed that acculturative stress accounts for a significant portion of the reported worse health condition among the Mexican-origin population in California. For both Latinos and Asians, Gorman et al. [25] showed that the gender difference in smoking can be partially explained by acculturative stress and the selection effect prior to migration.

Second, the stress developed during acculturation and migration should be differentiated from the independent acculturation effect. Migrants have to adopt the destination group's attitudes and behaviors out of the need for conformity, social bonds, or secured prestige [8, 9]. Under such circumstances, the relationship between migration and measurable outcomes is not simply a result of psychological maladjustment but is rather seen as the "outcome of a process of status attainment" [24]. For instance, when foreigners get exposed more frequently to the alcohol-permissive American culture, they will drink simply because the average drinking level is higher in the host environment, or because of peer pressure [33, 46]. This is particularly common for youth and young adults, since they often fail to resist the mounting pressure of substance use that dominates the American youth subculture [31, 64]. A study on Asian American adolescents showed that the association between acculturation and binge drinking can be fully explained by friends' drinking behavior [27]. Many Asian American club drug users use substance to break from the "Asian stereotype" and to navigate "authentic" American social spaces [29]. This effect is what most scholars are actually referring to, implicitly or directly, when talking

about acculturation, but in practice it is often confused with the effects of acculturative stress [28, 55].

Based on these two theoretical mechanisms in the migration process, we expect acculturation to be positively associated with substance use (Hypothesis 1); however, acculturative stress will mediate the association between acculturation and substance use, and acculturation only causes substance use through the effect of acculturative stress (Hypothesis 1a).

Co-ethnic Community's Moderation Effect

If acculturation causes substance use through increased level of stress and the conformity with pro-substance norms, migrants may avoid triggering these two mechanisms by resorting to the social realm of their co-ethnic community. Segmented assimilation theory further contends that integration is not always a voluntary choice, which implies that the health wellbeing of immigrants depends on their chance of having access to both mainstream and their own communal resources. Unlike the earlier waves of European immigrants, the new waves of non-white migrants either will not or cannot be entirely accepted into American culture, thus they have to rely heavily on the resources and social capital their co-ethnic communities come to provide [51, 69]. Alternatively, a conceptual model proposed by psychologists describes mental illness and maladaptive behaviors as originating from stressors but mediated by both internal and external locus of control, such as social support and emotional release [58, 59].

Bulut and Gayman [11] measured acculturation in multiple dimensions and found that one latent class of immigration pattern is bicultural affiliation. They further showed that better mental health is found among the bicultural immigrants, who have connections to both their co-ethnic and the mainstream social realms of America. Portes and Zhou [51] showed that, in face of prejudice and structural disadvantages, immigrant youths who were established in their own co-ethnic networks achieved better educational and economic outcomes. Others also found the preservation of co-ethnic networks serves as a buffer against discrimination and substance-permissive attitudes [17, 50]. Lee and Ferraro [37] showed that frequent contact with fellow Mexicans facilitates the flow of health information for the more acculturated second and third generation Mexican Americans. In a study by Kimbro [34], acculturation increases binge drinking, but living in a neighborhood with more foreign-born residents reduces the risk. Thus, if immigrants are exposed to the detrimental influences of acculturation, the harm can be mitigated if they are embedded in a home community.

One should note that the protective role of co-ethnic communities described above has been discussed as a complement or moderator of the acculturation process. Dense co-ethnic ties or insular networks per se could facilitate at-risk behaviors and even subcultural deviance, and this is why acculturation and cultural retention must work interactively for immigrant health. The overrepresentation of strong ties in co-ethnic communities often impedes the development of bridging ties, which are essential for upward mobility and socioeconomic promotion [12, 26]. Sociologists have long discovered that homogeneous social networks constitute a platform for deviance and health risk behaviors, and repeated interactions with other minority members only serve to reinforce the subcultural codes of conduct [23]. Further, co-ethnic ties may also benefit only some people while oppressing others, for whom acculturation provides a relief from their suffocating subcultures [3]. This is especially important when considering the function of smoking and drinking among the Chinese. Social smoking and drinking are highly demanding activities in the Chinese culture, and the non-conforming individuals often suffer loss of reputation, friendships, business connections, or even their jobs [5, 45, 49, 54]. Being surrounded by homogeneous others who all come from the same native place proves to be a risk factor in sexual deviance among Chinese migrants [67].

Based on the interactive nature of acculturation and ties to co-ethnic communities for migrants in the U.S., we propose that stronger attachment to co-ethnic communities is associated with more substance use among Chinese international students (Hypothesis 2). However, there will be a negative interaction between acculturation and co-ethnic ties: stronger co-ethnic ties increase substance use only among migrants with lower level of acculturation, and vice versa—acculturation only increases substance use among migrants with weak co-ethnic ties (Hypothesis 3).

International Students as an Immigrant Population

International students constitute a special case of international migration by satisfying the three criteria used to define immigrants: movement across geographic boundaries, changes of residence over specific periods of time, policy-based distinct identity set apart from local residents [52, 63]. First, like first-generation immigrants, international students face restrictive challenges to their identity and language skills [2]. But compared to first-generation immigrants, international students have even greater difficulties in securing a legitimate sense of existence as they are bound by temporary residency. Second, like second-generation immigrants, international students face a high level of peer pressure regarding substance use. Given the prevalence of a substance-permissive culture among American youths today [31], the impact of acculturation on

substance use may become even more pronounced for them than for first-generation immigrants.

Therefore, compared with other immigrant groups, the interplay between co-ethnic ties and acculturation is an equally, if not more, important mechanism affecting substance use among international students. As of 2016, there are over one million international students in the U.S., and China alone sends 32% of all the international students to the U.S. [21]. They have become a significant but neglected community in the scholarship on immigrant health.

