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IZA DP No. 13594

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ABSTRACT

Education, Spatial Disparities in Schooling and Black-White Interracial Marriage[1]

This study investigates the observed positive relationship between educational attainment and likelihood of black-white interracial marriages. Different from the previous studies that focus only on the role of individual education levels in interracial marriages, this study contributes to the literature by examining the impact of the spatial variations in relative black/white educational distributions in marriage markets. The first contribution of this study is to provide an answer to the low black-white intermarriage rate puzzle by suggesting that as black and white educational differences in general between lessen and as individual educational attainment increase black-white interracial marriages may not become more common. The relative importance of three mechanisms through which education may affect intermarriage probability is examined: (1) racial adaptability effect, (2) enclave effect, and (3) educational dissimilarity effect. Using the U.S. Census Data, this study's second contribution is the finding that the enclave and the educational dissimilarity effects are more important than the racial adaptability effect in explaining intermarriage probability of black males. Our results suggest that rising black individual educational attainments may not always result in an increased intermarriage likelihood. Differences in the black and white education distributions have a significant impact on the black/white interracial marriage probability.

JEL Classification: I21, J12, J15

Keywords: education, black-white interracial marriage, human capital

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1. Introduction

Maintaining good relations in a multiracial society depends on the extent to which different racial groups interact. One important aspect of these interactions is interracial marriage, which may underline the extent to which racial lines are crossed in a society. Using the 2000 U.S. Census data set, this study investigates the relationship between individual education, black and white education distributions in a marriage market, and the intermarriage probability of black men.

Some researchers argue that 1980s and 1990s marked a continuous decline in prejudice against black population (Firebaugh & Davis 1988, Kalmijn 1993, Schuman et. al. 1997). Black and white populations were becoming less dissimilar in terms of occupational distributions around the same time frame (Farley & Allen 1987). At the same time, racial segregation was declining in major cities since the 1970s (Massey & Denton 1987, Feagin 1991). Interracial marriage rates have been increasing, which suggests that racial distance have somewhat declined between whites and racial minorities (Qian 1999). Herman and Campbell (2012) find that 85 percent of white men and women consider intermarriage acceptable, however, improvements in attitudes do not imply a sharp increase in interracial marriages. Given the improvements in educational, cultural, legal, and economic aspects of black progress, researchers are puzzled that the black-white interracial marriages are still much lower than would be expected based on relative population sizes (Heaton & Jacobson 2000; Qian 1997; Wong 2003a, 2003b). The first contribution of this study is to provide an answer to the low black-white intermarriage rate puzzle by suggesting that as black and white educational differences get smaller and as educational attainment of a black man increase, contrary to what is expected, black-white interracial marriages may not become more common.

The second contribution of this study is to uncover the dominant channel(s) among three mechanisms through which education may affect black-white intermarriage probability (IMP) for black males. This study borrows Furtado's (2006, 2012) theoretical model and classification of mechanisms through which human capital may affect interethnic marriages between immigrants and natives in the U.S. The first mechanism is what we call as the *racial adaptability effect*, which is similar to Furtado's (2006, 2012) cultural adaptability effect and Gordon's (1964) assimilation theory. The racial adaptability effect asserts that intermarriage likelihood is higher for more educated individuals because they are exposed to people of other races more frequently due to increased opportunities to experience diverse environments and they are expected to be more comfortable sharing a household with someone of a different race. Demo and Hughes (1990) find that interracial interactions during childhood and

adolescence and higher socioeconomic status have a negative impact on in-group attachment for black population. Moreover, Schuman et al. (1997) and Jacobson and Johnson (2006) find that interracial marriages and opposition to anti-miscegenation laws relate positively to educational level among white population.[2] These studies affirm that education changes perceptions and attitudes towards other racial groups.

The second mechanism is the *enclave effect*, which was introduced by Furtado (2006, 2012). The enclave effect suggests that more educated black individuals are more likely to leave their racial enclaves. When they migrate out of their racial enclaves, they may move to places that have a lower concentration of black population, which, in turn, makes it easier to meet potential spouses of other races, and thus increases the probability of intermarriage. The enclave effect is related to Gullickson's (2006a) isolation theory.

The third mechanism that may affect IMP is the *educational dissimilarity effect*, which considers relative black-white education distributions in a marriage market. Unlike the racial adaptability and enclave effects, the educational dissimilarity effect suggests that the impact of an increase in education on the probability of intermarriage depends on the variations in education distributions across different races. The number of available black men has been declining in the U.S. (Kalmijn 1993, Charles & Luoh 2010). Due to reduced competition, marriage market for eligible and highly educated black men has improved. However, this study hypothesizes that whether this improvement will increase a black male's IMP depends on the local marriage market conditions. In a marriage market where black average education is much lower than white average education, a highly-educated single black man may have less competition because such men rare in those marriage markets. Also, in such marriage markets, a well-educated black man who prefers a highly educated spouse of the same race may be willing to give up racial similarities for educational similarities if it is less likely for him to find a highly-educated black spouse than to find a highly-educated non-black spouse. This scenario is less plausible because black men, on average, have lower years of schooling than black women. In either case, the IMP of a black man with higher levels of schooling increases in a marriage market where on average black-white education gap is larger. On the other hand, in a marriage market where black and white populations have similar educational distributions, a highly educated black man's IMP may not be higher because sorting based on race may take precedence. Therefore, the impact of individual education on the intermarriage probability of black men depends on the relative black/white educational distributions. The educational dissimilarity

[2] Authors find that 67 percent of whites and 83 percent of blacks approved of interracial marriages.

mechanism corresponds to Furtado's (2006, 2012) assortative mating effect and is consistent with the hypothesis suggested by Qian and Lichter (2007) that higher educational attainment does not translate into higher intermarriage rates.

