Birds of a Feather: Patterns, Heuristics, and Constraints of Cross-Boundary Marriage Sorting

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Patterns, Heuristics, and Constraints of Cross-Boundary Marriage Sorting

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Yun Zhou

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Abstract

I examine of the patterns, heuristics, and constraints of contemporary marriage sorting across various social boundaries and the resulting implications for understanding social openness and closure. Using a combination of regression models, in-depth interviews, and agent-based computational simulations, I focus on the interplays between individuals' ascriptive and achieved characteristics, and the interplay between micro-level preferences and heuristics and meso-level constraints and preconditions in shaping macro-level marriage outcomes.

Chapter 2 investigates intermarriage patterns among six racial/ethnic groups in the contemporary United States. The results suggest that racial/ethnic intermarriage in the U.S. is characterized by status-caste exchange. Intermarriage patterns among the six racial/ethnic groups contradicts the theorization of the color line as a non-black/ black divide. Instead, the findings suggest that the contemporary U.S. color line is characterized by a form of "tri-racial hierarchy", with whites and honorary whites at the top, followed by (collective) blacks, and certain Latino groups on the bottom.

Chapter 3 investigates marital sorting by education and *hukou* status in China from 1987 onward. Results point to a strong urban-rural differential in marriage desirability. Qualitative findings show that individuals of rural *hukou* are viewed as having distinct values, habitus, and cultural capital. Thus, even as rural-born individuals successfully cross the rural-urban gap through *hukou* conversion prior to marriage entry, their *hukou* origin acts as a lasting symbolic divide

Chapter 4 investigates the interplay between micro-level heuristics and meso-level constraints in shaping macro-level inter-racial/ethnic mate search outcomes. The results show that under in-group preference, the simulated overall intermarriage rates most closely resemble the current empirical observations across local marriage markets. When a local marriage market is segregated, intermarriage rates are low initially, yet individuals' mate searches serve as an integrating force. As sorting by education remains a powerful mechanism, a racially diverse yet educationally stratified population may not necessarily lead to greater boundary crossing through intermarriage.

Utilizing a mixed-methods approach, my dissertation contributes to the fields of social demography, race/ethnicity, gender, and family by highlighting the interplay between ascriptive and achieved characteristics in assortative mating, while focusing on both individuals' preference and structural opportunities in the marriage sorting process.

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Chapter 1

Introduction

The question of "who marries whom" holds important implications for understanding various aspects of social structure and inequality (Blau & Duncan 1967; Blossfeld & Timm 2003; Mare 1991). Homogamy and heterogamy reflect the extent to which individuals of similar/different ascriptive (e.g. race and social origin) or achieved (e.g. education and occupation) characteristics marry each other (Blossfeld & Timm 2003; Kalmijn 1991, 1998). As marriage signifies the acceptance of "outsiders" in one of the most intimate senses, homogamy and heterogamy are often viewed as indicators of the degree of closeness of social networks (Blossfeld & Timm 2003; Simmel 1917/1970; Laumann 1973). Building on the Weberian notion of social closure (Weber 1978), marriage, or the lack thereof, between different social groups provides a fundamental way to examine the relative permeability of group boundaries (e.g. Gordon 1964; Kalmijn 1998; Lieberson & Waters 1988) and the degree of openness of the stratification system (e.g. Mare 2000; Ultee & Luijkx 1990). What is more, as marriage is also consequential for the reproduction of populations, homogamy and heterogamy based on various characteristics further hold important implications for the reproduction of different forms of social hierarchy and order (Mare 2000).

At first blush, the relationship between patterns of assortative marriage and degrees of social openness/closure seems straightforward. Heterogamy points to the existence of intimate ties between different social groups, whereas homogamy is considered to be a form of social closure (Kalmijn 1998). However, a closer examination shows the link between patterns of homogamy/heterogamy and degrees of social openness/closure may be more complex than posited. Existing studies have largely focused on assortative marriage by a single matching dimension, yet when the interplay between individuals' various ascriptive and

achieved characteristics in the mate selection process is fully considered, scholars have put forth much more complicated, and sometimes contrasting, implications of cross-boundary marriage on social openness and boundary pearmeability.

Specifically, scholars of race, ethnicity, immigration, marriage, and family have begun to focus on couples' characteristics, particularly spousal educational attainment, in studying marriages across racial/ethnic boundaries (e.g. Fu 2001; Qian & Lichter 2007; Rosenfeld 2002). Although racial/ethnic intermarriage has long been considered one important aspect of assimilation and integration that signifies greater boundary permeability between groups (Gordon 1964; Lieberson & Waters 1988), recent research has moved in a direction that considers more critically the intersection between race/ethnicity and education, particularly the educational mismatch among couples, in racial/ethnic intermarriages. Some scholars have found that individuals from lower status racial groups with higher socioeconomic status tend to marry individuals of higher status racial groups with lower socioeconomic status (e.g. Kalmijn 1993; Qian 1997, 2005; Fu 2001). Such evidence of compensatory exchange of socioeconomic status with racial status suggests that increases in racial/ethnic intermarriage rates may point to not only decreases in social distance or relaxations of group boundaries, but also a persisting racial/ethnic status hierarchy. The tenuous link between racial/ethnic intermarriage and integration thus requires a critical reappraisal (Song 2009).

The idea of compensation and exchange between couples based on their respective ascriptive and achieved characteristics can be extended to contexts well beyond racial/ethnic intermarriage. Some researchers argue that the expansion of higher education in modern societies allows much easier and greater contacts between children of different social origins (e.g. Erikson & Jonsson 1996; Müller & Karle 1993; Shavit & Blossfeld 1993), leading to greater probabilities of marital coupling between members of different social status origin

groups (Blossfeld & Timm 2003). Rising educational homogamy, in this sense, reflects the extent to which individuals are able to move beyond their social origin stratum in the marriage market through the process of education, which further points to reduced boundary rigidity among different social origin status groups. However, even as assortative mating based on social origin status gives way to education-based matching, if similar patterns of compensatory exchange between educational attainment and social origin status are found, such patterns may suggest lasting hierarchical cleavages between members of different social origin groups. In other words, if higher educational attainment is used to compensate for lower social origin status in the marriage market, such a pattern may point to the lasting adverse effect facing individuals of disadvantageous social backgrounds that cannot be fully erased through adulthood status attainment. Therefore, the primary question I address with this dissertation is: How do individuals' ascriptive and achieved status jointly shape their marriage market outcomes? Answering this question provides a better understanding of the implications of different forms of cross-boundary marriage sorting for social openness and closure.

However, the quest does not end here. Marriage is driven not only by individual preferences and characteristics, but also by opportunities for contact (Kalmijn 1998). A variety of micro-, meso- and macro-level factors, from individual network structure and residential segregation patterns to relative group size and population composition, jointly make up the structural conditions constraining union formation (Beck-Gernsheim 2007; Blossfeld 1996; Qian 2005; Song 2009). Getting married, at its core, is a search process with difficult decision-making under uncertainty (Todd & Miller 1999), and is fraught with normative values and meaning-making (Gerson 2009; Rosenfeld 2007). However, most existing research on assortative mating has been quantitative ex-post-facto analysis based on observed and established unions using cross-sectional survey data. Such an approach effectively treats

marriage as a static individual state. Thus, such an approach obscures important mechanisms underlying the marriage sorting process. Without knowing how marriage sorting happens, the existing conventional approach leads to difficulties in theory generation and adjudication. I explore the cross-boundary marital sorting process through alternative methods in addition to using conventional statistical analyses of survey data. I make a methodological contribution to the study of assortative mating through adopting a mixed-methods approach. I rely on qualitative in-depth interviews to examine individuals' deep-held values, reasoning, and emotion in mate selection. I rely on agent-based computational models to understand the process through which individual preferences and heuristics in marriage search interact with structural preconditions and constraints to produce different population outcomes.

The rest of the dissertation is organized as follows: In Chapter 2, "Loosening Boundaries, Persisting Hierarchy, and the Changing Color Line: Minority-Minority Intermarriage in the Contemporary United States", I focus on the interplay between individuals' ascriptive (i.e. race/ethnicity) and achieved (i.e. education and income) characteristics in racial/ethnic intermarriage in the contemporary United States. Scholars have argued that when spouses' ascribed and achieved traits interact in the form of compensatory exchange, in addition to suggesting a loosening of boundaries, racial/ethnic intermarriages following the exchange logic may also point to a persisting hierarchical cleavage between different racial/ethnic groups. Drawing on this conceptual distinction between group boundary vis-à-vis status hierarchy, I examine the intermarriage patterns among non-Hispanic whites, non-Hispanic blacks, Puerto Ricans, Cuban Americans, Mexican Americans and East Asian Americans using the most recent wave of American Community Survey. By focusing on minority-minority intermarriage pairings, I move beyond existing research on intermarriage that solely considers racial/ethnic intermarriage between non-white minority groups and non-

Hispanic whites. Instead, I investigate how different groups relate to one another on the entire spectrum of the racial status hierarchy in the context of the marriage market. The unprecedented immigration influx, particularly from countries in Asia, Latin America, and the Caribbean, continues to hold profound implications for understanding the existing black-white racial divide in the United States. Specifically, scholars have asked: where do large numbers of non-white newcomers fall on the existing black-white divide. Through examining intermarriage patterns among the six racial/ethnic groups, this chapter thus further speaks to changing racial relations and the "color line" in the context of the "new immigration" (Lee & Bean 2004, 2007) in the contemporary United States.

Chapter 3, "Economic Resources, Cultural Capital, and the Rural-Urban Boundary in China's Marriage Market, 1987-2016" examines the interplay between another set of individual-level ascriptive and achieved characteristics. I investigate how educational attainment and household registration status (*hukou*; rural vs. urban) jointly shape individuals' desirability in China's marriage market. Using a combination of nationally representative surveys and original in-depth interviews, I investigate marital sorting by *hukou* and educational attainment from 1987 onward, paying special attention to individuals' reasoning, logics, and emotion in the marriage decision-making process. Quantitative results show that individuals born with a rural *hukou* occupy less advantageous positions in the marriage market. Rural-to-urban *hukou* converters fare better than their unconverted rural counterparts, but remain the less desirable option when compared to urban-born individuals of the same educational level. The qualitative analysis further reveals that the undesirability of rural *hukou* origin stems from the logic of cultural matching, which highlights the importance of shared norms, values, and cultural capital in forming intimate ties (DiMaggio & Mohr 1985). Contrary to suggestions in the literature that emphasize the role of economic resources in marriage sorting, individuals

frame their marriage ideals and decisions using an emotional logic that focuses on the importance of shared habitus, tastes, and cultural capital between spouses. The findings demonstrate the lasting adverse effect of rural *hukou* origin in contemporary China's marriage market where the rural-urban gap is not only a social distinction, but also a symbolic divide. For individuals who, at least on paper, have successfully crossed the rural-urban boundary through *hukou* conversion prior to marriage, their *hukou* origin continues to be visible and acts as a source of lasting symbolic distinction in the marriage market.

Chapter 4, "Individual Preferences Under Structural Constraints: An Agent-Based Model for Inter-Racial/Ethnic Mate-Search Heuristics in the United States", moves on from the interplay between various micro-level characteristics in order to further consider the interplay between micro-level individual preferences, characteristics, and heuristics and various meso-level structural conditions in shaping macro-level marriage outcomes. Drawing on the theoretical formulations in Chapters 2 and 3, I situate Chapter 4 in the growing literature of agent-based computational demography. Using racial/ethnic intermarriage as a case, I rely on agent-based computational models to show *how* macro-level population outcomes can be produced through various individual-level preferences and heuristics interacting with a variety of meso-level structural conditions within heterogeneous local marriage market contexts. I show that on the one hand, the effect of individual-level preferences on overall intermarriage rates is robust with respect to different population compositions in local marriage markets. On the other hand, group differences in size and educational composition matter for intermarriage vs. endogamy rates on the racial/ethnic group level, likely due to the between-group variations in the pool of potential partners. Furthermore, population composition matters not only in term of differences in absolute racial/ethnic group sizes, but more importantly, in term of the spatial distribution of different groups. In a segregated marriage

market, the mate search process itself works as an integrating force over time through the expansion of searching agents' social networks.

In this dissertation, focusing on the interplay between individual-level ascriptive and achieved characteristics, I conceptualize marriage as a search process that combines individual-level preferences, characteristics, and heuristics with structural preconditions and constraints. Each of the three empirical chapters addresses a specific aspect of cross-boundary marriage sorting and shows how one of the most intimate features (marriage) in individuals' lives is both shaped by and is shaping inequality patterns on the societal level. This dissertation is a mixed-methods endeavor. I rely on multiple methodological approaches of social scientific inquiry, viz. regression-based statistical modeling, qualitative in-depth interviews, and agent-based computational models, in order to extend the question from "who marries whom" to *how*, given heterogeneous individual heuristics and structural preconditions, marital unions form across various types of boundaries, and the implications for understanding social openness and closure.

Chapter 2

Loosening Boundaries, Persisting Hierarchy and the Changing Color Line: Minority-Minority Intermarriage in the Contemporary United States

2.1 INTRODUCTION

In the United States, marriages across racial lines increased more than twentyfold in the forty years between 1960 and 2000, from 150,000 to 3.1 million (Jacoby 2001; Lee & Bean 2007; Lee & Edmonston, 2011), and currently account for one in twelve marriages (Lee 2015). Racial/ethnic intermarriage is one important aspect of assimilation. In his seminal work, Gordon (1964) has argued that assimilation culminates in intermarriage, which often subsumes acculturation and socioeconomic status attainment. Assimilation is also considered to facilitate intermarriage (Hwang et al. 1997) as ethnic attachment weakens and chances of meeting potential mates of different race/ethnicity increase through greater contact with other groups (Lieberson & Waters 1988). Furthermore, as intermarriage signifies the acceptance of outsiders into one of the most intimate settings of one's own group, intermarriage is thus viewed as an indicator of the social distance and boundary permeability between different groups (Fu 2001; Gordon 1964; Lieberson & Waters 1988; Qian & Lichter 2007; Rosenfeld 2002).