Methodology

Sample

The dataset comes from a 2016 survey among Chinese international students conducted at a large educational institute in the Midwest of the U.S. These Chinese students were enrolled in majors including engineering, science, business, agriculture, and liberal arts. This population has an overall great economic and educational background, a characterizing group that has been overlooked in the existing literature.

Four waves of recruitment were conducted online and initiated by emails sent by the Registrar to the entire target population, therefore the only sampling error would come from non-response bias. The response rate was 22.4%. Among those who responded, 77% had completed all questions in the survey. Propensity score matching was employed to "weight up" the respondents with characteristics resembling the "dropouts" who had completed <30% of the questionnaire [61]. Total sample size was 960, and we had considerably overachieved our initially needed sample size of 353.[1] Our sample is representative to the population at the university by colleges and program types. The small remaining discrepancy between the sample and the population was addressed by post-stratification weights [39]. The survey protocol and questionnaires were approved by the IRB at the second author's university (#1602017143).

Measurement

The measurement of acculturation has been a central issue. Scholars have reached the general consensus that bluntly categorizing the foreign-born as less acculturated and the native-born as acculturated, or setting the standard of acculturation in terms of English fluency is too simple and sometimes naïve [28]. Therefore, multidimensional and bilingual measurements of the multiple aspects of acculturation are greatly desired.

In this study, we have considered two dimensions of acculturation for immigrants: acculturation by cultural practice, and by social networks. Immigrants' ties to co-ethnic community are also measured by cultural practice and social networks. Measuring acculturation by social media use, social network compositions, and news acquisition has been widely employed in the existing scholarship [68]. For example, Bidimensional Acculturation Scale asked respondents to rate their preferences for electronic media, friendship by races, and newspaper by languages [47]. The Cultural Life Styles Inventory measures the socialization and media preferences among immigrants [38].

To measure acculturation by cultural practices, the average frequency of using Facebook or Twitter was measured on a five-point Likert scale to represent the acculturative adoption of English social media, because both websites are inaccessible in China. In addition, the respondents were asked to choose the sources from which they regularly acquire news in the following categories: Chinese websites, Chinese periodicals, Chinese social media, English websites, English periodicals, and English social media. The number of choices in English sources was constructed as the level of the acculturative acquisition of information. Similarly, to measure co-ethnic ties by cultural practices, the survey asked the average frequency of using two Chinese social media, and the number of choices in Chinese sources for news acquisition.

Acculturation by social networks was measured by the number of non-Asian[2] roommates the respondent had ever had, and the frequency of talking to non-Asian faculty members outside the classroom settings. Measurements of co-ethnic social networks are the frequency of talking to Chinese faculty outside the classroom settings, and an estimate of the number of Chinese friends.

The dependent variables are: whether one was currently smoking, currently drinking at least once a month, and had got drunk in that semester. Acculturative stress is measured by three 5-points Likert-scale questions: "I often feel lonely here", "People don't understand me because of the language barrier", and "I am treated unfairly because of my race". Such measures are similar to the focal questions in the popular psychometric scales on acculturative stress (reviewed by Rudmin [55]), which assess the level of maladaptation during acculturation.

Other control variables include the level of financial ease, relationship status (married, in relationship, single), gender, type of origin place in China (metropolis, mid-sized cities, small cities or towns, villages). The proportion

[1] $n_0 = \left(\frac{z_{\frac{\alpha}{2}} s}{e}\right)^2 = 353$, assuming $z_{\frac{\alpha}{2}} = 1.96$ s = 0.5, and e = 0.05.

[2] Excluding Asian Americans.

of Chinese students in each college and program has been controlled for the ecological opportunity of forming co-ethnic ties. Meanwhile, length of stay was controlled for as a factor of exposure because longer duration of stay confounds the degree and quality of acculturation.

Statistical Analysis

Because the target population is not identically distributed across colleges and some colleges have a heavier concentration of Chinese international students, the errors estimated by conventional regression techniques could be deflated. The heterogeneous distribution of students across fields and programs undermines our confidence in linear regression's stability to generate coefficients, thus we employed generalized multilevel modeling to test our hypotheses [53], with individual respondents as the first level units and colleges as the second level units. The link function for the dependent variables was binomial and we also controlled for the length of stay in the U.S. as an exposure factor.

To test of mediatory role of acculturative stress, indicators of acculturative stress were step-wise introduce to the model. If the significant associations between acculturation and substance use have disappeared afterward, we may conclude a mediation effect [4]. Finally, we used two alternative constructs of acculturation to show whether the associations between individual acculturation variable and substance uses are sensitive to measurement errors. We constructed alternative measures of acculturation as (1) summated score of all acculturation variables and (2) the first factor loading of all acculturation variables via factor analysis. All analyses were conducted in R, with package "lme4" as the main analytical tool.

Results

Table 1 presents the basic demographic information and descriptive statistics of all the variables included in the subsequent regression models. A total of 9.4% people in the sample reported being a current smoker, 45.4% are current drinkers, and 13.4% have been drunk at least once in the current semester.

In Table 2, the levels of acculturation, co-ethnic ties, and acculturative stress are compared between the substance-users and non-users. Ties to co-ethnic community is significantly stronger for all three user groups. Smokers and drinkers use Chinese social media sites more frequently than non-smokers and non-drinkers. Acculturation level is significantly higher only for drunkenness. Reporters of drunkenness have significantly larger non-Asian networks ($.82 > .58$, $p < .01$), they also use English social media more frequently ($2.23 > 2.04$, $p < .05$).