Using 2000 U.S. Census data, this study finds that the educational dissimilarity effect and the enclave effect are more important than the racial adaptability effect in explaining the relationship between education and intermarriage probability of black males. An additional year of education increases the IMP for black male with average years of education (on average, black men have 13.2 years of schooling) by 0.4 percentage points, which is a large effect given the baseline 7.3 percent intermarriage probability. However, the direct effect of individual education in explaining intermarriage probability vanishes when we account for certain aspects of educational distributions of black and white populations. In line with the educational dissimilarity mechanism, the results suggest that the geographical variations in relative distributions of black-white educational levels have a significant impact on the probability of intermarriage. An additional year of education obtained by black male (with average education—13.2 years) in the metropolitan statistical area (MSA) with the highest educational gap increases his IMP by 0.921 percentage points, while an additional year of education obtained by a black male with average education in the MSA with the lowest educational gap increases his IMP by only 0.004 percentage points.

2. Background, Previous Literature, and the Identification Strategy

Existing studies have explored various aspects of black-white relationships and characteristics of those who cross racial lines in the domain of matrimony. These studies reveal several important aspects of these marriages in the U.S. First, black-white interracial marriages have become more common since the U.S. Supreme Court repealed laws banning interracial marriages in the case of Virginia v. *Loving* in 1967 (Gevrek, 2014). Black males are more likely to be married outside of their race than are black females even though during slavery white male and black female relationships were more common (Kalmijn 1993, 1998; Qian 1997, 1999; Heaton & Jacobson 2000; Fu 2001, 2007; Qian & Lichter 2001, 2007, 2011; Lee & Bean 2004; Harris & Ono 2005; Gullickson 2006b; Batson, Qian, & Lichter 2006; Fryer 2007; Belot & Fidrmuc 2010; Lewis & Ford-Robertson 2010). Higher frequency of black male/white female marriages is consistent with previous research that finds that white women and black men have more positive attitudes toward their race intermarrying than white men and black women (Paset & Taylor 1991, Rosenblatt et al. 1995, Zebrowski 1999).

Figure 1 plots Interracial Marriage Rates (IMRs) for black males and females.[3] While the IMRs for both groups were almost the same in 1962, the black male IMR has been much larger than the black female IMR in subsequent years. The IMRs for black males and females have increased 9.5-fold and 5-fold respectively from 1962 to 2005.

[Figure 1 here]

Second, an important aspect of black-white intermarriages is that education is found to be positively correlated with intermarriage probability. Previous literature focuses on three theories to explain this positive relationship.

First, the *status exchange theory*, which is highly dated, suggests that black-white marriages are usually formed through an exchange relationship in which black partners trade in their higher socioeconomic status (higher education) for higher social status of having a white spouse (Davis 1941, Merton 1941). According to this theory, interracial marriages should involve black partners marrying down while white partners marrying up in terms of education. Previous literature finds that whites in interracial unions are more likely to marry up in education in the U.S. (Kalmijn 1993, Qian 1997, 1999, Fu 2001). On the other hand, more recent studies contradict the findings of these older studies. For example, Fu (2008) provides evidence that couples have similar educational statuses in black-white marriages and there is no evidence of status exchange in intermarriage to whites.

Second, *the assimilation theory* considers education as a big force in the assimilation of racial groups because education increases interracial contact and weakens attachment to one's own race. According to the assimilationist perspective, intermarriage probability is expected to increase with education and interracially married couples are expected to be educationally homogamous (Gordon 1964, Gullickson 2006b). The racial adaptability mechanism of this current study is similar to the assimilation theory.

Several studies consider how the prevalence of racial segregation might affect this relationship, particularly regarding the isolation of black populations from the lower-socioeconomic groups. Third, *the isolation theory*, which was first introduced by Gullickson (2006a), suggests that in the post-Civil Rights era, lower socioeconomic status (SES) black groups are being isolated more and more from the

[3] The black male (female) IMR is the ratio of black males (females) with white spouses to the total number of married black males (females). We use 1962-2005 Current Population Survey (CPS) March supplements data to calculate IMRs for each year.

intermarriage market. Different from the status exchange theory, isolation theory implies that the educational attainment of a potential white spouse does not have any impact on the relationship between a black individual's education and his intermarriage probability. Theory predicts that black males with lower education levels will have less access to the marriage and intermarriage market, while black males with higher education levels will have a more access to the intermarriage market.[4] The *enclave effect* of this study is similar to Gullickson's isolation theory. All three theories predict that highly educated black males are more likely to be intermarried. The only difference between these theories is their predictions of the educational selection of white spouses. This current study contributes to the literature of black-white intermarriages in the U.S. by attempting to identify the mechanisms through which education might affect intermarriage probability of black males.

Previous research has examined the relationship between local marriage markets and educational sorting of couples in other contexts (Blau et al. 1982, Lichter, Anderson & Hayward 1995, South & Crowder 1999, Crowder & Tolnay 2000, Lewis & Oppenheimer 2000. Although Gullickson (2006a) was the first to study the relationship between educational distributions and interracial marriages, current study expands on the literature by introducing the idea that relative black-white educational distributions in local marriage markets interacted with individual education should matter to the intermarriage probabilities of black men after controlling for marriage market conditions.

2.1. Identification Strategy

To disentangle the racial adaptability effect from the educational dissimilarity effect and the enclave effect, this study uses the identification strategy derived from the theoretical model provided by Furtado (2006). In the interethnic marriage context, Furtado (2006, 2012) and Furtado and Theodoropoulos (2011) focus on the effects of different educational distributions of immigrants of various ethnicities in the U.S. Authors use a one-sided matching model in which individuals prefer to marry within both their ethnicity and educational level. Because searching for a spouse entails cost, individuals may trade similarities in ethnicity for similarities in education. The theoretical model implies that the impact of education on intermarriage through the cultural adaptability effect is always positive, while the impact of education through the assortative mating effect is ambiguous and depends on the

[4] This prediction is in line with the fact that racial segregation declined since 1970s, but higher SES black groups are less segregated than are lower SES black groups (Kalmijn 1993).

difference between average education in the ethnic group and the rest of the population. Our racial adaptability effect and educational dissimilarity effect are conceptually similar to Furtado's cultural adaptability effect and assortative mating effect, respectively.

