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FORTHCOMING *Demography*

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Racial Intermarriage Pairings

Abstract

Most studies of racial intermarriage rely on the prevalence of intermarriage to measure the strength of group boundaries, without scrutinizing the nature of intermarriage pairings.

Examining the characteristics of intermarried couples reveals that (1) intermarriages and endogamous marriages follow different patterns, and (2) that racial intermarriage pairings reflect a status hierarchy of racial groups inconsistent with a pattern of in-group preference. Evidence from the 1990 US Census PUMS, indicates that patterns in Blacks and Mexican Americans marriages with whites suggest that a racial hierarchy disadvantages members of these minority groups. For marriages between Japanese Americans and whites, however, crossing the group boundary does not affect couples characteristics.

Racial Intermarriage Pairings

Introduction

Current perspectives on intermarriage hold that a high incidence of marriage between members of two groups indicates a weak boundary between the two groups. Alba and Nee's (1996, 31) review of assimilation makes this claim for racial¹ intermarriage, and Kalmijn (1998, 396) makes the same claim for intermarriage in general. However, focusing only on incidence overlooks other important aspects of intermarriage. One such aspect is the characteristics of people who intermarry, apart from their group membership. What are the characteristics of intermarried couples? Might the pairings of characteristics in intermarriages differ from the pairings in endogamous marriages? If such differences exist, they may suggest, for example, that racial intermarriages are formed under conditions of group inequality. If intermarriages are formed even when group boundaries are strong, then intermarriage prevalence may not be as accurate an indicator of weak group boundaries as usually thought. Examining only the incidence of intermarriage without considering the characteristics of intermarried couples does not provide a complete account of the nature of group boundaries.

In what ways could group boundaries affect the characteristics of intermarried couples? Intermarriages could follow the standard assumption of an *endogamous intermarriage* pattern, where group boundaries have no effect on intermarriage patterns. That is, the characteristics of intermarried couples (apart from their group membership) could be similar to the characteristics of endogamous couples. This outcome is most likely under circumstances where group boundaries are in fact weak. A second possibility is that the characteristics of intermarried couples suggest *status exchange* (Davis 1941, Merton 1976 [1941]), which would indicate a hierarchical ordering of groups. Under this regime, members of higher status groups are able to

marry more desirable spouses because of their status advantage. Members of less desirable groups marry less attractive spouses because they themselves are less desirable. A third possibility is that intermarriages follow a pattern of *in-group preference* where individuals prefer to marry within their own group and see members of all other groups as less desirable. Under this scenario, the more attractive members of a particular group will be more likely to realize their preferences by marrying within their group.

The three ways in which the nature of group boundaries can affect intermarriage pairings reveal another shortcoming of examining only intermarriage frequencies. The standard approach cannot determine if people marry within their own group because they prefer high-status spouses or because they prefer members of their own group (Kalmijn 1998:397). Members of high-status groups will tend to be endogamous whether they prefer to marry high-status spouses or whether they prefer to marry members of their own group because their preferences are the same under both scenarios. Members of low-status groups will have only each other left to marry and hence will also be endogamous. Examining intermarriage pairings allows researchers to adjudicate between the status exchange and the in-group preference hypotheses which is not possible when examining only intermarriage frequencies.

Evidence from racial intermarriages examined here suggests that some intermarriages are indeed formed under conditions of strong group boundaries. Mexican Americans marriages with whites and Blacks marriages with whites appear to follow a pattern of status exchange, suggesting that Blacks and Mexican Americans are less desirable marriage partners than whites. However, Japanese Americans marriages with whites follow the same patterns as endogamous marriages, suggesting weak group boundaries between Japanese Americans and whites. Focusing exclusively on intermarriage prevalence does not provide a full account of the nature of

group boundaries. These results demonstrate that a racial hierarchy, not in-group preference, drives intermarriage patterns for Blacks and Mexican Americans.

Past research on U.S. racial intermarriage patterns has focused on the status exchange hypothesis. Most researchers claim to find support for the status exchange perspective (Schoen and Thomas 1989; Hwang, Saenz, and Aguirre 1995 for Asian Americans; Kalmijn 1993:137-139; Schoen 1995 for Blacks; Schoen, Wooldredge, and Thomas 1989 for Latinos; Qian 1997). However, recent studies have not adequately tested the status exchange hypothesis because they do not rely on sensitive measures of marriage patterns. This study outlines an improved test of the status exchange hypothesis and expands research in this area by also considering the in-group preference hypothesis. The explicit connection between the pattern of racial intermarriage pairings and the strength of group boundaries that I draw has also been missing from previous research.

Marriage market

Current individual-level theories of marital selection see marriage as a partnership that produces commodities such as children, status, insurance, economic support, and social support (Kalmijn 1998; Becker 1991:24; Oppenheimer 1997). This framework relies on a market metaphor for the marital selection process. People shop in the marriage market for the best spouse they can attract with the resources they have to offer, where the best spouse is the one with whom they can produce the most desired commodities (Goode 1964:32-37; Kalmijn 1991:27-39; Kalmijn 1993:425-426; Edwards 1969:521-523). The outcome is that people with high levels of resources will marry spouses who likewise have high levels of resources.

This marriage market framework is part of the explanation for why a bride and groom often match with respect to a variety of characteristics (Goode 1964:33-37; Kalmijn 1991:18-24; Mare 1991). Because desirable people are able to attract and marry other desirable people, couples often match with respect to many characteristics. Matching may be the dominant pattern, but where matching is not perfect, resources may be exchanged. For example, a man with a bachelor's degree might marry a woman with little schooling because of her unusual wealth. According to the marriage market framework, her wealth would compensate for her lack of schooling. Each individual's total resources would be equivalent, but the particular complements of resources each possesses differ.

Most of the studies examining the patterns that intermarriages follow have focused on an exchange of racial status for socioeconomic status. Davis (1941) and Merton (1976 [1941]) originated this line of research when they argued that members of lower status groups would be more likely to marry members of high status groups if they could offer higher socioeconomic status to compensate for their lower racial status. Schooling has been the socioeconomic status indicator of choice in research on this topic. Schooling is a key marriage market resource because it is an important indicator of one's lifetime income and cultural orientation (Mare 1991; Kalmijn 1991:35-39). It can provide both social status and economic well-being for the couple.

