

ESSAYS ON RATIONALITY AND SOCIAL ACTION:
STATUS EXCHANGE, ASSIMILATION, AND RED HAT STRATEGY

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ESSAYS ON RATIONALITY AND SOCIAL ACTION:
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This dissertation examines the rationality of social action. The firm adopting the “red hat” strategy or individuals seeking partners with matching assets and qualifications can all be seen as agents who try to maximize their utilities by searching for what they regard as the most profitable action. The dissertation includes three distinct chapters.

The first chapter reexamines the status exchange hypothesis (Davis 1941; Merton1941), and specifically reanalyzes the data from Fu (2001) on recent marriages among whites, blacks, Mexicans, and Japanese (from the 1990 PUMS data), which claims to corroborate the status exchange hypothesis for intermarriage between whites and blacks as well as between whites and Mexican Americans. Using a simple quasi-symmetry model, I show that the same-race and mixed-race marriage share a broadly similar pattern of educational homogamy, which is quasi-symmetric in character. Thus, I argue that this suggests little, if any, evidence for the status exchange hypothesis. Furthermore, the evidence strongly indicates that there is a remarkable consistency and symmetry in husband/wife educational attainment regardless of race (with the possible exception of white/white marriages); intermarried couples share a similar level of education, and educational homogamy dominates the educational marriages, no matter what their or their spouse’s races are.

The second chapter employs a game theory framework as well as case studies to examine the interactions between entrepreneurs and local governments under transitional institutions and examine how these actors play extensive games with perfect information. According to this game, the adoption of the “red hat” strategy is the rational results of the interaction between private firms and local governments.

The third chapter employs multi-level logistic models to examine the ACS 2008 data and shows that the multilevel modeling helps to decompose the variance of intermarriage to individual level (preference) and context-level characteristics constraints in the analysis of interracial marriage. Metropolitan-level variables, which are typically ignored in previous research, provide additional understanding of the previous of Asian interracial and endogamous marriage in the United States. Studies of interracial marriage can no longer easily overlook the population geographic distribution and the nativity or generation structure of minority groups.

BIOGRAPHICAL SKETCH

Yujun Wang was born and grew up in Jiangsu Province, P.R. China. She received her Bachelor of Arts degree from Renmin University of China, majoring in Sociology.

Yujun also received her Master of Arts degree at the Department of Sociology at Cornell University. Her major academic interests include economic sociology, interethnic relationship, race and ethnic relations, income inequality in contemporary China, social stratification, and sociological methodology.

To my parents

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CHAPTER 1 A CRITIQUE OF THE STATUS EXCHANGE THEORY OF MERTON AND DAVIS IN MATE ASSORTING

Introduction

*“...the reciprocal racial attraction and repulsion, might be measured by finding whether sexual relations are preferred or rare between two groups, and whether they are carried on permanently or temporarily and irregularly. In all groups with developed “ethnic” consciousness the existence or absence of intermarriage (connubium) would then be a normal consequence of racial attraction or segregation.” -Max Weber, *Economy and Society* (V,i).*

Since Weber’s famous insight that analysis of interracial marriage can shed light on the status of race relations in a society, sociologists have examined interracial marriage to uncover insights on the social structure of intergroup relations (Merton 1941; Davis 1941). Scholars have suggested that interracial marriage can be viewed both as a cause and indicator of social distance and assimilation (Alba and Golden 1986; Alba and Nee 1997; Alba and Nee 2003; Fu 2001; Gordon 1964; Kalmijn 1998; Lieberman, Waters et al. 1988; Park 1950). Interracial marriage rates have increased rapidly in the United States following the repeal of anti-miscegenation laws by the Supreme Court in mid-1960s. The rate of interracial marriage increased from 1.31% in 1980 to 1.81% in year 1990 and 2.89% in 2002 (U.S. Bureau of the Census, 2003). Although mixed-race marriage rates are still relatively low (compared to same-race marriage rates), they continue to grow rapidly, having more than doubled in the last 20 years. The continuing interest in inter-racial marriage as a strategic indicator of both structure and trends in interracial relations have led to competing perspectives debating the significance of recent trends in intermarriage rates. Further, advances in

statistical methodology have contributed to focus of debates on competing methodological approaches in the study of inter-racial marriage.

In this paper, I will try to accomplish three goals. First, I will introduce the competing theoretical approaches in the study of intermarriage: the assimilationist, structuralist, and exchange perspectives. Second, I will focus on a particular perspective, the exchange perspective and the *empirical controversy*¹ that it has aroused. While I will introduce the long debate between critics and supporters, I will focus on a particular scholarly disagreement between Fu (2001) and Rosenfeld (2005). Third, I will critique the claims that each side makes in interpreting the data in an on-going controversy over the validity of the status exchange hypothesis. Although I am sympathetic to Rosenfeld's position in the debate with Fu, in which he argues that evidence on inter-racial marriage does not provide support for the status exchange hypothesis, I will propose a new model that better fits the data.

Theory Context

In sociology, three perspectives compete to explain the structure and trends in intermarriage: assimilationist, structuralist, and status exchange. While I will briefly discuss the first two perspectives to provide some context, the focus of this paper will be on the third.

The Assimilationist Perspective

The main proponent of the assimilationist perspective is Milton Gordon (1964). Its basic argument is that intermarriage is the “keystone of the arch of assimilation” and the indicator of social distance between groups. According to Gordon's (1964) seven-stage model, assimilation starts with (1) acculturation (cultural

¹ I make a distinction between a *theoretical controversy* which involves disagreement over the logical structure of the theory and an *empirical controversy* which involves disagreement over the extent to which data does or does not support a given theory.

or behavioral assimilation), proceeds to (2) structural assimilation, which is “large scale entrance into cliques, clubs, and institutions of the host society in a primary group”, and follows with (3) marital assimilation. When large-scale intermarriage takes place, the minority group melts into the host society, which results in (4) “identificational assimilation”. The others states (5) “absence of prejudice”, (6) “discrimination”, and (7) “value and power conflict” follow naturally. Gordon claims that compared to those who do not intermarry, those who do, generally possess greater social, political, and economic characteristics that resemble those of the host society. This assimilationist view of inter-relationships has been shared by many students of racial and ethnic relations (Massey 1981; Massey and Mullan 1984; Lieberman, Waters et al. 1988; Alba and Nee 1997; Rosenfeld 2002; Alba and Nee 2003).

The Structuralist Perspective

The main proponent of the structuralist perspective is Peter Blau (1977; Blau, Blum et al. 1982; Blau, Becker et al. 1984; Rytina, Blau et al. 1988). Its basic argument is that a person’s decision in selecting a mate is severely constrained by the social structure, *despite* his/her cultural attitudes. A structuralist account would, for example, examine how the availability of potential marriage partners in the population affects a person’s marital choice. Blau (1977, 1982) claims that the opportunities of intergroup contact are higher in a heterogeneous and residentially integrated community than in a homogeneous and highly segregated one. He further argues that intermarriage is not only affected by group-specific attributes such as group size or sex ratio, but also by the amount of spatial and social proximity between groups (e.g. socioeconomic inequality). For Blau the assorting of partners depends not only on preferences but also the opportunities available to partners to marry one other (i.e., while people make marital decisions according to their cultural preferences, their decisions are, nevertheless, constrained by structural reality) (Blau, 1977). The

usefulness of a structuralist view in intermarriage has been widely recognized, especially for conducting empirical research (Gurak and Fitzpatrick 1982; Fitzpatrick and Hwang 1992; Anderson and Saenz 1994; Hwang, Saenz et al. 1994; Hwang, Saenz et al. 1997).

The Status Exchange Perspective

The main proponents of the status exchange perspective are Kingsley Davis (1941) and Robert Merton (1941). Its basic argument is that even under the circumstances of rigid intergroup boundaries and despite strong preferences to marry within their own group, blacks with high socioeconomic status might sometimes marry whites with low socioeconomic status. According to Merton, marriages between high status blacks and lower status whites represent an *informal exchange*, i.e., blacks exchange their higher achieved socioeconomic status for whites' higher ascribed social status and this exchange pattern is stronger for black husband & white wife pairs than for other interracial pairs.

While there has been relatively little controversy around the first two perspectives, status exchange has aroused much lively debate among researchers of intermarriage and continues to stimulate research (Kalmijn 1998). While many findings reaffirmed the status exchange hypothesis (Fu 2001; Kalmijn 1993; Qian 1997; Schoen and Wooldredge 1989;), many others have questioned its usefulness (Rosenfeld 2005; Heer 1974; Hwang et al. 1995; Liang and Ito, 1999; Heaton and Albrecht, 1996; Jacobs and Labov, 2002, Rosenfeld, 2005). The remainder of the paper is devoted to this debate over the merits of status exchange theory in accounting for intermarriage.

The Status Exchange Perspective: the Empirical Controversy

Advocacy for Status Exchange

Many findings have corroborated the status exchange hypothesis. The harmonic mean analyses by Schoen & Wooldredge (1989) show that with respect to education, white women marry up more often when marrying a black man than when marrying a white man; similarly, black men marry down more often when marrying a white woman than when marrying a black woman. Parallel conclusions were reached in the examination of the marriage choices of white men and black women; when marrying exogenously, white men marry down less often and black women marry up less often. These asymmetries in spouses' educational characteristics were assessed after adjusting for the marginal distributions of education of race-sex groups and thereby support the hypothesis that majority men and women marry a minority spouse in part under the condition of socioeconomic status gains.

Furthermore, Kalmijn (1993) proposed a hypergamy ratio² approach to test for status exchange in black-white intermarriage. He compared the observed hypergamy ratios within interracial marriages to the expected hypergamy ratios from log-linear models under quasi-symmetry in which the expected hypergamy ratios only arise from differences in marginal distributions and not from asymmetric selection. Analyzing the annual marriage license data for 33 states from 1968 to 1986, he found that the observed hypergamy ratio in black husband and white wife marriage was much larger than the expected ratio (1.252 compared to the expected .928) under the quasi-symmetry model, indicating white women are more likely to marry up than would be expected under the model which assumes no difference, and that the observed ratio in

² The hypergamy ratio is calculated as the number of women marrying up in terms of education to the number marrying down.

white husband and black wife marriage was 0.910, compared to the expected value of 1.289, indicating black women are more likely to marry down than would be expected.

Similar results were found in Qian (1997). Examining interracial marriage in the 1980 and 1990 Census data, he found that the exchange hypothesis is consistent with the data on intermarriage among African Americans, Hispanic, and Asian Americans. Acknowledging the educational homogamy pattern in interracial marriage, he claimed that the odds of interracial marriage increase with the couple's educational attainment, and that for interracial married couples with different educational attainments, minorities with high education levels tend to marry whites with low education levels.

Additionally, Fu (2001) identified endogamous intermarriage, status exchange, and in-group preference as the three underlying patterns for intermarriage. Moreover, he claimed to provide a better test of the status exchange hypothesis, arguing that his results support it especially well for intermarriage between whites and blacks as well as whites and Mexican Americans. But while his results are largely consistent with Kaimijn's (1993) and Qian's (1997) findings (based on the hypergamy ratio approach), he nevertheless, found that marriages between Japanese Americans and whites follow an endogamous intermarriage pattern.

Criticism of Status Exchange

Others have questioned the empirical support for exchange theory, particularly in regards to the generalization of status exchange theory to intermarriage of white and Asian Americans as well as white and Hispanics. Hwang et al (1995) show that this exchange pattern does not hold for Asian American women. They applied multinomial logit models to a representative U.S. sample of married Asians and find that Asian women with lower educational attainment have a higher probability of outmarriage,

while Asian men provide weak evidence of negative selectivity of SES and tend to marry persons with lower educational attainment than themselves.

Liang and Ito (1999) investigated the intermarriage patterns of five Asian American groups (Chinese, Koreans, Indians, Japanese, and Filipinos) in the New York City area. Focusing in particular on gender, nativity, and education, they found little evidence for Merton's (1941) hypothesis. Instead, their research revealed that:

- (1) US-born Asians are much more likely to intermarry than foreign-born Asians;
- (2) Asian women are much more likely to intermarry than Asian men; and that
- (3) intermarried individuals share educational homogeneity.

In a later paper, Qian and colleagues (1999) applied log-linear models to examine assortative mating patterns by race/ethnicity, educational attainment, and nativity status. They found no evidence that Asian Americans marry less-educated whites for an exchange of "higher" racial status.

Furthermore, Jacobs and Labov (2002) analyzed the data from the 1990 US Census to examine the intermarriage among 16 ethnic groups. They argued that an exchange pattern does not hold for the majority of Asian – non-Hispanic white marriages, nor for the four Hispanic groups, and concluded that the applicability of status exchange theory should perhaps be limited to intermarriage between blacks and whites.

Yet, other scholars questioned the applicability of status exchange theory even to intermarriage between blacks and whites, finding that interracial marriage is predominantly homogamous with respect to education. Using simple tabular analyses Bernard (1964) found that interracial marriage as of 1960 tended to be educationally homogamous. Similarly, Heer (1974) claimed that most black-white marriages are educationally homogamous and that the racial-caste hypogamy has no empirical support without controlling for the availability of marriage partners by educational

attainment. Gadberry and Dodder (1993) replicated Bernard's work and found that educational similarity in black-white marriages continued from 1960 through 1980.

Rosenfeld (2005) examined the contradictory literature on exchange hypothesis with regard to black-white intermarriages and claimed that status homogamy in interracial marriages has been mistaken for status change due to the black-white inequality³. Additionally, he claimed that gender differences among young couples have been mistaken for racially specific patterns of exchange. In addition, he found that the empirical support for status exchange is not robust, and that the simple tabulation that questions status exchange contradicts the more sophisticated methods that support status exchange. Favoring simple tabular analyses, Rosenfeld has questioned the validity of exchange theory and the justification of its continued use.

New Debate on Exchange Theory

Rosenfeld's research (2005) has led to a new round of discussion and debate on exchange theory in mate selection. Gullickson and Fu (2010) show in their comment that Rosenfeld's loglinear model is incorrect, and that he has misinterpreted his results. They reexamine Rosenfeld's data with a correct specification in the model and find the data show evidence of status exchange between white women and black men but no evidence of that between white men and black women. Kalmijn's results (2010) are in line with Gullickson and Fu (2010). While he recognizes the low observed degree of male dominance in mixed race marriages does not seem to support status exchange, he shows status homogamy is weaker in interracial marriage than in intra-racial marriage by comparing observed male dominance ratio to the expected level under quasi-symmetry model.

³ See Figure 1.2 in Appendix B for an explanation of the intermarriage pattern.

In a response to the above criticism, Rosenfeld (2010) argues that Gullickson and Fu (2010) have truncated results which exclude the best-fitting model. He shows that his models still support status exchange theory using Gullickson and Fu's parameter. In his reply to Kalmijn, Rosenfeld argues that Kalmijn's results are based on loglinear models that do not fit the data well. By adding additional controls into Kalmijn's models, he shows that the models can be improved dramatically and overturns Kalmijn's core result.

Addressing the Controversy

The empirical controversy mainly comes from how researchers test the status exchange hypothesis. Rosenfeld's study (2005) has claimed that there is a contradiction in simple and complex analyses of intermarriage. He explained it via a robust standard errors argument and tries to reconcile it by using negative binomial analysis. Gullickson and Fu (2010) point out that Rosenfeld's parameterization of status exchange does not measure status exchange. In turn, Rosenfeld (2010) also criticizes Gullickson and Fu for excluding the best-fitting model and shows that Kalmijn results are based poorly fitted models (Rosenfeld 2010). I will argue that this apparent contradiction is not real. The contradictory results are really due to the insistence on interpreting models that are not consistent with the data.

Fu (2001) claimed that he has provided an improved test of the status exchange hypothesis. He found that the "endogamous intermarriage model + constrained exchange parameters" (his Model 2a and 2b) fits better for marriages between whites and blacks as well as between whites and Mexican Americans than the "endogamous intermarriage model" and the "endogamous intermarriage model + unconstrained exchange parameters". Upon closer examination, one can see that the model which he claimed endorses the status exchange hypothesis, clearly shows a lack of fit

($L^2=215.7116$ with $df=9$ for whites and blacks and $L^2=95.9568$ with $df=9$). In addition, the previous model (Model 2c) fits the data much better than Fu's preferred "endogamous intermarriage model" (Model 1c) for marriages between Japanese Americans and whites. Although he has acknowledged the significant improvement in fit of Model 2c over Model 1c, he still claimed Model 1c as the more appropriate model solely based on the BIC statistics (Bayesian Information Criterion, Raftery 1986) when there is another model available that fits the data excellently. On the contrary, loglinear models that are consistent with the data clearly suggest that status exchange is a myth.

Rosenfeld (2005, 2010), Gullickson and Fu (2010), and Kalmijn (201) all solely rely on the BIC statistics to choose the best fitting models. However, the BIC has some important drawbacks and is not a reliable method for model selection in this context (Weakliem 1999; Weakliem 2004). According to Weakliem, 1) the BIC assumes a unit information prior and approximates the log of the Bayes factor for the model of interest compared to the saturated model. The BIC uses sample size as the sole measure of the informativeness of the data, and overlooks the structure or design of the data, which can be misleading since the hypothesis of interest may depend on only a subset of the overall data. 2) The posterior likelihood depends on the data and the researcher's prior. If researchers have different priors, they will have different posteriors; thus different researchers analyzing the same data may reach different conclusions. The BIC assumes the unit prior, a prior equivalent to the amount of information in a single sample point; however, the amount of information represented in a unit prior will vary from application to application. He argues that the BIC is not the "magical" criterion for choosing between models, contrary to what sociologists wish (See Weakliem 1999; 2004 for more details). Some researchers may continue to find the BIC useful as a rule of thumb for model simplification, but there is no obvious

reason to prefer it to other informal criteria such as the ratio of L2 to degrees of freedom, Akaike's information criterion, or the index of dissimilarity.

The status exchange hypothesis as stated by Merton (1941) and Davis (1941) requires couples to be different on two dimensions, i.e., races and status—without these differences the “exchange” cannot happen. Since intermarried couples are already different in races, then for “exchange” to happen, there must be a status gap between minorities and their white partners; in particular, in terms of education, minority husband has to have more education than his white wife and minority wife has to have more education than her white husband. If a minority and his white partner have the same status, then there will be no “exchange” in terms of status in interracial marriage.

In addition, to account for the educational differences between minorities and their white partners, we need to control for their educational distribution. Historically men tended to marry down along education (Schoen and Wooldredge 1989). Since white men tended to marry white women with less education, and since men tend to have more education than women, it is of no surprise that this pattern also can be seen in the black husband and white wife marriage combination. This could partly explain why Merton (1941) thought that this exchange pattern is stronger for black husband-white wife pairs than other interracial pairs. But this hypergamy pattern for women who marry up in education was partly due to the differential gender distribution of education and has become less prevalent as women's education increased.

Couples also tend to marry homogenously because persons with equivalent resource are the ones most likely to maximize their rewards (Campbell 1971; Schoen 1986). According to Mare (1991), people have a strong tendency to marry others of a similar educational background and this tendency has been increasing over the last half century. Status homogamy tends to emerge as the most important pattern of mate

selection in general and it is of no surprise that homogamy is also strong in interracial marriages. Kalmijn (1998) and Rosenfeld (2005) have identified the theoretical bases for educational homogamy as individual utility maximization, affinity, and propinquity and exposure (See Kalmijn 1998, Rosenfeld 2005 for more details).