Because of its significant implications for understanding assimilation and group boundaries, racial/ethnic intermarriage has received abundant attention from scholars of race, immigration, marriage, and the family. However, two key limitations remain. First, earlier research often considers only descriptive intermarriage rates (see a review by Lee & Bean 2004), leaving spousal characteristics in inter-racial/ethnic unions largely unexamined. Without knowing "who marries whom" among intermarried individuals, it is difficult to assess whether in inter-racial/ethnic unions marital partners have truly accepted each other as social equals (Qian & Lichter 2007). As Fu (2001) pointed out, if the characteristics of intermarried couples

are different from those of endogamous couples, such differences could be interpreted as evidence for persisting group inequality, rather than relaxed group boundaries.

To address this limitation, recent research often draws on Merton's (1941) and Davis' (1941) theory of status-caste exchange, which suggests that individuals from lower status racial groups with higher socioeconomic status are more likely to marry individuals of higher status racial groups with lower socioeconomic status, whereas the reverse is less probable. Some scholars have found intermarriage patterns to be consistent with this hypothesis (e.g. Kalmijn 1993; Qian 1997; Fu 2001). Here, on the one hand, crude increases in intermarriage rates may imply decreases in horizontal social distance and a relaxation of group *boundaries*. On the other hand, the status mismatch found among intermarried spouses points to a persisting racial/ethnic status *hierarchy*.

Although research drawing on the theory of status-caste exchange represents significant improvements, a second limitation remains: Merton's and Davis' status-caste exchange theory was originally formulated to account for black-white intermarriages. Empirical studies under this theoretical framework often only consider intermarriage patterns between blacks or non-white minority groups and non-Hispanic whites (e.g. Fu 2001; Gullickson 2006; Hwang et al. 1995; Hwang et al. 1997; Jacobs & Labov 2002; Kalmijn 1993, 1998; Labov & Jacobs 1986; Lee & Bean 2004; Lee & Fernandez 1998; Qian 1997; Wong 1989). Intermarriage patterns between non-white minority groups have remained largely under-researched.

This limitation is significant because racial relations in the contemporary United States have long moved beyond the black and white divide (Lee 2015; Lee & Bean 2007). One of the most distinctive aspects of the United States' "new immigration" (Bean & Bell-Rose 1999; Lee & Bean 2007; Waldinger & Lee 2001) is the shift in immigrants' national origins, from Europe

to Latin America, Asia and the Caribbean (Lee & Bean 2007). As the United States is projected to become a Majority-Minority society by 2043 (Lichter 2013), in the face of the drastic expansion of Latino and Asian populations (Lee & Bean 2007), examining the experiences of non-black racial and ethnic minorities is crucial for a complete understanding of contemporary racial inequality.

Furthermore, the emergence of large numbers of non-black minority groups raises questions about the nature of racial hierarchy in a multi-group society. Some scholars have argued that racial relations in the contemporary United States are evolving towards a hierarchy of whites over non-whites (see Lee & Bean 2007), while others view the primary hierarchy as non-blacks over blacks (Bobo & Zubrinsky 1996), and still others suggest a new tri-racial hierarchy consisting of whites, honorary whites, and collective blacks (Bonilla-Silva 2004a, 2004b).

Assimilation research has also shifted from adopting a "straight-line model" (Gordon 1964) to viewing the assimilation process as "segmented" (Portes & Zhou 1993, see also Lee & Bean 2004). In other words, assimilating into the white middle-class is no longer the only pathway. For some groups, especially those perceived to be non-white, assimilation now means joining the black inner-city underclass (Portes & Zhou 1993; Rosenfeld 2002).

Such shifts in immigration trends, racial relations, and assimilation patterns call for investigations of the racial/ethnic boundary and status hierarchy *among* different non-white minority groups, in addition to examining the boundary and hierarchy between non-whites and whites. Research in racial/ethnic intermarriage, in accordance, should also move beyond the traditional "black-white" or "minority-white" pairings and recognize the significance of understanding minority-minority intermarriage. Furthermore, on the theoretical front, examining minority-minority intermarriage pairings provides additional evaluation of the

status-caste exchange theory and tests whether the theory could be extended into marriages among non-white groups and be accepted as a general theory of intermarriage.

The primary objective of this chapter thus is to investigate how racial/ethnic intermarriage patterns, especially that of minority-minority pairings, implicate group boundaries and status hierarchy in the contemporary United States. I focus on six racial/ethnic groups: non-Hispanic whites, non-Hispanic blacks, East Asian Americans (Chinese, Japanese, and Korean Americans), Puerto Ricans, Mexican Americans, and Cuban Americans. In doing so, I make the following contributions to the existing scholarship on racial/ethnic intermarriage: To start, by focusing on minority-minority pairings, this chapter furthers the empirical understandings of racial/ethnic group boundaries and status hierarchy that are especially relevant in the contemporary context of the "changing color line". Moreover, through examining couple characteristics in different intermarriage pairing scenarios, this chapter modifies previous views on intermarriage and assimilation by highlighting the conceptual distinction between *group boundaries* and the *status hierarchy*. Finally, research on intermarriage conventionally utilizes log-linear or log-multiplicative models. In this chapter, I further make a methodological contribution by utilizing a new modeling strategy, i.e. Stereotype Ordered Regression (SOR) models in understanding racial/ethnic intermarriage patterns.

2.2 CONCEPTUALIZING (INTER)MARRIAGE

2.2.1 (Inter)Marriage as Status Exchange

Mate selection is often described through the metaphor of a market (Becker 1973; Goode 1970; Rosenfeld 2005). In this conceptualization, the bond of marriage represents an exchange of various forms of resources between rational actors with complementary

specializations (Raymo & Iwasawa 2005). For example, classic studies have contended that men exchange their economic resources for women's physical beauty and youth (Elder 1969; Goode 1951; Taylor & Glenn 1976, Waller 1937, see also Rosenfeld 2005) or domestic skills (Becker 1991). Such a conceptualization of exchange is often used to explain the observed patterns of homogamy. As individuals search for optimal mates based on the resources they themselves can offer, better-placed individuals are thus more likely to be able to attract and marry other individuals with more desirable traits (Fu 2001).

Originally proposed by Davis (1941) and Merton (1941), the theory of status-caste exchange follows the same conceptualization of marriage as an exchange process in a market. Merton (1941) hypothesized that blacks with low socioeconomic status can seldom marry whites with high socioeconomic status, whereas the reverse is possible (Merton 1941, see also Rosenfeld, 2005). According to Merton, marriage between blacks with high socioeconomic status and whites with low socioeconomic status represents a trade-off between racial status and socioeconomic standing (Rosenfeld 2005). The high socioeconomic status of the black spouse would compensate and make up for the white spouse's loss in social standing stemming from such a union (Rosenfeld 2005). Therefore, under the theoretical framework of status-caste exchange, although high crude racial/ethnic intermarriage rates would signal relaxed between-group boundaries, the status mismatch among intermarried couples points to a lasting racial status hierarchy.

Although some studies have extended the scope of Merton's and Davis' original theory to include additional intermarriage pairings, such as white-Asian and white-Latino unions (e.g. Hwang et al. 1995; Hwang et al. 1997; Jacobs & Labov 2002; Lee & Fernandez 1998), the status-caste exchange theory has not been fully extended into the context of minority-minority intermarriage pairings. In the following section, I discuss how such an extension furthers the

conceptual and empirical understanding of contemporary racial relations in the United States, which is especially relevant for ascertaining the direction of the "changing color line" (Lee & Bean 2004).

2.2.2 Status Exchange in the Context of the "Changing Color Line"

Immigration has increased the racial/ethnic diversity in the United States over the last several decades (Lee & Bean 2004) and transformed the United States into a society that consists of multiple nonwhite racial/ethnic groups (Alba & Nee 2003; Lee & Bean 2007; Bean & Stevens 2003; Sears et al. 2003). The unprecedented immigration influx poses significant implications for the traditional bipolar white-black racial boundary (Lee & Bean 2004; Lichter 2013). A puzzle of both theoretical and social significance is: where do immigrant groups fall along the black/white divide? In other words, is the arrival of non-white immigrants eradicating the traditional racial boundaries and changing the "color line" (Alba 1999; Bean & Stevens 2003; Gans 1999; Lee & Bean 2003; see also Lee & Bean 2004)?

Previous research has highlighted three possible directions of contemporary United States' evolving racial relations (see Lee & Bean 2007 for a review). The first possible emergent color line is the non white-white divide that has deep historical roots (Lee & Bean 2007). In this scenario, non-white groups such as Asians and Latinos should fall closer to blacks than to whites on the racial status hierarchy. The second possible scenario is the non black-black divide, which emphasizes the continued separation of blacks, both from whites and from other non-white groups (Alba 1990; Gans 1999; Gitlin 1995; Gregory & Sanjek 1994; Lee & Bean 2007). For example, earlier empirical research has shown that Asians and Latinos seem to fit in more easily with whites than blacks do (e.g. Warren & Twine 1997). Compared to blacks, they are also viewed as more culturally similar by whites (e.g. Gallagher 2003). Different from

the binary structures of the "white-non white" and "non black-black" hierarchies, the third model, "tri-racial hierarchy", points to yet another possible scenario and suggests that contemporary U.S. racial relations are characterized by a tri-racial stratification system consisting of whites, honorary whites, and collective blacks (Bonilla-Silva 2004a, 2004b). Chinese, Japanese, and Korean Americans as well as light-skinned Latinos are included in the "honorary whites" category, whereas dark-skinned Latinos are considered as part of the category of "collective blacks" (Lee & Bean 2007).

As crude intermarriage rates in the United States continue to rise, Asian Americans in particular are viewed as a strong driving force for such a trend (Lee 2015). Furthermore, recent studies have found that third-plus-generation Latinos have also become more likely to marry non-Hispanic whites (Lichter et al. 2011; 2015), while the boundaries between non-Hispanic whites and blacks remain relatively more rigid in terms of intermarriage rates (Qian & Lichter 2007; 2011). Thus, following Lee & Bean (2004), if Asians and Latinos are treated as racialized minorities falling closer to blacks on the status hierarchy, their increasing intermarriage rates with whites can be interpreted as an overall loosening of the white/non-white divide. On the other hand, if Latinos and Asians can indeed be seen as the new immigrant groups that will eventually "join the economic and social mainstream" and hence fall closer to whites, then their high intermarriage rates would mean an entirely different experience from that of blacks' (Lee & Bean 2004). To put it differently, the growing boundary permeability between whites and non-whites immigrant groups may not necessarily be a precursor of the loosening of the boundary between whites and blacks. In this latter scenario, the higher crude intermarriage rates between Latinos, Asians and whites would indeed signify that the traditional white-black color line is changing towards the non black-black divide: The boundaries are becoming more permeable between Latinos/Asians and whites while remaining to be relatively more rigid for

blacks. In addition to differential levels of boundary rigidity, this scenario also implies a status hierarchy among different groups. Latinos and Asians are ascending to an almost-white status, creating a new racial hierarchy of non-blacks over blacks (Bean & Stevens 2003; Bobo & Zubrinsky 1996; Gans 1999; Lee & Bean 2003; Shiao et al 2004; Waters 1999).

In the context of racial/ethnic intermarriage, the difficulty in ascertaining the exact direction of the "changing color line" partially stems from analyzing only intermarriage patterns between racial/ethnic minorities and whites. Such analyses provide no direct assessment of the distance between any given two minority groups. In other words, comparing each non-white group separately against whites provides little information on how these groups relate to one another on the entire spectrum of the racial status hierarchy. Thus, an extension of the status-caste exchange theory that incorporates intermarriage pairings among non-black minorities and non-Hispanic blacks is needed.

2.2.3 Status Exchange or Status Homogamy? Competing Conceptualizations

Scholars have put forth two additional competing models of racial/ethnic intermarriage: *endogamous intermarriage* and *in-group preference* (see Fu 2001). These two models further hold different implications for understanding racial/ethnic group boundaries vis-à-vis status hierarchy.

Endogamous Intermarriage. Endogamous intermarriage, a seemingly paradoxical term, conceptualizes racial/ethnic intermarriage as similar to racial/ethnic endogamy (that is, marriage between individuals of the same racial/ethnic background). Under the theoretical model of endogamous intermarriage, the characteristics of intermarried couples would be similar to those of endogamous couples, as whether to cross racial/ethnic group boundaries bears no significant effect on the mate selection process. In other words, mechanisms

underlying the marriage sorting process do not differ significantly for racial/ethnic endogamy versus intermarriage. Hence, a trend of rising intermarriages that follows the patterns of endogamous intermarriage signifies loosening group boundaries as well as an eroding status hierarchy (Fu 2001).

To test the theoretical model of endogamy intermarriage, if the observed intermarriage pattern fits the endogamous intermarriage scenario, then at a given level of educational advantage, controlling for population composition, an individual should not have different likelihoods of marrying spouses of various racial/ethnic backgrounds. In other words, educational advantage is not used to compensate for disadvantageous racial status.

In-group Preference. The second competing theoretical model of racial/ethnic intermarriage is in-group preference, which suggests that all else equal, individuals would always prefer marrying members of their own group to entering into inter-racial/ethnic unions. Here, racial/ethnic identity signifies a form of "cultural resource" (Kalmijn 1998) and provides a shared ground between spouses that reduces friction, enhances mutual support, and creates a common lifestyle (DiMaggio & Mohr 1985; Fu 2001).

