

Comment: An Endorsement of Exchange Theory in Mate Selection

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Status exchange theory has long held a central position in the study of interracial marriage between blacks and whites. Originally proposed by both Merton (1941) and Davis (1941) independently, status exchange theory predicts that interracial unions between blacks and whites will often involve an exchange of racial status for some other status characteristic, generally operationalized in research as education. Because whites may see marrying across racial lines as marrying “downward”, they must be compensated by marrying up on some other dimension. Therefore, status exchange theory predicts that whites in interracial marriages will be more upwardly mobile (hypergamous) and less downwardly mobile (hypogamous) in terms of education than if they were in a racially endogamous marriage. The opposite would be true for blacks in an interracial marriage.

Although an early generation of scholars in the 1960s and 1970s found little evidence of status exchange using simple models, a more recent generation of scholars has found significant evidence of status exchange, using more sophisticated approaches that address the shortcomings of earlier research. Kalmijn (1993) found evidence of status exchange in marriage register data for 12 states from 1970 to 1986, using the hypergamy ratio approach. Qian (1997) replicated Kalmijn’s method on young couples in the 1980 and 1990 microdata samples of the US Census, and found similar results. Schoen and Wooldredge (1989), using harmonic mean-based marriage rates, found significant evidence of status exchange in marriage registers for North Carolina and Virginia for the years 1969-71 and 1979-81. This analysis has been repeated by Schoen and Cheng (2006) using 1990 data for Virginia, North Carolina, and Wisconsin with similar results. Recently, Fu (2001) found evidence of status exchange using log-linear models applied to 1990 Census data.

In a recent article, Rosenfeld (2005) argues that these studies are incorrect and he proposes a new model using new data which shows no support for status exchange theory. However, as we will show, Rosenfeld misspecifies his model and misinterprets his results. In this brief comment, we

re-estimate the model using a correct specification and find that Rosenfeld’s data do in fact show evidence of status exchange between white women and black men, but not between white men and black women.

Rosenfeld’s model is flawed in two ways. First, Rosenfeld’s parameterization of status exchange does not actually measure status exchange because it does not model different patterns of educational assortative mating between interracial and intraracial couples. Second, even if one corrects for Rosenfeld’s error, the terms Rosenfeld includes in his models make the status exchange parameter itself an incomplete test of the theory. Rosenfeld essentially hides the evidence of status exchange within other parameters. We will address each of these points in turn.

Let us briefly recapitulate Rosenfeld’s model. We will focus on Models 2 and 4 of Rosenfeld’s Table 3. Model 2 shows support for status exchange using Rosenfeld’s parameter, while the inclusion of more terms in subsequent models causes Rosenfeld’s parameter to become zero. Because these subsequent models provide an overall better fit than Model 2, Rosenfeld sees them as evidence against status exchange. Although Rosenfeld’s parameter first drops to zero in Model 3, we focus on Model 4. The only difference between these two models is that Model 3 constrains EAM patterns to be the same for Whites and Others, whereas Model 4 estimates different patterns of EAM for Whites, Blacks, and Others. The comments here are equally valid if applied to Model 3 or Model 5. In each case, Rosenfeld’s parameter becomes zero due to the problematic inclusion of three-way terms between each spouse’s race and assortative mating.

Let F_{ijkl} be the frequency of marriages by husband’s race (i), wife’s race (j), husband’s education (k), and wife’s education (l). Race is measured as 1 for white, 2 for black, and 3 for other, and education is measured as six categories. Rosenfeld’s Model 2 can be written as:

$$F_{ijkl} = \lambda \lambda_i^{HR} \lambda_j^{WR} \lambda_k^{HE} \lambda_l^{WE} \lambda_{ij}^{HRWR} \lambda_{ik}^{HRRHE} \lambda_{jl}^{WRWE} \lambda_{kl}^{HEWE} e^{\beta x} \quad (1)$$

Where x is Rosenfeld’s coding of the status exchange variable. In addition to Rosenfeld’s parameter, this model fits the marginal distributions of husband’s race (HR), wife’s race (WR), husband’s education (HE), and wife’s education (WE), the association between spouses’ races (HR*WR), the distribution of education by each spouse’s race (HR*HE and WR*WE), and the general pattern of educational assortative mating (HE*WE).¹

Status exchange theory predicts different patterns of educational assortative mating (hereafter EAM) between black/white marriages and their racially endogamous counterparts. How one models this EAM difference is key to testing the theory of status exchange. Rosenfeld’s parameter, however, does not measure this difference at all.