Recognizing that the educational homogamy is strong in mate assorting in general and that there will be no “exchange” when intermarried couples have the same educational level, the best way to test status exchange is to examine whether the pattern of non-homogamous educational partnering within interracial marriage is asymmetric; and if it is, whether this educational association pattern is different from that of intra-racial marriage. Quasi-symmetry (QS) and its variants are the natural base models for the “no status exchange” hypothesis⁴. Firstly, the educational homogamy has already been accounted for under quasi-symmetry, in which the main diagonal cells that stand for educational homogamy are fitted exactly (perfectly). Secondly, the QS model accounts for the marginal distribution of husband’s and wife’s education. The symmetry model also fits the main diagonal cells perfectly, but it does not control for the different educational distributions of husband and wife.

Based on the above argument, I proceed to reanalyze Fu’s (2001) data, which he claimed to corroborate status exchange by fitting the QS models to the cross-classification table. After conducting a descriptive analysis, I first examine whether the QS pattern truly holds in the black husband & white wife and white husband & black wife pairs. Then I extend the QS model to other interracial as well as intra-racial marriage combinations to see whether the same educational association pattern holds

⁴ In order to test for status exchange, Kalmijn (1993) compared observed hypergamy ratios with the expected hypergamy ratios from loglinear model under quasi-symmetry. He has inexplicitly used QS model as a “no status exchange” for the comparison model.

in those cases. To assess the goodness-of-fit, I employ the likelihood-ratio test (LRT) and dissimilarity index.

Data and Methods

Data

I reanalyze Fu's (2001) data table which was derived from the 1990 US census, 5% Public Use Microdata Sample (U.S. Department of Commerce 1993). In it, Fu has linked couples by the state, household serial number, and subfamily number. Only native-born Americans are included to exclude the possible effects of nativity on intermarriage. The "straight line" (linear) assimilation theory (Alba and Nee, 1997) predicts that the foreign-born are less exogamous than the native-born, and that the younger the age at which an immigrant arrives, the more predisposed to intermarriage he or she will be. Although it might not be true from the point of view of non-linear assimilation theory, it tells us that the theories are different for native born and foreign-born Americans (Kalmijn 1991; Kalmijn and Flap 2001).

Fu analyzes the same-race marriage and only whites' marriages with other minorities⁵ because relatively few interracial marriages between nonwhite groups are available. Couples under age 35 are selected to reduce marriage survival bias (Cf Fu, 2001 for details). Educational attainments are classified into "less than high school diploma, high school diploma or equivalent, some college but less than bachelor's degree, and bachelor's degree or more" (Fu, 2001, p151).

⁵ Only non-Hispanic whites, non-Hispanic blacks, non-Hispanic Mexican Americans, and non-Hispanic Japanese Americans are included.

Advantages and disadvantages of Census data

Census data has been accepted as the most popular data sources for large-scale studies of races and ethnicity in the U.S. for its large nationally representative sample that makes comparison between many race groups possible. Its disadvantages for measuring intermarriage are well known as well (Harris and Ono, 2005; Mare 1991). First, census data measures the prevalence rather than the incidence of intermarriage, where demographic variables are measured cross-sectionally. For example, an individual's socioeconomic status is to be included as an explanatory variable for a person's selection of marriage partner. It would be ideal to obtain a measure prior to or at the time of marriage rather than using the current socioeconomic status at the time of survey because it is likely that a person's socioeconomic status changes after marriage. Recognizing this, researchers usually use only educational attainment as an indicator of a person's socioeconomic status since it not only is both highly correlated with occupational status and incomes but also remains unchanged over time. Besides, the use of occupation and income would restrict the sample to only employed persons and this could reduce the sample size and possibly exclude more women from the sample. Education thus is accepted as a reliable predictor of long-term economic well-being (Kalmijn 1993), as it serves as a salient proxy for past and future socioeconomic status of the married individuals under study.

Second, the age at first marriage is not available in most census data (1980 census is an exception) and the census does not ask about prior marriages for currently married couples. Intra-marriages and intermarriages have different assortative mating patterns for first marriage and remarriage (Agresti 2002), it would be ideal to study recent first marriage. Also the passage of time is associated with increasing tolerance for exogamy. To minimize the selection bias caused by remarriage, intermarriages researchers, in practice, limit marriages to those newly-wed young couples since they

are more likely to have married relatively recently, and are less likely to have experienced a divorce and remarriage (Fu 2001; Qian 1997; Harris and Ono 2005). As Hwang and Saenz (1990) have noted, Census's prevalence data does not generally specify time and place of marriage which "makes it extremely difficult to view variations in intermarriage over time or cross-sectional variations between different groups as indicators of differential assimilation or structural variability" (Hwang and Saenz, 1990, p. 564). The cross-sectional data does not allow us to locate whether the intermarried ethnic minorities originally lived in less segregated area or they tend to move out after marriage from ethnic concentrated area to suburban area where the majority of whites live. The longitudinal data that surmount these obstacles, which would enable us to draw a causal inference, are neither currently available nor likely to be available soon. As a result, the deficiency of the data should be kept in mind when drawing conclusions from this study.

Methods

Log-linear Models

First some notation. For the $I \times I$ square contingency table, let n_{ij} denote the observed frequency in the i th row and j th column of the table ($i=1,2,\dots,I; j=1, 2, \dots, I$). Let π_{ij} denote the probability of an observation in cell (i,j) under a theoretical model and μ_{ij} the corresponding expected frequency. The n_{ij} are assumed to have arisen as the result of either multinomial sampling or independent Poisson sampling. Loglinear models are often summarized by local odds ratios, which give the odds-ratio for every set of adjacent rows i and $i+1$ and adjacent column j and $j+1$. Each local odds ratio, θ_{ij} , is defined as:

$$\theta_{ij} = (\mu_{ij}\mu_{i+1,j+1})/(\mu_{i,j+1}\mu_{i+1,j}) \quad (1.1)$$

Let HR, WR, HE and WE denote husband's race, wife's race, husband's education, and wife's education. In the context of educational association in interracial

marriages, μ_{ijkl} is the expected number of marriages between husbands in education category i and race k and wives in education category j and race l .

In the next section, I consider various loglinear models for the data of the form:

$$\begin{aligned} \log \mu_{ijkl} = & \lambda + \lambda_i^{HE} + \lambda_j^{WE} + \lambda_k^{HR} + \lambda_l^{WR} \\ & + \lambda_{ij}^{HEWE} + \lambda_{kl}^{HRWR} + \lambda_{ik}^{HEHR} + \lambda_{jl}^{WEWR} + \lambda_{il}^{HEWR} + \lambda_{jk}^{WEHR} \\ & + \lambda_{ikl}^{HEHRWR} + \lambda_{jkl}^{WEHRWR} \\ & + \lambda_{ijkl}^{HEWEHRWR} \end{aligned} \quad (1.2)$$

When the last term $\lambda_{ijkl}^{HEWEHRWR}$ is omitted, it implies HE and WE are independent for any given racial combination of husband and wife.

The quasi-symmetry model for square tables was first introduced by Caussinus (1966) as an extension of the symmetry model. In this seminar paper, Caussinus show that the likelihood of a QS model can also be solved by using iterative methods. This paper is often referred to as the first to explain the links between quasi-independence (QI), symmetry (S), quasi-symmetry (QS) and marginal homogeneity (MH). Because of its explicit use of log-linear models and maximum likelihood methods, Caussinus' paper had a major influence on the development of log-linear model methodology.

Quasi-Symmetry Model for “No Status Exchange” Hypothesis

Here in the context of educational association, the quasi-symmetry model means that after adjusting for marginal distributions, odds-ratios are symmetric. The main diagonal cells that stand for the educational homogamy are fitted perfectly under the QS model. In the educational classification, quasi-symmetry means that people marry up and marry down in schooling are equally likely, after adjusting for the differences in the prevalence of educational attainment. In this sense, quasi-symmetry is a natural “base” model for the “no status exchange” hypothesis.

Variations on Quasi-symmetry

Separate QS/Unrestricted QS

Separate quasi-symmetry model for each racial combination. It can also be referred to as an unrestricted quasi-symmetry (UQS) model, where the “unrestricted” refers to the fact that the association parameters are allowed to depend on the HR/WR combination, that is, $\lambda_{ijkl}^{HEWEHRWR} = \lambda_{jikl}^{HEWEHRWR}$ for all combinations of i and j .

Uniform QS

Uniform quasi-symmetry model (UniQS) for a collection of racial combinations; that is, all the educational association parameters are the same in each racial combination, $\lambda_{ijkl}^{HEWEHRWR} = \lambda_{jikl}^{HEWEHRWR}$ for all ij pairs. For example, when the UniQS model is fitted to the mixed-race marriage, the educational association parameters has the property of

$\lambda_{ij12}^{HEWEHRWR} = \lambda_{ij21}^{HEWEHRWR} = \lambda_{ij13}^{HEWEHRWR} = \lambda_{ij31}^{HEWEHRWR} = \lambda_{ij14}^{HEWEHRWR} = \lambda_{ij41}^{HEWEHRWR}$ and the local odds ratios follows the property of $\theta_{ij12} = \theta_{ij21} = \theta_{ij13} = \theta_{ij31} = \theta_{ij14} = \theta_{ij41}$.

Analysis and Results

In this section, I first present a graphical display of Fu’s (2001) cross-classification table of husband’ and wife’s schooling by husband’s and wife’s race, which reveals that quasi-symmetry might be a suitable model for the data. Then, I fit various loglinear models⁶ for marriage between black husband and white wife (BW⁷), assess the goodness-of-fit of different models, and show the quasi-symmetry (QS) fit the BW subtable reasonably well. I also apply quasi-symmetry to marriage between

⁶ See Appendix A for model details.

⁷ First letter represents husband’s race and second letter wife’s race, with W for whites, B for blacks, M for Mexican Americans, and J for Japanese Americans. For example, WB represents the couples in which husband is white and wife is black. There are 10 possible racial combinations: WW, WB, WM, WJ, BW, MW, JW, BB, MM, and JJ (Intermarriages among minorities are excluded).

white husband and black wife (WB) and find that the QS model fits the WB table extremely well. Scrutinizing the educational associational parameters for BW and WB tables, I find they are similar. I then fit the QS model to other racial combinations and find that the QS model fits the data well except for the WW table, for which I will discuss the statistical lack of fit and the practical lack of fit by using dissimilarity index. Based on the similar educational association parameters of the QS model for each racial combination, I finally apply the QS model to the mixed-race and the same-race marriage excluding WW table.

Descriptive Analysis

First of all, I present the cross-classification table of Fu's (2001) in Table 1.1 and Figure 1.1. Table 1.1 is the cross-classification of races and educational attainment in percentage; within each racial combination sub-table, the cell represents n_{ij}/N , where n_{ij} is the observed cell count in Fu's and $N = \sum_i \sum_j n_{ij}$ is the total number of observations for that sub-table. Figure 1.18 is a graphical display of Table 1.1, with the size or area of each square proportional to n_{ij}/N . Zero counts in cells (of Fu's) are represented by small open circles.

⁸ Halpin and Chan (2003) have used the figure to describe the educational association pattern in Ireland and Britain.

Table 1.1 Cross-Classification of Husband's and Wife's Schooling by Husband's and Wife's Race (in Percentage)

	White Wife			Black Wife			Mexican Wife			Japanese Wife			
	<HS	HS	SC	<HS	HS	SC	<HS	HS	SC	<HS	HS	SC	BA+
White Husband													
<HS	4.9	5.1	2.1	4.0	2.1	2.9	5.2	4.5	2.2	0.7	0.9	2.7	0.0
HS	4.3	20.3	9.8	3.4	14.5	13.4	5.5	17.7	9.2	2.0	8.2	8.0	3.8
SC	1.5	8.8	14.9	1.9	7.1	21.6	2.6	9.3	19.6	0.7	5.3	17.3	8.0
BA+	0.2	2.1	6.5	0.2	1.1	7.4	0.6	2.4	7.9	0.0	2.0	9.1	31.3
	N=445,752			N=619			N=3,137			N=450			
Black Husband													
<HS	4.9	5.2	2.8	6.7	5.9	3.8	0.5						
HS	5.9	17.4	9.0	5.0	20.7	11.9	2.3						
SC	2.8	11.7	19.6	1.9	7.3	18.0	5.0						
BA+	0.3	1.5	4.4	0.2	1.1	3.8	5.8						
	N=1,830			N=28,517									
Mexican Husband													
<HS	6.8	7.0	2.8	0.3			18.9	10.1	3.7	0.2			
HS	5.2	16.2	9.9	1.3			9.1	19.1	7.5	0.9			
SC	2.7	10.3	19.3	5.0			2.7	7.5	12.5	1.9			
BA+	0.2	1.2	4.4	7.3			0.3	1.0	2.5	2.3			
	N=2,669			N=5,078									
Japanese Husband													
<HS	1.8	1.8	1.2	0.0			0.3	0.3	0.3	0.3			
HS	1.5	7.3	4.5	1.2			0.7	5.2	4.8	2.1			
SC	1.8	9.4	23.0	5.5			0.0	5.5	23.7	12.4			
BA+	0.0	3.6	13.3	23.9			0.0	0.7	12.4	31.3			
	N=330			N=291									

Data taken from *V.K. Fu 2001* (original source: 1990 U.S. Census 5% PUMS; both spouses under age 35, native-born)

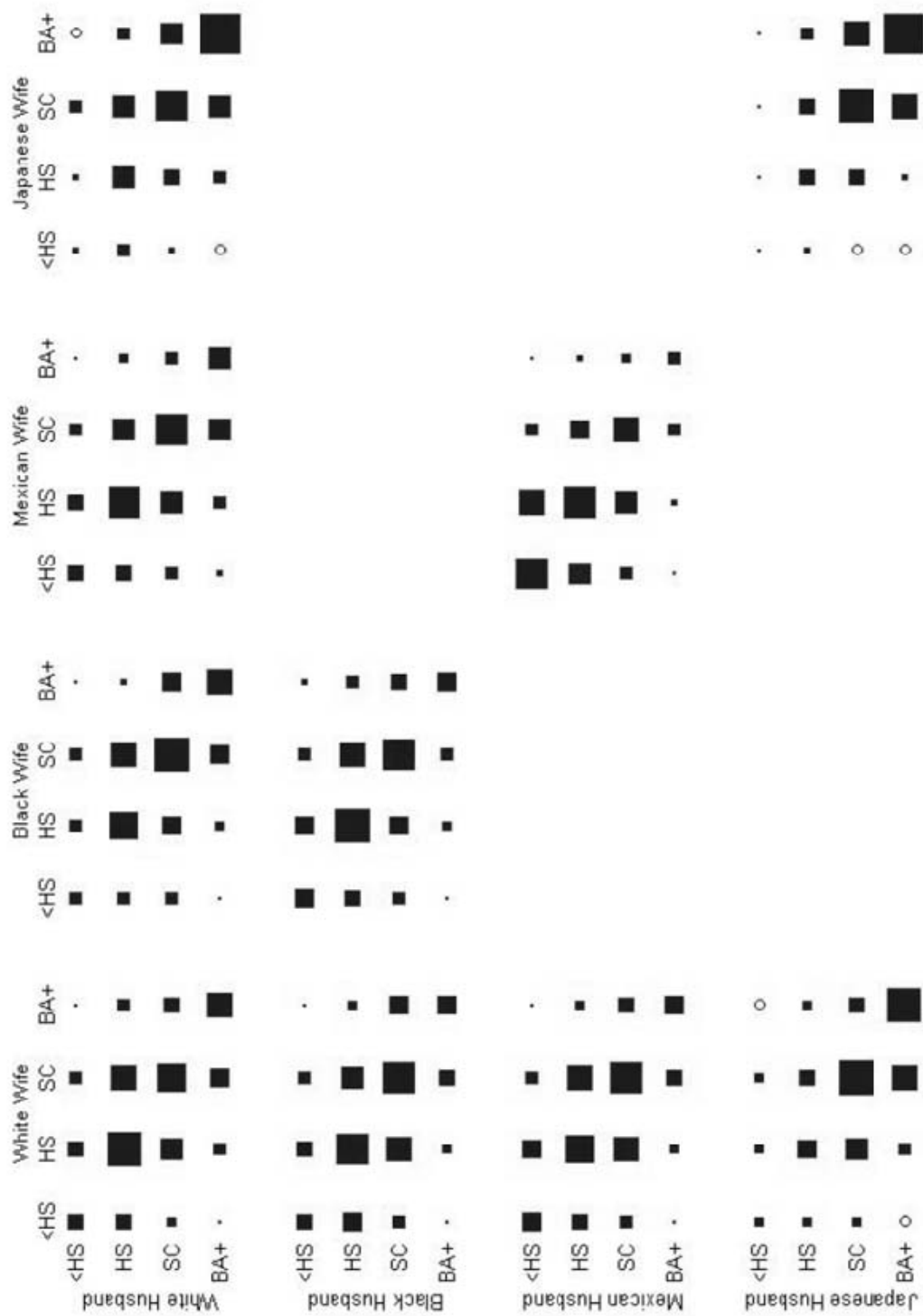


Figure 1.1 Cross-Classification Visualized

Data taken from V.K. Fu, 2001 (original source: 1990 U.S. Census 5% PUMS, both spouses under age 35, native-born)

Using simple tabular analyses, the Bernard study (1966) concludes that the majority of interracial marriages were educationally homogamous. This result is also found in Fu's data. In Figure 1.1, most of the observations lie on the main diagonal for all sub-tables. This clearly shows a strong educational homogamous pattern for both intra-racial and interracial marriages. From Table 1.1, the percentage table of this cross-classification, 49.3% of couples in black-white marriage were on the main diagonal, indicating a strong tendency for spouses to match on their educational attainment. Similarly, the percentages of educational homogamy for other interracial marriages are large and all above 50% except for Mexican husband and white wife (49.6%, slightly lower than 50%). In the same race marriages, not surprisingly, the same pattern is observed: 52.9% for white-white marriages, 51.2% for black-black marriages, 52.8% for Mexican-Mexican marriages, and 60.5% for Japanese-Japanese marriages are educationally equal. For marriages involved with Japanese, a large portion of marriages are on the right lower corner of the tables and for marriages involved with the Mexicans, most are on the left upper corners, which indicate that on average, Japanese have higher educational level than Mexicans, and that the educational distribution for Japanese is skewed to the higher-end and that for Mexicans is skewed to the lower-end. When the intermarriages were not similar in educational levels, for example, in the black husband and white wife marriages, 26.6% of the marriages are with black husbands marrying down, whereas 24.2% of the couples have white wife marrying down.

For intermarriage of white and Japanese Americans, the percentages are larger for Japanese marrying down (29.6% for Japanese husband marrying down compared to 14.2% of them marrying up in JW marriage; and 23.4% for Japanese wife marrying down compared to 19.1% of them marrying down). It seems to imply that Japanese spouse is more likely to marry down than his/her white partner. Recognizing the right-

skewness of educational distribution for Japanese Americans, the existence of larger proportion of Japanese marrying whites with less educational levels is not surprising in intermarriage between Japanese Americans and whites. However, if we control for the marginal distribution of educational attainment for both whites and Japanese Americans, the difference between hypergamy and hypogamy in term of education will disappear (the QS model that controls for marginal distributions of educational attainment fits the JW and WJ tables well). Off the diagonal, the tendency for matches between husband education HE_i and wife education WE_j is nearly equal to that for matches between HE_j and WE_i , but still shows some asymmetry. For example, for the BW subtable, $n_{12}=1688$ (5.9%), $n_{21}=1425$ (5.0%), $n_{23}=3384$ (11.9%), $n_{32}=2094$ (7.3%), $n_{34}=1430$ (5.0%), and $n_{43}=1072$ (3.8%). However, the marginal distributions of husband and wife's education have not been controlled for yet. When the disparity between the marginal distributions of educational distribution of husband and wife has been accounted for, we would expect a symmetry pattern in this table. Figure 1.1 does not control for the marginal distributions of husband's and wife's schooling either. The squares of off-diagonal cells seem to be symmetric along the main diagonal although there may still exist some differences between the area of those cells along the diagonal. Based on the fact that we have not controlled for the marginal distributions of spouses' educational attainment and that the association seen from Figure 1.1 seems to be symmetric, we expect a quasi-symmetry model that would fit the data well.