Intermarriage patterns following the in-group preference scenario imply more rigid boundaries between different groups, as intermarriage is always a less preferable option when compared to endogamy. However, in the case of in-group preference, there is no inherent status ordering of different groups (Gordon 1964; Fu 2001) because the decision not to out-marry is not driven by seeing other groups as inferior or undesirable. Furthermore, the in-group preference assumes that a partner from one's own racial/ethnic group is the most preferred. Therefore better-positioned individuals with more desirable traits (e.g. higher educational level or income) are more likely to succeed in marrying within their own groups.

To test the theoretical model of in-group preference, if the observed intermarriage pattern follows the in-group preference scenario, increases in one's socioeconomic status (e.g. educational attainment level) would be associated with a greater likelihood of marrying a partner of the same race/ethnicity.

Taken together, status exchange, endogamous intermarriage, and in-group preference implicate group boundaries and status hierarchy differently. As illustrated in Table 2.1, if the observed intermarriage pattern is characterized by status exchange, status ordering exists and persists between different groups, whereas group boundaries remain permeable. If the observed intermarriage pattern follows a pattern of in-group preference, group boundaries remain rigid while the status hierarchy is insignificant. Neither group boundaries nor status hierarchy are salient if the observed intermarriage patterns follows a similar pattern as that of endogamous marriage.

Table 2.1 Typology of Racial/Ethnic Intermarriage and Implications for Group Boundaries and Status Hierarchy

	Group Boundary	Status Hierarchy
Status-Caste Exchange	-	+
Endogamous Intermarriage	-	-
In-Group Preference	+	-

+ signifies salience

- signifies non-salience

In the context of the "changing color line", if the traditional white-black color line has evolved into a non black-black hierarchy (Lee & Bean 2007), this suggests that 1) the boundaries between Asians/Latinos and whites are more permeable, as compared to that between blacks and whites; 2) there exists a racial/ethnic status hierarchy of non-blacks over

blacks; and 3) non-black ethnic/racial minorities such as Asians and Latinos fall closer to whites than to blacks in terms of racial status ordering. In this scenario, we would expect to see status exchange occurring not only in black-white intermarriages, but also in intermarriages between blacks and non-black minorities. On the other hand, if a tri-racial hierarchy system exists, "honorary whites" such as East Asian Americans would fall closer to whites than to blacks in terms of the status ordering. However, the boundaries between different racial/ethnic groups would not necessarily be permeable. Thus, we would expect intermarriage between East Asian Americans and whites to follow a pattern similar to endogamous intermarriage. We would also expect to see patterns of in-group preference for all pairings.

Assessing the direction of the "changing color line" thus requires a direct measurement of the distance among all racial/ethnic groups, rather than comparing each non-white group separately against whites. In the following sections, I discuss the data and methods utilized in carrying out such an analysis.

2.3 DATA AND VARIABLES

2.3.1 Data and Sample

The American Community Survey (ACS) 2011-2015 Five-Year Sample was used for the analysis. Given that racial/ethnic intermarriage makes up a small fraction of total marriages, the five-year ACS sample allows greater analytical leverage than one-year and three-year ACS samples. The analytical sample included only individuals in different-sex marital unions. Married men and women were matched based on state, household ID and individual ID within the household. Individuals who are separated or do not live with their spouses were excluded from the final sample. Furthermore, ACS provides information on individual's year of

marriage[1], year of immigration, and total number of marriages up to the time of the survey, thereby allowing additional steps to be taken in order to minimize potential biases. First, marriages contracted outside the United States not only provide no information for understanding racial/ethnic group boundaries and status hierarchy in the U.S. marriage market, but including such marriages into the analysis may also upwardly bias endogamy rates. Couples were thus dropped from the sample if both partners' reported years of immigration are later than their reported year of marriage[2]. Secondly, scholars have cautioned against the potential bias introduced by a higher hazard rate of divorce for intermarried couples (e.g. Hwang et al 1997; Rosenfeld 2001). Therefore, the analytical sample includes only recently married couples (i.e. marriages contracted between 2011 and 2015). To further minimize selection bias, the final sample includes only couples where both partners are in their first marriages.

I focus on patterns of (inter)marriage among six racial/ethnic groups: non-Hispanic whites, non-Hispanic blacks, East Asian Americans (Chinese, Japanese, and Korean Americans), Puerto Ricans, Cuban, and Mexican Americans[3]. The six groups make up around 93% of the total sample. Previous research has found that ethnic distinctions within racial groups matter little for non-Hispanic whites (Alba 1990; Lieberson & Waters 1988) and non-Hispanic blacks (Cornell 1990), I thus do not distinguish individuals' ethnicities for non-Hispanic whites and blacks. Existing studies have shown that Chinese Americans, Japanese Americans, and Korean Americans occupy similar social standings (Lee & Bean 2007; Lee &

[1] To ensure consistency, individuals were removed from the analysis if the years of marriage reported by the husband and the wife were different. The number of cases with such inconsistency makes up a minuscule proportion of the total sample.

[2] As a robustness check, I further conducted analysis removing all couples if either partner immigrated to the United States after marriage. Results are discussed in a later section.

[3] For adequate analytical leverage, I have only included Puerto Ricans, Cuban and Mexican Americans in the analysis, as they are the three largest Hispanic groups in the United States.

Fernandez 1998). Furthermore, pan-national Asian identity has been found to be a significant force in the process of mate selection (Qian et al. 2001; Rosenfeld 2001). Therefore, in order to obtain a larger group size and greater analytical leverage, Chinese Americans, Japanese Americans, and Korean Americans were grouped together to form the category of East Asian American in the final sample. However, scholars have long shown that ethnic distinctions do matter for Latinos (e.g. Bean & Tienda 1987; Pang 1994). Therefore Puerto Ricans, Cuban Americans, and Mexican Americans are kept as separate categories in the analysis. Individuals belonging to other racial/ethnic categories were dropped from the analysis.

2.3.2 Variables

The key variables are race/ethnicity and educational attainment level for both the husband and the wife. Race/ethnicity is coded as a categorical variable with six groups. Following previous research, educational attainment level is treated as a four-level ordinal variable: less than high school, exactly high school, some college, and a four-year college degree or more (e.g. Fu 2001; Rosenfeld 2002).

In order to evaluate possible status exchange in racial/ethnic intermarriages, the main analysis focuses only on educationally hypergamous and hypogamous unions, i.e. couples where there exists an educational mismatch between partners. Educationally homogamous couples are examined as part of the auxiliary analysis discussed in a later section. Another key covariate of interest is spousal educational gap. For educationally hypergamous couples, spousal educational gap is specified as husband's educational level minus that of the wife's, whereas for educationally hypogamous couples, spousal educational gap is specified as wife's educational level minus that of the husband's. To obtain a more fine-grained measurement, I have used ACS' detailed educational coding and recoded husband's and wife's educational

attainment level as a seven-category ordinal variable[4] (1= Primary Education and below and 7=Post-graduate Education).

Furthermore, as an additional measure of individuals' socioeconomic status, in the analysis I have also considered the effect of individuals' income. Based on the reported income in ACS, each individual is placed into the corresponding income decile.

Although individuals' income and educational attainment level are both measured at the time of the survey (i.e. between 2011 and 2015), given that the analytical sample includes only first marriages contracted within the same time frame, respondents' reported educational and income information serve as reasonable proxies for their educational level and income at the time of marriage.

2.4 DESCRIPTIVE ANALYSIS

We start with the overall racial/ethnic intermarriage rates in educationally hypergamous and hypogamous unions. For both types of marriages, I present the column and row intermarriage tables with respect to husband's and wife's race/ethnicity. Taken together, they demonstrate the crude patterns of intermarriage and endogamy among the six racial/ethnic groups with spousal educational mismatch.

Table 2.2a is the intermarriage column table by husband's and wife's race/ethnicity in educationally hypergamous unions. For men of each racial/ethnic category, it shows the percentage of wives that come from each racial/ethnic group. For out-marrying husbands of the five non-white groups, white wives make up the largest portion of their partners. For example, for East Asian American husbands, 12.10% of their wives are white whereas only

[4] 1=Primary Education and below; 2=Junior High School; 3=Some High School; 4=High School; 5=Some College (including Associate's degree holders); 6=College and 7=Post-graduate education.

0.16% are black. Such a pattern is even more dramatic for Puerto Rican and Cuban American husbands. For Puerto Rican husbands, 35.21% of their wives are white whereas the figure is 42.70% for Cuban American husbands. Furthermore, Puerto Rican husbands also have the highest out-marrying rates with other non-white, particularly pan-Latino, groups. Out-marrying black husbands choose white wives the most often (16.16%) as well. As compared to the five non-white groups, white husbands have the highest endogamy rate. For out-marrying white husbands, they are most likely to marry Mexican American (3.75%) and East Asian American wives (1.14%), although both figures are significantly smaller in comparison to that of white wives' (93.39%).

Table 2.2a Intermarriage Column Table by Husband's and Wife's Race/Ethnicity Among Educationally Hypergamous Unions, ACS 2011-2015 Five Year Sample

	Husband's Race						
	White	East Asian	Mexican	Puerto Rican	Cuban	Black	Total
Wife's Race							
White	**93.39 (13270)**	12.10 (76)	13.77 (326)	35.21 (75)	42.70 (38)	16.16 (229)	74.05 (14014)
East Asian	1.14 (162)	**86.78 (545)**	0.76 (18)	0.47 (1)	3.37 (3)	0.28 (4)	3.87 (733)
Mexican	3.75 (533)	0.96 (6)	**84.12 (1992)**	12.68 (27)	2.25 (2)	3.53 (50)	13.79 (2610)
Puerto Rican	0.59 (84)	0 (0)	0.76 (18)	**43.66 (93)**	4.49 (4)	1.55 (22)	1.17 (221)
Cuban	0.27 (38)	0 (0)	0.13 (3)	2.35 (5)	**46.07 (41)**	0.21 (3)	0.48 (90)
Black	0.86 (122)	0.16 (1)	0.46 (11)	5.63 (12)	1.12 (1)	**78.26 (1109)**	6.64 (1256)
Total	100 (14209)	100 (628)	100 (2368)	100 (213)	100 (89)	100 (1417)	100 (18924)

Frequencies in parentheses

Correspondingly, Table 2.2b is the intermarriage row table by husband's and wife's race/ethnicity in educationally hypergamous pairings. For women of each racial/ethnic category, it shows the percentage make-up of their husbands' race/ethnicity. Table 2.2b tells a similar story to Table 2.2a. When out-marrying, non-white wives are again most likely to marry white husbands. One caveat is that although black women also choose white husbands more often when out-marrying, the percentage is significantly lower (9.71% as compared to 38.01% for Puerto Rican wives, 20.42% for Mexican American wives, 42.22% for Cuban American wives, and 29.35% for East Asian American wives). Similar to out-marrying white men, white women have the highest endogamy rate among the six groups. When out-marrying, they are mostly likely to marry Mexican American (2.33%) and black (1.63%) husbands.

Table 2.2b Intermarriage Row Table by Husband's and Wife's Race/Ethnicity Among Educationally Hypergamous Unions, ACS 2011-2015 Five Year Sample

	Husband's Race						
Wife's Race	White	East Asian	Mexican	Puerto Rican	Cuban	Black	Total
White	**94.69 (13270)**	0.54 (76)	2.33 (326)	0.54 (75)	0.27 (38)	1.63 (229)	100 (14014)
East Asian	22.1 (162)	**74.35 (545)**	2.46 (18)	0.14 (1)	0.41 (3)	0.55 (4)	100 (733)
Mexican	20.42 (533)	0.23 (6)	**76.32 (1992)**	1.03 (27)	0.08 (2)	1.92 (50)	100 (2610)
Puerto Rican	38.01 (84)	0.00 (0)	8.14 (18)	**42.08 (93)**	1.81 (4)	9.95 (22)	100 (221)
Cuban	42.22 (38)	0.00 (0)	3.33 (3)	5.56 (5)	**45.56 (41)**	3.33 (3)	100 (90)
Black	9.71 (122)	0.08 (1)	0.88 (11)	0.96 (12)	0.08 (1)	**88.3 (1109)**	100 (1256)
Total	75.08 (14209)	3.32 (628)	12.51 (2368)	1.13 (213)	0.47 (89)	7.49 (1417)	100 (18924)

Frequencies in parentheses

At face value, results from Tables 2.2a and 2.2b seem to support the scenario of status-caste exchange. The crude percentages show that in hypergamous pairings, for out-marrying minority men with higher educational attainment level than their spouses, across the board, marrying whites is the most likely choice. Moreover, the boundary between whites and non-whites is more permeable for non-black minority women than for black women.

What happens when wives have higher educational levels than husbands? We now turn to the crude racial/ethnic intermarriage rates in hypogamous unions. Tables 2.3a and 2.3b are the column and row table by husband's and wife's race/ethnicity in educationally hypogamous pairings. Similar to Table 2.2a, Table 2.3a shows the percentage make-up of wives' race/ethnicity for men in each racial/ethnic group.