In the interracial marriage framework, Furtado's model provides the following insights: the racial adaptability effect implies that if an individual's education increases, the probability of intermarriage always increases. The educational dissimilarity effect, on the other hand, takes the relative educational distributions of black and white populations into consideration. The positive impact of individual education on intermarriage likelihood is expected to be much larger in marriage markets where there are large differences in white-black educational distributions compared to marriage markets where there are small differences in white-black educational distributions.

In the regression framework the racial adaptability effect is captured by measuring the marginal effect of years of education on interracial marriage probability (IMP). The racial adaptability effect is present if the coefficient of the years of education variable is positive and statistically significant in the IMP equation.[5] The educational dissimilarity effect can be identified by utilizing the interaction between individual education and the variable capturing relative white-black educational distributions. If the coefficient of the average white-black educational gap and its interaction with years of schooling are statistically significant, while the coefficient of individual education no longer is, then one can conclude that the educational dissimilarity effect dominates the racial adaptability effect.

It is challenging to capture the enclave effect because the smallest identifiable geographical area in the Census data is the metropolitan area of residence. We use the residential segregation index in MSAs to capture the enclave effect. Residential segregation is found to have strong adverse effects on labor market and social outcomes of black individuals relative to white individuals (Collins & Margo 2000). The level of residential segregation is expected to be negatively related to the various aspects of interracial relationships, particularly intermarriage patterns in a locality. In the empirical model, to account for the enclave effect, we include various other variables that measure the population of black males and females, available black males and females, and various sex ratios in a black male's MSA of residence.

[5] Note that in the IMP equation, the dependent variable is an indicator variable that takes on the value of one if a black male is married to a white female and zero if he is married to a black female.

3. Data and Summary Statistics

This study uses the 5 percent sample of Integrated Public Use Microdata Series (IPUMS) of the 2000 U.S. Census Data. The sample is restricted to married non-Hispanic black males aged 25-54.[6] The focus is exclusively on the black-white marriages, even though some of the previous literature focuses on marriages between various racial/ethnic groups. This is a deliberate choice because this study explores the black-white racial divide without the added complexity of ethnicity, immigration, and nativity. The focus was intentionally put on black male-white female marriages, because the black female-white male interracial marriages are very rare (IMR among these groups is around 2% in 2000) and the small size of this group make the estimates highly unstable and insignificant across models.[7] This paper focuses on marriages, although black-white intimate relationships in U.S. history have not necessarily been marital. A focus on marriages is a common choice of the previous literature because crossing racial lines via marriage is considered to be the most visible sign of decreasing social distance, which sends a signal that racial lines could be permeable.

The Census data set is the only large enough data that allow us to study black-white marriages. However, one must keep in mind its limitation. It is a cross-sectional data in that each couple is observed once with no information on previous relationships. Therefore, the focus is on married individuals who currently live with their spouses.[8] Even though using the Census data has its limitations, the large samples enable one to construct accurate measures of education distribution and marriage market conditions in each MSA and in each race, gender and age-group.[9]

Defining marriage market is a difficult task. The proper definition should focus on one's social network, but the Census data do not provide sufficient information to identify social networks. Given the popularity of the mobile dating applications, we now have a deeper understanding of the locational preferences of people in the dating markets. A recent survey reveals that the 62 percent of single people search for a date within their 30-mile radius.[10] Previous research finds that marriages tend to form within

[6] The results do not change when the sample of Hispanic black males are included in the analysis.
[7] Unreported results are available upon request from the contact author.
[8] If intermarried couples are more likely to divorce, then using crosssectional data may underestimate the incidence of intermarriages and cause a marital dissolution bias. Although literature finds that divorce and race or ethnicity are strongly associated, previous research finds no evidence that crossing a black-white racial boundary per se increased the divorce risks (Zhang & Van Hook 2009, Jones 2010, Fu & Wolfinger 2011).
[9] Other data sets make it difficult to construct accurate measures that proxy local marriage market measures within finely defined cells due to small sample sizes.
[10] https://www.theladders.com/career-advice/2019-survey-on-dating-and-distance-how-far-are-people-willing-to-look-for-love

local areas (e.g., Blau et al. 1982, South & Crowder 1999, Lewis & Oppenheimer 2000, Gould & Passerman 2003). Our identification strategy hinges upon the assumption that the metropolitan area (MSA) can be considered as the local marriage market. Our choice is consistent with the previous research that deems that MSAs approximate marriage markets well (Gould & Paserman 2003). Gould & Paserman (2003) find that most of the population does not often move between MSAs. The authors find that among the most mobile age group (20-30 years of age) who lived in an MSA in 1975 and 1985, 73 percent and 75 percent of them lived in the same MSA in 1980 and 1990 respectively. Authors find that these percentages to be much higher for other age groups.

This study considers education (measured by years of schooling) rather than individual earnings as a determinant of intermarriage for two reasons. First, individual education is highly predictive of future earnings and a strong proxy for ultimate socioeconomic status. Many people get married when young, and they do not observe the future earnings of a potential spouse; rather they form expectations based on education and other personal attributes that are unobservable to researchers. Second, Wong (2003a; 2003b) finds that education is a more desirable spousal feature than earnings for black males.

This study uses the black-white mean educational gaps and black-white education standard deviations in MSAs as our measures of education distributions. To measure the extent of black-white interactions and to proxy for the enclave effect, current study uses various residential segregation indices. The black-white residential segregation index, which is the most frequently used one, quantifies whether different groups tend to live in the same neighborhoods or not. The index measures the percentage of black population that would have to change residence for each neighborhood to have the same percentage of black population as the geographical area overall.[11] The index ranges from 0 (complete integration) to 100 (complete segregation). We expect a negative relationship between the segregation index and interracial marriage probability. While the residential segregation index in an MSA varies from census to census, we find that pairwise correlations between these indices in years 1980, 1990 ad 2000 are at least 0.92.

