DOUBLE JEOPARDY OR COMPENSATING DISADVANTAGE? THE INTERACTION EFFECT OF GENDER AND RACE ON EARNINGS IN THE U.S.*

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Introduction

In the United States, two ascribed characteristics stand out for their strong association with labor force outcomes: Gender and racial/ethnic minority status. Indeed, a large body literature in both sociology and economics has been devoted to documenting the earnings differentials by gender and race/ethnicity and changes therein. In general, such work has found that women earn less than men and most racial/ethnic minority groups earn less than whites, and that human capital factors are insufficient to fully explain these differentials. Therefore, most researchers agree that being a member of a minority group and being female both represent significant disadvantages in the labor market. It follows that the labor market outcomes of minority women, who are disadvantaged in terms of both sex and race, warrant special concern.

In order to address the well-being of minority women in the labor market, one must first choose an appropriate reference group with which to compare them. One possibility is to compare female workers in a minority group to male workers in the group. This difference is sometimes called the gender "effect" (within the group). Another possibility is to compare female workers in a minority group to white female workers. This difference is sometimes called the race/ethnicity "effect" (among women). One natural, albeit naive, way to assess the outcome of minority women in the labor market is to assume that they experience a double earnings disadvantage associated with being both female and minority. That is, as King (1988) points out, many researchers have assumed that the effects of race and gender are additive – minority women's total disadvantage is simply the sum of their race penalty and their gender penalty. This assumption means that minority women are affected by race in the same way as minority men, and affected by gender the same way as white women. We call this assumption "double jeopardy." The "double jeopardy" characterization is problematic because it ignores the ways in which minority

women's experiences are unique, comparable neither to those of white women nor to those of men of the same race/ethnicity (King 1988).

There is already a great deal of evidence that calls into question the "double jeopardy" characterization. While minority women of most ethnicities are clearly disadvantaged, their earnings are often still higher than one might predict based on their race and sex alone. Among African Americans, many studies have shown that the earnings of black women are higher relative to white women than those of black men relative to white men (Blau and Beller 1988, 1992; Cancio, Evans, and Maume 1996; Carlson and Swartz 1988, King 1988, Marini 1989). While fewer studies have considered other races and ethnicities, several have uncovered a similar pattern among various Hispanic and/or Asian ethnic groups in relation to whites (Carlson and Swartz 1988, England, Christopher, and Reid 1999, Xie and Goyette 2004). Despite such evidence, very little attention has been paid to uncovering the exact nature of the apparent interaction between race and gender in determining earnings. Even studies that uncover such an interaction in the data frequently fail to comment on it (i.e., Blau and Beller 1992), focusing instead on either within-race or within-sex comparisons.

An alternative formulation allows race and gender to have interactive effects. That is, being female may have different implications according to race, and the effect of race may not be the same for men as for women. Many studies have implicitly allowed for such interactions by either estimating separate models of the effect of race on earnings for men and women, or separate models for the effects of gender on earnings for minorities (usually African Americans) and whites (i.e., Blau and Beller 1988. Others have compared white women, minority men, and minority women all to white men, but have not commented explicitly on the nature of the interaction between race and sex (i.e., Corcoran and Duncan 1979, Avalos 1996, Xu and Leffler 1992). Still others have explicitly mentioned the interaction between race and gender, but have focused on differences in the earnings determination process across groups without first establishing the nature or size of such an interaction (Kilbourne, England and Beron 1994, England, Christopher, and Reid 1999). A few studies have looked at the relative size of the effects of

gender and race, with the partial objective of determining which is a more important determinant of the earnings disadvantage of minority women (Cotton 1988, Durden and Gaynor 1998).

To date, no study has thoroughly explored the interactive effects of race and gender in determining earnings. We propose to remedy this gap in three ways: First, we will systematically test the extent to which the effects of race and gender deviate from the assumption of additivity. Second, we will examine gender inequality in earnings across all major racial and ethnic minority groups in the United States. While previous studies have examined one or two groups at a time, no research has explored the extent to which the interaction between gender, race, and earnings varies across race/ethnic group. While there are strong indications of a positive interaction for African American women (and a few indications of a similar effect for certain groups of Asian American and Hispanic women), it is unknown whether this pattern may hold for minority groups more generally. Finally, we will also document how the race/gender interaction may vary across subgroups within a racial/ethnic category. For this portion of the analysis, we will divide our sample into groups defined by marital and family status.

Methodology:

If there is no interaction between race and sex, then the earnings ratio of minority women can be determined as simply an additive function of their race-based and sex-based disadvantages. In this case, the earnings ratio of minority women could be inferred from two pieces of information: The female-to-male earnings ratio among whites, and the minority-to-white earnings ratio among males. This can be illustrated with the following 2X2 table:

Earnings Ratio Relative to White Men:

	Men	Women
White	1	.8
Minority	.9	X

Here, in the absence of an interaction, minority women will have an earnings ratio of .72. That is, relative to minority men they suffer a penalty of 20%, the same as the penalty suffered by white women relative to white men. Relative to white women, minority women suffer a penalty of 10%, the same as the penalty

of minority men relative to white men. This can be calculated as the product of the wages ratios of white women and minority men, .8X.9.