The marriage market framework can reveal how group boundaries affect intermarriage pairings. The first point to consider is that individuals with high total levels of resources will be able to attract spouses who likewise have high total levels of resources. The second point to consider is that couples do not match on all resources. Because any number of resources can be important on the marriage market, people rich with resources in one area may on average marry spouses advantaged in a variety of areas. Similarly, people who lack resources in one area may

on average marry spouses who are lacking in other areas. Women belonging to less desirable racial groups, for example, may tend to marry men who are less educated. If we apply these two principles to racial intermarriage, we can determine how group boundaries affect intermarriage patterns. More desirable individuals should be able to marry more desirable spouses. Below I will outline three scenarios for how racial boundaries can affect the characteristics of intermarried couples.

The first scenario is the *endogamous intermarriage* perspective, which holds that intermarriages follow the same patterns as endogamous marriages. This happens when crossing group boundaries has no effect on intermarriage patterns. This perspective can be found in Weber's discussion of status groups (Weber 1964:180-195; also see Parkin 1979 and McAll 1990). According to Weber, status group membership is accompanied by restrictions on social interaction. These restrictions may confine normal marriages to within the status circle (Weber 1964:188). This leads to the familiar assertion that high rates of intermarriage indicate weak group boundaries. If crossing group boundaries is not unusual, then people belonging to different racial groups should be able to marry equally desirable spouses. Although Weber's discussion makes no prediction about intermarriage patterns when group boundaries are strong, discussions of intermarriage which argue that intermarriage shows that members of different groups accept each other as social equals (Kalmijn 1998:396) rely on this perspective. The notion in the stratification literature of equality between husbands and wives may also contribute to this perspective (Sorensen and McLanahan 1987:660; see also Curtis [1986:179] and Szelenyi 1994).

The second scenario assumes that racial intermarriage patterns reflect a generalized racial status hierarchy. This derives from the *status exchange* hypothesis originated by Davis (1941) and Merton (1976 [1941]). Their original formulation argued that minorities compensated their

spouses with other resources such as schooling when they intermarried. Merton and Davis argued, for example, that marriages between highly educated Black men and less educated white women would be a common intermarriage pattern. In this case, the Black man's high level of schooling would compensate for his lower racial status. The key proposition of this hypothesis is that members of a society generally agree on which racial groups have high status and which groups have low status. Combining this proposition with the marriage market framework implies that members of higher status racial groups should be able to marry more desirable spouses than members of lower status racial groups. This scenario suggests that whites would marry more educated spouses than members of minority groups marry. Equivalently, spouses of whites would be more educated than spouse of non-whites.

This notion of status exchange originated with Davis' (1941) discussion of marriages between members of different castes in India. There has been sharp debate about the comparability of US race relations and India's caste system (Cox 1942, 1945; Beteille 1975; Berreman 1972). However, one common conceptual distinction between ethnic groupings and caste systems is that the different groups in a caste system are integrated in a hierarchical order, whereas ethnic groupings are not arranged hierarchically (Berreman 1972:32; Beteille 1975:224; Weber 1946:188-189). If US racial intermarriage pairings fit the status exchange pattern, this would suggest that US race relations possess the characteristic of caste systems that groups are hierarchically integrated. This would be consistent with findings and arguments emphasizing the perniciousness of US racial boundaries (e.g., Massey and Denton 1993; Bell 1992; Hacker 1992; Bobo 1997).

An alternative to the status exchange pattern is that groups in the US are arranged horizontally. This third scenario suggests that racial intermarriage patterns reflect a preference

for spouses belonging to one's own group. Under this scenario, people only marry outside of their own group if they are unable to find a desirable spouse who is a member of their own group. This *in-group preference* perspective follows from Gordon's (1964) discussion of assimilation where he asserts that people prefer the comfort of [their group's] communal institutions (1964:111). This perspective conceives of racial identity as a cultural resource (Kalmijn 1998:399-400) that individuals seek to match with their spouse. Cultural similarity enables a couple to forge a common lifestyle and enhances mutual support. Under this scenario, individuals who have more resources to offer on the marriage market will be more likely to realize their preferences by marrying members of their own group. If this is the case, then individuals with more schooling should be more likely to marry within their own group. The idea that similarity is attractive in social interaction is also present in the literature on racial residential segregation (Clark 1992) and friendship (e.g., Hallinan and Williams 1989). This third perspective is also found in Gordon's (1964:132-159) discussion of cultural pluralism in which groups boundaries are strong but members of different groups regard each other with tolerance.

What marriage patterns do the three different perspectives expect? The endogamous intermarriage perspective expects that racial intermarriages follow exactly the same patterns as endogamous marriages, except, of course, that they are crossing a racial boundary. Members of different groups should be able to marry similarly educated spouses. The status exchange perspective assumes a strong generalized racial status ordering. Since more attractive people marry each other, this suggests that higher racial status individuals will marry more educated spouses and that unusually well educated individuals will marry spouses with higher racial status. Accordingly, whites should marry more educated spouses. The in-group preference perspective

assumes that people prefer to marry within their own group. If more attractive individuals are more likely to realize their marriage preferences, then more educated people should be more likely to marry within their group. For whites, the expected pattern under the in-group preference hypothesis is the same as the expected pattern under status exchange. Both expect that more educated whites marry within their own group. For members of minority groups, however, the in-group preference hypothesis is the opposite of the status exchange hypothesis. Under the in-group preference hypothesis, more educated members of minority groups are expected to marry within their group.

Previous research

Previous research has tested the status exchange hypothesis against the endogamous intermarriage perspective. Figure 1 illustrates the different approaches to the status exchange hypothesis, focusing on marriages between Blacks and whites. It is a 2 x 2 x 4 x 4 cross-classification of husband's race (white, Black) by wife's race (white, Black) by husband's schooling by wife's schooling. For the discussion here the specific schooling categories used are irrelevant. Each 4 x 4 panel represents the education combinations for one of the four possible combinations of husband's race and wife's race. Within each panel, wife's schooling is the column variable and increases from left to right, and husband's schooling is the row variable and increases from top to bottom.