In the empirical analysis, each black man is matched to the measures of local marriage market conditions and to the measures of educational distributions in his MSA. Marriage market conditions are proxied by total MSA population, number of black males and females, number of available black males

[11] This study uses the dissimilarity index calculated by the U.S. Census Bureau using 1980, 1990, and 2000 Census data sets. See http://www.census.gov/hhes/www/housing/resseg/excel_msa.html for more information on various segregation indexes. Our main index is based on MSAs that are divided into census tracts that contain, on average, about 4,000 residents.

and females, and by various sex ratios.[12] We include these population variables to account for the probability that a black male meets a potential partner. Previous research finds that black individuals are less likely to intermarry in states and MSAs where the percentage of black population is larger, which is observed both in and outside of the South (Kalmijn 1993, 1998, Qian 1999). We expect a negative relationship between relative group size and IMP (Blau 1977, Blau et al. 1982, Blau & Schwartz 1984). The sex ratios capture the extent to which a black man competes for the same limited pool of women. The sex ratio hypothesis assumes that marriage rates are shaped by the availability of members of the opposite sex (Akers 1967, Guttentag & Secord 1983). All these variables are used to measure the overall quality and quantity of the marriage pool faced by black men in MSAs. Also controlled for are the region of residence, age and age squared, because previous studies find that region of residence matter to interracial marriage probability (Qian 1999) and those who married interracially tend to be younger than those who did not (Tucker & Mitchell-Kernan 1990, Heaton & Jacobson 2000).

3.1. Summary statistics

Our final sample consists of 82,451 black men aged 25-54 who are residing 321 metropolitan areas (MSAs) in the 2000 census. Table 1 shows descriptive statistics for full, interracially and intraracially married black males. Black males with white spouses have, on average, 0.45 years more schooling than those with black spouses.

[Table 1 here]

Intermarried black men live in MSAs with higher black mean education and lower white mean education. White-black mean education gap is 1.21 years for the entire sample, and interestingly, it is much lower at 1.12 years in the MSAs where intermarried black males live. Intermarried black males live in MSAs with lower segregation index. Education standard deviations in MSAs are similar for inter- and intra-racially married black men. Interracially married black males live in MSAs with a smaller black population and with fewer available black males and females. They are younger, much less likely to live in the South, much more likely to live in the West and in MSAs with a much smaller black male/white

[12] The "available" individuals are defined as noninstitutionalized and unattached individuals (never married/single, divorced, and widowed) that live in a MSA. We include black male/black female, black male/white female, white male/black female, and white male/white female sex ratios in MSAs.

female sex ratios. Table 1 reveals that non-identical black and white educational distributions and marriage market characteristics may be important in explaining black male intermarriages.

The educational distribution variables are measured at the time and location where the survey was conducted. Ideally, one would prefer these variables measured at the time and locality where these married couples searched for spouses. Unfortunately, the Census data set does not contain this information. The credibility of our identification strategy hinges on the assumption that black males were exposed to the same educational distribution variables at the time of marriage. To alleviate those concerns, for the robustness of our results, the model was also estimated for the sample of black males whose birth state is the same as their current state of residence. The rationale for this robustness check is that a black male who lives in his birth state at the time of survey is more likely to have gotten married in his current state of residence. There is a possibility that his exercise cannot fully address the possibility that the educational distribution variables changed over time. To tackle this issue, black-white mean educational levels based on 1980 and 1990 Census data sets were constructed and compared with 2000 black-white mean educational levels. The results show that no significant changes in black and white mean schooling occur at the state level over time.[13]

Next, the same exercise at the MSA level is repeated. The black mean education, white mean education and white-black mean educational gaps by MSAs are found to be highly correlated across the 1980, 1990 and 2000 Census data sets.[14] These exercises provide evidence that no significant changes in educational distribution variables occur either at the MSA or at the state level over time. Therefore, using the educational distribution variables based on 2000 Census data is not likely to cause any bias in the estimation.

4. Econometric Model and Results

We estimate the following model:

$$(1) \quad \Pr(IMP_{ij}) = \Phi[\, \phi_0 edu_{ij} + \phi_1 edu_{ij}(\overline{edu_{wJ}} - \overline{edu_{bJ}}) + \phi_2(\overline{edu_{wJ}} - \overline{edu_{bJ}}) + X_{ij}\beta + \varepsilon_{ij} \,]$$

where IMP_{ij} is an indicator variable that takes on a value one if black male *i* who resides in MSA *j* and married to a white female, and zero if he is married to a black female. The educational level of a

[13] The results are not reported here to conserve space but are available upon request.
[14] Unreported results are available upon request from the contact author.

black male who resides in MSA *j* is given by edu_{ij}. The black and white mean education in MSA *j* is $\overline{edu_{wj}}$ and $\overline{edu_{bj}}$ respectively. The variable $(\overline{edu_{wj}} - \overline{edu_{bj}})$ represents the white-black mean educational gap. The interaction term of individual education with the mean educational gap is included to account for the educational dissimilarity effect. X_{ij} is a vector of variables that includes segregation index in MSAs, black and white education standard deviations, age, age squared, region of residence dummies, sex ratios, population variables, and the proportion of people who are of individual *i*'s race, of the opposite sex, and are residing in MSA *j*. The model fitted with the probit estimation method under the assumption that the error term ε_{ij} is normally distributed and $\Phi[.]$ is the standard normal cumulative distribution function.

4.1 Results

Table 2 shows the marginal effects calculated at sample averages after estimating a Probit model for four specifications of Equation (1). The marginal effect of the interaction term and its standard error are calculated following the method suggested by Ai and Norton (2003). Robust standard errors are adjusted for clustering at the MSA level. While the first column shows the racial adaptability effect in isolation, the second and third columns introduce the enclave effect and the fourth column adds the educational dissimilarity effect. Starting with the second specification, the education standard deviations, population variables, the number of available black males and females, and four different measures of sex ratios are added to the model.