¹In actuality, Rosenfeld fits only three of the four terms for the HR*WR interaction in Model 2 and Model 4, but for simplicity of presentation and because there is no reason not to fit all four terms, we simply fit the saturated table. The results presented here are nearly identical if Rosenfeld’s parameterization is followed exactly.

This fact is easy to demonstrate by examining the ratio of the HE*WE table for interracial couples to the HE*WE table for intraracial couples using Rosenfeld’s coding scheme:

	black spouse	white spouse					
		<10	10-11	HS	SC	B	PG
$\log \frac{F_{21kl}}{F_{11kl}} = \log \frac{F_{12kl}}{F_{11kl}} = \log \frac{F_{21kl}}{F_{22kl}} = \log \frac{F_{21kl}}{F_{22kl}} =$	<10	0	$-\beta$	-2β	-3β	-4β	-5β
	10-11	β	0	$-\beta$	-2β	-3β	-4β
	HS	2β	β	0	$-\beta$	-2β	-3β
	SC	3β	2β	β	0	$-\beta$	-2β
	B	4β	3β	2β	β	0	$-\beta$
	PG	5β	4β	3β	2β	β	0

Interracial marriages above the main diagonal (where blacks have less education than their white spouses) are expected to be fewer than those below the main diagonal (where blacks have more education than their white spouses). Rosenfeld models the status exchange effect to be greater for larger education differentials.

The local log-odds ratios for the table above are the key to understanding differences in EAM between interracial and intraracial unions, because they indicate how much higher or lower are the local log-odds ratios from the HE*WE table in interracial unions compared to intraracial unions. It is straightforward to show that these local log-odds ratios are all zero in the table above. The Rosenfeld parameterization captures none of the EAM differences between interracial and intraracial couples. It does not test status exchange theory.²

Rosenfeld’s parameter is meaningless as a test of status exchange theory. However, his parameter can be simplified to a parameter which does test status exchange theory. The coding scheme for this new parameter, which we refer to as α , results in the following comparison between the HE*WE tables of interracial and intraracial unions:

	black spouse	white spouse					
		<10	10-11	HS	SC	B	PG
$\log \frac{F_{21kl}}{F_{11kl}} = \log \frac{F_{12kl}}{F_{11kl}} = \log \frac{F_{21kl}}{F_{22kl}} = \log \frac{F_{21kl}}{F_{22kl}} =$	<10	0	$-\alpha$	$-\alpha$	$-\alpha$	$-\alpha$	$-\alpha$
	10-11	α	0	$-\alpha$	$-\alpha$	$-\alpha$	$-\alpha$
	HS	α	α	0	$-\alpha$	$-\alpha$	$-\alpha$
	SC	α	α	α	0	$-\alpha$	$-\alpha$
	B	α	α	α	α	0	$-\alpha$
	PG	α	α	α	α	α	0

²It can be shown that Rosenfeld’s parameterization is a constrained fit of the four two-way tables HR*HE, HR*WE, WR*WE, and WR*HE. Details are available from the authors upon request.

This parameterization simply divides the table into white hypergamy, homogamy, and white hypogamy. The local log-odds ratios of this new table define the boundary between homogamy and white hypergamy and hypogamy. We test this new parameter on Rosenfeld’s data using his Model 2 and Model 4. The results are shown in Table 1. The parameter fits strongly in the expected direction for Model 2, but becomes zero in Model 4 much as Rosenfeld’s original parameter did.

Although this finding may appear to vindicate Rosenfeld, a far more important problem remains. The terms HR*HE*WE and WR*HE*WE that Rosenfeld adds to models 3, 4, and 5 allow EAM to vary by the race of each spouse. However, because such differential patterns are expected by status exchange theory itself, these parameters in fact include information relevant to testing the theory. By fitting these terms, one can no longer evaluate status exchange theory with a single parameter.