Loglinear Models

Selected Models for the BW Table

Table 1.2 shows the fit of several loglinear models⁹ for marriages between black husbands and white wives. The independence model assumes that there is no association between husband's education and wife's education. Clearly, the independence model fits the data poorly here. I contrast the model of quasi-symmetry with that of symmetry, which posits equal frequencies in corresponding cells above and below the main diagonal of each education classification, $\mu_{ij}^{HEWE} = \mu_{ji}^{HEWE}$. The symmetry model improves the fit significantly over that of the independence model, but still shows some lack of fit. The fit of the symmetry model, $L^2=12.213$ with $df=6$, shows that observed frequencies are asymmetric. It is then interesting to see whether this asymmetry can be accounted for by the quasi-symmetry model, where I allow for marginal distributions for husband's and wife's schooling to differ. From the excellent fit of quasi-symmetry ($L^2=3.456$ with $df=3$, with asymptotic p-value 0.326 which well exceeds 0.05.), it shows that the data on BW marriages is consistent with the hypothesis of no status exchange. The ordinal quasi-symmetry model still shows lack of fit and uniform fits poorly for the BW subtable. So here the QS model fits the BW table pretty well and it suggests that there is no asymmetry of exchange between educational level of black husband and that of white wife.

⁹ Please see Appendix A for models detail.

Table 1.2 Goodness of Fit of Selected Models to Black Husband and White Wife Subtable

Model	df	L2	p
Independence	9	593.285	0
Uniform	8	57.431	0
Symmetry	6	12.213	0.057
Quasi-independence	5	158.726	0
Ordinal Quasi-symmetry	5	10.198	0.070
Quasi-symmetry	3	3.456	0.326

Table 1.3 reports the fitted log local odds ratios for BW table. Since the property $\theta_{ij} = \theta_{ji}$ holds under quasi-symmetry, I only list estimated log local odds ratios in the upper triangle of the table.

Table 1.3 Estimates, $\log \hat{\theta}_{ij}$, of Symmetric Local Associations under Quasi-Symmetry for Black Husband and White Wife Subtable

i	j		
	1	2	3
1	1.012	0.174	0.522
2		1.176	0.660
3			1.734

Now take a close look at the fitted log local odds ratios values. First, the relatively larger figures on the main diagonals (compared to the off diagonal) indicate a strong educational homogamy pattern and it is very difficult for persons to marry across the boundaries between adjacent educational categories. Since

$$\hat{\theta}_{ii} = \frac{\mu_{i,i} / \mu_{i,i+1}}{\mu_{i+1,i} / \mu_{i+1,i+1}} = \frac{\mu_{i,i} \cdot \mu_{i+1,i+1}}{\mu_{i+1,i} \cdot \mu_{i,i+1}},$$

it actually describes the ratio of educational homogamous over the educational non-homogamous for the adjacent rows and columns of educational levels. For example, the fitted local odds ratio for high school diploma and some college is $\hat{\theta}_{22} = \frac{\mu_{22} \cdot \mu_{33}}{\mu_{23} \cdot \mu_{32}} = \exp(1.176) = 3.241$, which states that

the odds of a person marries someone with a high school education relative to someone with some college is 3.241 times higher if the person has a high school education than if they have some college. The bigger the ratio is, the more likely people marry within their own educational category and the more difficult for people to marry across the educational levels. Clearly, $\hat{\theta}_{33} = \exp(1.734) = 5.66$ is the biggest, indicating that the boundary between some college and college degree (and above) is the most difficult for people to cross in terms of one categorical distance. $\hat{\theta}_{33} > \hat{\theta}_{22}$ indicates that the boundary between some college and college degree (and above) is more difficult for a person with some college to cross than the boundary between some college and high school diploma. This is consistent with the finding that groups at the top of the educational hierarchy are more closed than groups in the middle (Uunk et al 1996; Hendrick 1994 cited in Kalmijn 1998). The biggest of $\hat{\theta}_{33}$ indicates that the strongest boundary is that between college graduates and lesser educated persons. One explanation for this strongest boundary is that college functions as local marriage markets that are physically separated from settings in which lesser-educated persons are involved. Also people marry later and spend more time in school. The

time between leaving school and marriage has narrowed. More likely unmarried people, especially the college educated, meet their spouse in school.

The positive parameters indicate that the further apart the couples' educational attainments, the less likely the marriage. For example, the odds ratio of less than high school diploma and college (and above) is simply the exponential of the sum of the local odds ratios in Table 1.3 including the lower triangle, which

is $\exp(\sum_{i=1, j=1}^{3,3} \theta_{ij}) = \exp(6.634) = 760.51$. It indicates that the odds of a black male marries a white partner with less than high school diploma relative to a white partner with college degree is nearly 761 higher if the black male has a less than high school education than if he has college degree.

Extension to Other Racial Combinations

I then fit the QS model to the white husband and black wife marriage (WB). The excellent fit of QS ($L^2=1.495$ with $df=3$) for WB table also strongly suggests that there is no exchange in the marriage of white husband and black wife. The excellent fit of the QS model for both BW and WB tables indicates that BW and WB follow the same educational association pattern, which is quasi-symmetry in character. This clearly suggests that there is no status exchange among white and black intermarriage.

Actually, I also fit the QS model to other racial combinations (the same-race marriage and the mixed-race marriage between whites and Mexican Americans as well as between whites and Japanese Americans) and find that the QS model fits the data pretty well except for WW table. For WW table, QS model has a residual deviance of 141 with 3 degrees of freedom. It shows a statistically significant lack of fit. However, the lack of fit here might be due to the large sample size since it is difficult to find models that fit the data according to conventional probability levels.

Table 1.4 presents the observed vs. the fitted counts under QS model for the white-white marriages.

Table 1.4 Observed V.S. Fitted Frequencies for WW Marriage

Observed				Fitted			
21,802	22,939	9,175	1,171	21,802	22,966	9,261	1,058
19,008	90,470	43,631	9,076	18,981	90,470	44,199	8,535
6,742	39,008	66,462	20,214	6,656	38,440	66,462	20,868
913	9464	28,780	56,897	1,026	10,005	28,126	56,897

Under the quasi-symmetry, the main diagonals of the WW subtable are fitted perfectly, which can be easily seen in Table 1.4. Off the diagonals, the fitted values deviate slightly from the observed frequencies.

Assess Lack-of-Fit in WW marriages: Statistical but Not Practical

To assess whether it is actually practically lack of fit, I will use dissimilarity index (Agresti 2002)(p329-330). Dissimilarity index, also called index of dissimilarity or referred to as “Delta” ($\hat{\Delta}$), evaluates the lack of fit by estimating the smallest fraction of the population under study that would need to move to different cells in order for the model to fit perfectly. The statistic is calculated from model residuals and can be taken as a direct interpretation of the magnitude of departures from the model

with smaller values representing a better fit ($0 \leq \hat{\Delta} \leq 1$). It has been widely used in social science as a supplement to the model selection criteria such as those based on the log likelihood. I calculate the Delta under quasi-symmetry model for white-white marriages, which is 0.0045 here. Agresti (2002, p329) argues that when $\Delta < 0.02$ or 0.03 , the sample data follow the model pattern quite closely, even though the model is not perfect. Though the relatively large L^2 value for white-white marriages indicated that the QS model does not truly hold, the small Delta value suggests that, in a practical sense, it fits decently. The reasonable fit of the QS model to each racial combination implies no status exchange.

Variations on Quasi-symmetry

Simply adding the quasi-symmetry fitting for each racial combination, I get the unrestricted quasi-symmetry (UQS) model. By looking at the estimated log local odds ratios¹⁰ for each racial combination under quasi-symmetry, I find values of these parameters are quite close for all these sub-tables. Then I try to fit uniform quasi-symmetry (UniQS) model to all the tables by the additional restriction that all the educational association parameters are the same in each racial combination, which results a fit of $L^2 = 374.37$ with 84 degrees of freedom. This suggests the UniQS model for all the subtables shows some lack of fit. Thinking that the statistical lack-of-fit might be skewed barely by the large sample size of white-white marriages, I fit separate UniQS models for the mixed-race marriages and the same-race marriages excluding whites. The excellent fit (for the-same race marriages excluding whites, the fit is $L^2 = 29.18$ with $df=21$; for the mixed-race marriages, $L^2 = 50.327$ with $df=48$) strongly suggests that the same-race and mixed-race marriages share a broadly similar

¹⁰ Upon request, the author will provide the log local odds ratios for each sub-table.

pattern of educational homogamy, which is quasi-symmetric in character. In addition, the closeness of the fitted log local odds ratios of UniQS models for different racial combinations (see Table 1.5) strongly indicates that there is a remarkable consistency and symmetry in husband/wife educational attainment regardless of race (with the possible exception of white/white marriages); intermarried couples share a similar level of education, and educational homogamy dominates the educational marriages, no matter how strong the racial endogamy is.

Table 1.5 presents the log local odds ratios for the uniform quasi-symmetry models for different racial combinations.

Table 1.5 Estimates, $\log \hat{\theta}_{ij}$, of Symmetric Local Associations under Quasi-Symmetry

Racial combinations	i	j		
		1	2	3
White-White	1	1.510	0.192	0.524
	2		1.264	0.486
	3			1.863
Same-Race(no WW)	1	1.504	-0.054	0.379
	2		1.452	0.350
	3			1.722
Mixed-Race	1	1.206	0.153	0.321
	2		1.247	0.540
	3			1.866

Discussion

Based on the above analysis, we claim that the same-race and mixed-race marriage share a broadly similar pattern of educational homogamy, which is quasi-symmetric in character; and that there is little, if any, evidence for the status exchange hypothesis. Furthermore, the evidence strongly indicates that there is a remarkable consistency and symmetry in husband/wife educational attainment regardless of race (white/white marriages may be slightly exceptional).

Here I am not denying race as a salient social distinction that people make in their marriage choices since spouses disproportionately often belong to the same race, but that educational homogamy is strong enough for couples to cross the racial line and that intermarried couples share a similar level of education, and educational homogamy dominates the educational marriages, no matter how strong the racial endogamy is. In fact, most exchange theorists also do not deny the importance of status homogamy (Elder 1969; Goode 1951).

Is Education a Valid Indicator?

Educational attainment affects marital choice in terms of both opportunity and preference. Educational institutions provide settings for intergroup interaction, and educational attainment is believed to have an effect on values, attitudes, knowledge, and life-styles of an individual (Kalmijn and Flap 2001). The prominence of educational homogamy increases in terms of preference and opportunities over time. First, due to the rapid increases in educational attainment in all populations, people's values, norms, and life-styles are more likely at later dates to be formed by common experiences in educational institutions (Kalmijn 1991; Kalmijn 1991; Kalmijn and Flap 2001). Second, the opportunities for matching on education have increased due to the prolonged numbers of years spent in educational institutions (Mare 1991).

Conclusions and Possible Future Research

In this paper, I have reexamined Fu's data, which supposedly support status exchange according to his preferred models. Using the simple QS model and its variations, I show that they actually support no status exchange.

In addition, I have disputed Rosenfeld's claim that simple tabular analysis has been marginalized because of their simplicity by identifying a complex model, the QS model, which indeed supports no status exchange hypothesis rather than status exchange. The apparent contradiction is not real and the contradictory results are really due to the insistence on interpreting models that are not consistent with the data. Loglinear models (the QS models and its variations) that are consistent with the data clearly suggest status exchange is a myth.

Furthermore, I have proposed a new model that better explains the educational pattern in intermarriage. The QS model and its variations bear the natural base for "no status exchange" hypothesis and they are consistent with the data.

The present research suggests several possible future studies. One study could investigate whether the status exchange hypothesis holds true in early 1940s when the racial boundary is exceptionally strong and also investigate whether it holds true in 2000 census data. Perhaps in the era of Merton (1941) and Davis (1941), minority people did compensate their social status for the racial status in interracial marriage. If the status exchange hypothesis did hold true when the group boundary was strong and it is not the case for the more recent data set, it might indicate the weakening of group boundaries in race lines. If the status exchange hypothesis receives no empirical support from the early data set, the justification of its continued use will be questioned. It might also be interesting to explore how the educational association pattern changes over time and how the educational combination in local marriage market influences people's marital choice.

APPENDICES

Appendix A

An $I \times I$ table satisfies symmetry when $\pi_{ij} = \pi_{ji}$, $i \neq j$. This has the loglinear model

$$\log \mu_{ij} = \lambda + \lambda_i + \lambda_j + \lambda_{ij}, \quad (\text{A.1})$$

where all $\lambda_{ij} = \lambda_{ji}$. In this model, the main-effect terms are the same for the two expected frequencies $\mu_{ij} = \mu_{ji}$, and marginal homogeneity occurs. As most believed, the symmetry model rarely fits well, especially when the marginal distributions differ substantially.

The quasi-symmetry model is less restrictive than the symmetry model. It allows the main-effect terms in the symmetry model differ. I define quasi-symmetry model by

$$\log \mu_{ij} = \lambda + \lambda_i^R + \lambda_j^C + \lambda_{ij}, \quad (\text{A.2})$$

where $\lambda_{ij} = \lambda_{ji}$ for all $i < j$ with the residual $df = (I-1)(I-2)/2$ (Caussinus 1966).

Agresti (2002, p. 425) also defines the following properties or conditions for quasi-symmetry to hold:

$$\frac{\mu_{ij}\mu_{ll}}{\mu_{il}\mu_{lb}} = \frac{\mu_{ji}\mu_{ll}}{\mu_{jl}\mu_{la}} \text{ for all } i < j \quad (\text{A.3})$$

or
$$\theta_{ij} = \theta_{ji}, \quad (\text{A.4})$$

that is, the odds ratios on one side of the main diagonal are identical to corresponding odds ratios on the other side.

When $\lambda_i^R = \lambda_i^C$ for $i = 1, \dots, I$, it becomes the usual model of symmetry, and when all $\lambda_{ij} = 0$, it's the independence model. Caussinus's (1966) showed that symmetry is equivalent to quasi-symmetry and marginal homogeneity holding simultaneously, thus

$$\text{symmetry} \equiv \text{quasi-symmetry} + \text{marginal homogeneity}. \quad (\text{A.5})$$

Special cases of quasi-symmetry:

Quasi-independence

Quasi-independence is the special case of quasi-symmetry when $\{\lambda_{ij} \text{ for } i \neq j\}$ are identical, and when $I=3$, they are equivalent (Causinus, 1966). It has a perfect fit on the main diagonal, but independence holds for the off-diagonals. Usually this model would be used for tables that should independence on the off-diagonal cells, but had large counts on the main diagonal.

$$\log \mu_{ij} = \lambda + \lambda_i^R + \lambda_j^C + \delta_i I(i = j) \quad (\text{A.6})$$

$$\text{where } I(i = j) = \begin{cases} 1, & i = j \\ 0, & i \neq j. \end{cases}$$

Ordinal Quasi-symmetry Model

When categories are ordered, I can fit a more parsimonious model. Let $u_1 \leq \dots \leq u_I$ denote ordered scores for both the row and columns. An ordinal quasi-symmetry model is

$$\log \mu_{ij} = \lambda + \lambda_i + \lambda_j + \beta u_j + \lambda_{ij}, \quad (\text{A.7})$$

where $\lambda_{ij} = \lambda_{ji}$ for all $i < j$. It is the special case of the quasi-symmetry model in which $\lambda_j^C - \lambda_j^R = \beta u_j$ has a linear trend. When $\beta = 0$, it becomes symmetry model.

Quasi-uniform association (Goodman 1979a)

$$\log \mu_{ij} = \lambda + \lambda_i^R + \lambda_j^C + \beta u_i u_j + \delta_i I(i = j) \quad (\text{A.8})$$

permits linear-by-linear association off the main diagonal. When scores are equally intervalled, it has uniform local association, given that the responses differ.

Appendix B

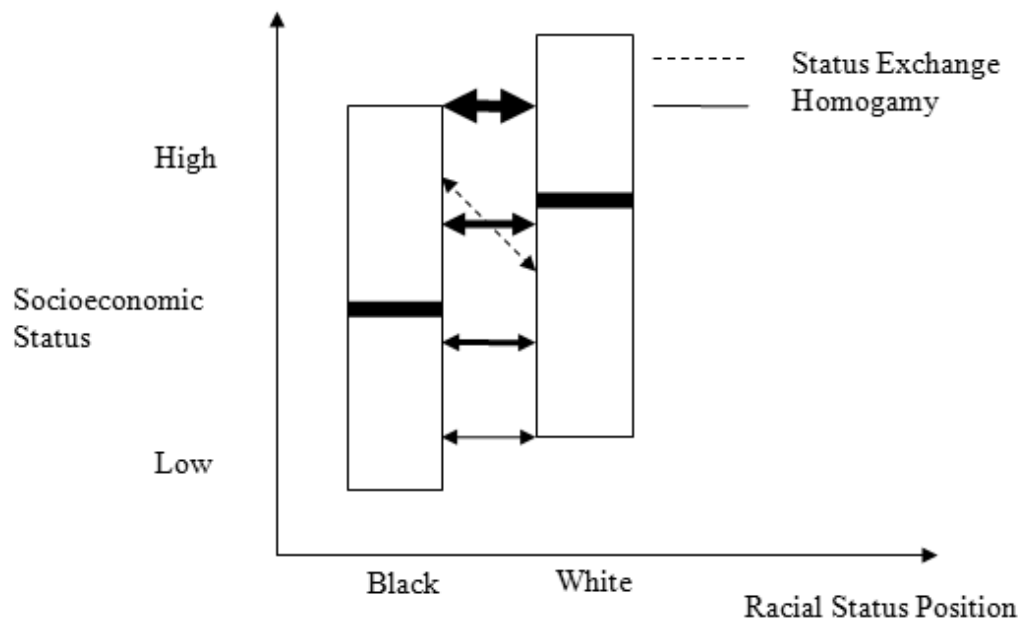


Figure 1.2 Educational Patterns in Black-White Intermarriage

Rosenfeld (2005) has visualized the black-white intermarriage pattern; however, he did not include in his figure the strength of intermarriage in term of educational level. So here Figure 1.2 shows educational patterns in black-white marriages, which has also taken advantage of Gullickson's (2004)'s visualizations. The thick solid lines inside the box represent median educational level. The dark arrows between the two groups represent educational homogamy with upper arrows thicker than the lower ones, which indicates the greater propensity for blacks and whites at higher educational levels to form interracial marriages; while downward sloping dashed arrow indicates status exchange.

As Rosenfeld (2005) has argued, in the climate of inequality between whites and blacks, homogamy can be mistaken for exchange because of the incomplete information about the interracial couples due to the taboo of intermarriage and social distances between blacks and whites (See also Rosenfeld 2005). For example, in Figure 1.2, the second solid line between the black and white groups represents an educationally homogamous marriage. So in this intermarriage, both spouses have the same socioeconomic level. However, from the view of “lower status” blacks, people with relative higher SES marrying out (it’s above the median educational level); while from whites’ perspective, people with relative lower SES (below the median of white educational level) marrying out.