[Table 2 here]

The first column of Table 2 shows that as the educational attainment of black male with average education level (average education of a black male is approximately 13.2 years) increases by one year, his interracial marriage probability (IMP) increases by approximately 0.4 percentage points. This effect is substantial given the 7.3 percent interracial marriage rate for black males. Without controlling for educational distributions, one cannot reject the presence of the racial adaptability effect of education on a black male's intermarriage likelihood. As expected, age has a negative and the quadratic of age has a

positive coefficient. Compared to the West, intermarriage is less likely in the Northeast and the Midwest, and it is least likely in the South.[15]

The second column of Table 2 indicates that when we control the education standard deviations and population characteristics of MSA, the coefficient of individual education decreases slightly, to 0.38 percentage points, but remains highly statistically significant at the one percent level. The coefficients of education standard deviations are negative yet not statistically significant at the conventional levels. Consistent with the previous literature, MSA population has a negative and statistically significant coefficient, which implies that the black male IMP is lower in bigger cities. A marginal rise in the total black male population or a marginal drop in the total black female population increases black male IMP by the same magnitude. Higher black male/white female sex ratios are associated with a lower IMP and higher white male/black female sex ratios are associated with higher IMP for black males.

To better capture the enclave effect, the third column of Table 2 adds MSA-level segregation index to the second specification. The results provide evidence that higher levels black-white segregation, as measured by the MSA level segregation index, is associated with lower black/white intermarriage probability. A five percent increase in the index reduces intermarriage likelihood by 0.4 percent, which is, in absolute value, equal to the effect of an additional year of education on IMP. The coefficient of individual education is unaffected and has a t-value of 9.46.

Next, we test the importance of educational dissimilarity effect by including average white-black education gap and its interaction with education in the intermarriage probability equation. White mean education levels are higher than black mean education levels in the 99.85 percent of the MSAs, therefore white-black average education gap is negative in almost all MSAs. The fourth column of Table 2 shows that when the mean educational gap and its interaction with individual education are controlled for, the coefficient of individual education becomes statistically insignificant. This finding indicates that the effect of individual education on the IMP is indirect, i.e. it works through its interaction with the white-black mean educational gap. Results also show that the introduction of educational dissimilarity effect did not change the coefficient and the statistical significance of the segregation index. Therefore, both educational dissimilarity and enclave effects are found to be important in explaining the interracial

[15] Gevrek (2014) shows that in the 16 southern states where antimiscegenation laws were struck down by the U.S. Supreme Court in 1967, the IMR has always been lower than in those states where interracial marriage was never illegal or it was legalized before the Supreme Court decision. See Fryer (2007) for a careful analysis of the trends in interracial marriage during the 20th century.

marriage probability of black men, while the racial adaptability effect, which is measured by the direct effect of education variable, becomes insignificant in explaining IMP.

In column 4, the interaction variable $edu_{ij}(\overline{edu_{wJ}} - \overline{edu_{bJ}})$ has a positive and statistically significant coefficient of 0.0033. A marginal increase in the years of education for a black male with average years of education will change his intermarriage probability by (-.00003+.0033*** $(\overline{edu_{wJ}} - \overline{edu_{bJ}})$ percentage points.

[Figure 2 here]

Figure 2 plots the educational distributions of blacks and whites in two MSAs. The highest mean educational gap between whites and blacks in the U.S. is in the Bryan-College Station, TX MSA, where the average black education is 12.07 years and the average white education is 14.87 years - a gap of 2.80 years. In this MSA, if an average black male acquires an additional year of education, his IMP increases by 0.921 percentage points. In contrast, the Bloomington-Normal, IL MSA has the lowest educational gap in the U.S., with the mean black education 14.11 years and the mean white education 14.13 years - it has a gap of 0.02 years. An additional year of schooling for an observationally equivalent black male in Bloomington-Normal, IL increases his IMP only by 0.004 percentage points. An increase in the educational attainment of a black male is associated with a very small increase in his IMP in a MSA where there is a small white-black average education gap, while, a rise in the educational attainment of a black male is associated with a large increase in his IMP in a locality where there is a large white-black average education gap.

5. Robustness Checks

The results presented in Table 2 show that black and white educational distributions play an important role on a black male's IMP. We conduct six robustness checks to test the validity and strength of the estimates. Table 2 estimations use white-black segregation index that is measured at the MSA Census tract level. First, the four specifications of Table 2 were replicated by using segregation indices that are measured at different Census geographic levels: at the Census block level and at the Census block

group level. The results are found to be robust to the use of segregation indices calculated at various Census geographic groups in MSAs.[16]

The IPUMS-USA warns users that some MSAs are only partially identified in some Census years. One should be cautious while using any variable that considers variation based on MSAs because in the 5 percent sample of 2000 IPUMS U.S. Census data, 35 U.S. MSAs were incompletely identified by more than 10 percent.[17] Second, the main results of this study are robust to the exclusion of these 35 MSAs from the analysis. In addition, to limit the extent of any bias due to sampling error, MSAs with fewer than 50 people in any gender-race group are dropped from the analysis. The top panel of Table 3 replicates Table 2 by omitting these incompletely identified 35 MSAs. The main results are unchanged when these MSAs are excluded.

[Table 3 here]

Alternative definitions of the marriage market were also considered to establish the robustness of the results. Third, Table 2 is replicated under the assumption that the marriage market is the current state of residence. In this case, this study uses the educational distribution variables for three different age groups: 25-34, 35-44 and 45-54 to better approximate for the marriage market conditions.[18] The introduction of assortative mating by age implies that the variations in variables that define educational distributions arise from race, age, and state in the middle panel of Table 3. Standard errors are corrected for clustering in (state of residence x age-group) cells. Consistent with the main results, we find that individual education does not have a direct impact on the probability of intermarriage, but its interaction with the white-black gap in educational attainment has a statistically significant positive coefficient. The main coefficients of interest are very similar to those in Table 2, indicating that the results are robust to change in the definition of the marriage market. The segregation index measured at the state level is found to be not statistically significant in explaining intermarriage likelihood.