Let us demonstrate this point more formally. According to status exchange theory, we expect the odds of interracial marriage to increase if the educational pairing of spouses involves upward marriage for the white person as opposed to educational homogamy. This statement can be expressed mathematically with the following odds ratio:

$$\frac{F_{21m(m-n)}/F_{11m(m-n)}}{F_{21mm}/F_{11mm}} \quad (2)$$

Where m is any value of education for both the husband and wife (educational homogamy), and n is any integer such that $0 < n < m$. This odds ratio shows how the odds of interracial marriage changes when we compare a white woman married homogamously to one married hypergamously in terms of education. Similar odds ratios could be constructed for black men, white men, and black women. If we substitute our α parameter for Rosenfeld’s term in Model 2, this parameter can be interpreted exactly as the log of all of these odds ratios, such that:

$$\frac{F_{21m(m-n)}/F_{11m(m-n)}}{F_{21mm}/F_{11mm}} = e^\alpha \quad (3)$$

Table 1: Comparison of Estimated Parameters

	Rosenfeld Parameter		Our Parameter	
	Model 2	Model 4	Model 2	Model 4
Estimate	0.07 (0.02)*	-0.06 (0.03)	0.11 (0.03)*	-0.09 (0.05)
G^2	2323.5	913.1	2320.4	913.25
DF	259	139	259	139
BIC	-1113.2	-931.3	-1116.3	-931.1

Standard errors in parentheses.

* $p < 0.001$

The estimate of the status exchange parameter in Model 2 simply “averages” over all of these odds ratios.

Model 4, however, changes the meaning of α considerably. Substituting our α parameter for Rosenfeld’s parameter, Model 4 can be written as:

$$F_{ijkl} = \lambda \lambda_i^{HR} \lambda_j^{WR} \lambda_k^{HE} \lambda_l^{WE} \lambda_{ij}^{HRWR} \lambda_{ik}^{HRHE} \lambda_{jl}^{WRWE} \lambda_{kl}^{HEWE} \lambda_{il}^{HRWE} \lambda_{jk}^{WRHE} \lambda_{ikl}^{HRHEWE} \lambda_{jkl}^{WRHEWE} e^{\alpha x} \quad (4)$$

The odds ratio from Equation 2 is now given by:

$$\frac{F_{21m(m-n)}/F_{11m(m-n)}}{F_{21mm}/F_{11mm}} = e^{\alpha \frac{\lambda_{2(m-n)}^{HRWE} \lambda_{1m}^{HRWE} \lambda_{2m(m-n)}^{HRHEWE} \lambda_{1mm}^{HRHEWE}}{\lambda_{2m}^{HRWE} \lambda_{1(m-n)}^{HRWE} \lambda_{2mm}^{HRHEWE} \lambda_{1m(m-n)}^{HRHEWE}}} \quad (5)$$

The measurement of the odds ratio changes dramatically. The α term alone no longer measures the log-odds ratio, but rather only in combination with a rather non-intuitive set of parameters. In effect, Rosenfeld has allowed the status exchange parameter measured in Equation 2 to vary across educational levels and race-gender groups. Therefore, α alone can no longer be considered a valid test of status exchange theory.

In order to test status exchange theory in Model 4, one needs to calculate the fifteen odds ratios associated with Equation 5 for white women, as well as the similar odds ratios for black men, white men, and black women. Table 2 shows the log of these odds ratios for each level of education. For a person of a given race and gender and holding the partner’s education at the row level, each value indicates the change in the log odds of interracial marriage when comparing a person married homogamously to a person married either hypergamously for whites or hypogamously for blacks. Status exchange theory predicts that each of these log-odds ratios will be positive.

The table clearly shows strong support for status exchange theory in unions involving black men and white women, where 24 of the 30 log-odds ratios are in the expected direction. However, there is little evidence of status exchange among white men and black women, where only 11 of the 30 log-odds ratios are in the expected direction. Although this gender disparity is an interesting and valuable finding, it could be modeled more parsimoniously by simply allowing the α parameter for Model 2 to vary by the gender type of interracial marriage, as shown in Table 3. Indeed, there is little gained in Rosenfeld’s Model 4 or his even less parsimonious Model 5 that would not be better achieved by calculating the log-odds ratios in Table 2 on the actual data (and thus implicitly the saturated model). The purpose of Model 2 is to provide a succinct summary measure of status exchange, which is not available in the other models which Rosenfeld introduces.

The same general logic applies to Rosenfeld’s critique of Qian and Fu presented in Tables 6 and 7. In both cases, he includes HR*HE*WE and WR*HE*WE terms that render Qian’s hypergamy ratios and Fu’s status exchange parameters meaningless. Furthermore, Rosenfeld makes another error in his treatment of the Fu model. In model F3 of Table 7, Rosenfeld includes the full interaction terms black*white*HE and black*white*WE. Yet, Fu’s status exchange parameters are themselves a constrained version of these terms. It is hardly surprising that Fu’s parameters change