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CHAPTER 2 PRIVATE ENTERPRISES IN TRANSITIONAL CHINA: A GAME THEORY EXPLANATION OF THE RISE AND FALL OF THE “RED HAT”

Introduction

The structure of the Chinese economy has changed significantly since the 1980s with the emergence of private enterprises. “Capitalism” as an economic order was dismantled with China’s thorough-going socialist transformation of industry and commerce by the mid-1950s. A private enterprise economy was restored only in recent decades in response to increasing concern about urban unemployment and economic stagnation following the Cultural Revolution. The rebirth and development of the private enterprise economy in China followed evolutionary bottom-up dynamics linked to China’s transition to a market economy (Zhang, 1993). China’s success in its economic transition and fast growth has attracted much research interest (Tsui etc. 2004; Nee 1989, 1992; Walder and Oi 1999). It has made China the natural laboratory to test and challenge various conventional theories, such as the theories of the firm and property, and those of institutional development (Boisot and Child, 1996; Cao, Qian, and Weingast, 1995; Megginson and Netter, 2001). Among the most puzzling aspects of China’s economic development is the phenomenon of an innovative ownership form of firms—local government ownership in general and rural Township-Village Enterprises (TVEs) in particular, which are neither privately nor state owned. As a matter of fact, we have observed thousands of private enterprises choosing to register as collective firms—*guakao* or as it were “wearing a red hat”. The unique ownership practices and TVEs were China’s growth engine until the mid-1990s. Under conventional property rights theories, the existence of well-defined private property rights is an essential precondition to the proper functioning of a market economy (Coase, 1992; North 1997), and unclear property rights theoretically ought to result in

such enterprises operating comparatively inefficiently and ultimately being forced out of the market (Demsetz 1967).

The success of these fake collective enterprises has created a puzzle: why are there so many fake collective enterprises, and why have they been successful under such unclear property rights? Many scholars have provided various efficiency explanations (Chang and Wang, 1994; Weitzman and Xu, 1994; Li 1996; Che and Qian 1998; Bai, Li, and Wang 2001). Following Grossman and Hart (1986), Chang and Wang (1994) study the ownership structure of the TVEs examining residual control rights as well as residual benefit rights. They conclude that the TVEs are controlled by the township-village government (TVG), and explain TVEs as the second-best political solution. Weitzman and Xu (1994) provide a cultural explanation of TVEs using a fundamental concept of repeated game theory to integrate China's cultural element of a cooperative spirit (China has been dominated by the values of collectivism and family) with standard property rights theories. Some studies explain TVEs as the second-best ownership solution, and argue that such non-standard ownership forms work to improve efficiency in an adverse environment characterized by insecure private property rights (International Finance Corporation, 2000; Li 1996; Che and Qian 1998; Qian 2003). Others explain TVEs with transaction cost theory (Nee 1992; Oi 1999; Tian 2000). Nee (1992) has begun to address the issues of the rational choice made by economic actors in China's present institutional environment. He argues that TVEs serve as a hybrid form in the context of underdeveloped formal institutions of law and market, and also that the informal institution of *guanxi* would have a lower agency cost than state-owned enterprises (SOEs) and lower transaction costs than private firms. Tsai (2006; 2007) contends that the red hat strategy is an example of how an adaptive informal institution contributed to institutional conversion of a formal regulation during the first decade of economic reform. These explanations

have recognized the significance of institutional change and the direct or indirect involvement of local government in the activities of TVEs.

In this paper, I will employ a game theory framework to explain the rational behavior of entrepreneurs and local government under the transitional institutions, and consider how these actors play the extensive games with perfect information. The paper is organized as follows. Section 2 introduces the red hat phenomenon. Section 3 presents the game. Then I interpret the evolution of the red hat phenomenon in Section 4, and provide concluding discussion in Section 5.

The “Red Hat” phenomenon

“Wearing a red hat” portrays a phenomenon in which enterprises invested in and run by individuals have an operational license registered under collective ownership (Kueh, 1985) and pay the attached collective units a certain sum of money as overhead expenses (a “management fee” or “administrative fee”). Indeed, during the initial period of development of the private economy, in particular before the State Council issued the so-called Tentative Stipulations on Private Enterprises (TSPE) to govern the registration and management of private firms, wearing a red hat exerted a certain positive effect on the development of private enterprises due to the unequal treatment received by private enterprises in comparison with their state-owned counterparts. Before the Private Enterprise Law was enacted in 1988, private enterprises with more than eight employees were not legally permitted. In addition, private firms were often subjected to public criticism and arbitrary treatment and harassment by bureaucrats such as tax collectors. The red-hat wearers have to turn in a certain sum of money as overhead expenses, relinquish some authority regarding decision-making, and lose some opportunities in market competition; however, the protection provided by the red hat can exempt them from suffering many troubles, and, moreover, can supply them with many material benefits such as tax breaks, bank

loans, and use of land similar to those received by state and collectively owned enterprises. Consequently, it is no wonder that the administration failed repeatedly in its efforts to ban the “red-hat wearing” phenomenon.

According to statistics provided by the State Administration of Industry and Commerce of China, in 1987 about fifty thousand enterprises across the country with a collective name were actually private ones, accounting for about 22.2% of the total number of private enterprises in China (Shaoxiang Qin, Ting Jia, 1993). In 1989, a sample survey of more than two thousand enterprises conducted in Chongqing showed that 92% of them were private enterprises but registered as non-private ones. Further, 80% of private enterprises exist under the name of township enterprises, neighborhood enterprises, enterprises administered by civil administration, school-run workshops, etc., through pseudo-contracts, pseudo-transfers and pseudo-joint-ventures (*Yearbook on Private Economy of China*, 1994). From January to April, 1991, among the 286 private enterprises that disappeared from the registry in the Baoding area of Hebei Province, 65 changed their ownership nature (two of them became state-owned enterprises, and the remaining 63 became collective enterprises), accounting for 22.7% of the total (Houyi Zhang, 1993).

However, there now is a move to take off the red hat throughout the country. For example, since the convening of the 15th National Congress of the Communist Party of China in September 1997, in Wujin city of Jiangsu Province alone, there have been 1081 enterprises that have taken off the red hat; over 260 in Qingdao within the initial two months of 1995; 6000 in Zhejiang Province by the end of October of 1997; and over 1000 in Shanghai by the end of 1998. Similar trends can be observed in many other cities. Nonetheless, there still exist more than three million “pseudo-collectives” throughout the country (Zhang and Wang 1999).

A Simple Extensive Game with Perfect Information

Model Setup and Solutions

This game concerns the interaction of local government and the private sector. The central government will be considered as the institutional environment, and is assumed to be a benevolent social planner (Libecap 1989). There are two sets of players: the local government and the private enterprises. First, we start with a simple game with only one private enterprise, F1, which may choose to register as private or as a collective by attaching to the local government, G; the local government may accept or reject this proposal. Then we will bring in more private enterprises as players.

The game is as follows. Firm F1 has two choices: *propose* to the local government G and register as collective, or *not propose* and register as private. If it proposes, the local government G may either *accept* or *reject*. We may model this situation as an extensive game with perfect information in which the terminal histories are *(Propose, Accept)*, *(Propose, Reject)*, and *Not Propose*, and in which the player function assigns firm F1 to the start of the game and the local government G to the history *Propose*. We assume all players are rational in the sense that they have precise information about what will occur under any choice made, that they have the ability to compare every choice against every other choice, and that they are fully aware of all possible choices. We also assume that all players have perfect information of other players; that is, all players have complete knowledge about the actions and payoffs of other players.

The model's sequence of play is shown in Figure 2.1. F1 moves first and must choose whether to propose to G. Once F1 has chosen *propose*, G chooses to *accept* or *reject*. The payoffs from this game are also given in Figure 2.1. In reality, the payoffs are more complicated, and the payoff function or utility function can be defined by

real factors such as resources from the market and the planned economy, which I will discuss later.

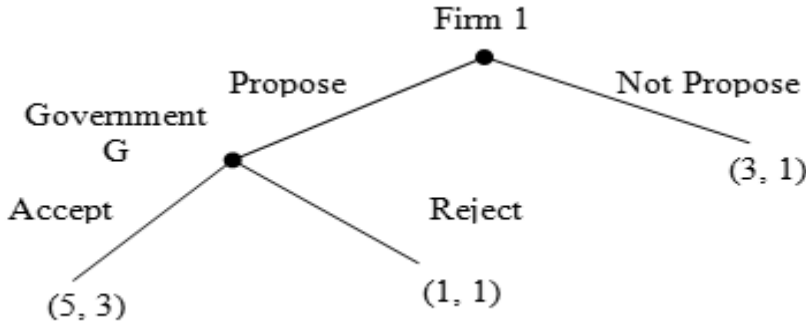


Figure 2.1 The extensive game of Firm 1 and Local Government G

Note: Firm 1's payoffs are the first number in each pair.

In the game shown in Figure 2.1, it seems clear that Firm 1 will propose to the local government G and the government G will subsequently accept the offer. Firm 1 would use backward induction¹ and reason that if it proposes then G will accept, because doing so is better for G than rejecting (payoff for G to accept is 3 instead of 1 to reject). Given that G will respond to the proposal in this way, Firm 1 is better off proposing (5 compared to 3 for not proposing).

Equivalently, the extensive game could be described in a strategic form. A player's strategy specifies the action the player chooses for every history after which it is his turn to move. In the game in Figure 2.1, Firm 1 has two strategies, *Propose* and *Not Propose*, and the local government G has two strategies, *Accept* or *Reject*. The strategic form of the game is shown in Table 1.1. We see that it has two Nash equilibria: *(Propose, Accept)* and *(Not Propose, Reject)*. The first equilibrium is the

¹ This line of argument is as follows. When a player has to move, he deduces, for each of his possible actions, the actions that the players (including himself) will subsequently rationally take, and chooses the action that will yield the terminal history he most prefers.

pattern of behavior isolated by backward induction discussed above. In the second equilibrium Firm 1 always chooses *Not Propose*. This strategy is optimal given the local government G's strategy to *reject* in the event of proposal. Further, G's strategy *Reject* is optimal given Firm 1's strategy: Firm 1 chooses *Not Propose*, so whether the local government G plans to choose *Accept* or *Reject* makes no difference to its payoff. Thus neither player can increase its payoff by choosing a different strategy, *given the other player's strategy*.

Table 2.1 The Strategic Form of the Extensive Game in Figure 2.1

		Government G	
		<i>Accept</i>	<i>Reject</i>
Firm 1	<i>Propose</i>	5, 3	1, 1
	<i>Not Propose</i>	3, 1	3, 1

However, the second equilibrium is not robust. In the strategic game, whenever F1 plays the game, it observes G's action, even if it chooses Not Propose; however, in the extensive game, when F1 chooses Not Propose, he or she never observes G's action because G never moves. In a strategic game, the rationale for the Nash equilibrium condition that each player's strategy be optimal given the other players' strategies is that in a steady state, each player's experience playing the game results in his beliefs about the other players' actions to be correct. This rationale does not apply to the Nash equilibrium (Not Propose, Reject), because F1 who always chooses Not Propose never observes G's action after the history Propose. We could interpret a Nash equilibrium of an extensive game by considering a slightly perturbed steady state in which, on rare occasions, non-equilibrium actions are taken (perhaps players make mistakes), and the perturbations allow each player eventually to observe every other

player's action after every history. However, on those rare occasions when F1 wears a red hat, the subsequent behavior of G to reject is not a steady state in the remainder of the game: if F1 enters, G is better off accepting than rejecting. That is, the Nash equilibrium does not correspond to a robust steady state of the extensive game, because the notion of Nash equilibrium ignores the sequential structure of an extensive game; it treats strategies as choices made once and for all before play begins.

Subgame perfect equilibrium is an equilibrium that corresponds to a perturbed steady state in which every history sometimes occurs; the players' behavior must correspond to a steady state in every subgame, not only in the whole game. The first Nash equilibrium is a subgame perfect equilibrium², while the second is not. In Figure 2.2, we have listed all the subgames of the game in Figure 2.1, and *(Propose, Accept)* is a subgame perfect equilibrium.

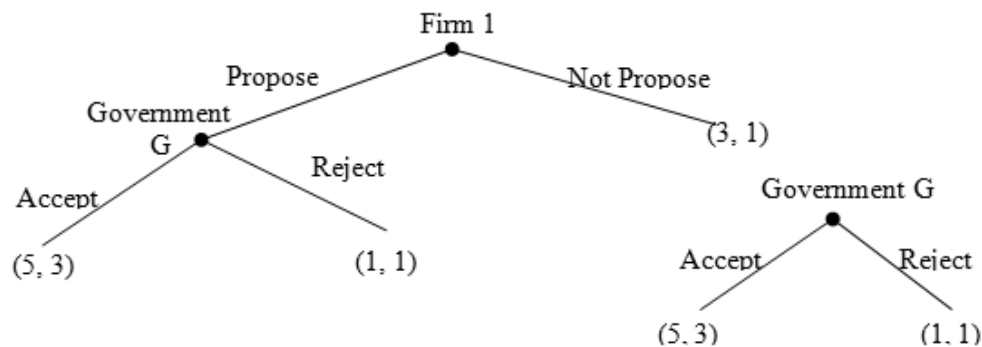


Figure 2.2 The Two Proper Subgames of the Extensive Game in Figure 2.1

So we have our two propositions to the game in Figure 2.2.

² Every subgame perfect equilibrium is a Nash equilibrium.

Prop.1 If F1 believes that the local Government will commit to *Reject* for sure, based on payoffs of the game in Figure 2.1, he would choose the second Nash equilibrium, that is, (*Not Propose, Reject*).

Prop.2 Unless F1 has the belief that the local Government G will commit to *Reject* for sure, based on payoffs of the game in Figure 2.1, he would choose the Nash equilibrium which is also a subgame perfect equilibrium, that is, (*Propose, Accept*).

For now, there are only two players, firm F1 and government G. We could extend this model to bring in more firms. For example, in time period 1, firm F1 could propose or not to propose to the local government G; in period 2, firm F2 could play the same game with government G; then in period 3, firm F3, etc. In addition, some of the firms could also choose to propose to G simultaneously.

This simple model could also be used to describe the interaction of red hat wearers and the local government when they think about taking off the hat as shown in Figure 2.3. The red hat wearer could either propose an offer to the local government for taking off the hat or simply stay with the hat on. The local government has the choice of whether to accept or reject this offer.

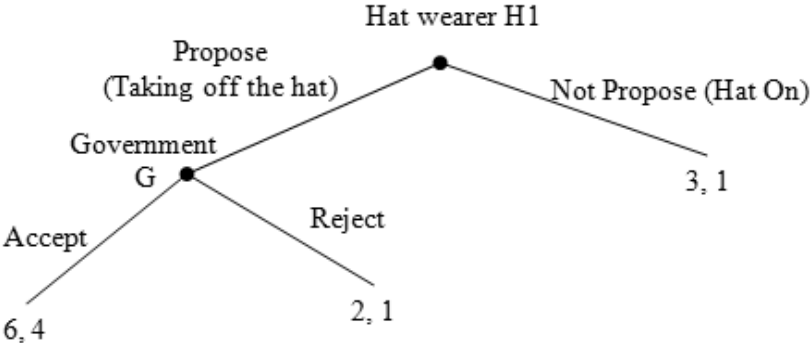


Figure 2.3 The Extensive and Strategic Form of a Game between Hat Wearers and the Local Government G.

Note: H1’s payoffs are the first number in each pair.

The previous propositions are based on the payoffs of the game in Figure 2.1. By empirical research, such as case studies, we could obtain the payoffs of the two players and accordingly get the best response actions for each of the players. In addition, although we could not have the exact payoff functions, we could still have a sense of how much the payoffs are. For example, in reality, we do not know the exact payoff function of F1, but we do know that the payoff might be related to market resources and planned resources, legal protections, taxes, etc.

For simplicity, we could assume that the utility of F and G are (0, 0) when F chooses not to wear the red hat and (-C, 0) when F proposes to wear the hat and Government G rejects, where C is the one time cost associated with F proposing to G. Then the utility (μ^f , μ^g) is simply the extra gains from wearing the red hat for the pseudo-private firm F and the local government G if G accepts (shown in Figure 2.4).

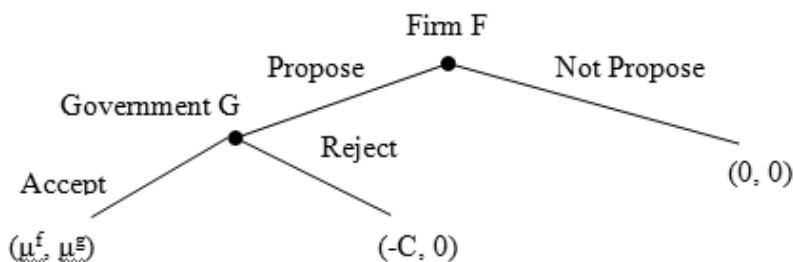


Figure 2.4 The Extensive and Strategic Form of a Game between Hat Wearers and the Local Government G.

Note: H1's payoffs are the first number in each pair.

Assumption 1 The Firm F's utility function $\mu^f(r^p, r^m, h, t, d)$ is continuously differentiable in its arguments, and satisfies the following conditions: $\frac{\partial \mu^f}{\partial r^p} > 0$ (1A);

$$\frac{\partial \mu^f}{\partial r^m} < 0 \text{ (1B); } \frac{\partial \mu^f}{\partial h} < 0 \text{ (1C); } \frac{\partial \mu^f}{\partial t} < 0 \text{ (1D); } \frac{\partial \mu^f}{\partial d} < 0 \text{ (1E)}$$

Assumption 1A implies that the utility of F is positively related to the resource that is redistributed in the planned economy. Assumption 1B implies that the utility of F is negatively related to the resource r^m that is available in the market; that is, the more resources the firm can get from the market, the more payoffs it will get. To incorporate more firms into this framework, we assume that the resource that is available to firm F is a function of the number (n) of firms who wear red hats and that r^p decreases as n increases. Assumptions 1C and 1D demonstrates that the utility of F will decrease as the overhead expenses h paid to the government increases and the tax rate t increases. Assumption 1E states that the more decision making authority the firm has to relinquish to the local government G, the less utility it will get.

Assumption 2 The local government G's utility function $\mu^g(r^p, r^m, h, t', d, e)$ is continuously differentiable in its arguments, and satisfies the following conditions:

$$\frac{\partial \mu^g}{\partial r^p} < 0 \text{ (2A); } \frac{\partial \mu^g}{\partial r^m} > 0 \text{ (2B); } \frac{\partial \mu^g}{\partial h} > 0 \text{ (2C); } \frac{\partial \mu^g}{\partial t'} > 0 \text{ (2D); } \frac{\partial \mu^g}{\partial d} > 0 \text{ (2E);}$$

$$\frac{\partial \mu^g}{\partial e} > 0 \text{ (2F).}$$

Here t' is the tax base that the local government keeps from the central government. Assumption 2F states that the local government values the employment rate and the higher rate e is the higher utility it will get.

According to these two assumptions, in the early stages of market transition, the gain of switching to collective firms from private firms is huge because of the access to more resources provided by the planned economy. However, with more and more firms wearing a red hat, the resources accessible by each red hat wearer become smaller in the planned economy and the total proportion of resources in the planned economy becomes smaller and smaller with the development of the market. Recognizing these factors, we would expect to see the rise of red hat wearers at the

early stage of market reform. Then, more and more red hat wearers would take off their hats, and fewer and fewer private firms register under the collective ownership in the first place as the reform proceeds. In reality the phenomena of the red hat follows this pattern.

In the following section, I will use a case to illustrate the model here, and employ the game model to explore the behavior of private entrepreneurs and the local government in the transitional institution. That is, I will attempt to explain why some of the private firms choose to register as collectives by paying an “administration fee” to a state or collective unit or local government organization, and why some red hat wearers choose to take off the hat and reveal their true ownership.

The Rise and Fall of the Red Hat Firms

Institutional Environment

Before proceeding to the case, I first will briefly introduce the unique context of Chinese transitional institutions.