In the estimation exercises, educational distribution variables are measured in the location where the U.S. Census data was collected rather than in the location where these black males searched for spouses, which could be the same localities. However, one can argue that individuals were exposed to a different environment at the time of marriage because they got married long ago in a place that is

[16] Results are not reported to conserve space but are available from the contact author.
[17] Please see: http://usa.ipums.org/usa/volii/incompmetareas.shtml
[18] In Table 2, we do not construct educational distribution variables for different age groups in MSAs, because it would be very difficult to obtain accurate measures of these variables due to limited sample sizes in each (MSA x age-group) cell.

different from his current place of residence. Fourth, to address this issue, the model was estimated for the sample of black males who are residing in their birth states as of the Census enumeration. The idea behind this robustness check is that those black males whose birth states are the same as their current states of residence are more likely to have gotten married in their current state of residence. The bottom panel of Table 3 presents the estimation results based on the sample of black men who reside in their birth states. We find that for those who are residing in their birth states, the racial adaptability and educational dissimilarity effects are both important.

Furtoda and Theodoropoulos (2011) point out that college completion may generate most of the educational dissimilarity effect. Fifth and sixth robustness checks examine this possibility by reestimating the model by only including those who have at least a college degree and at least a high school degree, respectively. Given lower mean education for black males, the observed educational dissimilarity effect may also be generated by those high school completers. Table 4 replicates Table 2 and shows the results for the full sample, for those with at least a high school degree and for those with at least a college degree. As per the expectations, results indicate that the educational dissimilarity effect is generated mainly by those with at least a college degree and those with at least a high school diploma.

[Table 4 here]

It is important to keep in mind the limitations of using the Census data in interracial marriage research. The 2000 Census data do not provide information on the age at the time of marriage. Therefore, one cannot determine the order of completion of education and marriage decision that may cause reverse causality. To alleviate this concern, we only include those who are aged 25 or older and currently not attending school in the analysis. Moreover, Lewis and Oppenheimer (2000) show that most people do not acquire more education after they get married. A longitudinal data set with the complete education, migration, dating and marriage history of individuals would be ideal. While we acknowledge the drawbacks of using the Census data in marriage research, it is the only data set that is large enough to generate reliable estimates.

5. Conclusion

Marriages between different ethnic, racial, socioeconomic groups improve health of intergroup relations in a society. The first contribution of this study is that it provides with an answer to the low

black-white intermarriage rate puzzle. Previous studies find a positive relationship between educational attainment and interracial marriage for black men. The results of this study suggest that the increasing educational levels of black males may not always lead to higher rates of black-white interracial marriages. A black male's IMP depends on the relative educational distributions of different races in the marriage market. Contrary to what is expected, as black and white populations become more similar in terms of education, a highly educated black male's interracial marriage probability may not increase because of the educational dissimilarity effect.

The second contribution of this study is to examine the mechanisms through which education may affect the probability of black male-white female interracial marriages in the U.S. Three mechanisms were explored. First, the *racial adaptability effect* predicts that an increase in education always results in an increase in the probability of intermarriage, as more educated people are exposed to a more diverse pool of marriage candidates. Second, the *enclave effect* implies that education may push individuals out of their racial enclaves. Living and working in places with fewer people of one's race increases the likelihood of meeting potential spouses of other races and increases the intermarriage probability. Like the racial adaptability effect, the enclave effect predicts that an increase in education always leads to an increase in the probability of interracial marriage. Third, the *educational dissimilarity effect* suggests that the spatial variation in educational distributions of blacks and whites has a significant impact on the probability of interracial marriage. According to the educational dissimilarity effect, the impact of education on the probability of interracial marriage is ambiguous. An increase in education may lead to a very small increase in the interracial marriage probability for a black male exposed to a small white-black mean education gap, but a sizeable increase in the interracial marriage probability for a black male exposed to a large white-black mean educational gap.

The empirical results of this study indicate that the racial adaptability effect, which is captured by the marginal effect of individual education on interracial marriage probability (IMP), is important in explaining the black male intermarriage when we do not control for enclave effect and the educational dissimilarity effect. For instance, an additional year of education increases the IMP for an average black male by 0.4 percentage points. The direct effect of individual education, however, vanishes after the differences in the distributions of education between blacks and whites are accounted for. The white-black average educational gap in MSAs has a significant effect on the probability of interracial marriage. An additional year of education obtained by an average black male in the MSA with the highest educational gap increases his IMP by 0.921 percentage points, while an additional year of education

obtained by an average black male in the MSA with the lowest educational gap increases his IMP by only 0.004 percentage points. The findings reveal that the enclave effect is also important in explaining the IMP. The results provide evidence that both the educational dissimilarity effect and the enclave effect are the dominant mechanisms through which schooling affects black-white interracial marriages.

In this study, the focus is exclusively on married heterosexual couples, although, studying other forms of romantic relationships between unmarried and/or non-heterosexual couples would help us understand intermarriage preferences. Focusing solely on the married couples indeed misses some of the dynamic aspects and the future of multiracial relationships. Contributions of future research that explores unmarried cohabitation, non-heterosexual couples and other forms of romantic relationships between different races would be immensely valuable.