To illustrate the standard approach to the status exchange hypothesis let us focus on marriages between Black men and white women, Panel 3 in Figure 1. Variants of the standard approach have been used for decades to test the status exchange hypothesis (Bernard 1966; Heer 1974; Monahan 1976; Hwang, Saenz, and Aguirre 1995; Schoen 1995; Schoen and Thomas

1989; Schoen and Wooldredge 1989; Schoen, Wooldredge, and Thomas 1989), but the discussion here will focus on the strongest, most recent studies (Kalmijn 1993; Qian 1997). This approach, called the hypergamy ratio approach (where hypergamy refers to women marrying up in schooling), examines first the ratio of the number of women marrying up in schooling (the darkly shaded cells below the main diagonal) to the number of women marrying down in schooling (the lightly shaded cells above the main diagonal).

These studies calculate this ratio first from the marriages that have actually taken place in the population and then from the marriages that would have taken place under the endogamous intermarriage hypothesis of weak group boundaries. These two ratios are then compared to determine, for example, if white women married to Black husbands actually marry up more often than expected under the endogamous intermarriage hypothesis. If this is found to be the case, the claim is that the data are consistent with the status exchange hypothesis. The reasoning is that the Black husbands' additional schooling compensates their white wives for the husbands' lower racial status.

Under the endogamous intermarriage hypothesis, for example, white women might be expected to marry better educated Black men half as often as they marry less educated Black men simply because of population composition. But in the intermarriages that have actually taken place, white women may actually marry better educated Black men *twice* as often as they marry less educated Black men. If this is the case, then white women are marrying up more often than expected under the endogamous intermarriage hypothesis and this finding is seen as consistent with the status exchange hypothesis. The same set of two ratios is also calculated for marriages between white men and Black women in Panel 2 and corresponding comparisons are made.

The focus of the hypergamy ratio approach on whether women are more likely to marry up or down is misplaced because fundamentally, the status exchange hypothesis is not concerned with whether women are more likely to marry up or to marry down. Instead, it is concerned primarily with whether or not members of different groups are equally desirable on the marriage market. My approach outlined above of examining different groups spouses schooling examines the status exchange hypothesis more directly. Observing how often women marry up or down is a roundabout and flawed approach to making the key comparison called for by the status exchange hypothesis. Certainly, the relative desirability of members of different groups will affect the hypergamy ratio, but there is no reason to focus on this ratio when more direct and less flawed measures are available.

The main flaw of the hypergamy ratio approach is its reliance on crude measures of marriage patterns which do not account for how *far* women marry up or down. In the sample of actual marriages between white women and Black husbands, white women who marry up may marry up by only one schooling category. The endogamous intermarriage hypothesis might expect, however, that white women marry up by several schooling categories. However, if the odds of marrying up instead of marrying down were higher in the actual data than under the endogamous intermarriage scenario, the interpretation would be that there is status exchange. This would be the interpretation even though white women in the sample seem to be marrying up *less far* than expected under the endogamous intermarriage hypothesis. Conversely, white women marrying down in actual marriages might marry down more categories than expected under the endogamous intermarriage hypothesis. But the odds of women marrying up instead of marrying down might nevertheless lead to a conclusion in support of status exchange, in spite of the shorter than expected distance white women actually marry down².

A second group of studies (Murstein 1976, 1986; Shinagawa and Pang 1990) also tests the status exchange hypothesis, but the methods they have used are also unsound. Panel 2 and Panel 4 on the right-hand side of Figure 1 illustrate one comparison deriving from this approach. These two panels describe Black women's marriages with white men and with Black men, respectively. The approach these studies use compares WEDUC2, the schooling of Black women married to white men with WEDUC4, the schooling of Black women married to Black men. The status exchange hypothesis predicts that $WEDUC2 > WEDUC4$, that Black women married to white men have more schooling than Black women married to Black men. If white husbands are indeed more desirable marriage partners than Black husbands, Black women with additional resources (schooling, in this case) will be the ones who are more likely to marry white men.

The hypotheses these studies test are well founded, but the methods used to test the hypotheses are flawed because these studies do not control for overall group schooling differences and patterns of educational assortative mating. A simple comparison of WEDUC2 with WEDUC4 does not constitute a rigorous test of the status exchange hypothesis. The reason is that we must also control for the schooling of these Black women's white and Black husbands. If, for example, the white husbands have more schooling than the Black husbands, it would *expected* that Black women married to white men have more schooling than Black women married to Black men. The Black women in Panel 2 may have more schooling than the Black women in Panel 4 merely because their husbands come from a group with more schooling, not because of status exchange.

Data and methods

The data for this study come from the 5 percent Public Use Microdata Sample of the 1990 U.S. Census (U.S. Department of Commerce 1993). To form the couples, men and women from each household who indicated that they were married were matched with each other based on state, household serial number, and subfamily number if necessary³.

To eliminate the effects that nativity may have on intermarriage, only native-born men and women married to native-born spouses were included in the analysis. Foreign-born individuals presumably have not been exposed to the same marriage market as native-born individuals. To reduce marriage survival bias in the sample, while still allowing for a reasonable number of cases, only those under the age of 35 married to others under the age of 35 were included in the sample⁴. In this study, I focus on marriages of whites with Blacks, Japanese Americans, and Mexican Americans⁵. I selected the sample for this study from the four largest racial groups in U.S. society. Since ethnic distinctions within racial groups matter little for whites (Lieberson and Waters 1988; Alba 1990) and Blacks (Cornell 1990:376-379), I include all Blacks and whites regardless of ethnicity. Because ethnic distinctions among different Asian American and Latino groups do matter (Pang 1994; Bean and Tienda 1987), I analyzed only Japanese Americans and Mexican Americans, the Asian American and Latino groups, respectively, with the largest native-born populations. Because marriages between members of the non-white groups are so few, I estimate models only for in-group marriages and the marriages of whites with Blacks, Japanese Americans, and Mexican Americans.