1. A Dual Track Approach

There are two track systems in China—the plan track and the market track. The two tracks follow different principles. Under the plan track, resources are allocated according to a pre-existing detailed plan. All of the related economic activities are regulated by the plan. For example, the quantities of goods that an enterprise will produce and the prices it will charge for the goods are all specified in the plan (administrative prices). Meanwhile, firms operating under the market track will follow market laws. Due to this dual track approach, some material is not available in the market track and even if it is, the prices are cheaper in the planned economy. According to Qian (2003), the dual track approach improves efficiency,

protects the interests of former interest groups, and makes the best use of existing institutions³.

2. Fiscal System Reform⁴

Before 1978, the fiscal system in China was highly centralized, and all revenues belonged to the central government through the practices of the revenue-sharing system. With the implementation of market reforms, the traditional tax base of the planned economy such as SOE profits and revenue collection declined steeply. In 1998, the central government introduced fiscal contracts with local governments (the “fiscal responsibility system”), in which a lump-sum subsidy to the center from each province was stipulated and then increased annually by an agreed upon rate, with any additional revenues accruing to the province; provinces use the retained revenues to meet their expenditure needs. However, revenues continued to decline due to the problems of SOE profitability and persistent credibility problems of the central government (Wong, Heady and Woo 1995). In contrast, the off-budget funds, also known as “extra-extra budgetary funds” or “little money lockers” grew during the 1980s and 1990s, although the magnitude is unknown (Wong and Bird 2005). These off-budget funds are widespread among township governments and villages; profits and contributions from local enterprises are the major source of these. Under this fiscal system, local governments in China were motivated to control local private enterprises to secure their own little money lockers (Wu 2003). The 1994 fiscal reform aimed to “recentralize” the fiscal system with three components: tax sharing, tax modernization, and tax administration (Bahl 1999).

3 For a detailed discussion of the dual track approach, please refer to Qian (2003) .

4 Refer to Wong and Bird (2005) for a detailed discussion of China’s fiscal reform.

3. Laws and Regulations

A. The First Stage (1977-1988)

During the initial period of development of the private economy, in particular before the Tentative Stipulations on Private Enterprises (TSPE) was issued in June, 1988, the legitimacy of private enterprises had not been acknowledged by the government. The private sector was limited to individual businesses (*getihu*), which first developed in a regulatory vacuum, except that a July 1981 government document had capped the number of employees a *getihu* could hire at eight. In 1983, China introduced a series of central and local regulations for the licensing and control of individual businesses, which pertained to issues such as taxation, product quality and hygiene, and free markets. Followed by inspection drives, “market rectification” drives became an opportunity to attack private business. The private economy was introduced into the socialist planned economy as a “supplement” (CCP Central Committee 1984). Private enterprises were not officially registered as a category until June 1988.

B. The Second Stage (1988-1997)

In 1988, TSPE was implemented. Under TSPE, *siyingqiye* (private enterprises), were distinguished from the smaller *getihu* (individual enterprise), and were defined as “a for-profit organization that is owned by individuals and employs more than eight people”. A State Council regulation regarding the lease contract of small State-owned enterprises was issued in May 1988⁵. The adoption of these lease contracts introduced private entrepreneurs into the management of SOEs, because managers could be recruited outside of the SOE. This led to the privatization of many

⁵ Tentative Regulations on the Lease of Small State-owned Industrial Enterprises, The State Council May 20, 1988.

township and village enterprises (TVEs). Another important change was introduced in the Chinese constitution in 1988, amendment of the 11th article which stated: “The state permits the existence and development of the private economy under law. The private sector is the complement of the public economy. The state protects the legal rights and interests of the private economy....” (Mao 1998). In 1993, “Proposals on Promoting the Development of Individual and Private Enterprises” and the Company Law were released.

C. The Third Stage (1997-present)

In 1997, the 15th National Congress of the Communist Party of China clearly stated in its congress report that the private economy is a “significant component of our socialist market economy.” This philosophy was reaffirmed in the 1999 revision of the Constitution: “the non-public sectors such as individual and private sectors of the economy constitute an important component of the socialist market economy; the state protects the lawful rights and interests of the non-public sectors of the economy such as individual and private sectors; the state conducts leading, supervision and management of this sector” (NPC 1999). On May 12th, 1997, the State Administration of Industry and Commerce enacted “The Notice on Problems Concerning Strict Checking and Ratifying of the Economic Nature of Enterprises”, which clearly stipulates the operational specifications for re-ratifying the enterprises’ economic nature in order to protect the development of the public economy and the legitimate rights of investors. In March 1998, the government issued a directive requiring all the red hat firms to take off the hat by November 1998.

The non-public economy is clearly defined in a Constitutional amendment of March 1999 as being elevated from “complementary status” to “a significant component of our socialist market economy”. This has had a significant impact on private enterprises in China. After the second revision of the Constitution, large

private enterprises have been permitted to be listed on the stock market; private enterprises also are able to participate in the transformation of state-owned and collective enterprises through joint investment, share holding, or purchase.

In addition, the policy makers have made significant changes to accommodate the rise of private business interests and to formally protect private property rights. In November 2002, the Sixteenth Congress of the Communist Party of China explicitly proposed to “improve the legal system to protect private property rights.” Further, in March 2004, the National People's Congress (NPC) amended China's constitution in order to stipulate that citizens' lawful private property is inviolable, thereby placing private assets on an equal footing with public property. This signifies a significant departure from previously believed central principles that private ownership is contrary to the common interest.

Great changes also occurred to the modes through which social resources were allocated. As the country's capability for allocating and controlling resources through the planned system weakened, markets began to play an increasingly stronger role in resource allocation, leading to an increase both in the free-floating resources in society and in the equal competition factor of the market. Currently, the Chinese government is establishing through legislation an equal civil treatment between state-owned, collective, and private enterprises. For example, on September 2nd, 1998, the State Council approved the adoption of the “Interim Provisions on Granting Private Manufacturers and Academies of Scientific Research the Self-Managed Import and Export Right”. On January 5th, 1999, twenty private manufacturers, including the XiWang Group, were the first to be granted the self-managed Import and Export right by the Ministry of Foreign Trade & Economic Cooperation.

Figure 2.5 shows the number of employed persons in township enterprises from 1978 to 2002 by ownership structure. At year 1989, after private firms were first

officially recognized in 1988, China had over 8.8 million persons employed in private firms in contrast to 47.2 million employed in collective-owned firms (as discussed previously, many large private firms disguised themselves as collective firms by wearing a red hat). The political events of 1989 caused a temporary setback to the growth of private enterprises in 1990 and 1991 with a declining number of persons employed in private firms and an increasing number employed in collective firms. Then Deng Xiaoping's famous "Southern Tour" in late 1992 called for a continuation of the reform and deepening of the transition to the market economy, which has renewed the growth in private sectors in the following years. With the development of the market transition, pseudo-collective firms chose to reveal their true identities by taking off their red hats and becoming private firms. This is shown in Figure 2.5 as substantial increases were found in employment in the private sector, in contrast to the corresponding decreases in the collective sector after 1995 (two years after the release of the Company Law in 1993). Similar patterns were found in the registered number of private firms versus collective-owned firms among Township enterprises (shown in Figure 2.6)

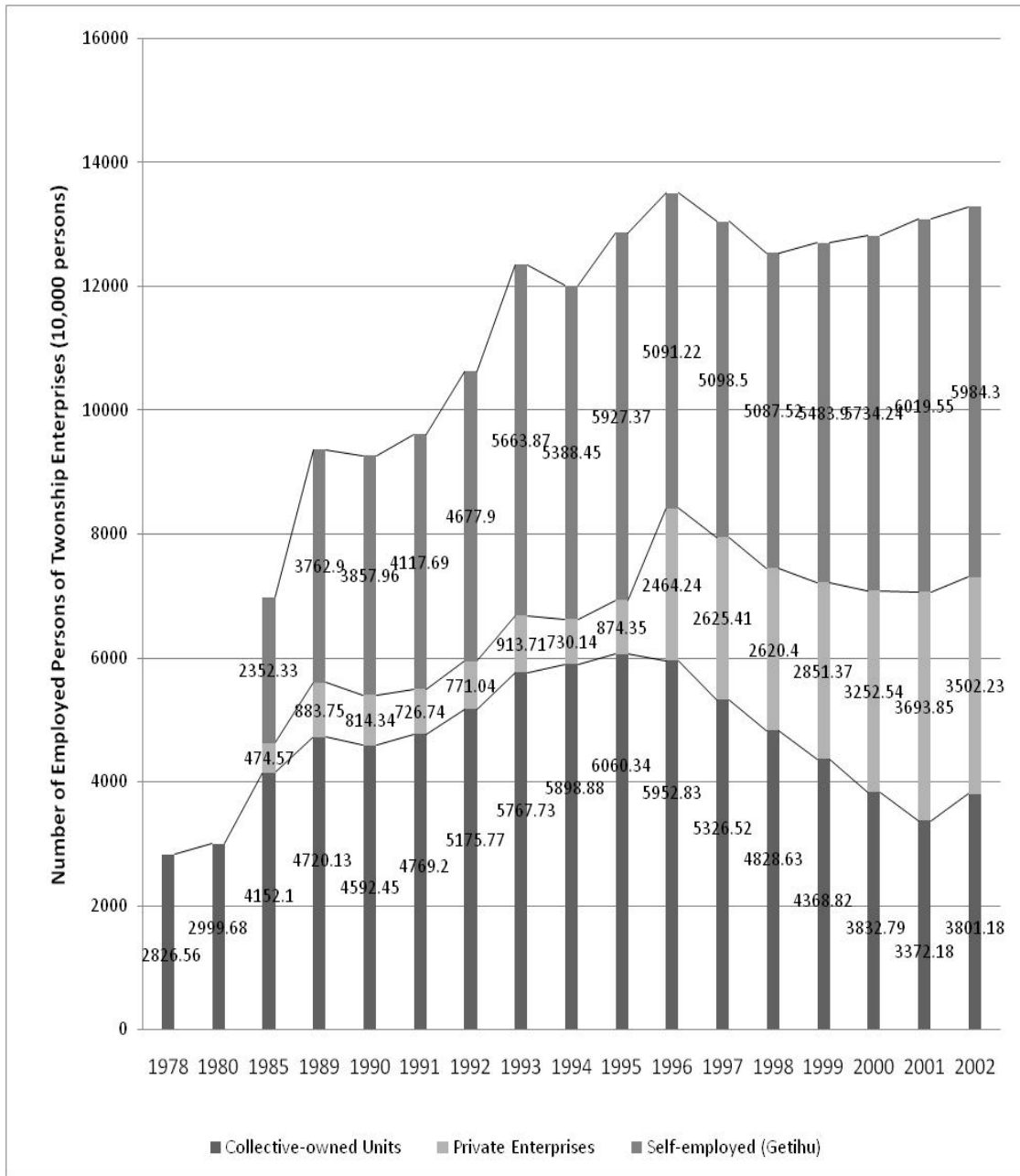


Figure 2.5 Employed Persons of Township Enterprises, by Ownership and Year

Source: *China State Statistical Yearbook 2003*, p448

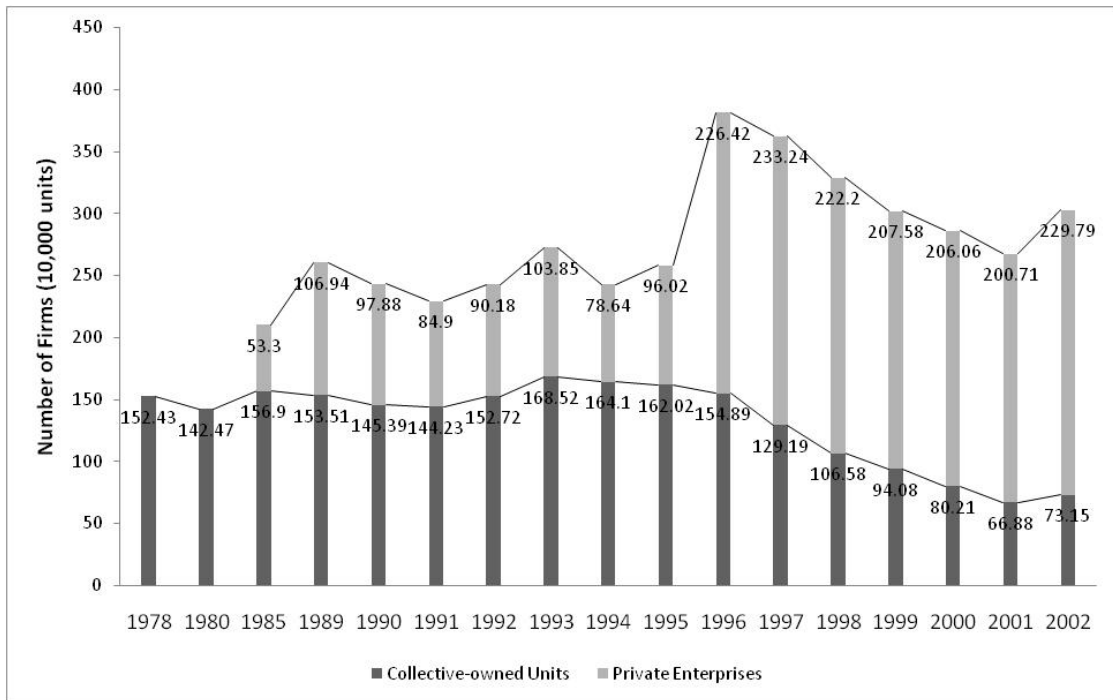


Figure 2.6 Number of Collective-owned and Private-owned Firms, by Year

Source: *China State Statistical Yearbook 2003*, p447.

A Game Theoretical Explanation of the Rise and Fall of the Red Hat

Case One⁶:

Mr. Song, a farmer of Chengguan Town, Sanhe County... sold his Liberation-brand automobile in 1986 and began to operate two diesel trucks. By the end of the same year, he changed his business to run a slaughtering and meat processing plant and stopped the hauling trade. The slaughtering and meat processing plant was put into formal production on January 20th, 1987. After the slaughtering and meat processing plant was set up, Mr. Song bought a microbus, refrigerator car, etc. So far, his total fixed assets were valued at 520,000 yuan, and current assets totaled 240,000

⁶ This case is translated from Qin and Ting, 1993, *Exploring the new social group*, China Development Press, Beijing, p.102-103

yuan. He had a 340,000 yuan loan from the bank, and sixty tons of fresh meat stock in the county's refrigerator. He had a store in front of the plant and another store on a market street of the county. The output in 1987 was worth one million yuan, with 150,000 as profit and over 30,000 paid as tax. The "Gucheng Slaughtering and Meat Processing Plant" run by Song is a private enterprise, but its operation license is in the name of joint management by the Nanguan village committee and the county's supply and marketing agency. The Nanguan village committee did not render any support for the slaughtering and meat processing plant, nor a penny of investment. However, the committee took away from Song several thousand yuan each year only because they lent the plant their name. The county's supplying and marketing agency only provided the plant with a 20,0000 yuan loan, which must be returned by the time due, while the slaughtering and meat processing plant in turn gave them six thousand yuan as dividends. It is stipulated in the contract that Mr. Song is the corporate representative of the plant and is in full charge of all the operation and management of the plant, with which Nanguan Village and the supplying and marketing agency should not interfere. By attaching to collective units, Song's private business enjoyed rapid growth. According to the investigation on the slaughtering and meat processing plant run by Song in May, 1988, he could get the following economic benefits through the use of the collective license:

1. Access to large-volume loans from banks. According to the bank regulations, individual⁷ loans should not exceed a maximum of 15,000 yuan, while one can borrow a loan of several hundred thousand on the strength of a collective license.

2. The maximum interest rate on individual loans is 11.52%, while that on

⁷ By July 1988, no private enterprise had been registered in Sanhe County, and township and village enterprises were divided into collective ones and individual ones.

collective loans is 6.6%. Merely in this item alone, Song could save 9,840 yuan in interest on his 200,000 yuan loan.

3. Private enterprises have to pay the local administration of industry and commerce 2% of their turnover as an overhead expense, while collective ones are exempt from such payment. In this item, Song could pay 20,000 yuan less if calculated on the basis of Song's one-million-yuan production value.

4. With private enterprises, the tax is calculated based on a graduated income tax rate of ten brackets, while with collective enterprises, the tax is based on a graduated income tax rate of eight brackets. Assuming that Song's annual profit was 150,000 yuan, he could save 15,950 yuan in taxes with the collective license.

5. Newly started collective enterprises are granted a one-year exemption from product taxes, and a two-year exemption from income tax. According to his production scale then, Song avoided paying the county 230,000 yuan in such taxes during the first two years.

Furthermore, self-employed laborers also had to pay the individual laborers' association fee, and they had a lower wage after taxes. These factors, though tiny proportionally, represented a considerable figure to a plant with a one-million-yuan production value like Song's.

Overall, despite the fact that he paid the supplying and market agency and Nanguan village over 10,000 yuan from his profit, the benefits he received from the collective license were several hundred thousand yuan. From this case, we can see that the payoff gained by switching to the red hat for Mr. Song μ^f (which has taken the cost associated with the red hat, 10,000 yuan here, into consideration) is very large and the cost C of switching is almost none. Song has enjoyed tax avoidance, fee dodging, and excess income acquisition. As to the Nanguan village committee, their payoffs μ^s from the game are several thousand yuan a year without any contribution except for lending

their name. As the extensive game model we discussed previously predicted, Mr. Song and the Nanguan village committee choose the action (*Propose, Accept*).

*Case Two*⁸:

Tri-color Company of Tongling City, in Anhui province was private from its birth, when its founder Feng Gao put the first batch of products onto the market. Gao discovered that his clients lacked confidence in private enterprises, and that banks also took great precautions in dealing with private enterprises. On his first trip to Tongling to market his products, the first question asked by whoever he met was, “What’s the nature of your company?” Hence, in 1986, Feng Gao changed his company into a collective one, and moved the Tri-color Company from Yaogou Town in Wuwei County to Tongling City. Feng Gao himself became the company’s managing director, under assignment by the Bureau of Economy and Trade of the Shizishan District in Tongling City. The party equipped him with a branch secretary of the Chinese Communist Party. Because the company now wore a red hat, it had to be managed as a red-hatted enterprise. However, the micromanagement from some government departments actually limited the further development of Tri-color, which had to apply for approval even for an investment of a mere 100,000 yuan. In 1996, Feng Gao planned to exclusively sponsor a Spring Festival soiree to be held in Shanghai, entitled “Eternal Friendship between Shanghai and Anhui People”. By doing so, he hoped to promote the reputation of his company as well as to express his appreciation for the support from people from all walks of life in Shanghai. This could have become a good activity in terms of public relations, for which Gao decided to donate 300,000 yuan; however the project was aborted due to the disapproval of some administrative

⁸ This case is translated from Zhang and Wang, 1999, *The Red Hat in Change*, China Industry & Commerce, Vol. 1

departments. In 1993, Feng Gao attempted to invest in a chemical industry project, which was listed among the “National Torch Program Projects”, China’s most important high-tech industry program and a national guideline program. However, the application had to go through one administrative level after another, and it took two years’ time to obtain the final endorsement. The approval meeting by departments concerned alone had been held 11 times. All of these experiences exhausted Feng Gao. Further, in late 1995, the Tri-color ordered new equipment from Jiangsu Province for 2,400,000 yuan, which was intended for developing high-pillar lamps. However, the machine was not put into use until 1997 due to more than year-long examination by the department in charge. The product turned out to be popular the moment it entered the market. “If we had been allowed to start the project earlier, we could have earned twice as much as 2,400,000 yuan by now,” said Feng Gao regretfully.