Table 1 Descriptive statistics of variables and the demographic background of the sample

Variable	Min, Max	Mean (SD)	Percentage (%)
Currently smoking	0, 1		9.4
Currently drinking	0, 1		45.4
Been drunk this semester	0, 1		13.4
Gender (1 = female)	0, 1		43.9
Origin place	0, 1		
Metropolis			60.1
Mid-size cities			25.2
Small cities or towns			10.9
Villages			3.9
Relationship status	0, 1		
Married			10.3
In relationship			35.6
Single			54.1
Financial ease	1, 5	3.21 (1.05)	
Length of stay in years	0, 8	2.82 (1.79)	
Percentage of Chinese in colleges	0, 1	.20 (.09)	
Co-ethnic ties			
Size of co-ethnic network (log)	1.61, 6.86	3.08 (1.12)	
Talk with Chinese faculty	0, 5	3.01 (1.39)	
Get Chinese news	0, 3	1.54 (.72)	
Use Chinese social media sites	0, 5	2.52 (.69)	
Acculturation			
Non-Asian networks	0, 4	.62 (.78)	
Talk with non-Asian faculty	0, 5	2.33 (.80)	
Get English news	0, 3	1.24 (.92)	
Use English social media sites	0, 5	2.07 (.89)	
Acculturation stress			
Loneliness	0, 5	2.42 (1.27)	
Language misunderstanding	0, 5	2.11 (1.14)	
Racial discrimination	0, 5	2.16 (1.18)	

Acculturative stress, a potential byproduct of higher acculturation levels, is higher in all three substance-using groups. Smokers have experienced greater loneliness ($2.70 > 2.38$, $p < .05$), more misunderstanding due the language barrier ($2.43 > 2.08$, $p < .05$), and more racial discrimination ($2.51 > 2.12$, $p < .05$) when compared to non-smokers. Language misunderstanding and racial discrimination are also higher among the reporters of drunkenness. Current drinkers have experienced a higher level of racial discrimination than non-drinkers ($2.34 > 2.01$, $p < .001$).

Table 2 Bivariate statistics of co-ethnic ties and acculturation levels by substance use status, with mean values and 95% confidence intervals presented

	Mean (95% CI)					
	Smoking		Drinking		Drunk	
	Yes	No	Yes	No	Yes	No
Size of co-ethnic network (log)	3.40 (3.09, 3.71)	3.05 (2.96, 3.13)*	3.19 (3.07, 3.32)	2.98 (2.88, 3.09)*	3.43 (3.16, 3.70)	3.03 (2.94, 3.11)**
Talk with Chinese faculty	2.96 (2.65, 3.26)	3.02 (2.91, 3.13)	3.10 (2.95, 3.25)	2.93 (2.80, 3.06)	3.02 (2.74,3.30)	3.01 (2.90,3.11)
Get Chinese news	1.69 (1.52, 1.87)	1.52 (1.47, 1.57)	1.54 (1.47, 1.61)	1.53 (1.45, 1.60)	1.48 (1.33, 162)	1.54 (1.49, 1.60)
Use Chinese social media sites	2.78 (2.60, 2.96)	2.50 (2.45, 2.55)*	2.60 (2.53, 2.67)	2.46 (239, 2.53)**	2.61 (2.47, 2.75)	2.51 (2.46, 2.56)
Non-Asian networks	.61 (.45, .77)	.61 (.55, .67)	.62 (.54, .71)	.61 (.54, .68)	.83 (.65, .99)	.58 (.53, .64)**
Talk with non-Asian faculty	2.17 (2.00, 2.35)	2.35 (2.29, 2.41)	2.31 (2.23, 2.39)	2.36 (2.27, 2.44)	2.29 (2.15, 2.44)	2.34 (2.27, 2.40)
Get English news	1.15 (.92, 1.38)	1.25 (1.17, 1.31)	1.25 (1.16, 1.35)	1.22 (1.13, 1.31)	1.26 (1.08, 1.45)	1.23 (1.16, 1.30)
Use English social media sites	2.01 (1.78, 2.25)	2.07 (2.01, 2.14)	2.11 (2.02, 2.21)	2.03 (1.94, 2.11)	2.23 (2.05, 2.41)	2.04 (1.97, 2.11)*
Loneliness	2.79 (2.48, 3.11)	2.38 (2.29,2.48)*	2.45 (2.32, 2.58)	2.39 (2.26, 2.52)	2.57 (2.31, 2.82)	2.40 (2.30, 2.49)
Language misunderstanding	2.43 (2.14, 2.72)	2.08 (1.99, 2.16)*	2.15 (2.02, 2.27)	2.09 (1.97, 2.20)	2.38 (2.13, 2.62)	2.07 (1.98, 2.15)*
Racial discrimination	2.51 (2.15, 2.87)	2.12 (2.04, 2.21)*	2.34 (2.21, 2.47)	2.01 (1.90, 2.12)***	2.57 (2.30, 2.85)	2.10 (2.01, 2.19)**

Significance of the difference between means based on Welch two-sample t-test: $t = (\bar{x}_1 - \bar{x}_2)/\sqrt{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)}$

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

Smoking

Multilevel logistic regressions were conducted on smoking status in Table 3. Among four indicators of acculturation, talking with non-Asian faculty members significantly reduces the likelihood of smoking. The corresponding odds ratio of this coefficient (−.51, p < .01) indicates that one higher level of communication with non-Asian faculty reduces the likelihood of smoking by a factor of 0.6. Hypothesis 1, acculturation increases substance uses, is therefore not supported. Random intercept, which was allowed to vary across colleges and programs, does not indicate different baseline smoking rates across different colleges.

When acculturative stress is introduced, the association between acculturation and smoking remains significant. This finding refutes the mediatory role of acculturative stress as stated in hypothesis 1a. One of the indicators of acculturative stress—being misunderstood due to language problems—is significantly associated with being a smoker (.41, p < .01).