Because population composition alone might lead to patterns which could be interpreted as consistent with any of the endogamous intermarriage, status exchange, or in-group preference perspectives, it is imperative to use methods of analysis that will control for the effects of

population composition. To examine the three intermarriage scenarios, I use log-linear models to analyze cross-classifications of husbands and wives education and race⁶. I classify schooling into four categories: less than high school diploma, high school diploma or equivalent, some college but less than bachelor s degree, and bachelor s degree or more. Although various models have been used to analyze assortative marriage (Johnson 1980; Qian 1997), testing the hypotheses of interest here does not require a particularly elaborate log-linear model. The test implemented here is in fact a test of the conditional independence of race and spouse s schooling. After controlling for (1) the general likelihood of intermarriage, (2) marginal educational differences between minorities and whites, and (3) the association between husband s and wife s schooling, is there still an association between respondent s race and spouse s schooling? If so, what pattern does the association follow?

The endogamous intermarriage hypothesis is that race plays no part in the marital selection process for intermarried people, except to take into account marginal group differences in schooling. Thus, after controlling for the three factors listed above, respondent s race should have no impact on spouse s schooling, if the data are consistent with the endogamous intermarriage hypothesis. The log-linear model I estimate is:

$$\log m_{ijkl} = \mu + \frac{HR}{i} + \frac{WR}{j} + \frac{HRWR}{ij} + \frac{HE}{k} + \frac{WE}{l} + \frac{HEWE}{kl} + \frac{HRHE}{ik} + \frac{WRWE}{jl} + \frac{HRWRWE}{ijkl} + \frac{HRWRHE}{ijk}$$

where the μ s denote parameters to be estimated. For the race and schooling marginal effects I use dummy coding where whites and less than a high school diploma are the omitted categories.

The $\frac{HR}{i}$, $\frac{WR}{j}$, and $\frac{HRWR}{ij}$ effects account for differences in the numbers of marriages between white men and white women, white men and minority women, minority men and white women, and minority men and minority women. The parameters $\frac{HE}{k}$, $\frac{WE}{l}$, $\frac{HRHE}{ik}$, and $\frac{WRWE}{jl}$

account for the marginal distribution of schooling for minority and white men and women. The γ_{kl}^{HEWE} effects account for the association between husband's and wife's schooling. These parameters constitute the endogamous intermarriage model, where respondent's race has no effect on spouse's schooling and the only differences among types of marriages result from differences in the marginal distributions of schooling. The endogamous intermarriage model imposes the constraint that spouse's schooling does not depend on race.

The γ_{ijl}^{HRWRWE} and γ_{ijk}^{HRWRHE} parameters represent the association between husband's race and wife's schooling and wife's race and husband's schooling, respectively. I estimate the association between husband's race and wife's schooling separately for white and minority wives. One set of parameters measures the association between husband's race and wife's schooling for white wives, and another set of parameters measures the association between husband's race and wife's schooling for minority wives. Likewise, I estimate the association between wife's race and husband's schooling separately for white and minority husbands.

This parameterization allows us to determine if whites' spouses are *stochastically higher* (Agresti 1990:9-10, 33, 266) in schooling than minorities' spouses. If one distribution is stochastically higher than another, then the higher distribution is more likely to have observations at the higher end of the ordinal scale. If the association parameters suggest that for each pair of adjacent schooling categories, the odds that whites have spouses in the higher schooling category is greater than the odds that minorities have spouses in the higher schooling category, then we conclude that whites' spouses have more schooling than minorities' spouses, supporting the status exchange hypothesis. The opposite finding that less educated members of minority groups marry whites would support the in-group preference hypothesis.

Table 1 shows the coding for the $\frac{HRWRWE}{ij1}$ and $\frac{HRWRHE}{ijk}$ parameters. Two different models are used to reveal the effect of respondent's race on spouse's schooling. The first is a column-effects model with unit-spaced scores for the rows (Agresti 1990:287-290; Ishii-Kuntz 1994). The second is an R+C model (Clogg and Shihadeh 1994:44-45) which generalizes the column-effects model by estimating the row scores as parameters. For both models, the estimated effects can be interpreted in terms of local odds ratios, which are odds ratios for adjacent rows and columns. Thus, the $\frac{HRWRWE}{ij1}$ effects represent the log of the ratio of the odds of having a high school diploma vs. having less than a high school diploma for minority husbands' wives to the same odds for white husbands' wives. The $\frac{HRWRWE}{ij2}$ and $\frac{HRWRWE}{ij3}$ parameters represent the effects for higher levels of schooling and the $\frac{HRWRHE}{ij1}$, $\frac{HRWRHE}{ij2}$, and $\frac{HRWRHE}{ij3}$ parameters represent the corresponding effects of wife's racial group on husband's schooling. The column-effects model constrains the exchange parameters, and hence the local odds ratios, in each set to be equal. The R+C model allows the exchange parameters in each set to vary.

In every case, a negative value for these exchange parameters suggests that minority respondents' spouses have less schooling than whites' spouses. If the exchange parameters for a particular comparison are all negative, then we can conclude that the minority group's spouses have less schooling than whites' spouses.

Results

The sample restrictions yielded a total of 488,673 marriages. Table 2 presents a cross-classification of husband's and wife's schooling by husband's and wife's race. The first column of coefficients in Table 3 presents crude odds ratios representing the likelihood of marrying members of one's own group. For Blacks, Japanese Americans, and Mexican Americans, the

odds of marrying a member of one's own group instead of marrying a white spouse is much larger than the odds that a white individual would marry a member of the minority group instead of a white spouse. The odds that a Black man or woman is married to a Black spouse instead of to a white spouse is 11,222 times the odds that a white man or woman is married to a Black spouse instead of a white spouse. For Mexican Americans, the corresponding odds ratio is 270, and for Japanese Americans the corresponding odds ratio is 873. These odds ratios do not account for group schooling differences and should only be considered crude indicators of intermarriage tendencies. However, they suggest that group boundaries between Mexican Americans and whites are weakest, followed by Japanese Americans, with very strong boundaries between Blacks and whites.