Apart from regular routine reports, Feng Gao had to make numerous ad hoc reports to each department on demand, often repeatedly reporting the same content; any default could be interpreted as “no respect for authority”. When the authorities came to check his work, Feng Gao faced a dilemma. He would wind up in trouble if he did not receive them; but if he did, the visit would take up a half or even one whole day, because the officials would check not only the overall situation of the company but also the employee’s wages and welfare conditions. On February 28th, 1998, after having assumed a 14-year-long false name of “pseudo-collective enterprise”, the assets of Tri-color valued at 50,000,000 yuan were transferred to Feng Gao by the local government after several rounds of negotiation.

In the initial period of market development, private enterprises were often subject to prejudice and doubts. This was particularly true in the second half of 1989, when there was mainly negative propaganda about them. Moreover, people used to associate private enterprises with “adulteration”, “fraud”, “speculation”, “tax dodging”

and “disorder”. That partly explains why private enterprises changed their company status: namely, for the sake of gaining trust from their consumers and customers. In case two, Gao wore a red hat to acquire a better social reputation and credibility to smooth the way for business negotiation. In this case, “Pseudo-collective” enterprises gained policy, ideological and economic benefits from the red hat, while the local government also got the overhead expenses paid and the decision-making authority relinquished by the firm. However, in the meantime, the unclear property rights made it impossible for Gao to act freely in the real market. With all these problems taken into consideration, Gao subsequently chose to take off the hat. For the local government, although the exact gains from allowing Gao to take off his hat were not specified, the context of several rounds of negotiation implied that the government extracted benefits. It became a win-win situation for taking off the hat.

However, many lawsuits also have arisen in reaction to proposals to take off the red hat. The unclear property rights often cause disputes regarding the ownership of the enterprise property rights; a famous lawsuit of China car tycoon Yang Rong, ex-chairman of Brilliance China Automotive (BCA)⁹ is a good example. In that case, the property rights are not easy to define and the gains of each party who obtain the property rights are huge. It therefore is rational for the local government not to allow Yang to take off the red hat.

Conclusions and Discussions

“Pseudo-collective” enterprises gained policy, ideological and economic benefits from putting on a “red hat”, while the local government also got a temporary break. All of these gains were compatible with the initial stage of market development of that time. The overhead expenses and the decision-making authority relinquished

⁹ The case of China car tycoon Yang Rong is covered in many international news reports.

by the red hat wearer were far less than what had been gained. However, as the reforms proceeded, all types of enterprises began to receive equal civil treatment. Furthermore, when the changing environment of “red hat” wearers offered losses as well as gains, it became hard for the red hat to stay on for long.

With a change in the institutional environment, a rational entrepreneur will adopt new organizational forms that adapt to the new environment, or he will have to pay high switching costs in the near future. In the first and second stage of the development of the private economy, the “red-hat” enterprises could access cheap resources in the planned economy and obtain protections through transactions with local governments. In return, they had to relinquish a certain part of decision-making authority and industrial profits. When the transaction expenses (including the relinquished decision-making authority, joint demarcation of property rights, and a certain part of industrial profits) are far less than those faced in the market, private enterprises certainly prefer to stay with a “red hat”. In the third stage, with the strengthened market and equal treatment from governmental policy, the situation became different: the resources formerly controlled by the government could be purchased on the market, and thus the transaction expenses between enterprises and government became unnecessary. The relinquished decision-making authority of the private enterprise consequently fetters its further development and puts it at a disadvantage in the strengthened market. In addition the unclear property rights and all the hidden dangers the red hat entails cause private entrepreneurs to worry that if disputes emerge, it might put them into an unfavorable position. At this juncture, the institutional environment has changed, and resource allocation likewise is changing. The entrepreneurs, who can purchase key resources formerly controlled by government at the market place, pursue their interest in transactions with the market and tend to take off the hat.

The local government and central government also have an important role in the taking off of the red hat by private enterprises. The private economy has become a bright spot in terms of shaking off economic stagnation, enlarging employment opportunities, and improving economic growth since the 1997 National Conference of the Chinese Communist Party. Governments at all levels therefore have initiated various policies and measures to promote the development of the private economy, since the public economy alone no longer suffices as a measure of achievement for the administrators. Moreover, local governments also encourage pseudo-collectives to take off the “hat”, because they do not want to see the property rights disputes caused by the red hat fettering the development of private enterprises, as that could cause the loss of impetus for capital accumulation and require short-term governmental actions.

On the one hand, the loss of enormous tax money and the irregular transactions associated with wearing red hats have become a hot-bed for corruption, and have interrupted the regular market order. Meanwhile, under the pressure of pseudo-collectives, individual and private enterprises either are forced to suspend business or follow suit and put on red hats, which leads to the shrinking and malformation of individual and private enterprises. It is for this reason that the country has made very early efforts to investigate and purge this phenomenon of pseudo-collectives, but this has been in vain. Now, despite the fact that the tax policy has been unified and collective licenses no longer provide them with an opportunity to take advantage of the loopholes in policy, the government still regularly encourages the pseudo-collectives to take off the “hat”. It does so because the registered number of private enterprises is far too low due to the existence of “pseudo-collectives”, which has affected the accuracy of state macroeconomic management and scientific analysis.

According to this extensive game with perfect information, the rise and fall of the “red hat” are the rational results of the interaction between enterprises and local

governments. However, more information is needed to specify the utility function and how the payoffs would evolve in the transitional economy. This paper has examined the interaction between the private firms and the local government, with the assumption that the central government acted as a beneficial planner. Future research could bring in the central government as a third actor and use a game theory framework to explain the evolution of property rights in China's market reform.

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CHAPTER 3 WHY DO PEOPLE INTERMARRY— A MULTILEVEL ANALYSIS OF ASIAN AMERICAN'S MARITAL ASSIMILATION

Introduction

Interracial marriage in the United States has been the subject of debate over several decades, and it has been accepted as a key indicator of both social distance and assimilation (Alba and Golden 1986; Alba and Nee 1997, 2003; Gordon, 1964; Lieberman and Waters 1990; Fu 2001; Park 1914). Because marriage represents an intimate and long-term relationship of co-equals, Kalmijn (1998) argues that growing intermarriage or heterogamy reflects shifting group boundaries and bears on the potential for assimilation and cultural and socioeconomic change. Besharow and Sullivan (1996) argue that the rapid increase of interracial marriage in the 1980s reflected the improvement of race relations and the decline of racial distance. The extent of interracial marriage is often viewed from the perspective of national prevalence which implicitly assumes a single national marriage market (for example, Kalmijn 1993; Qian 1997).

However, marital patterns differ quite substantially on the basis of geographic location and racial composition. Harris and Ono (2005) argue that most national estimates of homogamy-heterogamy odds ratios do not account for variation in racial composition across marriage markets and thus geographic constraints on interracial marriage may be misinterpreted as evidence of social distance between groups. Using data from the 1990 census, they indeed find that national estimates of race effects on partnering decline dramatically and variously (from 19 percent to 53 percent) once they control for the racial composition of local marriage markets, and that potential biases are largest for white-Hispanic or white-Asian marriages. Their study show that the assessments of social distance from intermarriage with a single national marriage

market assumption are sometimes confounded with the geographic constraints of local marriage markets on intermarriage (Blackwell, Qian, & Lichter 2006).

Previous research has shown that racial composition varies across local areas (Massey, 2001; Sandefur et al., 2001) and race effects on partnering also vary by region (Model and Fisher, 2001; Rosenfeld, 2001). Data from the 2000, created by the Lewis Mumford Center¹, indicates that racial composition varies across metropolitan areas. Asian Americans accounts for 3.6 percent of total population, however, its geographic distribution differ substantially across metropolitan areas. For example, Asians are 69 percent of the population in Honolulu, 27 percent in San Jose, and 25 percent in San Francisco, but only 10 percent of the population in New York, 4 percent in Philadelphia, and 1 percent in Pittsburgh. In addition, the Asian American population has expanded in size and distribution throughout the United States since the 1970s. According to Barnes and Bennett (2002), Asian Americans were predominantly concentrated in Hawaii and California in 1970 (about 1.5 million), and its population was increased to 13 million by 2000 and dispersed through the US with significant communities in Seattle, WA; New York, NY; Houston, TX; Newark, NJ; Chicago, IL; and Minneapolis, MN.

In recent studies, researchers have begun to interpret intermarriage from the scope of local marriage markets. For example, using census data from 1980 and 1990 in selected metropolitan areas, Rosenfeld (2001) examines race and ethnic effects on interracial marriage in several large multiethnic marriage markets, and finds that both Hispanic and Asian pan-national identities are a significant force in mate selection and the strength of such pan-national Hispanic and Asian associations vary by region, education, and nativity. This suggests taking a single national marriage market

¹ Racial composition, Dissimilarity index, and Exposure index by metropolitan areas can be downloaded from <http://mumford.albany.edu/census/data.html>.

approach may overlook the varying degrees of underlying tendency to intermarry and the varying racial composition across the US.

Previous studies have shown that interracial marriage is distributed unevenly in the US (Rosenfeld, 2001). According to a social and demographic trends report released by Pew Research Center (2010), in 2008, a record of 14.6% of all new marriages in the US were between spouses belonging to different race or ethnicity groups, and that intermarriage rates varied by region, by state and racial group. Study the interracial marriage at the national level might not give a complete picture of interracial marriage. To examine how local marriage market conditions affect interracial marriage, the multilevel model (or in another term, hierarchical linear model) is ideal (Mason, Wong, & Entwisle, 1983). Individuals are nested within local areas and tend to form their marriages within local marriage markets (e.g., Lewis and Oppenheimer, 2000; South and Crowder, 1999). The multilevel design controls for local marriage market conditions and presumably yields less-biased standard errors and p values for the contextual effects (Kalmijn and Tubergen, 2010). In addition, as shown in Figure 3.1, the rate of interracial marriage varies by state, which also indicates a multilevel design is appropriate.

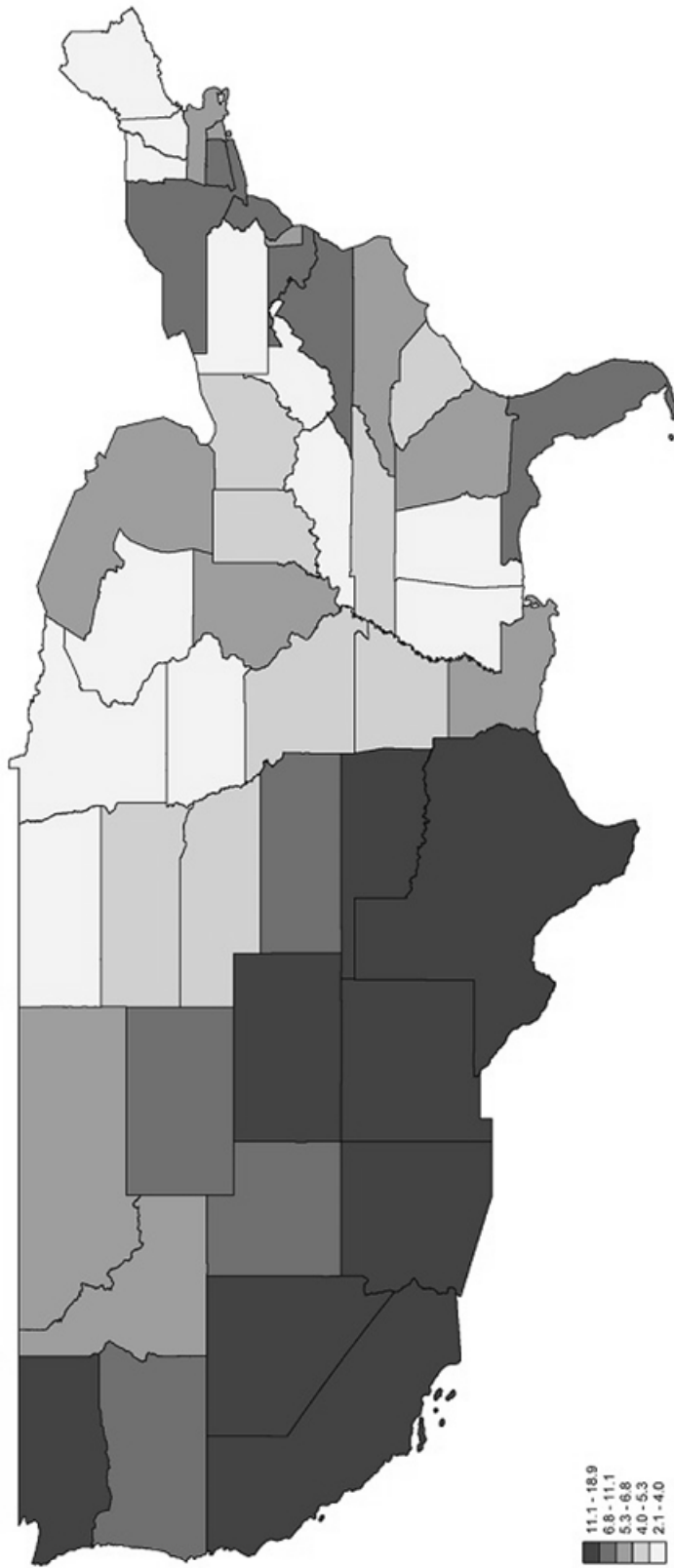


Figure 3.1 Interacial Marriage Rate by State (%), First Marriage, Wife 15-55 Years Old, ACS 2008

Note 1: In this figure, “interacial marriage” refers to pairings between these racial groups (non-Hispanic white, non-Hispanic black, the Hispanic, non-Hispanic Asian, and non-Hispanic other races).

Note 2: Alaska and Hawaii are not shown on the map (with Alaska having an interacial marriage rate of 15.4% and Hawaii 27.2%).

Source: Analysis of the 2008 American Community Survey (ACS), based on IPUMS series

Asian Americans have succeeded in many areas (e.g., educational and occupational attainment) and intermarriage rates are high; they have come to symbolize successful assimilation into the mainstream of America. Yet, because the race effects on partnering may differ between national market and local marriage markets for white-Asian marriages (and white-Hispanic marriages, as shown by Harris and Ono, 2005), I examine data extracted from the recent American Community Survey 2008 1% sample from the Integrated Public Use Microdata (IPUMS). I also apply multilevel logistic regression models to explore how local marriage markets conditions affect the Asian American's assimilation through assortative mating.

The paper is organized as following: I first review the literature on interracial marriage, and then provide a theoretical perspective trying to integrate the existing theories. This is followed by a discussion of data and methods. Using the 2008 American Community Survey data, I employ multilevel logistic regression models to understand how local structural factors help weaken racial boundaries between Asian and non-Asian groups. Then I presents the results and interpretation of findings, followed by my last section, where I conclude that local marriage market and multi-level analysis that incorporates micro- and macro-level variables helps us to better understand how racial minorities (such as Asian Americans and immigrants) are incorporated into the United States through assortative mating. I also argue the need to pay special attention to the geographic distribution of population and the nativity or generation structure of minority groups.

Literature Review

Traditionally three mostly complementary perspectives have been used to explain the prevalence of racial and ethnic intermarriage: assimilationist, structuralist, and status exchange. I will review the three perspectives respectively.

Assimilation Theory

In the field of assimilation theory, the most influential and dominant perspective is Milton Gordon's (1964) seven-stage model. He brings forward the dimensions to assimilation theory, and argues that assimilation has multiple forms and that different kinds of assimilation can occur at very different rates. He argues that assimilation begins with acculturation (cultural or behavioral assimilation), and then proceeds through structural assimilation, which is "large scale entrance into cliques, clubs, and institutions of the host society in a primary group." Structural assimilation inevitably leads to marital assimilation and is the "keystone of the arch of assimilation." When large-scale intermarriage takes place, the minority group melds into the host society, "identificational assimilation" takes place, and the other stages, that is, "absence of prejudice, discrimination, and value and power conflict" will follow naturally. He claims that compared with those who do not intermarry, those who intermarry generally possess of greater social, political, and economic characteristics that are more like those of the host society. This assimilationist view of inter-group relationships has been shared by many students of racial and ethnic relations (Alba and Nee 1997, 2003; Lieberman and Waters, 1988; Massey 1981; Massey and Mullan, 1984; Qian and Lichter, 2001, 2007; Rosenfeld 2002; Woodrum, 1981).

However, Gordon's view of assimilation as a one-way uniform process by which all immigrants would eventually conform to the white Anglo-Saxon Protestant middle-class core culture has been criticized for its ethnocentricity and inevitability. In

Remaking the American Mainstream, Alba and Nee (2003) extend the classical assimilation theory to account for the recent diverse immigrant groups and regard assimilation as an incremental process that stems from individuals' purposive action and the *unintended consequences* of their workaday decisions to optimize on past investments in human, cultural and social capital (Nee and Sanders 2001). Their new assimilation theory does not assume a one-direction process, inevitable, or irreversible, but an incremental process that must be explained as a contingent outcome stemming from the cumulative effect of individual choices and collective action in close-knit groups, which are expressed differently both within and across ethnic groups. Assimilation is caused by a repertoire of behavioral mechanisms, the precise mix of proximate ones varying considerably across groups (Nee and Alba 2003). According to Alba and Nee (2003), social boundaries such as race and ethnicity are socially constructed, and can be "crossed," "blurred," or "shifted" across generations, and thus, the American mainstream can be "remade" by the contemporary influx of immigrants from diverse backgrounds (see Qian and Lichter 2007 for more discussion about Alba and Nee's assimilation theory).

According to Gordon (1964), the greater primary structural assimilation occurs the longer the members of an immigrant group have been in the United States. Nativity plays an important role in predicting intermarriage. The out-group marriage tends to increase along with length of residence in the host country and over successive generations (Gurak and Fitzpatrick 1982). Using US 1990 Census data, Qian and Lichter (2001) show that marital assimilation differ between natives and immigrants across racial minorities and nativity remains a significant barrier to immigrant assimilation.

Structural View

Another major contribution comes from Blau's structural opportunity perspective (Blau, 1977; Blau et al., 1982, 1984, 1988). This theory concerns how the structural composition of the population confines marriage choice, i.e., how the availability of potential marriage partners constrains or facilitates opportunities for contact and ultimately marital choice. Structural variables center on the size and composition of the population with specific characteristics, such as race or imbalanced sex ratio, shaping marital opportunities. He argues that the intermarriage is not only shaped by group-specific attributes such as the group's size and sex ratio, but also affected by social and spatial proximity between groups, such as socioeconomic inequality. Blau and his followers have concentrated on explaining variations in intermarriage rates at the community level using aggregate census data. The structural approach focuses on the opportunity for intergroup relations as determined by the relative size of the minority group, the availability of potential partners in the minority group, internal diversity and the social and spatial proximity between groups (Blau et al., 1984; Fitzpatrick & Hwang, Fossett & Kiecolt, 1991; 1992; Lichter, McLaughlin, Kephart, & Landry, 1992; South & Messner, 1986).

Exchange Theory

The exchange hypothesis is concerned with whether people exchange or trade valued resources or characteristics in the marriage market. This tradition can be traced back to Merton (1941). Merton argues that male African Americans are more likely to marry white women than are their female counterparts; some highly-educated and African American men presumably exchange higher achieved socioeconomic status for the white women's higher ascribed social status. He termed this pattern as "hypogamy for white women." After more than 60 years, Merton's exchange thesis still remains the focus of debate among scholars of intermarriage (Kalmijn, 1998) and

continues to stimulate research. Many findings from early studies reaffirmed Merton's theory (Heer 1974; Schoen and Wooldredge 1989; Kalmijn 1993). For example, Kalmijn (1993) shows that the pattern of white women marrying black men with higher levels of education remained stable in both 1970s and early 1980s. Some find status-race exchange also exists among Hispanics (Aderson and Saenz, 1994; Cready and Saenz, 1997; Gilbertson et al., 1996; Schoen et al., 1989).