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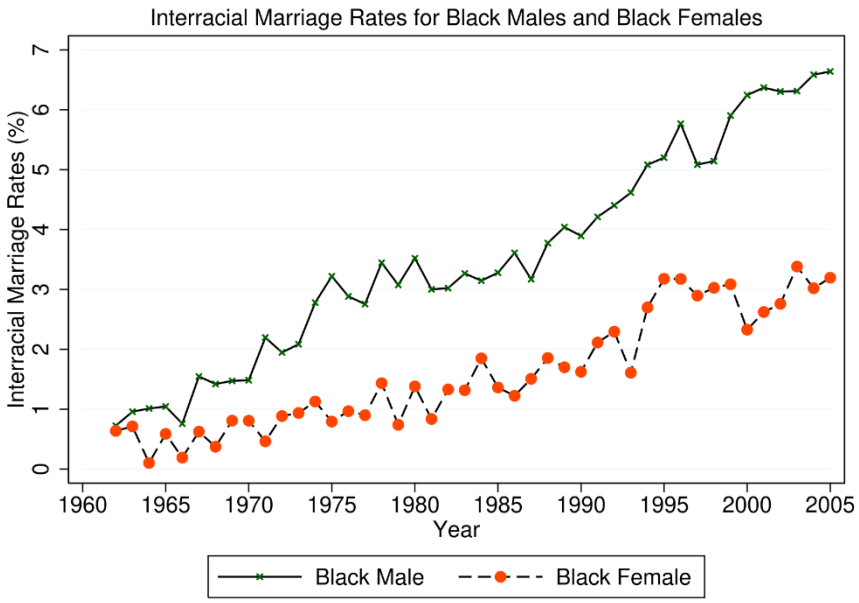
Figure 1:

Interracial Marriage Rates for Black Males and Black Females



Source: 1962-2005 Current Population Survey (CPS) March Supplement data are used to match spouses and to calculate IMRs. This sample contains individuals who are at least 16 years old. The IMR for black males (females) is defined as the proportion of black males (females) with white spouses out of all married black males (females).

Figure 2: Example - Black and white education distributions

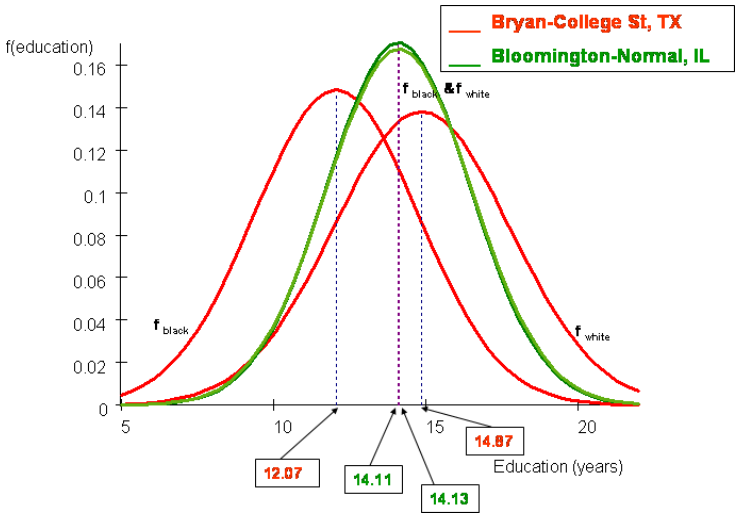


Table 1. Descriptive statistics

Variable↓	**Full Sample**	**Interracially married**	**Intraracially married**
	mean (std dev)	**mean (std dev)**	**mean (std dev)**
Education	13.22 (2.47)	13.63 (2.45)	13.18 (2.47)
Age	41.03 (6.53)	39.13 (7.56)	41.18 (7.50)
Black mean education in MSA	12.93 (0.34)	12.99 (0.38)	12.92 (0.33)
White mean education in MSA	14.15 (0.55)	14.11 (0.54)	14.15 (0.55)
White mean education - black mean education	1.21 (0.44)	1.12 (0.45)	1.21 (0.44)
Standard deviation of black education in MSA	2.45 (0.18)	2.40 (0.22)	2.45 (0.17)
Standard deviation of white education in MSA	2.67 (0.19)	2.59 (0.18)	2.67 (0.18)
White/black segregation index in MSA	61.67 (11.11)	59.34 (11.62)	61.85 (11.05)
Population in MSA (unweighted)			
Total	382,701 (298,768)	32,6665 (182,716)	387099 (300,379)
Black male	3,804 (3,475)	2,667 (3,135)	3893 (3,484)
Black female	4,916 (4,597)	3,376 (4,145)	5037 (4,609)
Black male available	2,096 (1,982)	1,467 (1,785)	2145 (1,988)
Black female available	3,196 (3,052)	2,194 (2,748)	3264 (3,061)
Sex ratio in MSA			
Black male/black female	0.82 (0.20)	0.92 (0.42)	0.82 (0.16)
Black male/white female	0.26 (0.16)	0.18 (0.13)	0.27 (0.16)
White male/black female	5.38 (8.97)	10.93 (18.9)	4.94 (7.48)
White male/white female	0.98 (0.03)	0.98 (0.03)	0.98 (0.03)
Northeast	0.17 (0.37)	0.17 (0.37)	0.17 (0.37)
Midwest	0.17 (0.38)	0.21 (0.40)	0.17 (0.37)
South	0.56 (0.49)	0.36 (0.48)	0.58 (0.49)
West	0.10 (0.30)	0.25 (0.43)	0.09 (0.28)
Observations	82,451	6,001	76,450
Percent of total sample	100	7.3	92.7

Note: Source: The 5% sample of 2000 IPUMS U.S. Census data. The sample is restricted to the non-Hispanic blacks and whites aged 25 to 54, residing in one of the U.S. Census Metropolitan Areas. Metropolitan areas (MSAs) with less than 50 observations in any gender/race cell are omitted.

Table 2. Education, education distributions and interracial marriage: marginal effects after Probit model.