Log-linear models

Table 4 lists the goodness-of-fit χ^2 and BIC statistics for the log-linear models analyzing these marriages⁷. Let us begin by discussing the models for marriages between whites and Blacks.

Model 1a is the endogamous intermarriage model which assumes that the only determinants of marriage patterns are educational assortative mating, marginal group education differences, and an overall intermarriage tendency. For Blacks, the endogamous intermarriage model clearly does not fit the data as well as the saturated model ($P[\chi^2_{39} > 311.1541] < 0.0001$), although the BIC statistic indicates that it is more plausible than the saturated model. Model 2a is the column effects model and adds a set of constrained exchange parameters (described in Table 1) to the endogamous intermarriage model. A likelihood ratio test reports that these constrained exchange parameters improve the fit of the model substantially ($P[\chi^2_4 > 95.4425] < 0.0001$). The BIC statistic for Model 2a also suggests that this model is substantially more plausible than the

endogamous intermarriage model. Model 3a is the R+C model which relaxes the constraints on the exchange parameters in Model 2a and estimates independent parameters for the three local odds ratio in each comparison. A likelihood-ratio test for Model 3a against Model 2a ($P[\chi^2_8 > 46.0204] < 0.0001$) suggests that Model 3a fits the data significantly better than Model 2a, but the BIC statistic for Model 3a indicates that it is actually less plausible than Model 2a. Based on the BIC statistic, I prefer Model 2a, especially because the sample size is so large. With such a large sample, relatively small improvements in fit may be statistically significant even if they are of little consequence substantively (Raftery 1995). The constrained exchange parameters of Model 2a are also easier to interpret and more directly address the status exchange and in-group preference hypotheses.

A similar pattern also holds for Models 1b, 2b, and 3b for marriages between whites and Mexican Americans. Model 1b, the endogamous intermarriage model, does not fit the data well according to the goodness-of-fit chi-square test ($P[\chi^2_{39} > 448.8377] < 0.0001$), but the BIC statistic suggests that the endogamous intermarriage model is in fact more plausible than the saturated model. Model 2b, the column effects model with constrained exchange parameters, is a significant improvement in fit over the endogamous intermarriage model ($P[\chi^2_4 > 352.8809] < 0.0001$). The BIC statistic also indicates that Model 2b is more plausible than the endogamous intermarriage model. Model 3b, the R+C model with unconstrained exchange parameters, is a significant improvement in fit over Model 2b ($P[\chi^2_8 > 59.2621] < 0.0001$), but the BIC statistic suggests that it is in fact less plausible than Model 2b. Because of the large sample size, I prefer Model 2b.

For marriages of whites with Blacks and Mexican Americans, the preferred models are the column effects models with constrained exchange parameters. For marriages of Japanese

Americans with whites, however, the preferred model is Model 1c, the endogamous intermarriage model. A goodness-of-fit chi-square test ($P[\chi^2_{39} > 60.0065] = 0.0169$) suggests that the fit of this model may be marginally acceptable, and the BIC statistic suggests that this model is indeed more plausible than the saturated model. Model 2c clearly gives an adequate fit to the data ($P[\chi^2_{35} > 35.9220] = 0.4251$) and also shows a significant improvement in fit over Model 1c ($P[\chi^2_4 > 24.0485] < 0.0001$), but it also has a larger BIC statistic than Model 1c, suggesting that it is less likely to be the true model than is the endogamous intermarriage model. The large sample size and large BIC statistic for Model 2c suggest that Model 1c would be more appropriate for these data. Model 3c does not fit the data significantly better than Model 2c ($P[\chi^2_8 > 9.9969] = 0.26524$), nor does it have a smaller BIC statistic than either of the other two models. Thus, on the basis of the BIC statistics, I prefer Model 1c, the endogamous intermarriage model, for marriages between Japanese Americans and whites.

Status exchange for Blacks

Let us focus on marriages between Blacks and whites. The first column in Table 5 lists the constrained Model 2a exchange parameters. Three of the parameters in the first column are consistent with the status exchange hypothesis, one of these three is also consistent with the in-group preference hypothesis, and the fourth is consistent with the endogamous intermarriage hypothesis. The first coefficient is consistent with the endogamous intermarriage hypothesis and suggests that whites husbands of Black wives and white husbands of white wives have equivalent amounts of schooling. The second coefficient is consistent with the status exchange hypothesis because Black husbands of Black wives have less schooling than Black husbands of white wives but contradicts the in-group preference hypothesis because better educated Blacks are marrying

whites. The schooling distribution of white wives' Black husbands is stochastically higher than the schooling distribution of Black wives' Black husbands. The odds that a Black woman's Black husband falls in a higher schooling category instead of a lower schooling category is 25 percent less than the odds that a white woman's Black husband falls in a higher schooling category instead of a lower schooling category. The third coefficient is consistent with both the status exchange hypothesis and the in-group preference hypotheses. It suggests that Black husbands' white wives have less schooling than white husbands' white wives. Black husbands' white wives are 10 percent less likely than white husbands' white wives to be in a higher education category. In this case, Black husbands' spouses are less desirable than white husbands' spouses. At the same time, it is less educated, less desirable whites who are unable to marry within their own group. The fourth coefficient is consistent with the status exchange hypothesis but contradicts the in-group preference hypothesis. It suggests that Black husbands' Black wives have less schooling than white husbands' Black wives. Black husbands' Black wives are 11 percent less likely than white husbands' Black wives to be in a higher education category.

Status exchange for Mexican Americans

The second column of coefficients in Table 5 lists the estimates of the constrained exchange parameters describing marriages between Mexican Americans and whites. Three of the Model 2b constrained exchange parameters are negative and consistent with the status exchange framework. One of these negative coefficients is consistent with the in-group preference framework. The remaining coefficient is consistent with none of the hypotheses.