Some scholars nevertheless have doubts about the statistical evidence of hypogamy and question the usefulness of exchange theory in explaining even for the black experience (Heaton and Albrecht, 1996). Hwang et al. (1995) shows that this exchange pattern does not hold for Asian Americans. They apply multinomial logit models to a representative U.S. sample of married Asians and find that Asian women with lower educational attainment have higher probability to out marry, while Asian men provide weak evidence of negative selectivity of SES and tend to marry persons with lower educational attainment than themselves. After examining the intermarriage among 16 ethnic groups, Jacobs and Labov (2002) claim that this exchange pattern does not hold for the majority of Asian white marriages nor for the four Hispanic groups, and conclude that the applicability of such theory, which comes from the test on black and white marriage, should perhaps be limited to intermarriage between blacks and whites. Analyzing data from the 1990 US Census, Liang and Ito (1999) examine the intermarriage patterns of five Asian American groups (Chinese, Koreans, Indians, Japanese, and Filipinos) in the New York City region according to gender, nativity, and education and find little evidence for Merton's (1941) hypothesis. They find that US-born Asians are much more likely to intermarry than foreign-born Asians, and that Asian women are much more likely to intermarry than Asian men. Intermarried individuals often shared similar educational levels. Qian (1999) et al., apply log-linear models to examine assortative mating patterns by race/ethnicity,

educational attainment, and nativity status. However, they find little or no evidence that Asian Americans marry less-educated whites in exchange for "higher" racial status.

In fact, Merton suggests that the theory of structural components in intermarriage complements the theory of personal interaction.

Opportunity and Preferences within Local Marriage Markets: An Integration of Macro and Micro perspective

Liebersohn and Waters (1988) have offered a useful conceptual model of the determinants of interethnic marriage. Opportunity affects the odds of intermarriage, as does the disposition of others toward one's group and disposition of members of one's own group toward other group, which in turn are shaped by socioeconomic background. Alan Gray (1987) also proposes an opportunity-preference model to decompose the probability of intermarriage² into components of opportunity (marriage market representation), and preference (the combination of social barriers and social distance between groups). Examining the opportunity and preference within the local marriage markets has the potential to integrate the three traditions in intermarriage research. Structural constraints, such as the group's size and sex ratio in local marriage markets, spatial proximity, shape potential marital partners' opportunities for interaction and intimacy. Exchange theory can also be included in this preference. Here, the preferences can be multidimensional and exchangeable. For example, white women marrying black men can exchange their racial status for the social economic

² The probability of a marriage occurs can be decomposed into the probability the two partners will meet in the marriage market, and given the probability they meet, the probability that they will be chosen by each other as marriage partners.

status. According to assimilation theory, after controlling for the opportunities, there would be no strong racial preference between the white race and the assimilated.

The macro-structural and the assimilation perspectives have been regarded as two complementary approaches to intermarriage, while using multi-level models to control for the local marriage market characteristics and to consider the possible interactions has become a valuable statistical tool (Mason, Wong, & Entwisle, 1983). It therefore is surprising that we have not seen more progress in integrating macro level and micro level factors in analyses of intermarriage patterns. There are a few exceptions that attempt to integrate micro- and macro-level explanations to understand intermarriage by incorporating assimilationist and structural perspectives (Hwang et al., 1994; Hwang, Saenz, and Aguirre 1997; Kalmijn and Tubergen, 2010; Lievens 1998). However, Hwang et al. (1997) have acknowledged the complexity of the multilevel models and focused only on the additive effects of two sets of individual factors and community level factors without full implementation of hierarchical models.

Previous research has shown that overall rates of interracial marriage have increased over time. For example, Qian (1997) uses log-linear models to examine the interracial marriage pattern and trends by looking at the 1980 and 1990 census, and finds that interracial marriage increased between 1980 and 1990 after controlling for racial composition. However, we do not know whether national intermarriage patterns and trends reflect changing preferences or demographic composition of local marriage markets. This paper attempts to explain intermarriage between Asians and non-Asians to understand how people's in-group preferences are constrained by structural circumstances of local marriage markets through multi-level modeling. The multi-level models or Hierarchical Linear Models (HLM) "enable us to conceptualize in terms of (nested) multiple levels" (Raudenbush and Bryk, 1986:3). They give more

reliable parameter estimates and efficient standard errors by taking autocorrelation into account. The metropolitan areas act as the local marriage market, and “the context effects would be underestimated in a normal regression model and the effect would often be falsely accepted as significant” (Kalmijin and Tubergen, 2010). This paper attempts to take advantage of the multilevel design which yields less-biased standard errors and p values for the context effect.

Data and Methods

Data

The data for this study is based on the 1% sample from the Integrated Public Use Microdata (IPUMS) of the 2008 *American Community Survey* (ACS). The ACS provides an annual snapshot of the American population similar to that provided by the decennial census long form. The 2008 ACS datasets are full 1% samples containing more than 2,800,000 person records. The IPUMS version of the 2005-2008 ACS constructed at the University of Minnesota provides additional geographic identifiers and constructed variable identifying married couples in the household which are not available via the Census Bureau.³ One feature of IPUMS version of ACS data collects individuals’ spouse information if they are married. These variables were constructed based on individuals’ relationship to the household head, adjacency on the census form, and similarity in age (IPUMs 2008).

Despite being a highly useful large-scale database for the study of race and ethnicity in U.S., these data are not without limitations. ACS data are cross-sectional and do not contain information on where marriages occurred. It is therefore, possible

³ <http://usa.ipums.org/usa/acs.shtml>

that some marriages were formed aboard and ideally these couples should be eliminated from the analysis since our analysis focus on factors influencing interracial marriage in the USA context only. In addition, the ACS data, like the census data, measures the prevalence of marriage rather than the incidence. With data on intact marriages, I am unable to include marriages that ended in divorce, which previous study indicate may be disproportionately interracial. The metropolitan-level information in the ACS refers to current rather than the residence when couples got married. Some people move between the time of their marriages and the ACS survey. According to a research on internal migration of married couples by Blackburn (2010), only about 8% of the 3-year periods identified in their data involved a move (defined as any changes in address). It would be reasonable to assume that for the majority of couples the residence place when they got married and the residence place at the survey year are the same if we count them at the metropolitan level. However, to minimize the noise, I limit my analysis to recent marriages, in which couples married within 5 years of the ACS 2008.

Age at first marriage is not available in recent decennial census data (1980 census and 2008 ACS are exceptions) and the census does not ask about prior marriages for currently married couples. Because intra- and inter-racial marriage patterns differ between first marriage and remarriage (Jacobs and Furstenburg 1986; Kitano et al. 1984), it is ideal to study recent first marriage. Also older people are expected to have higher rates of intermarriage because the passage of time is associated with increasing tolerance for exogamy (Patterson 1997). To minimize the selection bias caused by remarriage, intermarriage researchers, in practice, limit marriages to those younger couples since they are more likely to have married relatively recently, and are less likely to have experienced a divorce and remarriage (Fu 2001; Qian 1997; Harris and Ono 2005). Here, I take the advantage of the newly

released 2008 ACS, which includes age at first marriage and information on the number of times one has been married. My analysis is limited to Asian men and women who are native-born Americans or who immigrated to the United States before their first marriage and who married within the past 5 years. However, this restriction has not eliminated the possibilities that some recently arrived married Asian could have brought their spouses to the United States sometime after they arrived.

The cross-section aspect of the ACS data also limits causal inferences. Considering that the individual's socioeconomic status is included as an explanatory variable for a person's selection of marriage partner, theoretically it should be measured prior to or at the time of marriage rather than using the current socioeconomic status at the time of survey because a person's socioeconomic status may change after marriage. I address this potential problem by using educational attainment as an indicator of a person's socioeconomic status; education is a stable characteristic in adulthood and is highly correlated with occupational status and income. Education is a reliable predictor of long-term economic well-being (Kalmijn 1993a); it serves as a salient proxy for past and future socioeconomic status of the married individuals studied.

Table 3.1 presents the racial distribution of the spouses of Asians. It shows that only a sizeable proportion of Asian Americans are married out. The rate of out-marriage among Asian women was almost twice of that of Asian men. About 33% Asian women who married within 5 years of 2008 ACS married someone of different race or ethnicity, compared with 17% of Asian men.

Table 3.1 Race of Spouse, First Marriage of Asians (Newly Married, 15-55 Years Old)

	Asian men		Asian women	
Asian	2,939	(82.8%)	2,815	(66.9%)
White	478	(13.5%)	1,176	(28.0%)
Black	20	(0.6%)	71	(1.7%)
Hispanic	103	(2.9%)	136	(3.2%)
Other	10	(0.3%)	10	(0.2%)
Total	3,550	(100.1%)	4,208	(100.0%)

Note: “Newly married” refers to people who got married within 5 years of the 2008 ACS (similarly hereinafter).

Although rates of outmarriage differ between Asian men and women, outmarriage with whites is the norm. Figure 3.2 shows that among those who married interracially, the large majority of Asian men and women married out to a white person, with Asian women (85%) slightly more likely than Asian men (78%) to marry a white person. Asian women are also slightly more likely than Asian men to marry a black person (5% versus 3%). In contrast, for marriages between Asians and Hispanics, Asian men have higher percentage than Asian women to marry a Hispanic person (17% versus 10%).

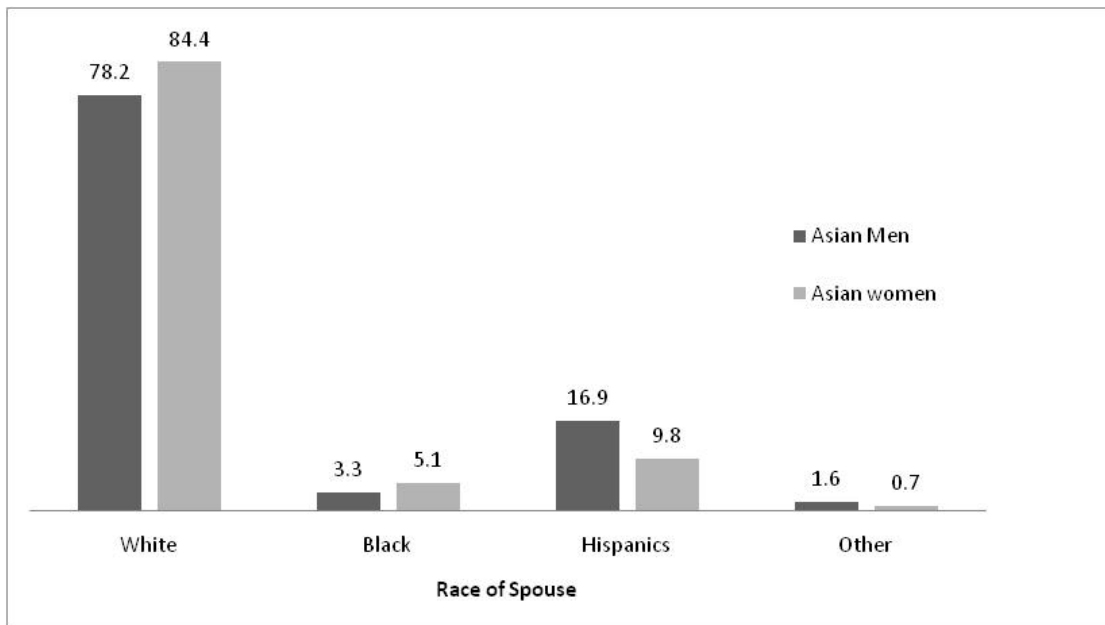


Figure 3.2 Percent of Spouse's Race among Out-Marriage of Asian Men and Women, First Marriage, Newly Married, Asian aged 15-55

I further disaggregate Asians by ethnic groups and nativity. Table 3.2 shows marriage types of Asian men and women by their nativity status. For both Asian men and women, the rate of Asian ethnic endogamy declines along generation line with first generation having the largest proportion of same ethnic marriage (88% for Asian men and 67% for Asian women), and with 2nd or higher generation (native-born) having smallest (45% for Asian men and 40% for Asian women). The rate of interracial marriage (marriage between Asian and non-Asian) increases across generations. First generation has the lowest level of interracial marriage while second or higher generation has the highest level. Pan-Asian marriage has similar pattern as interracial marriage⁴.

⁴ A detailed discussion of pan-ethnicity and nativity would be covered in another paper on assimilation.

Table 3.2 Marriage Type by Nativity (First Marriage, Newly Married, 15-55 Years Old)

	Asian Men				Asian women			
	Ethnic Endogamy	Pan-Asian Marriage	Inter-racial Marriage	Row Total	Ethnic Endogamy	Pan-Asian Marriage	Inter-racial Marriage	Row Total
1 st Gen.	1,690 (87.6)	98 (5.1)	142 (7.4)	1,930 (100)	1,628 (67.1)	134 (5.5)	663 (27.3)	2,425 (100)
1.5 th Gen.	513 (65.4)	101 (12.9)	170 (21.7)	784 (100)	478 (52.5)	89 (9.8)	343 (37.7)	910 (100)
Native-born	379 (45.3)	158 (18.9)	299 (35.8)	836 (100)	348 (39.9)	138 (15.8)	387 (44.3)	873 (100)
Total	2,582 (72.7)	357 (10.1)	611 (17.2)	3,550 (100)	2,454 (58.3)	361 (8.6)	1,393 (33.1)	4,208 (100)

Note: Proportions are in parentheses. Ethnic endogamy refers to marriage among a specific Asian ethnic group (such as Chinese endogamy, Japanese endogamy etc.).

Table 3.3 shows the proportion of immigrants in each ethnic group. Most Asian groups are predominantly immigrants. For example, 89% of Asian Indian men and 82% of Korean men are foreign-born Americans. Japanese group has a relatively smaller proportion of immigrants with men having 46% of immigrants and women having 71% of immigrants.

Table 3.3 Ethnicity and Nativity of Asian Samples (First Marriage, Newly Married, and 15-55 Years Old)

	Asian Men			Asian Women		
	Pop. Size	Relative Size (%)	Prop. of Immigrants (%)	Pop. Size	Relative Size (%)	Prop. of Immigrants (%)
Chinese	668	18.8	77.1	865	20.6	80.9
Japanese	123	3.5	46.3	236	5.6	71.2
Filipino	529	14.9	66.9	777	18.5	80.3
Asian Indian	915	25.8	89.3	781	18.6	88.1
Korean	278	7.8	82.4	394	9.4	84.0
Vietnamese	353	9.9	87.5	376	8.9	85.9
Other Asian ethnics or combination	684	19.3	63.3	779	18.5	64.3
Total	3,550	100.0	76.5	4,208	100.0	79.3

Dependent Variable

The odds of interracial marriage of Asian Americans with non-Asians⁵ will be measured using logistic regression models within the multilevel context. The dependent variable “intermarriage” is a dummy variable that is coded as 1 when the marriage is between an Asian minority and a non-Asian spouse, and 0 otherwise. The model is estimated separately for Asian men and Asian women.

⁵ I also analyze the intermarriage between Asians and non-Hispanic whites, and found similar results.

Independent Variables

Individual Level Variables

Nativity Status

The sample is limited here to native-born Asian Americans or Asian immigrants who came to the United States before their first marriage. This would exclude most immigrants who married abroad and moved to the United State. The out-group marriage tends to increase along with length of residence in the host country and over successive generations (Gurak and Fitzpatrick 1982). Qian and Lichter (2001) show that there are more interethnic or interracial marriages among native-born than among foreign-born Asian Americans, and that there are more interethnic marriages among later-generation than among early-generations. With this consideration, I create three dummies indicating their nativity statuses as native-born (2nd and higher generation), those who immigrated to the U.S. before age 14 (fully or partially socialized under the U.S. context, 1.5th generation), and those who immigrated after age 14 but before their first marriage (socialized under their sending country, 1st generation). I would expect Asians born or raised in the U.S. are more likely than foreign-born Asians to be involved in interracial marriages.

English Proficiency

English proficiency is measured by the variable “SPEAKENG” in ACS which indicates whether the respondent speaks only English at home, and also reports how well the respondent, who speaks a language other than English at home, speaks English. We also create 3 dummies, which describe their English speaking ability as “do not speak English/not well”, “speak well/very well”, and “speak only English”.

Educational Attainment

Socioeconomic assimilation is measured through status attainment, i.e., education, occupational status, and income. As we discussed before, other

determinants of socioeconomic background such as income and occupation are not included because the ACS data measures income and occupation at the time of survey but not at the time of marriage. Although education is also measured at the time of survey, it changes less over time after marriage compared to income or occupation. In addition, education is often regarded as the major indicator of socioeconomic status which is highly correlated with income and occupation and the inclusion of all three in one model could introduce multicollinearity (Gordon 1968, cited in Hwang et al. 1997).

Education attainment affects marital choice in terms of both opportunity and preference. Educational institutions provide settings for intergroup interaction. Education attainment is believed to have an effect on values, attitudes, knowledge, and life-styles of an individual (Kalmijn 1998). Highly educated persons may embrace more individualistic attitudes that may counteract the influence of family origin in mate selection (Kalmijn 1991). Higher education also may weaken identification with the origin group (Hwang et al. 1995). Studies of intermarriage find that in white ethnic group (Lieberson and Waters 1988) and blacks (Kalmijn 1993a), interethnic partnership is more common among highly-educated members than among their less-educated peers so we expect that different level of education qualification would yield a difference in the probability of intermarriage likewise.

Educational attainment is measured by the number of years completed by an individual.

Macro-structural Variables at Metropolitan-level

The macro-structural variables or marriage market conditions include metropolitan-level indicators such as relative size of Asian group, racial heterogeneity index, sex ratio within Asian group. Following Lewis and Oppenheimer (2000), I define local marriage markets as Consolidated Metropolitan Statistical Areas and

Metropolitan Statistical Areas for urban populations⁶. All these macro-structural variables are measured at each metropolitan area.

Group Size

Group size measures opportunities for inter-group interaction. Blau (1984) argues that the relative group size has a negative effect on intergroup relations. In small groups, opportunities for ingroup contacts are substantially lower, leading to a higher probability of intergroup contacts. I expect to find a negative effect of relative group size on the marriage between a Asian and a non-Asian, i.e., the probability of being married to Non-Asian groups would be lower in local marriage markets where the relative size of Asian Americans is large and higher where the relative size of Asian minority group is small, other things being equal. Group size is measured as the percent of Asians in the total population (15 to 55 years old) at the metropolitan-level in 2008. This variable is attached to individual records and does not vary within the metropolitan area.

Sex Ratio

I measure the sex ratio for Asian minorities by taking the natural log transformation of the number of non-institutionalized Asian men per non-institutionalized Asian women (both groups are aged between 15 and 55) at each metropolitan area. After transformation, the sex ratio is balanced if it is 0 and the range is $(-\infty, \infty)$. When the sex ratio is below 0, Asian men are scarce compared to Asian women; and when it is above 0, there are more Asian men than women within a metropolitan area, and therefore Asian men would probably look outside of racial

⁶ According to IPUMS 2008, the Census Bureau has not released information associating the PUMA boundaries (the lowest level of geography) with 2005-onward metropolitan area definitions, and thus the METAREAs in the 2008 ACS IPUMs data present metropolitan classifications based on *metropolitan boundaries from 2000*. The definition of METAREA variable in 2008 ACS is consistent with that of Census 2000.

boundary for marriage partners. Due to the computation of the Asian sex ratio, it has different effects on Asian men and women. For men, the Asian sex ratio would be positively related to interracial marriage; for women, the Asian sex ratio would be negatively related to intermarriage.