Table 2: The change in the log-odds of interracial marriage when one spouse moves from homogamy to white hypergamy

	black men/white women				white men/black women							
	white woman's education				black woman's education							
homogamous (m)	hypergamous ($m-n$)		hypogamous ($m+n$)		hypergamous ($m-n$)		hypogamous ($m+n$)					
	<10	10-11	HS	SC	B	PG	<10	10-11	HS	SC	B	PG
<10 years	-0.29						-0.04	0.13	-0.59	-1.04	-0.82	
10-11 years	0.27	0.29					0.07	-0.44	-0.89	-0.25		
High School	0.66	0.34	-0.08					-0.19	-0.49	-0.54		
Some College	-0.38	1.27	0.32	0.37							0.04	-0.67
Bachelor's	0.59	0.22	0.41	-0.07	0.29							-0.49
Post-Graduate												
homogamous (m)	black man's education				white man's education							
	hypergamous ($m+n$)		hypogamous ($m-n$)		hypergamous ($m-n$)		hypogamous ($m+n$)					
	<10	10-11	HS	SC	B	PG	<10	10-11	HS	SC	B	PG
<10 years	0.25	0.56	0.89	-0.76	0.07							
10-11 years		0.04	0.09	0.63	-0.52	0.37						
High School			0.27	0.45	0.82	0.35	0.10					
Some College				0.35	0.06	0.39	0.26	0.20				
Bachelor's					0.80	-0.29	-0.22	-0.24	-0.12			
Post-Graduate						0.45	0.38	-0.11	-0.44	-0.23		

The relevant odds ratios are:

For black men: $(F_{21(m+n)m}/F_{22(m+n)m})/(F_{21mm}/F_{22mm})$

For white women: $(F_{21m(m-n)}/F_{11m(m-n)})/(F_{21mm}/F_{11mm})$

For black women: $(F_{12m(m+n)}/F_{22m(m+n)})/(F_{12mm}/F_{22mm})$

For white men: $(F_{12(m-n)m}/F_{11(m-n)m})/(F_{12mm}/F_{11mm})$

dramatically when one adds the unconstrained version to the model, but Fu’s parameters alone can no longer be used to evaluate status exchange. One must also examine the additional parameters in the unconstrained model.

The gender disparity we have discovered in Rosenfeld’s data is interesting in and of itself. In fact, this finding is perfectly consistent with Merton’s original theory which argued that a black woman’s status characteristics would not be valued on the marriage market to the same degree as a black man’s status characteristics. This finding also parallels the weaker support for status exchange Fu found for marriages between black women and white men. This gender disparity should be a focus of future research.

Rosenfeld’s critique of status exchange theory is broader than these log-linear models. None of his other arguments, however, are as important as Rosenfeld’s empirical claims which we have demonstrated are inaccurate. Nonetheless, we will briefly touch on two of Rosenfeld’s other points.

Rosenfeld argues that the recent use of complex log-linear models is inferior to the simple kinds of tabular analysis he presents in Table 1 of his article. This point is misleading. Models should be just complex enough to answer the question for which they are designed and no more. His simplistic tabular analysis fails to address the fundamental question of status exchange theory because it does not account for the effect of population composition on marriage outcomes. Log-linear models are the appropriate tool for overcoming this limitation. Rather than jettisoning log-linear models due to their complexity, we would suggest that log-linear models must be used carefully, with thoughtful consideration given to the meaning of key parameters.

Rosenfeld also argues that his data are superior to Census data because he captures short-duration marriages rather than younger couples. We agree that short-duration marriages are a better study population than younger couples, but an even better study population would be true marriage incidence data. Both Kalmijn (1993) and Schoen and Wooldredge (1989) use true incidence data from marriage records and find considerable support for status exchange theory, but

Table 3: General status exchange parameter estimated separately for black male/white female and white male/black female unions.

	Model 2
BM/WF Parameter	0.15 (0.03)*
WM/BF Parameter	-0.02 (0.06)
G^2	2314.5
DF	258
BIC	-1108.9

Standard errors in parentheses.

* $p < 0.001$

Rosenfeld does not address their work at all.

Like Rosenfeld, we are fans of robustness. However, we are more interested in the robustness of empirical results rather than the robustness of standard errors. Support for status exchange theory has been found across a variety of datasets, including vital statistics registers and at least two decades of Census data. It has also been found using a variety of approaches ranging from hypergamy ratios to Schoen’s harmonic mean-based marriage rates. For black male/white female couples, it has now also been found using Rosenfeld’s own data. Based on this record of empirical findings, it is unlikely that anyone in this field is ready to abandon status exchange theory.

The authors would like to thank Michael Hout and Thomas DiPrete for their helpful comments.

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