Table 2.3a Intermarriage Column Table by Husband's and Wife's Race/Ethnicity Among Educationally Hypogamous Unions, ACS 2011-2015 Five Year Sample

	Husband's Race						
Wife's Race	White	East Asian	Mexican	Puerto Rican	Cuban	Black	Total
White	**95.21 (25156)**	12.25 (67)	19.96 (874)	38.34 (189)	34.34 (57)	15.27 (440)	76.77 (26783)
East Asian	1.02 (270)	**86.11 (471)**	0.48 (21)	0.41 (2)	1.81 (3)	0.59 (17)	2.25 (784)
Mexican	2.35 (621)	1.10 (6)	**77.51 (3394)**	8.11 (40)	4.82 (8)	1.63 (47)	11.80 (4166)
Puerto Rican	0.52 (137)	0.18 (1)	1.03 (45)	**41.78 (206)**	4.82 (8)	1.53 (44)	1.26 (441)
Cuban	0.19 (50)	0.18 (1)	0.27 (12)	2.64 (13)	**53.01 (88)**	0.17 (5)	0.48 (169)
Black	0.71 (188)	0.18 (1)	0.75 (33)	8.72 (43)	1.20 (2)	80.81 **(2328)**	7.44 (2595)
Total	100 (26422)	100 (547)	100 (4,379)	100 (493)	100 (166)	100 (2881)	100 (34888)

Frequencies in parentheses

Here again, we see that when out-marrying, men of non-white minority groups are most likely to marry whites. Puerto Rican and Cuban American husbands have the highest percentage of marrying white wives (38.34% and 34.34% respectively). Correspondingly, Puerto Rican husbands are also more likely to marry wives of other non-white and pan-Latino groups. East Asian and black husbands in contrast have the lowest percentages of white wives (12.25% and 15.27% respectively).

Table 2.3b Intermarriage Row Table by Husband's and Wife's Race/Ethnicity Among Educationally Hypergamous Unions, ACS 2011-2015 Five Year Sample

	Husband's Race						
	White	East Asian	Mexican	Puerto Rican	Cuban	Black	Total
Wife's Race							
White	**93.93 (25156)**	0.25 (67)	3.26 (874)	0.71 (189)	0.21 (57)	1.64 (440)	100 (26783)
East Asian	34.44 (270)	**60.08 (471)**	2.68 (21)	0.26 (2)	0.38 (3)	2.17 (17)	100 (784)
Mexican	15.09 (621)	0.15 (6)	**82.46 (3394)**	0.97 (40)	0.19 (8)	1.14 (47)	100 (4116)
Puerto Rican	137 (31.07)	1 (0.23)	10.20 (45)	**46.71 (206)**	8 (1.81)	9.98 (44)	100 (441)
Cuban	29.59 (50)	0.59 (1)	7.10 (12)	7.69 (13)	**52.07 (88)**	2.96 (5)	100 (169)
Black	7.24 (188)	0.04 (1)	1.27 (33)	0..66 (43)	0.08 (2)	**89.71 (2328)**	100 (2595)
Total	75.73 (26422)	1.57 (547)	12.55 (4379)	1.41 (493)	0.48 (166)	8.26 (2,881)	100 (34888)

Frequencies in parentheses

Similar to Table 2.2b, Table 2.3b is the intermarriage row table that shows the percentage make-up of husbands' race/ethnicity for women in each racial/ethnic group. Table 2.3b shows a consistent pattern in line with the previous tables. For educationally advantageous women of the five non-white groups, marrying white husbands is the most likely

option when out-marrying. However, black women again have the lowest out-marrying rate with whites, as compared to other non-white minority groups.

Taken together, the results from Tables 2.2a through 2.3b seem to point in the direction of status-caste exchange, as educationally advantageous non-white individuals are most likely to marry whites when out-marrying. In addition, the boundary between whites and non-whites is more permeable for non-black minorities than for blacks. However, Tables 2.2a through 2.3b demonstrate only the crude intermarriage rates between different racial/ethnic groups, without controlling for population composition. In other words, the higher percentages of spouses of certain racial/ethnic groups found in Tables 2.2a through 2.3b could be a result of the relatively larger group sizes and greater availability of potential spouses of those groups. On this note, we move to the multivariate analysis.

2.5 MULTIVARIATE ANALYSES OF INTERMARRIAGE TABLES

To understand how patterns of racial/ethnic intermarriage implicate group boundaries, status hierarchy, and the "changing color line", the primary goal of the multivariate analysis is to determine whether/to what extent there exists a racial status hierarchy. To do so, the multivariate analysis aims to demonstrate the different strength of associations between husband's and wife's race/ethnicity (i.e. racial/ethnic endogamy vs. intermarriage) by the levels of couples' educational attainment for the six groups. Specifically, the multivariate analysis illustrates the effects of individuals' educational attainment and income on the likelihood of marrying a spouse from a given racial/ethnic group.

The majority of research on racial/ethnic intermarriage have utilized log-linear and log-multiplicative models. One key limitation of such models is the constraint of dimensionality, i.e. the difficulty in incorporating multiple (continuous) predictors (such as

spousal educational gap or income) into the analysis. I instead rely on Stereotype Ordered Regression (SOR) models (DiPrete 1990; Hendrickx 2000) to analyze the relative chances of racial/ethnic endogamy vis-à-vis intermarriage. SOR models are especially useful in this context because they permit the incorporation of several covariates, both in continuous and categorical forms (Wu & Treiman 2007).

2.5.1 Statistical Models

Based on the 6*4*4*6 (i.e. husband's race/ethnicity*husband's educational level*wife's educational level*wife's race/ethnicity) intermarriage table, the SOR model estimates a scaling metric for the outcome variable and a single parameter for each predictor (Anderson 1984; DiPrete 1990; Hendrickx 2000). The scaling of the dependent variable is estimated as part of the model results. Compared to ordinal logistic regressions, the SOR model is more flexible with respect to the proportional odds assumption. That is, the SOR model does not assume any specific ordering of the categories of the dependent variable (in this case, spouse's racial/ethnic categories) (Hendrickx 2000). Unlike standard multinomial logistic regression, the SOR model does assume that the dependent variable can be ranked on a single dimension (Hendrickx 2000). The SOR model estimates a scaling metric for the dependent variable as one of the model outcomes based on the data and the effects of the independent variables. In this sense, the primary advantage of the SOR model is the suitability for analyzing variables such as race or occupation that are semi-ordered yet the ranks are not entirely clear (Hendrickx 2000; for other applications of this model, see Hendrickx & Ganzeboom 1998; Wu & Treiman 2007).

The SOR model is specified as:

$$\text{Log}\left(\frac{P[Y=j]}{P[Y=j']}\right) = \text{logit}\left(\frac{\pi_j}{\pi_{j'}}\right) = \alpha_j - \alpha_{j'} + (\varphi_j - \varphi_{j'}) \sum_{k=1}^{K} \beta_k X_k \qquad (1)$$

To identify the model: $\sum \varphi_j$=0 and $\sum \varphi_j^2$=1

Two sets of SOR models are estimated separately for educationally hypergamous and hypogamous unions. For educationally hypergamous unions, Y is the wife's race/ethnicity with category j=1-6, whereas for educationally hypogamous unions, Y is the husband's race/ethnicity with category j=1-6. α_j is the constrained intercept parameter, which is similar to the constant term in the OLS framework. φ_j is the scaling metric for the dependent variable (wife's race/ethnicity j in educationally hypergamous unions and husband's race/ethnicity j in educationally hypogamous unions). φ_j is a measure of distinguishability of different categories given the predictors, that is, how different two categories are. A smaller difference in φ means that two categories are closer to be indistinguishable. Substantively, ϕ_j measures a "well-placed" spouse, based on the data and the model. X_k are the SOR covariates. β_k are the effect parameters of the covariates. Different from the OLS framework, the effect of an one-unit change in X_k on the log odds of marrying a spouse of race/ethnicity j versus j' is captured by $(\phi_j - \phi_{j'})\beta_k$ rather than β_k.

Within this framework, following Hendrickx & Ganzeboom (1998) and Wu & Treiman (2007), we could write Goodman's (1979) row and column model 2 as:

$$\text{Logit}\left(\frac{\pi_j}{\pi'_{j'}}\right) = \alpha_j\text{-}\alpha_{j'} + \left(\varphi_j - \varphi_{j'}\right)\mu\sigma_i \qquad (2)$$

To identify the model: $\sum \sigma_i$=$\sum \varphi_j$=0 and $\sum \sigma_i^2$=$\sum \varphi_j^2$=1

Here, we see the second advantage of the SOR model for analyzing intermarriage tables. Similar to log-linear models, the SOR model takes into consideration the population composition driving the crude intermarriage patterns by controlling for the marginal distributions. In the context of racial/ethnic intermarriage, self's race/ethnicity is treated as another covariate and is rescaled by σ_i. μ is the off-diagonal association parameter of self's

and spouse's racial ethnicity. In addition to permitting multiple predictors, the SOR model allows μ to co-vary with additional covariates. For example, to test the possible existence of in-group preference vis-à-vis status exchange, we could allow μ to co-vary with self's education so as to see whether the association between husband's and wife's race/ethnicity is different for individuals with various levels of educational attainment. This is expressed as:

$$\text{Logit}\left(\frac{\pi_j}{\pi'_{j'}}\right) = \alpha_j\text{-}\alpha_{j'} + \left(\varphi_j - \varphi_{j'}\right)\left(\mu_0 + \sum_{t=1}^{T}\mu_t X_t\right)\sigma_i + \left(\varphi_j - \varphi_{j'}\right)\sum_{k=1}^{K}\beta_k X_k \quad (3)$$

Likewise, to identify the model: $\sum \sigma_i = \sum \varphi_j = 0$ and $\sum \sigma_i^2 = \sum \varphi_j^2 = 1$

Here, μ_0 is the basic association parameter and μ_t are the effects of X_t on the association (t<k).

Further restrictions can be imposed on equation (3). Specifically, given endogamy rates are likely to vary across different racial/ethnic groups, we can single out the diagonal cells and model the diagonal associations separately for each of the six groups. This is specified as:

$$\text{Logit}\left(\frac{\pi_j}{\pi'_{j'}}\right) = \alpha_j\text{-}\alpha_{j'} + \sum_{i=1}^{6}\gamma_i d_i + \left(\varphi_j - \varphi_{j'}\right)\left(\mu_0 + \sum_{t=1}^{T}\mu_t X_t\right)\sigma_i + \left(\varphi_j - \varphi_{j'}\right)\sum_{k=1}^{K}\beta_k X_k$$

where d_i=1 if i=j and 0 otherwise (4)

Again, to identify the model: $\sum \sigma_i = \sum \varphi_j = 0$ and $\sum \sigma_i^2 = \sum \varphi_j^2 = 1$

I estimated my final models based on equation (4). Models 1a and 1b include only self's educational level and spousal educational gap as the SOR covariates. Models 2a and 2b further incorporate self's income decile into the model. Models 1a and 2a are estimated for educationally hypergamous unions whereas Models 1b and 2b are estimated for educationally hypogamous unions.

In equation (4), four sets of parameters are of particular interest: 1) the endogamy parameter γ, which measures the strength of racial/ethnic endogamy; 2) the scaling parameter φ_j, which provides a direct assessment of the distance between different racial/ethnic groups; 3) μ and its interaction term, which measures the association between husband's and wife's race/ethnicity, and how the association is affected by education, and 4) β_k, when scaled by $(\varphi_j - \varphi_{j'})$ it measures the effect of the SOR covariates (self's educational level, spousal educational gap, and self's income) on the likelihood of marrying a spouse or race/ethnicity j versus j'.

2.5.2 Results and Interpretation

In the context of racial ethnic intermarriage, the estimated scaling metric φ_j most directly illustrates the existence and order of a racial/ethnic status hierarchy. The off-diagonal association between husband's and wife's racial/ethnic categories (μ), the interactions between μ and covariate X_t (μ*X_t), and the endogamy parameter (γ) together illustrate whether and to what extent in-group preference is present for different racial/ethnic groups, at various educational levels. The SOR covariates for self's education and income help to illustrate whether and to what extent in-group preference exists, whereas the spousal educational gap covariate helps to illustrate whether and to what extent status-exchange is present for different intermarriage pairings.

Table 2.4 presents the estimated parameters for Model 1a through 2b.

Table 2.4 Parameters for Stereotype Ordered Regression of Intermarriage Tables, ACS 2011-2015 Five Year Sample

	Model 1a (Hypergamous Unions)	Model 1b (Hypogamous Unions)	Model 2a (Hypergamous Unions)	Model 2b (Hypogamous Unions)
Scaling metric for spouse's racial/ethnic category (φ)[a]				
White	1	1	1	1
East Asian	0.49	0.13	4.12	0.10
Mexican American	-2.03	-0.62	-3.02	-0.66
Puerto Rican	-1.49	0.18	-1.90	0.18
Cuban American	0.15	0.08	0.06	0.07
Black	0.00	0	0	0
Endogamy parameter (γ)				
White	1.78***	3.79***	1.41***	3.74***
	(0.12)	(0.22)	(0.10)	(0.21)
East Asian	4.99***	4.90***	4.97***	4.93***
	(0.16)	(0.14)	(0.17)	(0.14)
Mexican American	3.27***	4.63***	2.64***	4.66***
	(0.15)	(0.22)	(0.15)	(0.23)
Puerto Rican	3.21***	2.24***	3.12***	2.24***
	(0.17)	(0.14)	(0.18)	(0.14)
Cuban American	4.52***	4.03***	4.49***	4.03***
	(0.26)	(0.20)	(0.26)	(0.20)
Black	4.50***	4.08***	4.74***	4.06***
	(0.13)	(0.10)	(0.12)	(0.10)
The stereotype ordered effects of covariates (β)				
Self Education: High School	0.11	0.97***	0.15***	0.79***
	(0.01)	(0.20)	(0.07)	(0.17)
Self Education: Some college	0.21**	1.68***	0.26***	1.37***
	(0.10)	(0.19)	(0.07)	(0.16)
Self Education: BA and above	0.34***	2.47***	0.41***	2.00***
	(0.10)	(0.19)	(0.07)	(0.16)
Spousal Educational Gap	-0.12***	-0.37***	-0.08***	-0.31***
	(0.01)	(0.02)	(0.01)	(0.02)
Self Income Decile			0.005*	0.02***
			(0.003)	(0.01)
Spousal Race/Ethnicity Association (μ)				
Overall association	0.19***	-0.31	0.32***	-0.18
	(0.02)	(0.29)	(0.04)	(0.17)
Association*Self Education	-0.07***	-0.52***	-0.77***	-0.31***
	(0.00)	(0.05)	(0.01)	(0.03)
Model fit statistics:				
Log likelihood	-7378.25	-12465.59	-7376.71	-12461.66
Pseudo R2	0.78	0.80	0.78	0.80
Df	25	25	26	26

***p<0.01 **p<0.05 *p<0.1
SE in parentheses
[a] No SEs for scaling parameters

2.5.2.1 Examining Status Hierarchy

The scaling metric φ_j defines a "well-placed" spouse in the context of the model and given the data (Hendrickx 2000). Moreover, the difference between two φ scores indicates the distance between the two categories. The more similar the φ parameters of the two categories are, the more likely that the two categories are indistinguishable (Lunt 2001). The scaling metrics for the first and the last category are constrained to be 0 and 1 respectively, as part of the model specifications. The scaling metrics most directly illustrate a status hierarchy among different racial/ethnic groups in the context of the marriage market.