In the next column, variables of co-ethnic ties are added. Each higher level of using Chinese social media contributes to an elevated risk of smoking by a factor of 3.39 (the exponential of 1.22, p < .001). This finding supports hypothesis 2 that ties to co-ethnic community are associated with substance use. This model is a better fit to the data over the last two models by reducing deviances while retaining parsimony, which results in lower AIC and BIC statistics.

Next, we added interaction terms between acculturation and ties to co-ethnic community, and found a significant negative interaction between reading Chinese news and English news (−.62, p < .05). Figure 1 visualizes this interaction: with stronger co-ethnic ties in terms of reading Chinese news (the grey curve), acculturation reduces the likelihood of smoking. However, if one has weak co-ethnic ties (the black line), acculturation will increase his/her likelihood of smoking. Hypothesis 3 is supported that acculturation only increases substance use among people with weak co-ethnic ties.

Drinking

In the first column of Table 4, different components of acculturation show contrasting directions in affecting drinking. More frequent use of English media increases one's likelihood of drinking (.29, p < .01), but having bigger non-Asian networks reduces the likelihood (−.43, p < .001). The contradictory findings from these two acculturation indicators suggest that we cannot confirm hypothesis 1, i.e. acculturation leads to higher risk of substance use. Also similar to the smoking model, while acculturative stress measured by language misunderstanding is positively associated with drinking (.19, p < .05), it does not mediate the relationships

Table 3 Generalized multilevel linear regressions on smoking status

Smoking	Acculturation	Acculturative stress	Co-ethnic ties	Co-ethnic ties × acculturation
Non-Asian networks	**−.23 (.17)**	.11 (.16)	−.09 (.19)	−.33 (.49)
Talk with non-Asian faculty	**−.51 (.19)****	−.48 (.20)*	−.40 (.22)	−.57 (.58)
Get English news	**−.30 (1.7)**	−.21 (.15)	−.51 (.20)**	.66 (.56)
Use English social media sites	**−.08 (.16)**	−.10 (.16)	−.26 (.19)	−1.13 (.67)
Loneliness		**.13 (.11)**	.16 (.14)	.17 (.14)
Language misunderstanding		**.41 (.13)****	.31 (.15)*	.34 (.15)*
Racial discrimination		**.03 (.11)**	.05 (.15)	.01 (.15)
Size of co-ethnic network (log)			**.07 (.13)**	.03 (.18)
Talk with Chinese faculty			**−.18 (.13)**	−.43 (.38)
Get Chinese news			**.12 (.25)**	.91 (.42)*
Use Chinese social media sites			**1.22 (.26)*****	.60 (.56)
Co-ethnic networks × non-Asian networks				**.07 (.15)**
Chinese faculty × non-Asian faculty				**.12 (.16)**
Chinese news × English news				**−.62 (.28)***
Chinese social media × English social media				**.30 (.23)**
Gender (1 = female)	−1.93 (.33)***	−2.18 (.37)***	−2.49 (.41)***	−2.38 (.41)***
Origin place				
Mid-size cities	−.20 (.28)	−.17 (.33)	.02 (.36)	−.02 (.37)
Small towns	−1.78 (.91)*	−1.52 (.66)*	−1.47 (.91)	−1.76 (.97)
Village	.73 (.61)	−.39 (.83)	−.02 (.96)t	−.02 (.94)
Relationship status				
In relationship	1.56 (.59)**	1.53 (.60)*	1.18 (.66)	1.16 (.66)
Single	.75 (.61)	−.79 (.63)	.62 (.69)	.73 (.69)
Financial ease	−.36 (.13)**	−.33 (.12)**	−.39 (.15)**	−.41 (.15)**
Percentage of Chinese in colleges	1.75 (4.15)	2.03 (3.81)	.45 (3.99)	.49 (3.71)
Random intercept	1.71 (1.31)	1.20 (1.09)	1.09 (1.05)	1.03 (1.02)
Deviance	614.3	585.7	537.6	529.9
AIC, BIC	642, 707	620, 697	580, 674	579, 693

All coefficients were offset by the length of stay in the U.S. so that $\log\left(\frac{\mu_x}{Stay_x}\right) = \beta_0 + \beta_j x + \epsilon$. Sample was weighted by post-stratification weights and propensity scores. Standard errors in brackets. New variables added to a model in bold typeface

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

between acculturation and drinking, and thus cannot support hypothesis 1a.

Ties to co-ethnic community prove to be a risk factor of drinking. Out of a scale of five, one higher level of using Chinese social media sites increases drinking by a factor of 1.51 (exp(.41), p < .01). Hypothesis 2 is once again validated.

When considering the interactive relationship between acculturation and ties to co-ethnic community for drinking, we have further evidences to support hypothesis 3. The interaction term between co-ethnic network size and non-Asian networks is significantly negative (−.32, p < .01), and so is that between reading Chinese and English news (−.55, p < .001). The interaction between talking with Chinese faculty and non-Asian faculty is also negative with a trending significance (p = .07). The interactive relationships between the variables of acculturation and co-ethnic ties are visualized in Fig. 2.