Racial Heterogeneity Index

The macro-structural theory predicts that contact opportunities are high in places with many different groups and where the population is evenly distributed over these groups (Blau 1977, Blau etc. 1984). The heterogeneity index (also called index of diversity) is the probability that any two persons randomly selected from a metropolitan area are of a difference race (Lieberson 1969). I construct the racial heterogeneity index at each metropolitan area as $H = 1 - \sum_i p_i^2$, where p_i is the proportion of each racial group at metropolitan level (Lieberson 1969). According to Lieberson (1969), the maximum level of H is $1 - \frac{1}{N}$ given a finite number of groups. Here we have 5 groups (non-Hispanic whites, non-Hispanic blacks, Hispanics, and non-Hispanic Asians, and non-Hispanic other racial group, the theoretical range of racial heterogeneity index is between 0 and 0.8. When heterogeneity index has a score of 0, it means that two randomly selected persons in the metropolitan area come from the same race group (no racial diversity); when the score is 0.8, it means the two randomly selected persons have different races and the racial diversity is high.

As predicted by macro-structural theory, higher rates of Asian-nonAsian intermarriage are expected in local marriage market where racial heterogeneity index is high.

I also include the age at first marriage and, to address skewness in the size distribution of metropolitan areas, the log transformation of the total metropolitan population (aged 15-55) as a control variable in our models.

Methods

I use multi-level logistic regression model for hypotheses testing. All individuals are nested in metropolitan areas. In total, 284 metropolitan areas are identified in ACS 2008 IPUMs. To obtain reliable estimates of the metropolitan-level effects, I exclude metropolitan areas with very few individuals (only those metropolitan areas with at least 5 individuals are included). As predicted by the macro structural theory, relative group size would have negative effects on intermarriage. Deleting areas with very few Asian minorities (e.g., less than 5 individuals from the Asian group) would likely underestimate the effects of relative group size on intermarriage. Data in Table 3.4 shows that the intermarriage rates for Asian men and Asian women lower after restricting the sample to areas with size Asian minority populations (16% and 31% versus 17% and 33%). The rate of out-marriage among Asian women was still about twice of that of Asian men.

After imposing restrictions on the sample, the non-weighted sample consists of 3099 Asian men and 3694 Asian women, which yields 68 metropolitan areas for Asian men with an average number of 46 married Asian men (15-55 years old) and 84 metropolitan areas for Asian women with an average number of 44 married Asian women (15-55 years old).

Table 3.4 presents descriptive statistics of the dependent and independent variables. Please note that the range for Asian sex ratios is different for Asian men and women since we have restricted our analysis to metropolitan areas with at least 5 married individuals in Asian groups. Both Asian men and Asian women in our sample have an average of 15 years of education. Age at first marriage was 30 for Asian men and 29 for Asian women. For nativity status, a little more than half are first generations (55% for Asian men and 57% for Asian women); about one fifth are native-born, second or higher generations. Around one fourth of individuals in our

sample speak only English at home, which seems to be consistent with the proportion of native-born in the total Asian sample.

Table 3.4 Descriptive Statistics of Dependent and Independent Variables

	Asian Men (N=3099)				Asian Women(N=3694)			
	Mean	Sd.	Min	Max	Mean	Sd.	Min	Max
<i>Dependent variable</i>								
Intermarriage	0.16	0.37	0	1	0.31	0.46	0	1
<i>Independent variables</i>								
Individual level								
Years of education	15.47	3.09	0	21	15.35	2.90	0	21
Age at 1st marriage	30.29	5.64	15	55	28.5	5.99	15	53
1st gen.	0.55	0.50	0	1	0.57	0.49	0	1
1.5th gen.	0.22	0.42	0	1	0.22	0.42	0	1
Native-born	0.23	0.42	0	1	0.20	0.40	0	1
Not speak/not well	0.06	0.24	0	1	0.09	0.28	0	1
well/very well	0.69	0.46	0	1	0.65	0.48	0	1
Speak only English	0.24	0.43	0	1	0.26	0.44	0	1
Control variables								
Metropolitan population size (logged)	10.07	0.95	6.98	11.35	9.99	0.99	7.02	11.35
<i>Metropolitan level</i>								
Group size	0.14	0.13	0.01	0.67	0.14	0.13	0.01	0.67
Sex ratio(logged)	-0.12	0.06	-0.45	0.10	-0.12	0.07	-0.52	0.10
Racial Heterogeneity Index	0.57	0.11	0.18	0.67	0.57	0.12	0.18	0.67

For macro-level variables, relative group size of Asian (percent of Asian) varies from 1 percent to 67 percent in our sample across the metropolitan areas. Asian sex ratio (logged) has a range of (-.52, .1), and if we take the exponential of the minimum and maximum of sex ratio (logged), we have a range of .6 to 1.1. If we

transform it to the percent of Asian men in the Asian population, percent of Asian men varies from 48% to 60% across the metropolitan areas. Racial heterogeneity index also varies between macro-level areas with a range from 0.18 to 0.67.

The analysis proceeds with the following steps. I will first perform a single-level logistic analysis, using individual-level predictors and control variables. This single-level analysis will be used as the starting point. I then account for variation in intermarriage across marriage market areas. Then I add contextual-level variables, examine possible changes in individual level effects, and interpret the effects of the metropolitan level variables.

Stata 11 was used to obtain the parameter estimates.

The multilevel logistic regression model is well described with examples in Guo and Zhao (2000). In our analysis, model 1 is a single-level model which can be written as

$$\log[p_i/(1 - p_i)] = \beta_0 + \sum_k \beta_k X_{ki} \quad (1)$$

where p_i is the probability of person i being married to a non-Asian partner (versus a Asian partner), β_0 the intercept, β_k the regression coefficient associated with the predictor X_{ki} .

In model 2 we allow for variation between metropolitan areas in the probability of being married to a non-Asian partner versus an Asian partner. The model becomes

$$\log[p_{ij}/(1 - p_{ij})] = \beta_{0j} + \sum_k \beta_{kj} X_{ki} \quad (\text{level 1 model}) \quad (2)$$

and

$$\beta_{0j} = \beta_0 + \mu_{0j} \quad (\text{level 2 model}) \quad (3)$$

where p_{ij} is the probability of person i being married to a non-Asian partner (versus a Asian partner) in metropolitan j , β_{0j} the intercept in metropolitan j , β_{kj} the regression coefficient associated with the predictor X_{ki} , β_0 the overall intercept, and μ_{0j} is the random effect accounting for the random variation at level two with $\mu_{0j} \sim N(0, \sigma_\mu^2)$

Equation (2) and (3) can be combined as

$$\log\left[\frac{p_{ij}}{1 - p_{ij}}\right] = \beta_0 + \sum_k \beta_{kj} X_{ij} + \mu_{0j} \quad (\text{combined model}) \quad (4)$$

In model 3 we have included metropolitan level predictors, and the level 2 model is given by

$$\beta_{0j} = \beta_0 + \sum_q W_{qj} + \mu_{0j} \quad (\text{level 2 model}) \quad (5)$$

where W_{qj} a vector of metropolitan-level characteristics.

The combined model can be written as

$$\log\left[\frac{p_{ij}}{1 - p_{ij}}\right] = \beta_0 + \sum_q W_{qj} + \sum_k \beta_{kj} X_{ij} + \mu_{0j} \quad (\text{combined model}) \quad (6)$$

Results

Table 3.5 presents the results of logistic regression model and multilevel logistic (random intercept) models of intermarriage on individual and contextual variables for Asian men who are native born or had immigrated to the United States before his first marriage. Individual level parameters show little change when metropolitan-level variation is included in the analysis. For example, the changes in the coefficients of English proficiency and nativity status dummies are small, indicating the individual-level effects of English proficiency and nativity status are robust when macro-level variation is controlled. Asian men' age at first marriage in the single-level model shows a small negative effect (-.03) on intermarriage, and loses its significance when macro-level variations were introduced.

Table 3.5 Single-level and Multilevel Logistic Regression of Intermarriage of Asian Men in Metropolitan Areas, ACS 2008 (N= 3,099)

	Model 1		Model 2		Model 3	
	b	se	b	se	b	se
<i>Individual effects</i>						
Years of education	-0.01	0.021	-0.02	0.021	-0.03	0.021
Age at 1st marriage	-0.03**	0.010	-0.02*	0.010	-0.02	0.010
1.5th gen.	0.72***	0.148	0.75***	0.152	0.74***	0.150
Native-born	0.93***	0.151	1.02***	0.155	1.06***	0.152
well/very well	1.19*	0.523	1.23*	0.527	1.28*	0.527
Speak only English	2.81***	0.529	2.97***	0.534	3.02***	0.533
<i>Control variables</i>						
Metropolitan population size (logged)	-0.06	0.057	-0.17	0.114	-0.06	0.083
<i>Metropolitan level</i>						
Group size					-2.62***	0.501
Sex ratio (logged)					-1.86*	0.876
Racial Heterogeneity Index					-0.96	0.649
Constant	-2.39**	0.846	-1.30	1.246	-1.86*	0.935
Pseudo R2	.18					
Number of Metropolitan areas			68		68	
Residual Group-Level Variance			.250		.007	

Standard errors in second column

* p < 0.05, ** p < 0.01, *** p < 0.001

Contrary to the predictions by previous research, there is no positive educational effect of Asian minorities on interracial marriage (the effect is negative and not significant). However, over one half of all Asians are first generation, and educational attainment is positively correlated with English proficiency. Previous researches often examine native-born Americans who would not worry about their English proficiency. For example, Qian's (1997) well-known analysis of racial assortative mating has shown that the odds of interracial marriage increases with couples' educational attainment. Consequently, I re-estimated the single-level and multilevel logistic regression models without English proficiency and found a positive and significant effect of years of education. The effect of education on intermarriage is confounded by English proficiency (which is high among the most educated).

There is no significant effect of the size of the metropolitan population (15 to 55 years old) in the analyses of intermarriage among Asian men. When context level variables were introduced in the model, individual level variables, English proficiency and nativity status have shown the effects as expected. As predicted by the assimilationist perspective, the probability of interracial marriage is highest in the second or higher generation (native-born Asian Americans), and the lowest for the first generation. For example, from model 3 in Table 3.5, the odds ratio for a Asian man of native-born to out marry is almost 3 times higher of that of a first generation (first generation is the reference group, $\exp(1.06)=2.89$). The results confirm that the out-group marriage tends to increase with length of U.S. residence and over successive generations (Gurak and Fitzpatrick 1982). In addition, English proficiency has a positive effect on interracial marriage. The more fluently an Asian man speaks English, the more likely he is to marry out to other races.

Model 2 allows for a random metropolitan variation, and the residual level 2 variation (variation between metropolitan areas) is $\sigma_{\mu}^2 = .25$. VPC (Variance Partition

Coefficient) = $\sigma_{\mu}^2 / (\sigma_{\mu}^2 + \sigma_{\epsilon}^2)$. However, for multilevel binary logistic models, the variance of σ_{ϵ}^2 is not available because the error term is not in the equation (4) unlike standard multilevel models. Instead, the variance of a standard logistic distribution is used⁷, $\sigma_{\epsilon}^2 = \pi^2 / 3 = 3.29$. Substituting the values of σ_{ϵ}^2 and σ_{μ}^2 into the VPC equation, we obtain $VPC = .25 / (.25 + 3.29) = .071$, which indicates that adjusting for the effects of individual level and control variables, almost 7.1% of the remaining variance in the propensity to marry with other race or ethnicity is due to between-metropolitan variation.

This substantial variation in intermarriage between metropolitan areas in model 2 indicates the usefulness of a multilevel model for these data. By adding the metropolitan-level variables in model 3, the variance drops to a very small figure (.007), which is statistically non-significant. This result suggests that almost all of the metropolitan-level variance in intermarriage is explained by the specific contextual variables considered here.

The metropolitan-level effects have mixed results, however. As expected, the relative group size of Asians has a significant and negative effect on the interracial marriage compared to endogamous marriage for Asian men. When percentages of Asians are high, Asians have more contact opportunities within their group for marriage partners, and are less likely to out marry. This is consistent with Blau's structural opportunity of inter-group relations.

Perhaps unexpectedly, the Asian sex ratio (logged) has a negative effect on the likelihood that Asian men are intermarried versus married to Asian women. Asian men

⁷ The binary outcomes p_{ij} can be re-expressed in terms of a linear model for a continuous latent (unobserved) variable p_{ij}^* , where p_{ij}^* represents the underlying propensity of being out married (category 1) rather than marrying within own group (category 0). Then p_{ij}^* can be defined just as a continuous variable with error term having a logistic normal distribution with $\sigma_{\epsilon}^2 = 3.29$. See Bryk and Raudenbush (1992) for more discussion about the latent variable representing of a random intercept model for binary responses.

may be importing home-country brides when an imbalanced sex ratio limits local opportunities for within-group marriage. The usual assumption is that Asian men in unfavorable marriage markets will consider out-marriage with non-Asians. However, in reality, they may also return to their home countries for marriage partners and then bring their spouses to the United States. Previous research finds this as a possibility (Lievens, 1997). My sample is restricted to Asian men who immigrated to the United States before his first marriage. But imported partners can be identified as Asian women who immigrated to the United States in the same year as their marriage or who arrived later after marriage. Some additional analyses revealed that the marriages of 863 out of the 3099 Asian men (28%) have a spouse who migrated to the United States at the time of marriage or arrived after the marriage. Among these marriages, 82% involve first generation Asian men. This suggests that when the local marriage markets lack sufficient Asian partners, men may adopt the strategy of importing spouses from their origin countries.

Racial heterogeneity index of a metropolitan area shows a negative but non-significant effect on intermarriage, which implies that higher levels of racial diversity in metropolitan areas does not necessarily insure greater opportunities for interracial marriage. This finding contradicts the structural perspective based on racial composition. In Figure 3.2, we have examined spouses' race groups for Asians and found most intermarriage (around 80%) is formed between an Asian minority and a white person. Even though the race groups (other than white group) are more evenly distributed, it does not necessarily increase the probability that Asians will marry non-Asians.

The results of logistic regression model and multilevel logistic (random intercept) models of intermarriage for Asian women who are native born or had immigrated to the United States before her first marriage are shown in Table 3.6. The

results for Asian women and men are similar with respect to the effects of years of education, English proficiency, nativity status⁸, group size, and racial heterogeneity index. For example, relative to non-English speakers (or speak not well), Asian women who speak only English at home are 12.8 times higher more likely to intermarry.

There is also gender asymmetry. First, age at first marriage now has a significant positive effect on intermarriage. The higher are the ages of Asian women, the higher probabilities for them to marry interracially. Second, the sex ratio has negative effect on intermarriage among Asian women, which is consistent with predictions (contrary to Asian men's result). When there are fewer Asian men available locally, Asian women are more likely to intermarry. I also look at the imported partners of Asian women and found that only 6% of the total Asian women marriages who have a partner coming to the United States at the time of their marriage or after their marriage. Asian women are far less likely than Asian men to import spouse. Third, metropolitan population size has significant negative effect on intermarriage among Asian women; the larger the population size, the less likely Asian women are to marry out.

⁸ The effect of native-born status (compared to the first generation) becomes significant when metropolitan level variables are included in the models.

Table 3.6 Single-level and Multilevel Logistic Regression of Intermarriage of Asian Women in Metropolitan Areas, ACS 2008 (N= 3,694)

	Model 1		Model 2		Model 3	
	b	se	b	se	b	se
<i>Individual effects</i>						
Years of education	-0.02	0.015	-0.02	0.015	-0.02	0.015
Age at 1st marriage	0.08***	0.007	0.08***	0.007	0.08***	0.007
1.5th gen.	0.35***	0.100	0.37***	0.102	0.39***	0.102
Native-born	0.19	0.114	0.28*	0.117	0.34**	0.115
well/very well	1.08***	0.201	1.13***	0.206	1.13***	0.205
Speak only English	2.43***	0.215	2.55***	0.220	2.55***	0.220
<i>Control variables</i>						
Metropolitan population size (logged)	-0.26***	0.039	-0.32***	0.076	-0.26***	0.051
<i>Metropolitan level</i>						
Group size					-2.49***	0.361
Sex ratio (logged)					-2.06***	0.587
Racial Heterogeneity Index					-0.36	0.431
Constant	-1.75***	0.482	-1.27	0.765	-1.75***	0.522
Pseudo R2	.13					
Number of Metropolitan areas			84		84	
Residual Group-Level Variance			.149		0	

Standard errors in second column

* p < 0.05, ** p < 0.01, *** p < 0.001

Conclusion

Past research on Asian Americans has focused primarily on individual-level variables at the national level in order to understand group differences in social boundaries and assimilation. Scholars have paid less attention to local marriage market conditions, which typically circumscribe patterns of daily interaction. Unfortunately, there have been surprisingly few attempts to integrate micro- and macro-level explanations that incorporate assimilationist and structural perspectives. The analyses presented here have combined the individual-level assimilationist perspective and the macro-level structuralist perspective to better understand the marital choices of Asian Americans. Multi-level logistic models demonstrated that both levels of independent variables are significant and help to explain the variation of intermarriage outcome for Asian minorities. Individual-effects remain robust when we control for variation in metropolitan-level characteristics and consider alternative model specifications and measurement strategies. In addition, when individual-level variables are controlled for, differences are found between metropolitan areas. These differences have been counted for by the contextual characteristics, which provide mixed results for Blau's structuralist perspective (Blau, 1994).

At the individual level, the predictions derived from the assimilationist perspective on nativity or generation status and language ability have been largely confirmed. In general, the Asians born or raised in the United States are more likely than foreign-Asians to have greater English language proficiency and to marry interracially. The nativity status reflects length of exposure to the mainstream culture and the degree of acculturation and structural assimilation (Alba and Nee, 2003; Qian and Lichter 2001). These findings are consistent with assimilationist theories.

However, the effect of educational attainment is confounded by English language proficiency and does not show a positive effect on the propensity for

intermarriage when the English language abilities remain in the models. This is due to the nativity or generation structure of Asian minorities; more than half of Asians in the ACS are first generation immigrants.

Marital choice involves seeking partners with matching assets and qualifications. And individuals can be seen as agents who try to maximize their utilities by searching for what they regard as the most attractive partner. Preferences reflect social and cultural values that often vary among different groups or vary over time. Meanwhile, marital selection is also related to and constrained by the opportunity structure in the local marriage market. The structure of the local marriage market influences opportunities to realize marital preferences.

Group size enhances opportunities of Asians to marry within their group. The racial heterogeneity index was negatively associated with out-marriage, which is contrary to predictions of the structuralist perspective. In some additional analyses, I substituted another measure of evenness of racial groups, index of dissimilarity⁹, which measures residential segregation between Asians and non-Asians. Segregation was not significantly associated with out-marriage, and its inclusion did not eliminate or reserve the negative effect of racial heterogeneity on outmarriage. The sex ratio of Asian men versus Asian women yields different result for Asian men and women. For Asian men, the larger male to female sex ratios were associated with lower interracial marriage. Under unfavorable local marriage market conditions, Asian men seemingly adopt the strategy of importing partners from their countries of origin. For Asian women, the smaller male to female sex ratio is, the more likely for them to enter the

⁹ It is a measure of evenness with which two groups are distributed across the component geographic areas that make up a larger area, and is defined as the proportion of one group members that would have to move to achieve an even racial distribution in a neighborhood (Massey and Denton, 1987).

intermarriage (in contrast with Asian men, only a few of them import partner from back home countries).

In conclusion, this paper has shown that the multilevel modeling helps to decompose the variance of intermarriage to individual level (preference) and context-level characteristics constraints in the analysis of interracial marriage. Metropolitan-level variables, which are typically ignored in previous research, provide additional understanding of the previous of Asian interracial and endogamous marriage in the United States. Studies of interracial marriage can no longer easily overlook the population geographic distribution and the nativity or generation structure of minority groups.

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