We start with educationally hypergamous unions. Here, φ parameters for wives of each racial/ethnic group are estimated based on the husband's educational level and the within-couple educational gap. In a sense, the φ parameter captures what kind of spouse wives of a certain racial/ethnic group are able to attract. Being able to attract better-positioned partners translates into a higher status in the context of the marriage market. Judging from Model 1a in Table 2.4, non-Hispanic white wives are the best-placed (φ=1), followed by East Asian wives (φ=0.49). East Asian wives fall right in the middle between whites and blacks. Cuban American wives are slightly better placed than blacks, yet the distance between the two groups is small (φ=0.15). The coefficients for non-Hispanic blacks (φ=0), Mexican Americans (φ=-2.03) and Puerto Ricans (φ=-1.49) imply that Mexican American and Puerto Rican wives, rather than black wives, are the worst-placed on the status hierarchy in the context of the marriage market. The distance between Mexican Americans and blacks is also the largest. In other words, white women are the most able to attract men with the highest education, as well as men with the most educational advantage (over their wife). Mexican American women are the least able to attract men with the highest education or with the most educational advantage.

The upper left-hand panel of Figure 2.1 provides a visualization of the results.

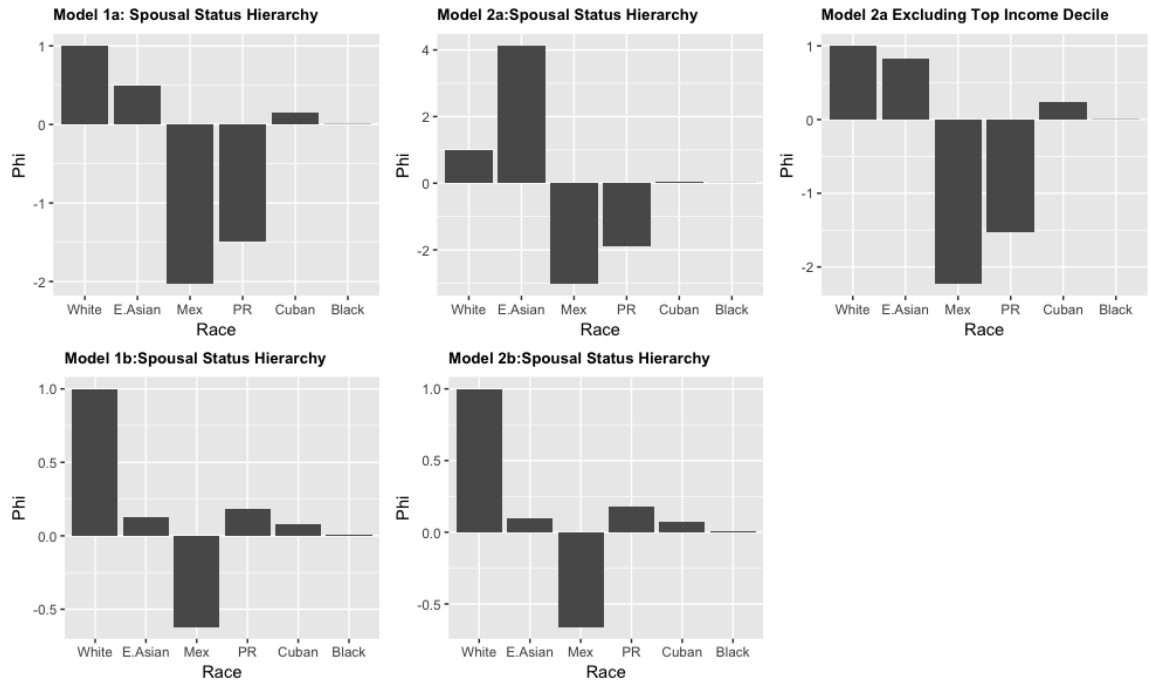

Figure 2.1 Status Ordering of Spouses of the Six Race/Ethnic Categories Based on SOR Regression Estimates

When husband's income is included in the model (Model 2a), the position of East Asian wives on the status hierarchy changes sharply. In educationally hypergamous unions, when taking into consideration husband's income, East Asian women ascend to the top of the hierarchy, surpassing whites. The relative positions and ordering of the other non-white groups remain the same, as shown in the second panel of the first row in Figure 2.1. Diagnostic analysis shows that this anomaly in East Asian American wives' placement is driven by the fact that as compared to other groups, the proportion of husbands coming from the

top income decile is the largest for East Asian American wives[5]. When couples with husbands belonging to the top income decile are removed from the analysis, the status ordering falls back to the same pattern as estimated by Model 1a, with whites on the top followed by East Asian Americans, and Puerto Ricans and Mexican Americans on the bottom. The upper right-hand panel of Figure 2.1 provides a visualization[6].

We now turn our attention to educationally hypogamous unions. Here, the ordering of the scaling metrics φ for husband's race/ethnicity remains stable between Models 1b and 2b. Panels on the bottom row of Figure 2.1 provide visualizations. Again, the results show that Mexican American husbands, rather than black husbands, are the "worst-placed" on the status hierarchy. In other words, Mexican American husbands are the least able to attract wives with greater socioeconomic status and educational advantage. The distance between Mexican American husbands and blacks is also the largest among all non-white minority groups. However, in educationally hypogamous unions, Puerto Rican and Cuban American husbands become better positioned than blacks, albeit with small distances.

Taken together, results from Models 1a through 2b most directly contradict the scenario of a non black-black divide: in both educationally hypergamous and hypogamous marriages, it is Mexican Americans, rather than non-Hispanic blacks, that fare the worst in the marriage market and fall to the bottom of the status hierarchy. Among all non-white groups, Mexican Americans also have the largest distance from blacks. Furthermore, across the board, whites occupy the top position on the status hierarchy, while East Asians and Cuban Americans are better placed than their non-Hispanic black counterparts to varying degrees.

[5] The percentages are listed in Table A1 in the Appendix.

[6] Table A2 in the Appendix provides the full parameter listings of the SOR model estimated for educationally hypergamous unions with the top income decile removed.

One caveat is that the relative ordering of Puerto Ricans against other non-white groups differs between educationally hypergamous and hypogamous unions. In educationally hypergamous unions, Puerto Rican wives fall below blacks whereas in hypogamous unions, the ordering between Puerto Rican and black husbands is reversed. Such a difference is likely the result of differential selection into various types of marital sorting by education. Overall, the results paint a picture of a combination of a white-non white divide and a revised version of the "tri-racial hierarchy" (Bonilla-Silva2004a, 2004b; Lee & Bean 2007), with whites and honorary whites (i.e. East Asians) on the top, followed by (collective) blacks, and certain Latino groups on the bottom.

2.5.2.2 Boundary and Hierarchy: Education, Endogamy, and Intermarriage

To examine how individuals' socioeconomic status intervenes in the association between husband's and wife's race/ethnicity, and the implications for group boundaries vis-à-vis status hierarchy, we turn our attention to the following set of parameters: 1) μ is the off-diagonal association between husband's and wife's race and ethnicity. When μ is interacted with X_t (self's educational level), the direction of the interaction terms illustrates whether higher education weakens the overall association between husband's and wife's race/ethnicity in marriage; 2) γ (the endogamy parameter) illustrates how strong the tendency for in-group marriage is for each racial/ethnic group; 3) the β coefficients (i.e. the SOR coefficients), when scaled by $(\varphi_j - \varphi_{j'})$, capture the effects of self's socioeconomic status and comparative advantage on the likelihood of marrying a wife of a different race/ethnicity. Across all models, the comparative advantage is captured by the spousal educational gap variable. In Models 1a and 2a, individuals' socioeconomic status is operationalized as self's educational attainment

level, whereas in Models 1b and 2b, individuals' income decile is also incorporated into the analysis.

We start with educationally hypergamous unions. In Model 1a, the off-diagonal association between husband's and wife's race/ethnicity (μ) is co-varied with husband's level of educational attainment. For men with below high school education, there is a small but significant and positive association between husband's and wife's race/ethnicity (0.19). Yet with every unit increase in men's education (i.e. moving from below high school to exact high school education, or moving from having completed some college to having completed a BA or more), the association between husband's and wife's race/ethnicity becomes significantly weaker, as indicated by the negative interaction term (-0.07). This negative coefficient suggests that globally, higher education overall is correlated with weaker associations between husband's and wife's race/ethnicity. In other words, greater educational attainment facilitates racial/ethnic intermarriage.

The endogamy parameters γ illustrate the racial/ethnic group differences in out-marrying. γ measures the likelihood of wives having the same race/ethnicity as husbands for each of the six racial/ethnic groups. Here, the endogamy parameters for the six racial/ethnic groups are all highly significant and positive, which means that for all racial/ethnic groups, there exists a strong diagonal association between husband's and wife's race/ethnicity, i.e. a strong tendency for racial/ethnic endogamy. Among the six groups, non-Hispanic whites have the lowest endogamy parameter ($\gamma = 1.78$), which implies that they are most likely to out-marry. The endogamy parameters (γ) are higher for non-Hispanic blacks ($\gamma = 4.50$), Cuban Americans (γ=4.52), and East Asian Americans (γ=4.99) than for Mexican Americans (γ =3.27) and Puerto Ricans (γ=3.21). This result is particularly interesting because rather than blacks, it is Mexican Americans and Puerto Ricans that score the lowest on the scaling

metrics. Yet both groups have lower endogamy parameters (i.e. are more likely to out-marry) than other non-white groups. These findings further point to the conceptual disjuncture between *group boundaries* and *status hierarchy*. Furthermore, while individuals do prefer marrying members of their groups to varying degrees, as indicated by the highly significant and positive endogamy parameters, higher educational attainment also facilitates intermarriage, which modifies the in-group preference scenario.

When examining the effects of the SOR covariates (β), the effect size of each covariate is captured by $(\varphi_j - \varphi_{j'})\beta_k$. With the exception of husband's education at the exact high school level, the SOR covariates are all highly significant. Looking first at the effect of self's educational attainment, as demonstrated by the positive coefficients (0.21 and 0.34), higher educational attainment facilitates marrying a better-placed wife. For example, globally the net odds for a husband who has completed some college marrying an East Asian wife rather than a black wife is more than one-tenth greater ($1.11=e^{(0.49-0)*0.21}$) than the corresponding odds for a husband who has below high school education. The net odds for a husband who has at least college education marrying an East Asian wife rather than a black wife is nearly twenty percent greater ($1.18= e^{(0.49-0)*0.34}$) than the corresponding odds for a husband who has below high school education.

However, it must be noted the observed effect of self's educational attainment may also capture the sheer sorting by education. In other words, perhaps East Asian wives as compared to black wives attract husbands with higher education levels and are thus better positioned on the status hierarchy because overall, East Asian wives also have higher educational attainment themselves. To discount this alternative explanation and further gauge the pattern of status exchange in racial/ethnic intermarriage and its implications for group boundaries and status hierarchy, we turn to the other SOR parameter, i.e. spousal educational

gap. To illustrate the effect sizes more concretely, I present and compare the net effects of one unit of spousal educational gap for the following five intermarriage pairings in educationally hypergamous unions:

Odds of marrying a white wife rather than a black wife:

$$e^{(1-0)*1*-0.12}=0.89$$

Odds of marrying an East Asian wife rather than a black wife:

$$e^{(0.49-0)*1*-0.12}=0.94$$

Odds of marrying a Mexican American wife rather than a black wife:

$$e^{(-2.03-0)*1*-0.12}=1.28$$

Odds of marrying a Puerto Rican wife rather than a black wife:

$$e^{(-1.49\ -0)*1*-0.12}=1.20$$

Odds of marrying a Cuban American wife rather than a black wife:

$$e^{(0.15-0)*1*-0.12}=0.98$$

The above results show that, using marrying a black wife as the baseline, a given unit of husband's educational advantage is associated with higher odds of him marrying a Mexican American or a Puerto Rican wife, lower odds of marrying a white or an East Asian wife, and nearly the same odds of marrying a Cuban American wife. In other words, with a *fixed* level of educational advantage, compared to marrying a black wife, a husband is more likely to succeed in marrying a Mexican American or Puerto Rican wife and less likely to succeed in marrying a white or East Asian wife. If intermarriage is characterized by endogamous intermarriage, while all else equal and after controlling for population composition, a *fixed* level of educational advantage should not be associated with differential likelihoods of marrying individuals from various racial/ethnic groups, since under the endogamous intermarriage scenario, race/ethnicity should bear no significant effect on the process of mate selection. Moreover,

because with a *fixed* level of educational advantage, in hypergamous unions, it is more difficult to marry a white or an East Asian American wife, the findings further illustrate a racial/ethnic status ordering that favors whites and East Asians over Puerto Ricans and Mexican Americans among women. Therefore, the above results lead to a rejection of the endogamous intermarriage model and provide support for the scenario of status exchange.