Drunkenness

While drinking status may capture some aspects of one's substance use behavior, it is such a common conduct that few would consider sipping drops of wine a health risk behavior. Getting drunk, on the other hand, can more accurately reveal the mechanisms linking social changes and health behaviors. As Table 5 shows, acculturation measured by English social media use is associated with being drunk in the current semester (.41, p < .01), thus, hypothesis 1 is confirmed for drunkenness. Acculturative stress does not

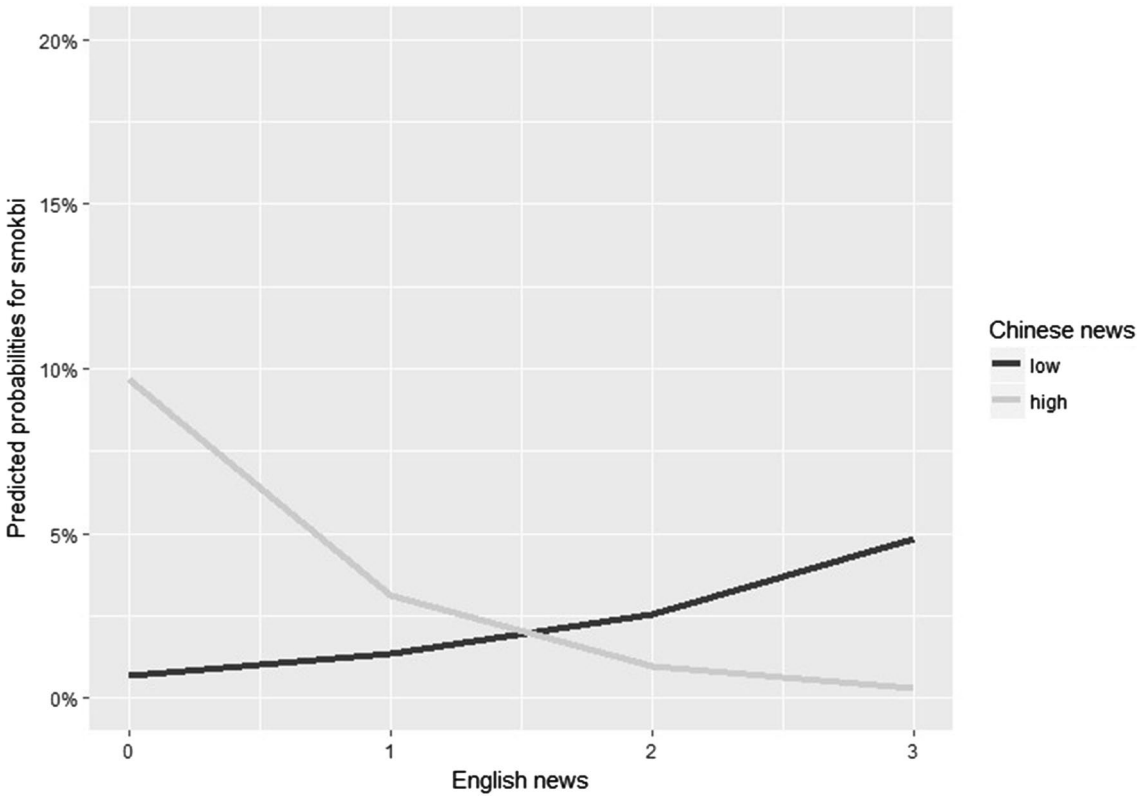

Fig. 1 Interaction in smoking model

mediate the positive association between acculturation and drunkenness, refuting hypothesis 1a.

The findings also show that ties to co-ethnic community increase the likelihood of being drunk. Larger co-ethnic network size is positively associated with drunkenness (.31, $p < .01$). Hypothesis 2 is again supported by this finding. Also note that when co-ethnic ties variables are introduced, the previously consistent and strong gender effect disappears. It is possible that the gendered pattern of drunkenness is attributed to the differential strengths of co-ethnic ties between men and women.

The effects of acculturation on drunkenness are moderated by ties to co-ethnic community. There is a negative interaction between talking with Chinese faculty and with non-Asian faculty (−.27, $p < .05$), as well as between reading Chinese news and English news (−.53, $p < .05$). From the two interactive plots in Fig. 3 one can see that acculturation only increases drunkenness likelihood for people who have very weak ties to their co-ethnic community.

Robustness Checks

We have also performed the same regressions with alternative constructs of the variables to check the robustness of our findings. In Table 6, we have presented the results using the raw summations of the variables for acculturation and co-ethnic ties. In addition, we have also constructed common factor loadings on the respective group of variables using factor analysis. All other parameters remain similarly configured as in the previous models. The results are very robust and only confirm our previous findings: except for smoking using summated variables as the predictor, all interactions between the constructs of acculturation and that of co-ethnic ties are negative and significant. Co-ethnic ties by itself increase the likelihood of substance use, but substance use decreases when the levels of both acculturation and co-ethnic ties are sufficiently high. Both hypothesis 2 and 3 are confirmed.

Discussion

Overall, this study establishes three major findings that could advance the theories on acculturation and substance use. First, there is not a unanimous acculturation effect on substance use, and we reject the hypothesis that acculturation by itself leads to substance use. Second, acculturation and acculturative stress are separated mechanisms for substance use, since acculturative stress is not a mediator between acculturation and substance use. Third, this study