The first coefficient reveals that Mexican American women's white husbands are 13 percent more likely than white women's white husbands to be in a higher education category. This contradicts all the hypotheses considered here since it predicts that Mexican American women (who presumably have lower racial status than white women) marry more attractive white husbands than white women do. The other three coefficients are consistent with the status exchange hypothesis because in each case, Mexican Americans marry less educated spouses. Mexican American women marry Mexican American men with higher levels of schooling 26 percent less often than white women do. Mexican American men marry white women with higher levels of schooling 7 percent less often than white men do. And finally, Mexican American men marry Mexican American women with higher levels of schooling 24 percent less often than white men do. The third coefficient is also consistent with the in-group preference hypothesis, suggesting that more educated white women are more likely to marry white men. However, the second and fourth coefficients have signs opposite those expected by the in-group preference hypothesis, suggesting that *less* educated Mexican Americans marry within their own group.

Endogamous intermarriage for Japanese Americans

The third column of coefficients in Table 5 presents the coefficients from Model 2c, describing marriages between Japanese Americans and whites. As the endogamous intermarriage model is the preferred model, there seems to be little difference in the schooling of whites and Japanese Americans' spouses. Only one of the exchange parameters from Model 2c is statistically significant, and it actually indicates that Japanese American women are 31 percent more likely than white women to marry white men with higher levels of schooling.

Intermarriage prevalence and intermarriage pairings

Accounting for group education differences and differences in racial status reveals a more accurate picture of intermarriage tendencies than the crude odds ratios in Table 3's first column of coefficients. The second column of coefficients in Table 3 presents odds ratios from the preferred models discussed above which adjust for group education differences and differences in racial status, if any. For Blacks, the ratio of the odds that a Black man or woman is married to a Black spouse instead of a white spouse to the odds that a white man or woman is married to a Black spouse instead of a white spouse is 18,603. The corresponding odds ratio for Mexican Americans is 585, and the corresponding odds ratio for Japanese Americans is 734. A z-test calculated from a single log-linear model including the preferred models for each of the groups suggests that the difference between the log odds ratios for Japanese Americans and Mexican Americans is statistically significant ($P [|z| > 1.984] = 0.047$). The difference between the log odds ratios of Blacks and Mexican Americans is also statistically significant ($P [|z| > 28.040] < 0.0001$). The same is true of the difference between the log odds ratios of Blacks and Japanese Americans ($P [|z| > 22.759] < 0.0001$). These results suggest that Japanese Americans and Mexican Americans have a weaker tendency to marry within their group than Blacks. Japanese Americans also have a stronger tendency than Mexican Americans to marry within their group.

Since these log-linear model parameters are estimated from national data and hence cannot account for the local nature of marriage markets, they are merely suggestive of the strength of the boundaries between these minority groups and whites. However, a comparison of the conclusions drawn from examining intermarriage prevalence for Japanese Americans and Mexican Americans with the conclusions drawn from examining intermarriage pairings for the same two groups illustrates a potential pitfall of the standard practice of focusing exclusively on

intermarriage prevalence. According to intermarriage rates, the boundary between whites and Japanese Americans is stronger than the boundary between whites and Mexican Americans. According to intermarriage patterns, the boundary between whites and Japanese Americans is weaker than the boundary between whites and Mexican Americans. This demonstrates that the standard practice of comparing intermarriage rates to determine the relative strength of group boundaries may be unreliable.

Discussion and conclusions

Overall, the evidence presented here is most consistent with the status exchange hypothesis for marriages between whites and Blacks, and whites and Mexican Americans. For marriages between Japanese Americans and whites, the endogamous intermarriage hypothesis carries the day. Some of the coefficient estimates are also consistent with the in-group preference hypothesis, but the overall pattern of results more strongly supports the status exchange hypothesis. These findings indicate that in a sphere of social interaction as intimate as marriage, racial stratification still has a presence for Blacks and Mexican Americans. For members of these two groups, racial boundaries reduce their attractiveness on the marriage market. For Japanese Americans, however, racial boundaries do not matter in their marriages with whites. For members of all three groups, however, there is still a strong tendency to marry within their own group.

Marriage across racial boundaries does not indicate complete acceptance between members of the two groups. Although racial intermarriages may help weaken racial boundaries, intermarriage prevalence may not be a reliable indicator of weak racial boundaries. People who intermarry are assumed to be among those least likely to be affected by group boundaries.

However, the evidence presented here demonstrates that even among those who intermarry, racial boundaries matter and play a significant role in spouse selection. This suggests that the prevalence of racial intermarriages should not be the sole characteristic of intermarriage used to investigate group boundaries.

This study has also shown that a racial hierarchy governs the marriage market. This demonstrates that US race relations possess one characteristic of a caste system. This finding is also consistent with studies of attitudes toward residential segregation which find a hierarchy of preferences for neighbors belonging to different racial groups (Bobo and Zubrinsky 1996; Zubrinsky and Bobo 1996).

The results reported here using an improved test of the status exchange hypothesis are largely consistent with Kalmijn's (1993) and Qian's (1997) findings using the hypergamy ratio approach. Both studies concluded that there is status exchange in marriages between Blacks and whites. Qian (1997) also found that there is status exchange in marriages between Hispanics and whites. Hwang et al (1995) concluded that there is evidence of status exchange in marriages between Asian Americans and whites, but Qian (1997) actually found that Asian American women seem to be more attractive marriage partners than white women, according to white men at least.

One unexpected pattern appears in the coefficients that relate white husbands' schooling to wife's race. These coefficients are the only ones that do not fit the status exchange hypothesis for Blacks and Mexican Americans' intermarriages. The coefficient for Japanese Americans' intermarriages also does not fit the endogamous intermarriage hypothesis. Although I do not have an elaborate explanation for these discrepant findings, they may derive from the unique position of white men at the top of the racial status and gender hierarchies. These coefficients

indicate that white men who marry non-white women are high in the education hierarchy as well. Perhaps their uniquely advantaged position atop these hierarchies allows them the freedom to choose spouses with little regard for their spouses' racial and socioeconomic resources. However, a more definitive explanation will require further research.