To facilitate discussion, we will work with the natural logarithm transformation of earnings. This allows us to discuss the relationship between sex and race in log-additive, rather than multiplicative, terms. The relationship can be stated in log-additive terms with reference to the following table. Let k denote the kth group, with k= 1, …K.

Log of earnings:

	Men	Women
White (k=1)	Y_{11}	Y_{12}
Black (k=2)	Y_{21}	Y_{22}
Mexican (k=3)	Y_{31}	Y_{32}
. . .		
K	Y_{K1}	Y_{K2}

In the absence of an interaction, the gender effect is defined to be the same across racial/ethnic groups:

(1) $Y_{12} - Y_{11} = Y_{22} - Y_{21} = \ldots = Y_{k2} - Y_{k1} \ldots = Y_{K2} - Y_{K1}$

Thus, the female-to-male ratio in earnings is: $\exp(Y_{12} - Y_{11}) = \exp(Y_{22} - Y_{21}) = \ldots = \exp(Y_{K2} - Y_{K1})$

Equivalently, we also have a race/ethnicity effect that does not vary by gender:

(2) $Y_{11} - Y_{21} = Y_{12} - Y_{22;} \ldots Y_{11} - Y_{K1} = Y_{12} - Y_{K2}$

Now let us define the following quantity (which is actually the difference-in-difference estimator)

(3) $d_k = (Y_{k2} - Y_{k1}) - (Y_{12} - Y_{11})$

The condition of no interaction means that $d_k = 0$, for all k=1…K.

That is, the earnings difference between whites and minority group k is the same for men and women, and the earnings difference between men and women is the same for whites and for minority group k. This indicates that there is an additive effect of being minority and being female – that is, minority women suffer the full disadvantage of each status. This formulation represents the "double disadvantage" characterization assumed in much of the previous literature.

If the effects of being minority and being female are not merely additive, there are two possible alternatives. The first case is as follows:

(4) $Y_{11} - Y_{12} > Y_{k1} - Y_{k2}$

(or equivalently $Y_{11} - Y_{K1} > Y_{12} - Y_{K2}$)

Here, we have $d_k > 0$. If $d_k > 0$, there is a positive interaction between being minority and being female. This positive interaction can be interpreted to mean that there is a smaller penalty for being female among minorities, or a smaller penalty for being nonwhite among females. We call such a positive interaction a "compensating disadvantage."

Alternatively, there could be a negative interaction between being minority and being female. If this is the case, we would expect the following equations to hold:

(5) $Y_{11} - Y_{12} < Y_{k1} - Y_{k2}$

(or equivalently $Y_{11} - Y_{k1} < Y_{12} - Y_{k2}$)

In this case, $d_k < 0$. This negative interaction can be interpreted as meaning either that being nonwhite carries a greater penalty for females than males, or being female is a greater disadvantage among minorities than among whites. Such a negative interaction can be termed a "compounding disadvantage."

We examine the relationship between race and sex in earnings determination using the following methodology: For each racial or ethnic group k, we compute the quantity d_k, which represents the difference between the minority sex earnings gap and that of whites. Previous literature leads us to expect to find that d_k is positive for some racial groups, but it is not known how generally this is true. Although we have no theoretical reason to believe that d_k may be negative for any group, such a relationship is possible and cannot be ruled out a priori. In addition to the unadjusted d_k, we will compute d_k after adjusting for basic wage-relevant characteristics. These include education, experience, and region.

Finally, we will examine d_k across subpopulations. Human capital theory posits that specialization within families is responsible for much of the sex earnings gap. If the sex earnings gap does vary across family type, this could relate to the race-sex interaction in two ways. First, racial differences in marriage and fertility rates could lead to racial differences in the sex earnings gap. Second,

the effect of family type may vary across racial groups. Specifically, historically high rates of labor force participation among certain groups of minority women imply that the human capital theory of role specialization may apply more to whites than to other groups in the U.S. If this is true, we would expect to see less variation in the sex earnings gap by family type for minority groups than for whites. Due to these considerations, we will disaggregate the sample by family type and re-compute d_k.

Data

We use data from the 2000 PUMS. In order to get desirable sample sizes for each of our racial groups, we use the following technique. Due to the small number of Asian Americans, we take all persons who report any Asian ancestry from the 5% file. All other groups, with the exception of non-Hispanic whites, are taken from the 1% file. Finally, a sample of 1 in 10 non-Hispanic whites is taken from the 1% file. When computing descriptive statistics, we weight the data accordingly.