Table 4 Generalized multilevel linear regressions on drinking status

Drinking	Acculturation	Acculturative stress	Co-ethnic ties	Co-ethnic ties × acculturation
Non-Asian networks	**−.43 (.11)*****	−.43 (.12)***	−.31 (.12)*	.65 (.36)
Talk with non-Asian faculty	**−.21 (.11)**	−.21 (.12)	−.18 (.14)	.38 (.33)
Get English news	**−.13 (.10)**	−.11 (.10)	−.20 (.11)	.72 (.27)**
Use English social media sites	**.29 (.10)****	.34 (.11)**	.36 (.12)**	.80 (.37)*
Loneliness		**.01 (.08)**	−.04 (.08)	−.04 (.08)
Language misunderstanding		**.19 (.09)***	.22 (.09)*	.24 (.10)*
Racial discrimination		**.08 (.09)**	.05 (.09)	.04 (.09)
Size of co-ethnic network (log)			**.12 (.08)**	.34 (.11)**
Talk with Chinese faculty			**−.02 (.07)**	.38 (.23)
Get Chinese news			**.19 (.15)**	.91 (.25)***
Use Chinese social media sites			**.41 (.16)****	.81 (.35)*
Co-ethnic networks × non-Asian networks				**−.32 (.11)****
Chinese faculty × non-Asian faculty				**−.17 (.09)**†
Chinese news × English news				**−.55 (.14)*****
Chinese social media × English social media				**−.18 (.14)**
Gender (1 = female)	−.86 (.19)***	−.86 (.19)***	−1.01 (.21)***	−1.03 (.21)***
Origin place				
Mid-size cities	−.23 (.21)	−.27 (.21)	−.25 (.22)	−.27 (.23)
Small towns	.10 (.31)	.02 (.32)	.19 (.33)	.15 (.33)
Village	−.04 (.54)	−.18 (.55)	−.26 (.60)	−.37 (.61)
Relationship status				
In relationship	2.42 (.39)***	2.41 (.41)***	2.17 (.43)***	2.16 (.44)***
Single	1.46 (.39)***	1.48 (.41)***	1.29 (.43)**	1.26 (.44)**
Financial ease	−.13 (.08)	−.14 (.09)	−.11 (.09)	−.12 (.09)
Percentage of Chinese in colleges	−1.5 (1.6)	−2.06 (1.85)	−2.27 (1.93)	−2.14 (1.91)
Random intercept	.16 (.40)	.24 (.49)	.26 (.51)	.25 (.50)
Deviance	1397	1355	1286	1255
AIC, BIC	1425,1490	1390, 1467	1328,1423	1305, 1418

All coefficients were offset by the length of stay in the U.S. so that $\log\left(\frac{\mu_x}{Stay_x}\right) = \beta_0 + \beta_j x + \epsilon$. Sample was weighted by post-stratification weights and propensity scores. Standard errors in brackets. New variables added to a model in bold typeface

*p < .05; **p < .01; ***p < .001, †<.09

has found that ties to co-ethnic community per se are positively associated with substance use. But more importantly, when interacting with acculturation, ties to co-ethnic community become a beneficial force for the immigrants. When immigrants simultaneously engage in the American society and their own ethnic community, such bicultural affiliation reduces the likelihood of their smoking, drinking, and getting drunk.

Regarding the absence of a mediator role for acculturative stress, this phenomenon suggests that acculturative stress is a risk factor for substance use but is independent from the acculturation process. Blau [8, 9] made the theoretical case that social movers become similar to their peers in the destination class simply because of a structural shift of the population rather than any individual psychological response. Rudmin [55] also recommended discontinuing the use of acculturative stress as an intervening construct and considering it as conceptually independent from acculturation. The findings established in this study would agree with this recommendation.

It is hardly surprising that ties to co-ethnic community per se increase substance use, because homogeneous network structures are found to cause at-risk behaviors [10, 32, 67]. However, with rich connections to both origin and host communities, immigrants will be able to get access to diverse types of support, flexibly resorting to alternative norms when one's own subculture becomes suffocating, while also utilizing the emotional and cultural resources of their own community to ward off the peer pressure from the host community.