After adding husband's income decile into the model (Model 2a), we observe little change in the sizes, signs, and significance levels of all parameters. Again, the model shows that higher education promotes intermarriage and enables individuals to marry "better-placed" spouses. Similar to the SOR covariate of educational attainment level, the coefficient for husband's income decile is significantly positive, albeit with a much smaller effect size.

Taken together, when examining educationally hypergamous unions, the results paint a picture of a racial/ethnic group ordering that does not follow the non-black/black divide. Rather, the scaling metrics demonstrate that non-Hispanic whites and East Asians are the best-placed, whereas Puerto Ricans and Mexican Americans, rather than non-Hispanic blacks, fare the worst.

Turning our attention to educationally hypogamous unions, the SOR estimates exhibit a similar pattern. First, when looking at Models 1b and 2b, it is apparent that higher education promotes intermarriage, as demonstrated by the significant and negative interaction term μ^*X_t (-0.52 in Model 1b and -0.31 in Model 2b). Second, similar to the results discussed above, the significant and negative coefficient of spousal educational gap (-0.37 in Model 1b and -0.31 in Model 2b) provides no support for the endogamous intermarriage scenario. Rather, a *fixed* level of educational advantage corresponds to greater likelihoods of marrying a spouse in a lower status racial/ethnic group than in a higher status group. Furthermore, adding wife's income into the model does not alter the sizes, signs, and significance levels of the coefficients.

However, when examining educationally hypogamous unions, the endogamy parameters (γ) are higher across the board. In other words, women with a higher educational level than their spouses are more likely to choose members of their own racial/ethnic group in hypogamous unions. Among the six groups, Puerto Ricans have the lowest endogamy parameter (γ=2.24), suggesting that they are most likely to out-marry. This is consistent with the descriptive results. Not only do Puerto Ricans have high out-marrying rates with whites, they are also more likely to out-marry other non-white, particularly pan-Latino, groups.

In sum, when looking at unions with spousal educational mismatch, results from the multivariate analysis paint a picture of status-exchange in racial/ethnic intermarriage. The findings provide little support for the endogamous intermarriage scenario and at the same time modify the in-group preference model. While individuals do prefer marrying members of their own racial/ethnic group, education is a great facilitator of intermarriage. Higher educational attainment is associated with weakening association between husband's and wife's race, while greater socioeconomic advantage is needed in order to marry spouses with higher racial/ethnic status. The results also demonstrate that the tendency for racial/ethnic endogamy varies among the six racial/ethnic groups studied. Particularly in educationally hypergamous unions, Puerto Ricans and Mexican Americans have the lowest endogamy parameters, meaning that as a group, both exhibit a greater tendency for racial/ethnic intermarriage. Such findings are noteworthy because on the one hand, a strong tendency for intermarriage implies more permeable group boundaries. On the other hand, among the six racial/ethnic groups analyzed, it is Mexican Americans, rather than non-Hispanic blacks, that consistently occupy the lowest position on the racial status scaling metrics. Such discrepancies further illustrate the conceptual disjuncture between *group boundaries* and *status hierarchy*.

Although largely consistent, results based on educationally hypergamous versus hypogamous unions do show some differences with respect to the racial/status ordering of spouses for certain groups. For both educationally hypergamous and hypogamous unions, whites and Mexican Americans respectively occupy the highest and lowest position on the racial status hierarchy. In hypergamous unions, East Asians fall right in between non-Hispanic blacks and whites, whereas Puerto Ricans join Mexican Americans at the bottom of the racial status hierarchy. In hypogamous unions, with the exception of Mexican Americans, the non-white minority groups fall much closer to one another on the status hierarchy with smaller distinguishability.

2.5.3 Robustness Checks and Auxiliary Analysis

I have performed additional analyses to test the robustness of the results discussed above. First, rather than excluding unions in which both partners' years of immigration come after the reported year of marriage, I reconstruct the sample to exclude all unions if *either* partner's year of immigration is later than the reported year of marriage. This is to test for any potential bias introduced by including marriages contracted between immigrants and native-born individuals or between "early" and "late" arrivals. Table A3 in the Appendix presents the full model results. Here, the sizes, signs, and significance levels of the scaling metrics (φ), the SOR covariates (β), the association parameter μ and its interaction term μ*X_t, as well as the endogamy parameters (γ) have largely remained stable.

Second, I test the robustness of the estimates to alternative variable specifications. Here, educational attainment is re-specified as a three-level ordinal variable that combines individuals with exact high school education with those having below high school education.

Table A4 in the Appendix presents the results. Again, the sizes, signs, and significance levels of all key covariates have remained stable.

Finally, as an auxiliary analysis, I have refitted Models 1 and 2 to educationally homogamous unions. Wife's race/ethnicity is treated as the outcome variable and husband's educational attainment level and income decile the key SOR covariates. The association parameter μ is allowed to co-vary with X_t (i.e. husband's educational level). Table A5 in the Appendix presents the full parameter listings. Here again, we see that higher education promotes intermarriage, as demonstrated by the significant and negative interaction term between husband's educational attainment and the association parameter μ (-0.09). The scaling metrics φ again show that it is Mexican Americans, rather than non-Hispanic blacks, that occupy the lowest position in the status hierarchy[7]. In addition, the endogamy parameter is also the lowest for Mexican Americans, meaning that they are most likely to out-marry. Such findings further corroborate the previously discussed mismatch between racial status hierarchy and group boundary rigidity. In other words, a more permeable boundary does not translate into a higher position on the status ordering, and vice versa.

2.6 SUMMARY AND CONCLUSION

Racial/ethnic intermarriage has long been considered to be one of the fundamental aspects of assimilation. A careful re-examination of intermarriage patterns in the contemporary United States is important for two reasons.

[7] Here, East Asian Americans have again ascended to the top of the status ordering, surpassing whites. Given that φ is estimated based on the data and model predictors, in educationally homogamous unions, this result is driven by the fact that East Asian Americans overall have the highest educational attainment level.

First, traditional research on racial/ethnic intermarriage often treats an increase in crude overall intermarriage rates between different racial/ethnic groups as the indicator for increased boundary relaxation and group integration. However, drawing on Merton's and Davis' theory of status-caste exchange, recent empirical research has highlighted the importance for considering couple characteristics, particularly the possible mismatch in spouses' educational attainment levels, into the analysis of racial/ethnic intermarriage. If status mismatch occurs in intermarriage pairings with higher socioeconomic status serving as a compensation for lower racial status, observed intermarriage, despite its increasing prevalence, would still signify a persistent racial status hierarchy. A conceptual distinction thus needs to be drawn between racial/ethnic *group boundaries* and *status hierarchy*. In this sense, the existence of and increases in racial/ethnic intermarriage do not necessarily point to increasing societal openness or diminishing social distances among various racial/ethnic groups. Likewise, for a given group, a more porous group boundary between selves and members of outside groups does not always correspond to a higher position on the status hierarchy.

Secondly, with the unprecedented influx of immigrants from Latin America, Asia, and the Caribbean, contemporary U.S. racial relations are characterized by a move beyond the traditional black-white divide. Immigration poses a theoretically and socially significant question for understanding changing racial relations in the United States: where do immigrants fall on the traditional white-black color line?

Given that the three different scenarios of racial/ethnic intermarriage each holds unique implications for understanding racial/ethnic group boundaries vis-à-vis status hierarchies, investigating the current patterns of intermarriage holds part of the answer to the puzzle of the "changing color line". Using log-linear or log-multiplicative modeling, existing research on U.S. racial/ethnic intermarriage focuses predominantly on pairings between

whites and non-white minorities (including non-Hispanic blacks). Although such research can demonstrate the group boundary rigidity and relative status ordering between whites and each of the non-white groups, solely comparing each non-white group against whites provides little information on how these minority groups relate to one another on the entire spectrum of the status hierarchy.

Using Stereotype Ordered Regression (SOR) models and focusing on unions with spousal educational mismatch across six racial/ethnic groups, this chapter shows that in the context of the marriage market, Mexican Americans and to a lesser extent, Puerto Ricans, rather than non-Hispanic blacks, fall at the bottom of the status hierarchy. East Asian Americans, on the other hand, fall in between non-Hispanic blacks and whites, whereas Cuban Americans fall extremely close to blacks. These results contradict the idea of a color line characterized by a non-black over black divide and instead point to the persistence of a white over non-white divide and a modified tri-racial hierarchy, with whites and honorary whites at the top, followed by (collective) blacks and certain Latino groups.

The analysis further demonstrates that racial/ethnic intermarriage in the contemporary United States is characterized by status-exchange rather than by endogamous intermarriage. Although in-group preference is largely present, education serves as a facilitator for intermarriage. Furthermore, although Mexican Americans occupy the bottom position on the status hierarchy, they have the lowest endogamy rates across the board in hypergamous, homogamous, and hypogamous unions. These findings thus support the conceptual distinction between *group boundaries* vis-à-vis *status hierarchy* in understanding the implications of racial/ethnic intermarriage.

Several limitations and questions remain that require future scholarly attention. First, I was not able to distinguish immigrant generations in the analysis. Some studies have

documented generational variations in intermarriage, particularly with respect to higher intermarriage rates with non-Hispanic whites for third-plus-generations of Latino groups (Lichter et al. 2011, 2015). Furthermore, scholars have highlighted the issue of "ethnic attrition", particularly among later-generation Mexican Americans, in tracking assimilation and sociocomic outcomes of immigrant groups across generations (Alba & Islam 2009; Antman et al. 2016; Lee and Bean 2010; Perlmann & Waters 2007). The observed low position of Mexican Americans in the status hierarchy may thus be because a non-negligible proportion of later-generation Mexican Americans no longer self-identify as such. Future studies are needed to further account for generational variations and potential biases introduced by ethnic attrition, in order to test the robustness of the observed status hierarchy. Related to this, a demographic consequence of racial/ethnic intermarriage is the growth in populations with multi-racial identifications. In future research it will be worthwhile to consider how an increase in the multi-racial population further implicates the racial status hierarchy and group boundaries in the context of the marriage market and beyond.

Secondly, to obtain adequate analytical leverage, in this chapter I have merged Chinese, Japanese, and Korean Americans together to form the category of East Asian Americans. As marriage between these three groups may also be considered a form of intermarriage, in future work it is worthwhile to examine the (inter)marriage patterns for the three groups separately, through innovative methods more equipped to deal with small-N and sparse tables.

Another limitation of this chapter is its sole focus on racial/ethnic *intermarriage*. As cohabitation becomes increasingly common in the contemporary United States with varying degrees of prevalence among different racial/ethnic groups, it is worth asking what the patterns of inter-racial/ethnic cohabitation are, and whether inter-racial/ethnic cohabitation is qualitatively different from racial/ethnic intermarriage. A related limitation is that the

analysis in this chapter starts with heterosexual individuals in their first marriages. It is thus difficult to fully interrogate the heterogeneity in selection in the marriage sorting process. In other words, why do some individuals out-marry whereas others do not? Do patterns of intermarriage differ across life course, or between first marriages and later marriages? There remains much we do not fully understand about individuals' search heuristics and decision-making when it comes to intermarriage. Additional work is needed to more thoroughly identify the mechanisms through which individuals differentially enter into and maintain inter-racial/ethnic unions.

Chapter 3

Economic Resources, Cultural Capital, and the Rural-Urban Boundary in China's Marriage Market, 1987-2016

3.1 INTRODUCTION

Abundant research exists that examines marriage sorting along a multitude of dimensions, such as race/ethnicity (e.g. Fu 2001; Qian 1997, 1998b; Qian & Lichter 2001, 2007; Rosenfeld 2008), family background and parental wealth (e.g. Charles et al. 2013), education (e.g. Mare 1991; Schwartz & Mare 2005; Smits et al. 1998), occupation (e.g. Hout 1982; Kalmijn 1991b, 1994), and religion (e.g. Kalmijn 1991a). Numerous studies have documented patterns of assortative mating by individuals' ascriptive or achieved characteristics in different societies across time. Because marriage signifies the acceptance of others in one of the most intimate senses, marriage- or the lack thereof- between members of different social groups is viewed as an indicator of the relative permeability of group boundaries (e.g. Gordon 1964; Kalmijn 1998; Lieberson & Waters 1988) and the rigidity of the stratification system (e.g. Blossfeld 2009; Blossfeld & Timm 2003; Mare 2000; Ultee & Luijkx 1990). Nevertheless, the link between assortative mating patterns and the degree of social openness and closure becomes more complicated and tenuous when fully considering the interplay between individuals' ascriptive and achieved characteristics. Specifically, when spouses' ascribed and achieved traits interact in the form of compensatory exchange[8], marriages following the exchange logic may also point to a lasting hierarchical cleavage between groups (Fu 2001).

[8] As example, scholars of racial/ethnic intermarriage have consistently found that individuals of lower racial status groups with higher socioeconomic status are more able to marry individuals of higher status racial groups with lower socioeconomic status, whereas the reverse is less probable (e.g. Kalmijn 1993; Qian 1997; Fu 2001). In other words, there exists a compensatory exchange between individuals' socioeconomic standing and racial status.