Because the process of wage determination is more complex for immigrants than for the native-born, we examine only U.S.-born workers. In order to assure that our comparisons are made among similar workers, we restrict our sample to full-time, full-year workers between the ages of 25 and 55. (We recognize that looking only at full-time, full-year workers prevents us from examining one important source of both racial and sexual earnings inequality – namely, labor supply.) We create a system of 19 mutually exclusive racial categories. Because Hispanics are treated as an ethnic rather than a racial category in the Census, Hispanics can be of any race. Therefore, in order to achieve exclusivity, our coding system gives priority to Hispanic ethnicity. If an individual reports Hispanic ethnicity, he or she is coded into the appropriate Hispanic category, regardless of race. All individuals in race categories other than "Mexican," "Cuban," "Puerto Rican," or "Other Hispanic" are non-Hispanic. Table 1 gives sample sizes of each of our racial/ethnic groups.

Preliminary Results

Table 2 provides preliminary results from our analysis. The racial categories are listed in order of highest to lowest earnings among men (with the exception of whites, who are listed first as the reference

category). Columns 1 and 2 present the geometric mean earnings of each racial group for men and women, respectively. Column 3 gives the female-to-male earnings ratio within each racial group. While white women make about .7 times the earnings of white men, it is clear that women's relative earnings are higher in most other racial groups. Column 4 gives the earnings ratio relative to white men for minority men of each group. Column 5 gives the antilog of the quantity d_k, defined above. A positive value of d_k corresponds to $\exp(d_k)$ being greater than 1, while a negative value corresponds to d_k less than 1. The exponentiated d_k can be thought of as the ratio of minority women's observed to predicted earnings, where predicted earnings are based on the assumption of additivity between race and sex effects.

The results in Column 5 are striking. In every case, $\exp(d_k)$ is greater than 1. For 13 out of our 18 minority groups, it is also statistically significant. This is strong evidence that the effects of race and sex on earnings are not additive. Instead, there appears to be a positive interaction between being female and being a member of a minority group. This interaction is widespread across different ethnicities, with groups as diverse as Mexicans, Filipinos, and Native Americans all showing evidence of such an effect.

The next section of our analysis will re-calculate d_k adjusting for human capital factors and region of residence. We will then proceed to test whether our results are robust across different family types.

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Table 1: Sample Sizes by Race

Race	N
White Only	49,895
Chinese	4,674
Asian Indian	972
Korean	673
Japanese	6,133
Cuban	677
Other, multi-eth Asian	1,211
Asian-white	3,600
Black-Asian	352
Filipino	3,474
Other	5,414
Vietnamese Only	211
Black-white	368
Native Am.-white	2,555
Other Hispanic	7,027
Puerto Rican	6,110
Mexican	16,168
Black	57,827
Native American	4,301

Table 2: Earnings and Relative Earnings by Race and Sex

	(1) Mean Annual Earnings - Men [1]	(2) Mean Annual Earnings - Women [1]	(3) Female-Male Earnings Ratio (within race)	(4) Minority-white Earnings Ratio (for men)	(5) **Observed-Predicted Earnings Ratio (women)** [2]
White Only	40,600	28,700	0.706	1	**1.000**
Chinese	54,600	44,100	0.809	1.343	**1.145** ***
Asian Indian	47,700	38,300	0.803	1.174	**1.137** **
Korean	46,300	39,700	0.857	1.141	**1.214** ***
Japanese	48,600	38,300	0.787	1.198	**1.114** ***
Cuban	41,000	31,100	0.759	1.010	**1.075**
Other, multi-eth Asian	39,500	33,400	0.846	0.973	**1.198** ***
Asian-white	39,800	32,600	0.818	0.980	**1.158** ***
Black-Asian	38,900	29,900	0.767	0.958	**1.086**
Filipino	37,900	32,000	0.845	0.934	**1.196** ***
Other	35,700	28,600	0.802	0.878	**1.136** ***
Vietnamese Only	35,300	27,300	0.773	0.870	**1.094**
Black-white	34,800	27,400	0.785	0.858	**1.112** *
Native Am.-white	33,600	23,800	0.708	0.827	**1.003**
Other Hispanic	32,800	24,900	0.760	0.807	**1.077** ***
Puerto Rican	31,900	26,600	0.833	0.786	**1.179** ***
Mexican	31,300	24,800	0.794	0.770	**1.124** ***
Black	30,000	25,200	0.839	0.740	**1.189** ***
Native American	29,800	22,900	0.768	0.733	**1.087** ***

*Race-sex interaction statistically significant at the .1 level.
**Race-sex interaction statistically significant at the .01 level.
**Race-sex interaction statistically significant at the .001 level.

(1) Geometric mean of annual earnings
(2) Given by $\exp(d_k) = \exp[(Y_{11} - Y_{12}) - (Y_{k1} - Y_{k2})]$