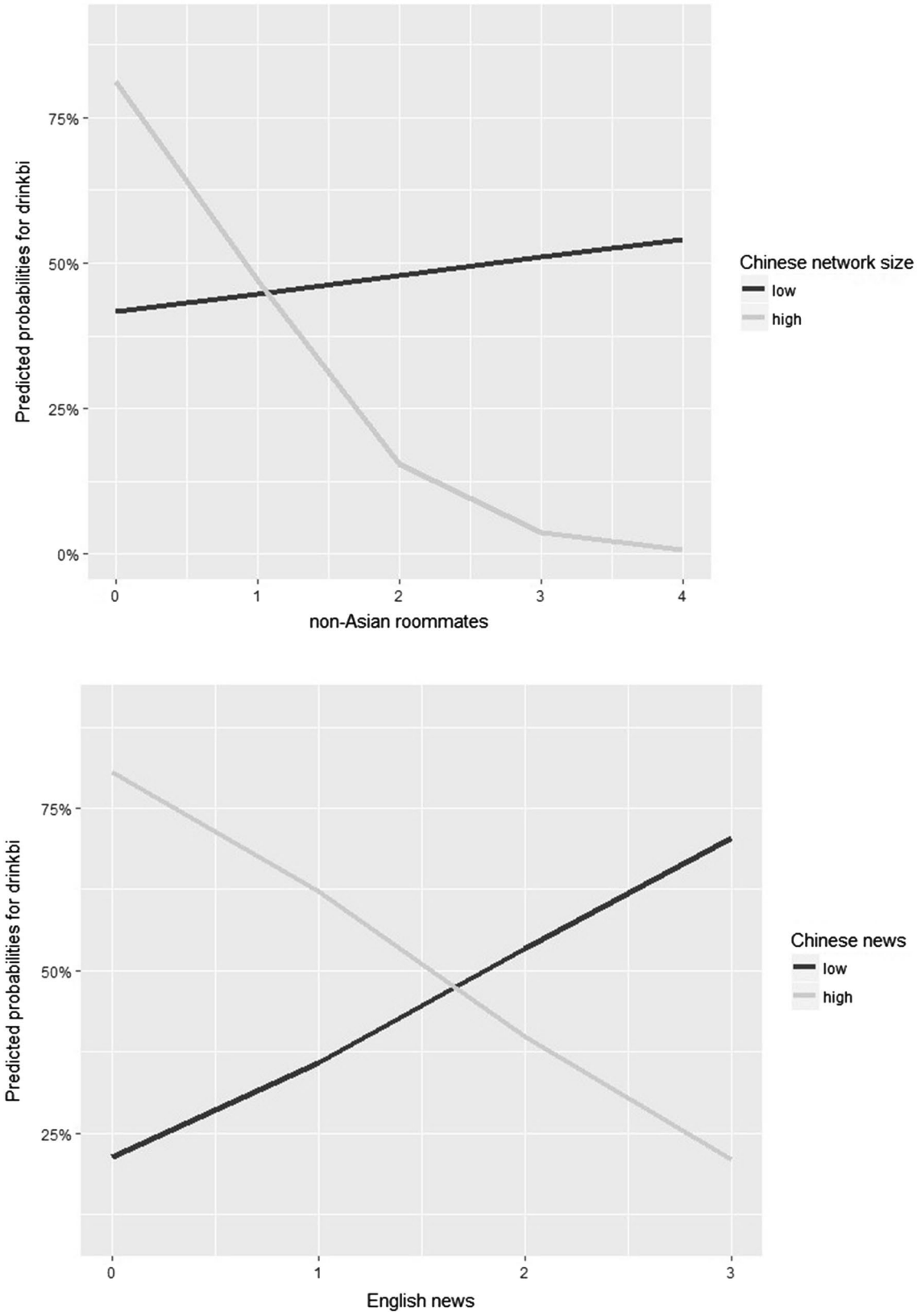

Fig. 2 Interactions in drinking model

Table 5 Generalized multilevel linear regressions on drunkenness status

Drunkenness	Acculturation	Acculturative stress	Co-ethnic ties	Co-ethnic ties × acculturation
Non-Asian networks	**−.03 (.14)**	.01 (.14)	.04 (.15)	.43 (.40)
Talk with non-Asian faculty	**−.26 (.16)**	−.24 (.16)	−.29 (.19)	.54 (.45)
Get English news	**−.21 (.14)**	−.18 (.15)	−.29 (.16)	.69 (.41)
Use English social media sites	**.41 (.16)****	.49 (.14)***	.49 (.15)**	.78 (.44)
Loneliness		**−.04 (.11)**	−.05 (.12)	−.05 (.11)
Language misunderstanding		**.55 (.12)*****	.56 (.13)***	.61 (.12)***
Racial discrimination		**.05 (.11)**	.03 (.12)	.01 (.12)
Size of co-ethnic network (log)			**.31 (.12)****	.44 (.15)**
Talk with Chinese faculty			**−.07 (.11)**	.52 (.33)
Get Chinese news			**.13 (.21)**	.76 (.35)*
Use Chinese social media sites			**.09 (.21)**	.37 (.47)
Co-ethnic networks × non-Asian networks				**−.12 (.12)**
Chinese faculty × non-Asian faculty				**−.27 (.13)***
Chinese news × English news				**−.53 (.21)***
Chinese social media × English social media				**−.10 (.16)**
Gender (1 = female)	−.69 (.26)**	−.67 (.28)*	−.50 (.29)	−.50 (.29)
Origin place				
Mid-size cities	−.03 (.28)	−.04 (.30)	−.01 (.31)	−.02 (.31)
Small towns	.37 (.44)	.17 (.47)	.25 (.50)	.27 (.50)
Village	.74 (.73)	.37 (.76)	.70 (.79)	.68 (.80)
Relationship status				
In relationship	3.27 (.61)***	3.17 (.63)***	3.21 (.67)***	3.18 (.67)***
Single	2.90 (.62)***	2.85 (.65)***	3.02 (.68)***	3.04 (.68)***
Financial ease	−.13 (.11)	−.15 (.12)	−.14 (.12)	−.17 (.12)
Percentage of Chinese in colleges	.93 (2.13)	.81 (2.27)	1.61 (1.94)	1.20 (1.86)
Random intercept	.25 (.50)	.29 (.54)	.11 (.34)	.09 (.30)
Deviance	817	754	719.8	706
AIC, BIC	845, 909	788, 866	762, 857	756, 869

All coefficients were offset by the length of stay in the U.S. so that $\log\left(\frac{\mu_x}{Stay_x}\right) = \beta_0 + \beta_j x + \epsilon$. Sample was weighted by post-stratification weights and propensity scores. Standard errors in brackets. New variables added to a model in bold typeface

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

Our finding is particularly relevant to Asian immigrants, who face the double jeopardy of the peer pressure to use substance and the barrier to successful acculturation. On one hand, they have an intense experience with the substance-permissive culture among American youths than their parents' generation; on the other hand, the perpetually perceived foreignness as Asians exacerbates the difficulty of acculturation [19, 29]. In consequence, they have to rely on a flexible combination of the mainstream culture and their co-ethnic community for survival and integration. One such strategy employed by these migrants to solidify their position in the host society is selective assimilation, where some ethnic values and codes of conduct are intentionally preserved [66].

There is much more for policy makers to do based on what the current study humbly suggests. We recommend that policy makers and public health professionals consider the cooperative nature of acculturation and cultural retention for the improvement of health in this community. However, the achievement of such an interactive combination is not entirely a voluntary decision any individual can freely make. Berry [6, 7] pointed out that certain types of integration are not possible when policies are hostile to immigrants. Portes and Zhou [51] also discussed how a receiving country's popular attitudes as well as public policies can powerfully shape the destiny of immigrant groups of different races.