Understanding the implications of marriage sorting based on various ascriptive and achieved characteristics requires an exploration of how individuals make marriage decisions. Existing theoretical explanations of assortative mating patterns fall largely into two camps, i.e. economic competition and cultural matching (Kalmijn 1994). The two frameworks differ on their respective take on the relative power of individuals' ascriptive versus achieved traits in the marriage market, and thereby have different implications for the link between marriage sorting patterns and the relative openness of the stratification system.

The economic competition framework posits that individuals always prefer partners with greater economic resources in order to maximize family income (see Kalmijn 1994). This framework would suggest that advantageous present-day status attainment could offset disadvantages in individuals' ascriptive characteristics, such as race or social class origin. If marriage sorting indeed follows this logic, such a scenario would point to greater social openness, as individuals are able to move beyond their social origin stratum through adulthood status attainment in the marriage market. The cultural matching framework, on the other hand, highlights the importance of shared norms, values, and cultural capital in marriage sorting. Studies supporting the cultural matching framework often point to the lasting power of ascriptive traits in forming intimate relationships (DiMaggio & Mohr 1985; Gordon 1964; Kalmijn 1994, 1998). Correspondingly, the enduring effect of individuals' ascriptive traits in the marriage market would implicate a higher degree of rigidity and closure in the stratification system.

To adjudicate the two theoretical accounts, current empirical research is lacking in two regards. First, existing studies have largely been concerned with studying marriage sorting along a singular dimension. The focus is predominantly on estimating the effect of a given characteristic in driving marriage outcomes, *net of* other factors. The interplay and potential

compensatory exchange between individuals' various ascriptive and achieved characteristics are not thoroughly considered, beyond the context of racial/ethnic intermarriage. Without fully understanding such an interplay, it is difficult to ascertain the relative importance of individuals' ascriptive and achieved characteristics in driving marriage market outcomes. It is further difficult to test whether individuals' disadvantageous ascriptive characteristics can be offset by advantages in their achieved traits, as the economic competition framework would suggest. Thus, the existing approach of considering marriage sorting along a single dimension impedes scholars' ability to adjudicate between different theoretical perspectives. Secondly, research on assortative mating has relied almost solely on large-scale survey data and quantitative ex post facto analysis of established unions[9]. In such analysis, marriage is treated as a realized outcome fixed in time, rather than a search process involving individual reasoning, preferences, decision, and meaning-making. Such an analytical approach thus obscures key underlying mechanisms in understanding *how* individuals evaluate potential mates and *why* they come to various marriage decisions.

The present study fills these gaps and adjudicates between the two theoretical frameworks by examining the roles of household registration status (*hukou*) and educational attainment in China's marriage market from 1987 onward. With the promulgation of the Household Registration Regulation in 1958, the household registration system (*hukou*) that categorizes individuals as either rural (agricultural) or urban (non-agricultural) has been one of the major sources of social stratification and profound social cleavages in contemporary China (Whyte 2010). Using a mixed-methods approach that combines large-scale national surveys and 90 in-depth structured interviews, I investigate how educational attainment and *hukou*

[9] When qualitative methods are used (e.g. Streib 2015), such studies start from already established unions as well and retrospectively explore individuals' decision- and meaning-making in marriage entry.

status jointly shape individuals' marriage outcomes. Specifically, the quantitative analysis focuses on the extent to which having a rural *hukou* origin adversely affects individuals' desirability in the marriage market, particularly for the rural-born population that have successfully obtained urban *hukou* prior to marriage entry. In doing so, I examine whether and to what extent adulthood status attainment could offset the disadvantages in individuals' social origin in the context of the marriage market. The qualitative analysis seeks to further understand how individuals evaluate potential partners and the reasons behind their mate selection preferences and marriage decisions. Specifically, the qualitative analysis most directly elucidates the meaning individuals attach to various spousal traits, thereby illustrating the source of (under)desirability for members of different social groups and provides evidence for adjudicating between the two theoretical frameworks.

Before discussing the data, methods, and findings, I first provide an overview of existing theoretical accounts of assortative mating. I then present the Chinese context and the *hukou* system in greater detail. In doing so, I highlight the unique advantage provided by studying marriage sorting in the Chinese context for adjudicating the two theoretical frameworks on the link between marriage sorting patterns and social openness and closure.

3.2 GENERAL THEORIZATIONS OF ASSORTATIVE MATING

3.2.1 Economic Competition and Cultural Matching

Conventional wisdom suggests that individuals search for the best partner from a pool of potential mates. But what is a "good" match? The economic competition framework highlights the central role of economic resources in driving marriage outcomes. The framework encompasses several different theoretical models.

First, a longstanding theorization of marriage regards mate selection as a process of specialization and exchange for joint utility maximization (Becker 1973, 1974, 1991). Under the "specialization and exchange" model, individuals are assumed to enter different, specialized roles upon marriage, with the husband in paid labor and the wife in unpaid housework (Becker 1985). Marriage thus represents a bond of mutual dependency and an exchange of resources between rational actors with differential comparative advantage in the household and the labor market (Raymo & Iwasawa 2005; Yu & Xie 2015).

The "specialization and exchange" model has been used to explain the observed patterns of status homogamy. The underlying logic is straightforward: Acquiring an advantageous socioeconomic position and thus having more economic resources translates into greater desirability and a higher probability of attracting an equally desirable spouse in the marriage market. Furthermore, as gender roles become less specialized, men will begin to seek and compete for women with greater economic resources just as women have traditionally valued and sought out economically advantageous men (Kalmijn 1994).

An alternative theoretical model under the economic competition framework is the "marriage-search" theory (Oppenheimer 1988), which again focuses on the role of economic incentives and resources in driving mate selection outcomes. The marriage-search model acknowledges that high-status individuals in the labor market make more attractive marriage partners in modern society (Oppenheimer 1994, 1997). However, given the "gender revolution" (Goldin 2006) in women's employment and earnings, highly educated women are now more able to support themselves. As a result, not only are these women able to carry out a longer and more thorough search (Yu & Xie 2015), the economic incentive to seek out mates with high socioeconomic status attainment may also decrease. In other words, highly educated

women may instead be willing to "marry a man who is unlikely to be a great provider but who is highly desirable in other respects" (Oppenheimer 1994: 315).

These two theoretical models predict different patterns of status homogamy in the long run. However, both emphasize the role of economic resources in driving marriage outcomes. Here, economic resources have largely been operationalized as adulthood educational and labor market attainment. Thus, under the economic competition framework, it is the "present" that matters. One would hypothesize that mate selection for individuals with the same adulthood status attainment outcomes would be similar, regardless of their social origins. A group of scholars have indeed argued that the ascribed "past", e.g. social origins, has lost its importance in marriage sorting for individuals who share similar adulthood class positions, because as adults, these individuals have undergone similar educational trajectories, hold occupations of comparable prestige, and have similar access to earnings and networks (e.g. Aschaffenburg & Maas 1997; Chin & Phillips 2004; DiMaggio 1982; Erickson 1996; McFarland & Pals 2005, see also Streib 2015).

Unlike the economic competition framework that largely focuses on individuals' current educational attainment and labor market positions, the cultural matching framework draws on the Bourdieusian notions of cultural capital and habitus (Bourdieu 1984) and emphasizes the importance of shared norms, tastes, and values in mate selection and union formation. Shared cultural capital "ensures a common basis of conversation, provides confirmation of one's norms and values, and reduces friction within marriage that may arise from dissimilarity in tastes" (Kalmijn 1994: 423).

The cultural matching framework points to the lasting effect of social origin on forming intimate relationships (DiMaggio & Mohr 1985; Kalmijn 1994). Different classes are viewed as possessing distinct tastes, norms, values, and moral worth (Bourdieu 1984; Lacy

2007; Lamont 1992, 2000). The lasting cultural differences thus make marriage formation across the social class line difficult (DiMaggio & Mohr 1985; Kalmijn 1994). Newer research on highly educated U.S. couples of different social class origins has taken on a more optimistic tone and instead suggests that such cultural distinctions produced by differences in social origins are not always divisive (Streib 2015). Such research nonetheless highlights the enduring imprint of social origin on individuals' mate selection process and married life.

3.2.2 Past and Present: Social Openness and Closure

To what extent does the past matter? With their different takes on the relative importance of achieved versus ascribed characteristics in marriage sorting, the economic competition and the cultural matching frameworks speak to the profound implications of assortative mating on social openness and closure.

On the one hand, if economic resources are the primary driving force in the mate selection process, such a scenario would point in the direction of greater social openness because advantageous adulthood status attainment could offset the disadvantages in individuals' ascriptive traits. Individuals are thus able to move beyond their social origin stratum in the marriage market through adulthood status attainment. On the other hand, under the cultural matching framework, individuals' ascriptive characteristics have a lasting effect in the form of enduring cultural distinctions that cannot be fully negated by adulthood status attainment. If marriage formation were governed more by the logic of cultural matching, such a scenario would be indicative of a lasting cleavage between members of different social groups based on ascribed traits.

Although the scholarship on assortative mating is abundant, empirical evidence for the theoretical frameworks remains ambiguous, with varied accounts across countries and across

time. Descriptive findings of matching patterns based on singular dimensions such as education and occupation are often interpreted as support for either economic competition or cultural matching, but such quantitative variable-based analysis of established unions provides little insight in understanding how individuals evaluate potential partners and make marriage decisions, or the meaning they attach to various spousal traits. In the following section, I highlight how the examination of marriage sorting in contemporary China using a mixed-methods approach addresses such gaps.

3.3 THE CASE OF CHINA: THE DUALITY OF *HUKOU*

3.3.1 *Hukou*: Social Boundary and Symbolic Divide

Introduced in 1958, the *hukou* system that separates individuals as either rural or urban was originally set up as a population control strategy in China to cope with the state's demand for rapid industrialization (Chan 1992; Chan 2009; Cheng & Selden 1994; Wang 2005). Under the *hukou* system, individuals seeking to permanently change residence must obtain approval for *hukou* change from the local authorities (Chan 2013). To carry out the industrialization program, the state deliberately created a "dual economy and society" (Chan 2009: 200). Strong state support was given to the industrial sectors located in urban areas. The agricultural sector was designated as non-priority, yet it encompasses the majority of China's population (Chan 2009; Wu & Treiman 2004, 2007). Under the *hukou* system, urban residents are entitled to state-provided social welfare and benefits such as housing subsidies, health care, and pensions that are not available to their rural counterparts (Chan 1996, 2009; Chan & Buckingham 2008; Solinger 1999; Wang 2005; Whyte 2010; Wu & Treiman 2004, 2007). *Hukou* change, particularly from rural to urban areas, is heavily regulated (Chan 2013; Wang 2005).

Existing scholarship has shown the *hukou* system to be much more than just a population control tool that restricts internal migration (Chan 2001, 2013; Chan & Yang 1996). It also holds a multitude of broad implications for various aspects of China's economy and society (Chan 2009; Fan 2008; Wang 2005; Wu & Treiman 2004). Specifically, the *hukou* system is "an important mechanism in distributing resources and determining life chances in China" (Wu & Treiman 2007: 418). Extensive scholarship has documented the rural-urban gap in China along a variety of dimensions throughout individuals' life course, such as educational attainment (e.g. Hannum 2003; Hannum et al. 2011), income (e.g. Xie & Zhou 2014), intergenerational occupational mobility (e.g. Wu & Treiman 2007), and health (e.g. Chen et al. 2010; Zhang & Treiman 2013).

Furthermore, the rural-urban gap created and maintained by the *hukou* system is far more than just a social boundary, i.e. the "objectified forms of social differences" observed in different groups' unequal access to resources and opportunities (Lamont & Molnár 2002). The rural-urban gap is a symbolic boundary as well, that is, the conceptual categorization of individuals that creates senses of (dis)similarity and group in/exclusion (Lamont & Molnár 2002). Studies have shown that across the world, rural and urban populations are viewed as having distinct values, attitudes, and tastes (e.g. Albrecht & Albrecht 1996; Hofferth & Iceland 1998). Similarly, in China's popular discourse, rurality has been associated with being less modern or civilized. Rural residents are denigrated as having less education, less human and cultural capital, and lower overall worth (*di suzhi*) (e.g. Otis 2011).

3.3.2 *Hukou*: Ascriptive Trait and Achieved Characteristic

Hukou, which some have dubbed China's caste system (see Wang 2010), is largely an ascriptive characteristic. Individuals' *hukou* status is determined at birth based on parents'

hukou registration status[10]. However, *hukou* conversion from rural to urban is possible, yet such a conversion is difficult with strict quota and limited opportunities. Educational attainment, along with party membership and military service, has been the major channel for *hukou* mobility (Wu & Treiman 2007; Zhang & Treiman 2013). In a way, *hukou* conversion benefits the "best and the brightest of the rural population" (Wu & Treiman 2007: 419), yet as noted above, rural residents overall are denigrated, devalued, and viewed as culturally distinct from their urban counterparts. For a select segment of the rural population that has undergone *hukou* conversion, the question becomes: To what extent does transcending such a social boundary enable individuals to cross the symbolic divide as well in the marriage market? More generally, to what extent does the achieved "present" negate and offset the disadvantages of the ascribed "past"?

Examining the marriage sorting outcomes for rural-born individuals, particularly those who have obtained urban *hukou* prior to marriage, allows us to adjudicate the theoretical frameworks of economic competition vis-à-vis cultural matching. If economic resources, understood as present-day educational and labor market attainment, are the primary driving force in marriage sorting, we would expect *hukou* converters to fare similarly to their urban-born counterparts in the marriage market as they have arrived at the same present-day standing (i.e. both urban). In other words, for *hukou* converters, the disadvantages associated with rural *hukou* origin would be offset by their adulthood status attainment. However, if the logic of cultural matching holds greater explanatory power, we would expect there to still be a lasting adverse effect of rural *hukou* origin for individuals who, on paper, have successfully crossed the rural-urban boundary.