One identification problem in testing hypotheses about intermarriage pairings is the exchange of other resources besides schooling and racial status. For example, minority women who marry white men may have more prestigious occupations than the white women these men might have married. In this case, minority women are exchanging occupational prestige (instead of schooling) for the higher racial status of their spouses, and therefore the status exchange perspective would not expect them to have more schooling than the white women their husbands might have married. Alternatively, the white husbands might be unusually deficient in some respect, and the minority wives might not need to compensate so much for their lower racial status. Unfortunately, the data I use to test hypotheses about intermarriage pairings do not contain measures of many of the other characteristics that are important on the marriage market.

This is an important, but not a disastrous problem, however. A number of resources important on the marriage market such as income and occupational prestige are in fact strongly related to schooling. Kalmijn (1991:35-39) stressed the importance of education on the marriage market because of search costs and uncertainty about a potential spouse's future characteristics. Focusing on education can reduce search costs since a potential spouse's education can usually be known with certainty. Education can also be a rough indicator of a potential spouse's current and future resources. Elaborating the model I propose here to include resources besides schooling and race would be a worthy direction for future study, but the more parsimonious framework used here should still yield solid evidence about intermarriage pairings⁸.

This study has demonstrated that the standard practice of examining only the frequency of intermarriage overlooks important information about group boundaries that can be found by examining the patterns of intermarriage pairings. Examining the characteristics of intermarried couples reveals additional information about the strength of group boundaries. Furthermore, examining intermarriage pairings reveals whether an in-group preference or status hierarchy regime governs the marriage market. Although this study has focused on racial intermarriage, these ideas can be extended to studies of intermarriage with respect to other characteristics such as religion and social class background.

Notes

1. For the purposes of this paper, I use the term *racial intermarriage* to refer to marriages between members of different racial and ethnic groups.
2. If researchers account for how *far* people marry up or down, then theoretically and empirically, focusing on actual levels of schooling of the spouses would make no difference in the results.

A modification of this standard approach that does not compare husband's schooling with wife's schooling would be to compare the schooling of a person's expected high racial status spouse with the schooling of a person's expected low racial status spouse. The status exchange framework would predict that the expected low racial status spouse have more schooling than the expected high racial status spouse.

One might, for example, compare the schooling of a woman's expected Black husband with the schooling of the same woman's expected white husband. If the expected Black husband had more schooling than the expected white husband, then this would sustain the status exchange hypothesis. The Black husband's additional schooling would compensate for his lower racial status with respect to the white husband. If the focus were on white women in Figure 1, for instance, the status exchange hypothesis would expect HEDUC1 (the schooling of white women's white husbands) to be less than HEDUC3 (the schooling of white women's Black husbands).

However, tests of this hypothesis are not identified because the comparisons deriving from this approach are confounded with marginal differences in schooling. One component of the endogamous intermarriage hypothesis is that group differences in schooling determine racial intermarriage patterns. With standard log-linear marriage models, the terms that represent

marginal group differences in schooling are precisely equivalent to the terms that this approach relies on to test the status exchange hypothesis.

3. Since marriage licenses do not record the racial backgrounds of the bride and groom in all states, census data are the only large sample data that are readily available. Since marriage license data record education at the time of marriage, they cannot account for people who receive more schooling after marriage. Census data are somewhat better, but still possess this shortcoming.

4. Unfortunately, data on marriage order and marriage timing needed to identify recently married couples are not available in the 1990 PUMS.

5. Because, I cannot control for generation using census data some of the differences among the racial groups might be the result of differences in generational composition.

6. The log-linear models used here cannot completely account for population composition because they only consider married couples and hence do not include unmarried people in the pool of potential spouses.

7. The full set of coefficients from these models are available on request from the author.

8. Another important point to note is that the log-linear models estimated in this study assume proportional exposure with respect to schooling by group. The models used in this study assume, for example, that whites are exposed to Blacks who have the same levels of schooling as the Blacks Blacks are exposed to. Unfortunately, the data used in this study (and most other studies) cannot eliminate differential exposure as an alternative explanation for these findings.

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Table 1: Exchange parameter coding for effects of husband s racial status on wife s schooling and effects of wife s racial status on husband s schooling

Wife s schooling	Husband s racial group			Log local odds ratio ^a
	White	Minority		
< HS diploma	e1		e1	n/a
HS diploma	e2		$\frac{HRWRWE}{ij1} +$ e2	$\frac{HRWRWE}{ij1}$
some college	e3		$\frac{HRWRWE}{ij1} + \frac{HRWRWE}{ij2} +$ e3	$\frac{HRWRWE}{ij2}$
BA or more	e4	$\frac{HRWRWE}{ij1} +$	$\frac{HRWRWE}{ij2} + \frac{HRWRWE}{ij3} +$ e4	$\frac{HRWRWE}{ij3}$

Husband s schooling	Wife s racial group			Log local odds ratio ^a
	White	Minority		
< HS diploma	e1		e1	n/a
HS diploma	e2		$\frac{HRWRHE}{ij1} +$ e2	$\frac{HRWRHE}{ij1}$
some college	e3		$\frac{HRWRHE}{ij1} + \frac{HRWRHE}{ij2} +$ e3	$\frac{HRWRHE}{ij2}$
BA or more	e4	$\frac{HRWRHE}{ij1} +$	$\frac{HRWRHE}{ij2} + \frac{HRWRHE}{ij3} +$ e4	$\frac{HRWRHE}{ij3}$

^aThe local odds ratio is the ratio of the odds for adjacent rows that a minority wife s (husband s) spouse has the higher level of schooling to the odds that a white wife s (husband s) spouse has the higher level of schooling. Negative values for the local odds ratios suggest that wives (husbands) of minority husbands (wives) have less schooling than wives (husbands) of white husbands (wives).

The models for each minority group include four sets of exchange parameters. These sets of parameters compare:

- (1) the schooling of white wives minority husbands to the schooling of minority wives minority husbands,
- (2) the schooling of white wives white husbands to the schooling of minority wives white husbands,
- (3) the schooling of white husbands minority wives to the schooling of minority husbands minority wives, and
- (4) the schooling of white husbands white wives to the schooling of minority husbands white wives.