Variable↓	(1)	(2)	(3)	(4)
Education	.0040***	0.0038***	0.0038***	-0.0003
	(8.75)	(9.56)	(9.46)	(0.36)
(White mean edu - black mean edu)				0.0033***
x Education				(4.69)
White mean edu - black mean edu				-0.0367***
				(3.05)
White/black segregation index in MSA			-.0008***	-.0008***
			(2.88)	(2.91)
Black education standard deviation		-.0053	-.0095	-.0148
		(0.43)	(0.81)	(1.16)
White education standard deviation		-.0019	.0012	-.0062
		(0.11)	(0.07)	(0.38)
Population				
Total x 10^(-5)		-.0622*	-.0472	-.0453
		(1.95)	(1.62)	(1.61)
Black male		.0001**	.0001**	.0001**
		(2.54)	(2.48)	(2.50)
Black female		-.0001**	-.0001**	-.0001**
		(2.55)	(2.55)	(2.52)
Black male available		-.00008	-.00005	-.00005
		(1.35)	(0.95)	(0.97)
Black female available		.00009*	.00008	.00008
		(1.85)	(1.63)	(1.59)
Sex ratio in MSA				
Black male/black female		0.035	.0022	-.0001
		(0.40)	(0.26)	(0.02)
Black male/white female		-.1609***	-.1534***	-.1525***
		(5.80)	(5.99)	(6.04)
White male/black female		.0010***	.0009***	.0010***
		(2.93)	(2.89)	(2.85)
White male/white female		.0734	.0463	.0439
		(1.09)	(0.71)	(0.68)
Age	-.0048***	-.0045***	-.0046***	-.0046***
	(4.14)	(4.10)	(4.15)	(4.17)
Age^2	.00003**	.00003**	.00003**	.00003**
	(2.06)	(2.11)	(2.16)	(2.19)
Northeast	-.0495***	-.0232***	-.0162**	-.0177**
	(3.46)	(3.29)	(2.02)	(2.19)
Midwest	-.0443***	-.0178***	-.0059	-.0065
	(3.39)	(2.63)	(0.73)	(0.83)
South	-.1062***	-.0408***	-.0359***	-.0362***
	(7.29)	(5.27)	(4.25)	(4.31)
Mean of dependent	.0727	.0727	.0727	.0727

Probability (at xbar)	.0643	.0582	.0580	.0584
Observations	82,451	82,451	82,451	82,451

Source: 5% IPUMS, 2000 US Census Data Set. The sample is restricted to the non-Hispanic black males aged 25-54. Metropolitan areas with less than 50 observations in any gender/race cell are omitted. The West is the excluded region. t-statistics are reported in parentheses and are in absolute values. The coefficients are the marginal effects after DProbit model. Robust standard errors are clustered at the metropolitan area level. ***, ** and * indicate respectively 1%, 5% and 10% significance levels.

Table 3. Robustness Checks: alternative definitions of marriage market.

samples↓	(1)	(2)	(3)	(4)
Exclude incompletely identified MSAs				
Education	0.0040***	0.0038***	0.0038***	-0.0004
	(8.33)	(9.19)	(9.05)	(0.305)
(White mean edu - black mean edu) x Education				0.0031***
				(4.21)
White mean edu - black mean edu				-0.0309***
				(2.52)
White/black segregation index in MSA			-0.0009***	-0.0009***
			(3.25)	(3.37)
Mean of dependent				.0737
Observations				77,346
Current state of residence†				
Education	0.0040***	0.0036***	0.0036***	-0.0004
	(9.84)	(9.42)	(9.39)	(0.29)
(White mean edu - black mean edu) x Education				0.0040**
				(3.00)
White mean edu - black mean edu				-0.0399*
				(1.84)
White/black segregation index in MSA			-0.0007**	-0.0004
			(2.04)	(1.36)
Mean of dependent				.0723
Observations				103,126
Birth state‡				
Education	.0047***	0.0044***	0.0044***	0.0020***
	(10.61)	(10.15)	(10.15)	(2.86)
(White mean edu - black mean edu) x Education				0.0023***
				(3.73)
White mean edu - black mean edu				-0.0122
				(1.32)
White/black segregation index in MSA			0.00005	0.00005
			(0.15)	(1.27)
Mean of dependent				.0746
Observations				92,466

Source: Robust standard errors are clustered at the metropolitan area level. Metropolitan areas with less than 50 observations in any gender/race cell and the ones incompletely identified by more than 10% are omitted. †States with less than 50 observations in any age/gender/race cell are omitted. Robust standard errors are clustered at the current state of residence X age-group level. ‡ States with less than 50 observations in any age/gender/race cell were omitted. Standard errors are corrected for clustering in the birth state X age-group cells. ***, ** and * indicate respectively 1%, 5% and 10% significance levels.

Table 4. Robustness Checks: impact of education on interracial marriage by educational levels.

samples↓	(1)	(2)	(3)	(4)
Full sample				
Education	.0040***	0.0038***	0.0038***	-0.0003
	(8.75)	(9.56)	(9.46)	(0.036)
(White mean edu - black mean edu) x Education				0.0033***
				(4.69)
White mean edu - black mean edu				-0.0367***
				(3.05)
White/black segregation index in MSA			-.0008***	-.0008***
			(2.88)	(2.91)
Mean of dependent				.0727
Observations				82,451
	(1)	(2)	(3)	(4)
High school degree or more				
Education	.0045***	0.0044***	0.0043***	-0.0013
	(8.40)	(8.67)	(8.64)	(1.27)
(White mean edu - black mean edu) x Education				0.0047***
				(5.50)
White mean edu - black mean edu				-0.0530***
				(3.86)
White/black segregation index in MSA			-.0008***	-.0008***
			(2.97)	(2.99)
Mean of dependent				.0767
Observations				70,148
	(1)	(2)	(3)	(4)
College degreee or more				
Education	.0033***	0.0032***	0.0031**	-0.0030
	(2.63)	(2.63)	(2.56)	(0.78)
(White mean edu - black mean edu) x Education				0.0047*
				(1.67)
White mean edu - black mean edu				-0.0474
				(0.96)
White/black segregation index in MSA			-0.0010**	-0.0008**
			(2.19)	(2.13)
Mean of dependent				.0881
Observations				15,961

Source: 5% IPUMS, 2000 US Census Data Set. The sample is restricted to the non-Hispanic black males aged 25-54. Metropolitan areas with less than 50 observations in any gender/race cell are omitted. The West is the excluded region. t-statistics are reported in parentheses and are in absolute values. The coefficients are the marginal effects after DProbit model. Robust standard errors are clustered at the metropolitan area level. The estimates for the other independent variables are not shown to conserve space but are available upon request. ***, ** and * indicate respectively 1%, 5% and 10% significance levels.