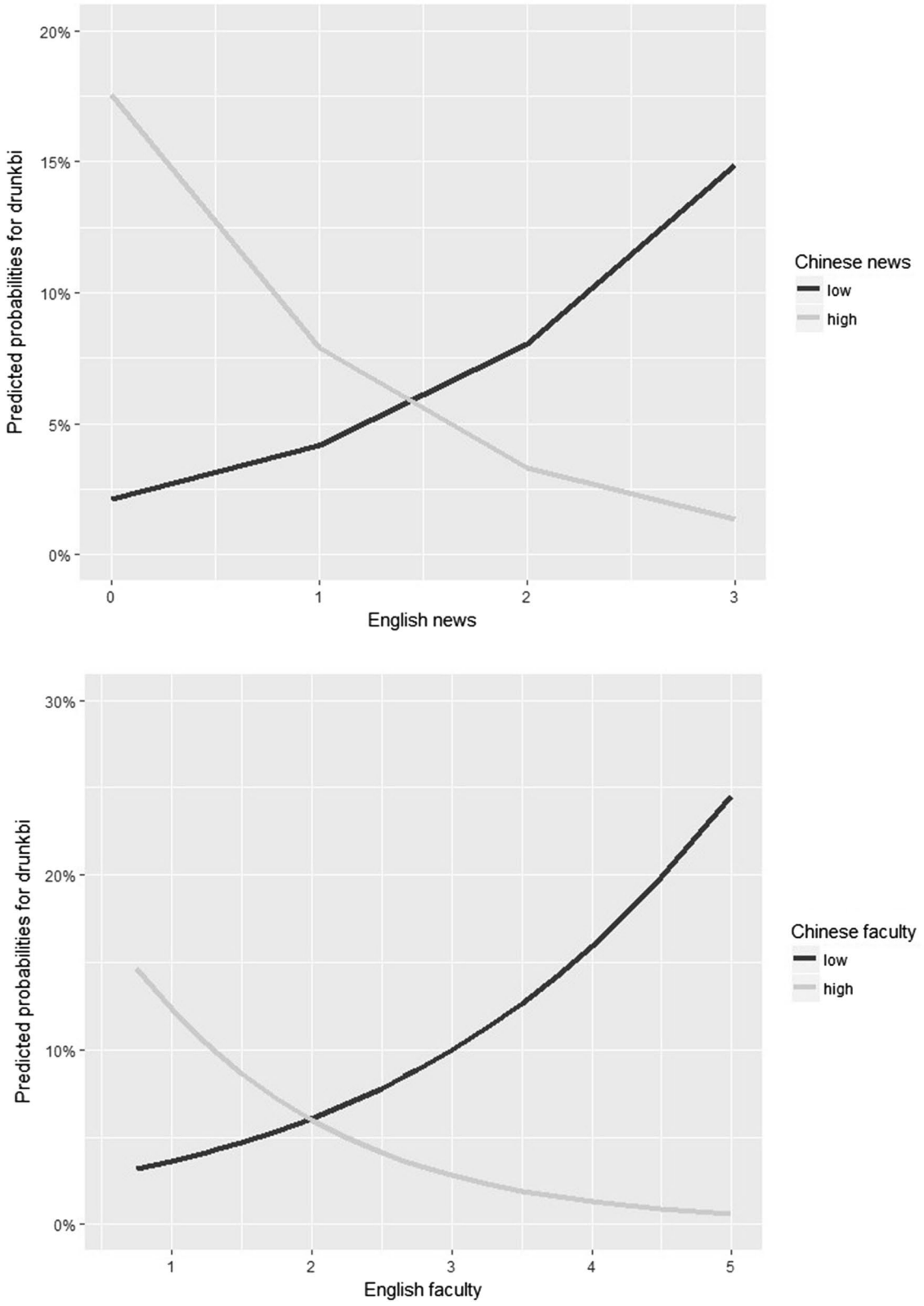

Fig. 3 Interactions in drunkenness model

Table 6 Robustness check using alternative measurement constructs with all the other co-variates controlled

	Smoking		Drinking		Drunkenness	
	Main effect	Interaction	Main effect	Interaction	Main effect	Interaction
Acculturation by summation	−.27***	−.02	−.04	1.30***	.34	.59*
Co-ethnic community by summation	.13*	.28	.12**	.97***	.13	.45*
Acculturation × co-ethnic community		−.02		−.13***		−.05*
Acculturation by common factor loading[a]	−.90***	−.65*	−.01	.11	.05	.21
Co-ethnic community by common factor loading[b]	.89***	.94*	.50***	.69***	.21	.33
Acculturation × co-ethnic community	–	−.77*	–	−1.24***		−.70**

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

[a]Proportion of variances explained is .17, hypothesis that 1 factor is sufficient is retained at Chi square test's p = .99

[b]Proportion of variances explained is .16, hypothesis that 1 factor is sufficient is retained at Chi square test's p = .35

With an exclusive policy and the reactionary sentiment among the nativists, many contemporary immigrants cannot or will not have sufficient exposure to the American society due to language barrier, the hurt of racial stereotypes, and their temporary residency. Meanwhile, many also refrain from co-ethnic social life due to a perceived inferior status of "only hanging out with Chinese/blacks/Mexicans", which is itself a xenophobic statement that assumes ethnic enclaves breed deviance. We suggest based on our findings that policy makers should facilitate a welcoming environment for all immigrants. At least, policies should welcome the wholesome existence of immigrant communities. This can be achieved through strategies such as allowing certain families with native-born children to legally stay, stopping racial profiling practices that disproportionally penalize racial minorities, and promoting cultural heritage and pride within ethnic communities.

Limitations

Despite its many strengths, this study has a few limitations. First, in the future, the measurement of acculturative stress might benefit from using refined psychometric scales as developed by earlier studies. Second, the generalizability of this study can be extended to the greater Asian or Chinese immigrant population if samples beyond the student populations are collected. Although Chinese immigrants are more likely to come to the U.S. through an education-employment pipeline, many others are political refugees or unskilled laborers. Alternatively, immigrants of other ethnicities should be studied as well, such as South Asians and Southeast Asians. Moreover, the generalizability of our study can also be extended if schools in other regions outside the Midwest are included, where Chinese students may have dramatically different exposure to local co-ethnic communities. Overall, we invite scholars to further explore whether acculturation and co-ethnic ties have a unique impact on different groups of immigrants, and how immigration policies constrain the opportunities for immigrants to form co-ethnic and inter-ethnic ties.

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Compliance with Ethical Standards

Conflict of interest The authors (Xiaozhao Y. Yang, Fenggang Yang) declare no conflict of interest involved during any stage of the conduct of this research.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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