Table 2: Cross-classification of husband s and wife s schooling by husband s and wife s race

	White wives				Black wives				Mexican American wives				Japanese American wives			
	< HS diploma	HS diploma	some college	BA or more	< HS diploma	HS diploma	some college	BA or more	< HS diploma	HS diploma	some college	BA or more	< HS diploma	HS diploma	some college	BA or more
White husbands	21802	22939	9175	1171	25	13	18	1	163	140	69	11	3	4	12	0
< HS diploma																
HS diploma	19008	90470	43631	9076	21	90	83	6	173	555	288	35	9	37	36	17
some college	6742	39008	66462	20214	12	44	134	41	80	292	615	97	3	24	78	36
BA or more	913	9464	28780	56897	1	7	46	77	18	75	249	277	0	9	41	141
Black husbands	90	96	51	3	1904	1688	1097	139								
< HS diploma																
HS diploma	108	318	164	22	1425	5901	3384	664								
some college	51	214	359	106	546	2094	5129	1430								
BA or more	5	28	80	135	65	311	1072	1668								
Mexican American husbands	181	188	76	8					958	515	186	10				
< HS diploma																
HS diploma	139	432	265	34					462	968	379	44				
some college	72	274	516	133					138	382	637	94				
BA or more	6	32	118	195					13	50	127	115				
Japanese American husbands	6	6	4	0									1	1	1	1
< HS diploma																
HS diploma	5	24	15	4									2	15	14	6
some college	6	31	76	18									0	16	69	36
BA or more	0	12	44	79									0	2	36	91

Source: 1990 US Census 5 percent PUMS; both spouses under age 35, native born

Table 3: Log odds ratios and odds ratios of intermarriage

		Crude	Adjusted ^a
Odds of Blacks marrying Blacks instead of whites vs. odds of whites marrying Blacks instead of whites	Log odds ratio	9.3256***	9.8311***
	standard error	(0.0469)	(0.1077)
	Odds ratio	11222	18603
Odds of Mexican Americans marrying Mexican Americans instead of whites vs. odds of whites marrying Mexican Americans instead of whites ^b	Log odds ratio	5.5997***	6.3720***
	standard error	(0.0299)	(0.0619)
	Odds ratio	270	585
Odds of Japanese Americans marrying Japanese Americans instead of whites vs. odds of whites marrying Japanese Americans instead of whites ^c	Log odds ratio	6.7725***	6.5987***
	standard error	(0.0933)	(0.0943)
	Odds ratio	837	734
p < 0.10		*p < 0.05	**p < 0.001
		***p < 0.0001	

^aAdjusted odds ratios are taken from the preferred models for each group discussed in the results section.

^bThe log odds ratio for Mexican Americans is significantly different from the log odds ratio for Blacks (P [|z| > 28.040] < 0.0001).

^cThe log odds ratio for Japanese Americans is significantly different from the log odds ratio for Blacks (P [|z| > 22.759] < 0.0001). The log odds ratio for Japanese Americans is also significantly different from the log odds ratio for Mexican Americans (P [|z| > 1.984] = 0.047).

Table 4: Goodness-of-fit χ^2 and BIC statistics for marriage models

Model	Degrees of freedom	G ²	BIC
Marriages between Blacks and whites			
1a. Endogamous intermarriage model: HRWR, HEWE, HRHE, WRWE	39	311.1541	-198.7584
2a. Endogamous intermarriage Model + constrained exchange parameters	35	215.7116	-241.9022
3a. Endogamous intermarriage Model + unconstrained exchange parameters	27	169.6912	-183.3251
Marriages between Mexican Americans and whites			
1b. Endogamous intermarriage model: HRWR, HEWE, HRHE, WRWE	39	448.8377	-59.3963
2b. Endogamous intermarriage model + constrained exchange parameters	35	95.9568	-360.1507
3b. Endogamous intermarriage model + unconstrained exchange parameters	27	44.6947	-307.1597
Marriages between Japanese Americans and whites			
1c. Endogamous intermarriage model: HRWR, HEWE, HRHE, WRWE	39	60.0065	-447.3803
2c. Endogamous intermarriage model + constrained exchange parameters	35	35.9220	-419.4251
3c. Endogamous intermarriage model + unconstrained exchange parameters	27	25.9251	-325.3427

HR = husband's race (white, minority)

WR = wife's race (white, minority)

HE = husband's education (< HS diploma, HS diploma, some college, bachelor's degree+)

WE = wife's education (< HS diploma, HS diploma, some college, bachelor's degree+)

Exchange parameters are described in the text and in Table 1.

Table 5: Log odds ratios and odds ratios that Blacks , Mexican Americans , and Japanese Americans spouses have more schooling than whites spouses

		Blacks , Mexican Americans and Japanese Americans vs. whites chances of marrying a spouse with more schooling		
		Model 2a: Blacks	Model 2b: Mexican Americans	Model 2c: Japanese Americans
White husbands schooling: Minority women vs. white women	Log odds ratio	0.0205	0.1226***	0.2668***
	standard error	(0.0514)	(0.0229)	(0.0642)
	Odds ratio	1.021	1.1304	1.3058
Minority husbands schooling: Minority women vs. white women	Log odds ratio	-0.2925***	-0.3017***	-0.1271
	standard error	(0.0323)	(0.0315)	(0.1208)
	Odds ratio	0.7464	0.7396	0.8806
White wives schooling: Minority men vs. white men	Log odds ratio	-0.1047**	-0.0697**	0.0978
	standard error	(0.0311)	(0.0258)	(0.0755)
	Odds ratio	0.9006	0.9327	1.1027
Minority wives schooling: Minority men vs. white men	Log odds ratio	-0.1180*	-0.2731***	0.1042
	standard error	(0.0551)	(0.0313)	(0.1171)
	Odds ratio	0.8887	0.7610	1.1098

p < 0.10

*p < 0.05

**p < 0.001

***p < 0.0001

Figure 1: Approaches to the status exchange hypothesis