[10] Prior to 1998, individuals could only inherit *hukou* status from their mothers.

3.3.3 Assortative Marriage in China: Empirical Findings and Limitations

Compared to research on Western countries, studies on assortative mating patterns in post-1949 China remain relatively few. Pioneering research (e.g. Croll 1981, 1983, 1984; Parish 1984; Whyte & Parish 1984) has provided qualitative evidence that sheds light on how political changes have influenced educational assortative mating patterns. More recent research has been disproportionately concerned with marriage sorting along a singular dimension, viz. educational attainment (e.g. Han 2010; Raymo & Xie 2000; Smits 2003; Song 2009; Xu et al. 2000). Relying on quantitative analysis of survey data, these studies have provided sometimes contrasting descriptive accounts of the patterns and trends of educational homogamy in post-1949 China. Research on marriage sorting that explicitly addresses the issue of *hukou* conversion and rural-urban marriages is rare, with one exception (Wang & Schwartz 2015) that examines the macro-level determinants and trends of rural-urban marriages between 1958-2008.

Recent empirical research on China's assortative mating patterns suffers from some of the common limitations discussed earlier. Little attention has been paid to the interplay between individuals' ascriptive and achieved characteristics in the marriage market. Nor are individuals' reasoning, values, and emotion in the mate selection process sufficiently considered. Thus, although these studies provide detailed descriptive accounts of the trends and patterns of education-based assortative mating in post-1949 China, the underlying mechanisms through which such trends and patterns come into being remain largely a "black box". In this light, the current study makes the following empirical contributions. First, using large-scale nationally representative surveys and 90 in-depth interviews with both single and married men and women, I adopt a mixed-methods approach to study marriage sorting in China from 1987 onward. The combination of quantitative and qualitative data and analyses

not only reveals the aggregate-level trends and patterns, but also allows exploration of individuals' deep-held reasoning, values, and emotion in mate selection and marriage entry *processes*. Secondly, in addition to evaluating the effect of *hukou* as a static social origin attribute, I specifically consider the duality of *hukou* as a characteristic that can be both ascriptive and achieved, and both a social and a symbolic boundary. Specifically I model the effect of *hukou* conversion on individuals' desirability in China's marriage market. In doing so, the present study contributes to the conceptual understanding of marriage sorting through adjudicating the existing two theoretical frameworks, in order to better understand the implications of observed assortative mating patterns for social openness and closure.

3.4 STUDY DESIGN

3.4.1 Quantitative Analysis: Data and Model

To investigate the overall trends and patterns of assortative mating in China from 1987 onward, I rely on three nationally representative datasets that each covers a specific time period. The 2003 and 2006 China General Social Surveys (CGSS) were used to uncover the patterns of assortative mating between 1997 and 2006. The 1996 Life Histories and Social Changes in Contemporary China dataset (hereafter referred to as the 1996 Life History Survey) was used to evaluate marriage patterns between 1987 and 1996. All three datasets are based on nationally representative samples. The 1996 Life History Survey and the 2006 CGSS include both urban and rural populations, whereas the 2003 CGSS covers only urban China. Compared to other available datasets on contemporary China, these three datasets are the only ones that provide the necessary information on individuals' marriage, *hukou*, and education histories. The three datasets also include relevant demographic information (e.g. age, *hukou* history, educational attainment) for respondents' parents and, when applicable, current spouse.

To minimize possible selection biases introduced by differences between first marriages and later marriages, I have restricted my sample to first marriages contracted within the last ten years covered by the survey. Specifically, from the 1996 Life History Survey, I have obtained the relevant information on both spouses for all first marriages contracted between 1987 and 1996. Similarly, from the 2006 CGSS, I have extracted information on both partners for all first marriages contracted between 1997 and 2006. For married individuals, age, *hukou* trajectory and educational level are specified at the time of marriage rather than at the time of the survey[11].

In analyzing marriage tables, the current standard approach of log-linear and log-multiplicative models cannot fully account for the populations at risk of marriage, as such models only incorporate established unions into the analysis. The sometimes-employed event-history models that consider the unmarried population are generally single-sex approaches that do not address variability in marriage entry by age-sex compositions, thereby leading to the "two-sex problem" (Kashyap et al. 2015; Schoen 1988). I rely instead on the harmonic mean marriage function proposed by Schoen (1981, 1988), which offers an elegant solution to the "two-sex problem" while at the same time accounting for the population at risk of marriage.

The model in its simplest form can be specified as follows (Kashyap et al. 2015):

$$N_{ij} = \alpha_{ij} \frac{M_i F_j}{nM_i + mF_j} \quad (1)$$

[11] The 2003 CGSS was used to construct the population at risk of marriage between 1997 and 2006 as required by the modeling strategy. Details of the model construction and data requirements are discussed in the Appendix.

N_{ij} refers to the number of marriages contracted between males of age i and females of age j in some period[12]. M_i and F_j are the numbers of unmarried males and females of age i and j respectively in the middle of that period. When i and j are specified as age intervals, n and m are the length of the intervals in years (see Kashyap et al. 2015; Schoen 1988). The harmonic mean marriage function relates the number of marriages contracted between males and females with given characteristics to that of the population at risk, therefore allowing estimations of the "force of attraction" parameter (Schoen 1988), i.e. a "composition-independent propensity to marry" (Kashyap et al. 2015) between males and females of certain groups. In equation (1), α_{ij} is the "force of attraction" parameter between males of age i and females of age j. A higher "force of attraction" parameter between two given groups means that members of these two groups have a higher propensity of forming marital unions with each other.

The simplest form of age-sex composition (Equation 1) can easily be extended to incorporate additional variables. For example, it is feasible to estimate the α parameter between males of age i and *hukou* status p and females of age j and *hukou* status q. Below is the model specification.

$$N_{ijpq} = \alpha_{ijpq} \frac{M_{ip}F_{jq}}{nM_{ip}+mF_{jq}} \quad (2)$$

Here, I have started with the simplest model with respect to only the age-sex composition (Equation 1). To evaluate the role *hukou* origin plays in the marriage market, I have then included male and female *hukou* origins into the model (Equation 2). In doing so, I estimated the "force of attraction" parameters for different age-*hukou* pairings. If the attraction

[12] The harmonic mean marriage function is equipped to deal with age in either continuous or ordinal form (Schoen 1988).

parameters are lower for rural-born individuals, such results will suggest lower propensities of forming marital unions and a greater disadvantage in the marriage market for this group.

To investigate to what extent the effect of rural *hukou* origin on marriage desirability persists, I have reclassified individuals into three groups based on their *hukou* trajectories prior to marriage entry, viz. 1) rural-born non-converters; 2) *hukou* converters (i.e. born with rural *hukou* and obtained urban *hukou* before marriage) and 3) urban-born individuals[13]. The final model (Equation 3) focuses on individuals' *hukou* trajectory and another classic signifier of status attainment, i.e. educational level. Model 3[14] thus evaluates the effect of *hukou* origin and conversion on marriage desirability for people of similar educational levels, and tests if and to what extent the effect of rural *hukou* origin may persist for those who have achieved similar educational and *hukou* status to their urban-born counterparts. That is to say, if conditional on educational attainment, the attraction parameters are lower for *hukou* converters, such results would point to a lasting adverse effect of rural *hukou* origin that cannot be fully negated by adulthood educational attainment and *hukou* conversion.

$$N_{klp'q'} = \alpha_{klp'q'} \frac{M_{kp'} F_{lq'}}{M_{kp'} + F_{lq'}} \quad (3)$$

Similar to previous notations, $N_{klp'q'}$ represents the number of marriage contracted between men with *hukou* trajectory p' and educational level k and women with *hukou* trajectory q' and educational level l in some period. $M_{kp'}$ represents unmarried males with *hukou* trajectory p' and educational level k in the middle of that period, whereas $F_{lq'}$ represents unmarried

[13] The number of urban-born individuals who change to rural *hukou* is negligible.

[14] Unlike the 2006 CGSS, the 1996 Life History Survey does not have enough information to properly construct the *hukou* trajectory variable for married individuals. The 1996 Life History Survey provides respondents' *hukou* information at birth, at age 14 and at the time of the survey. Thus for married individuals who have undergone *hukou* change, it is impossible to distinguish whether such changes happened before or after marriage. Therefore, the final model (Equation 3) is only estimated for marriages contracted between 1997 and 2006.

females with *hukou* trajectory p' and educational level l. $\alpha_{klp'q'}$ is the corresponding "force of attraction" parameter[15].

Detailed discussions of the data requirements and variable construction, including treatment of missing data, for implementing Schoen's harmonic mean marriage function are included in the Appendix.

3.4.2 Qualitative Analysis: In-depth Interview Sample, Protocol, and Analysis

I have supplemented the quantitative analysis of nationally representative surveys with in-depth interviews conducted between January and March 2016. If the quantitative analysis answers the question of *what* the trends and patterns are on the aggregate level, the qualitative analysis moves one step further to address the question of *how* individuals evaluate and make sense of potential partners' various ascriptive and achieved characteristics and come to their marriage decisions.

The qualitative data consist of 90 in-depth structured interviews with men and women in two Chinese metropolitan areas. The primary goal of the qualitative analysis is to uncover individuals' stated values, attitudes, preferences, and reasoning in the mate selection and marriage entry process *as it happens*. Therefore, I have primarily relied on interviews with never-married men (N=30) and women (N=31) who are currently in the process of searching for partners and/or making marriage decisions. In addition, I have also conducted 29 supplementary interviews with men (N=7) and women (N=22) in their first marriages.

[15] Rather than estimating Model 3 based on the marriage table by age-*hukou* trajectory-educational level, I have combined all age groups and construct a marriage table by *hukou* trajectory and educational level only, so as to avoid generating an overly sparse table. Combining age groups may create potential bias due to the heterogeneous propensities by age, period, or cohort. However, given that the analytical sample includes only first marriages contracted within the last ten years of the survey, such a bias is not extreme.

Interviews with these married individuals allow me to further explore how the decisions to enter into unions were made.

Considering the limitations of a small-N design, I have imposed strict selection criteria so as to avoid generating an overly fragmented sample. To qualify for the study, one has to be heterosexual, aged 22-36, and have completed some form of tertiary education. All respondents reside in one of two metropolitan areas. Detailed demographic attributes of interview respondents are summarized in the Appendix.

The respondents were recruited via snowball sampling. To allay the concern of excessive clustering within the final sample, a maximum of three referrals from the same "seed" in the referral chain were interviewed.

The interview protocol covers the following themes: 1) characteristics of the ideal, and when applicable, current spouse, 2) respondents' stated reasoning for their mate selection preferences, 3) conditions that need to be met (for example, completion of schooling or home purchase) before marriage entry, and 4) respondents' expectations and views of marriage (e.g. what marriage means to the respondents). Dating histories, including reasons for relationship dissolutions, were asked for all respondents. For never-married individuals, the interview protocol includes questions on their perceived obstacles in marriage entry. Respondents in their first marriages were asked about their level of satisfaction with married life, particularly whether there was any discrepancy between their ideal and actual marriage.

Each respondent was first asked to describe his/her ideal spouse and reasoning for such preferences. To explicitly evaluate the logics of economic competition vis-à-vis cultural matching, each respondent was asked to rate the importance of a variety of socio-economic and demographic factors when selecting a potential partner and provide reasoning for the ratings. These factors include spousal educational level, income, occupation, family

background, sibship size, and age. Specifically, all respondents were asked explicitly whether they would consider marrying someone of rural *hukou* origin. To further gauge how the impact of rural *hukou* origin on individuals' desirability in the marriage market may be intervened by additional socioeconomic attributes, I provided multiple vignette-like descriptions of hypothetical partners, in which I kept rural *hukou* origin as a constant while varying other socio-economic and demographic characteristics (e.g. assigning the hypothetical partner higher income, more prestigious occupation, or higher educational level, etc.) Respondents were asked to rate their relative acceptance levels of these hypothetical partners and were further probed about their reasoning for such preferences.

To ensure consistency, I conducted all interviews myself. Interviews were recorded and on average lasted for 1.5 to 2 hours. Detailed notes were taken during the interviews. Following the grounded theory approach (Charmaz 2001), after listening to the recordings multiple times, I wrote an analytical memo for each interview in order to inductively identify key themes that emerged from the data. The analytical memos paint a holistic picture of the process through which respondents have come to their mate selection preferences and marriage decisions.

Given the inherent drawbacks of a small-N non-random sample, the qualitative data are not intended to provide a representative description of China's marriage sorting patterns. Rather, the qualitative results serve to further complement and triangulate the quantitative findings of the aggregate-level patterns and trends, through uncovering individuals' deep-held values and preferences as well as the underlying reasoning in their marriage decision-making processes, all of which remain largely invisible in the statistical analysis of marriage tables.

3.5 FINDINGS

In this section, I start with the findings from the quantitative analysis of the survey data. I first describe the overall trends and patterns of the estimated forces of attraction with respect to both age-sex and age-sex-*hukou* origin compositions. In doing so, I illustrate the comparative disadvantage of rural *hukou* origin in the marriage market between 1987 and 2006. I then discuss the extent to which the disadvantage of rural *hukou* origin persists for rural-born individuals that have successfully obtained urban *hukou* prior to marriage entry in the period 1997-2006. I conclude by presenting the qualitative findings and highlighting the possible theoretical explanations for the lasting adverse effect of rural *hukou* origin that is observed even in the most recent period.

3.5.1 Force of Attraction by Age and *Hukou* Origin

When considering only the age-sex composition, the "force of attraction" estimates tell a consistent story across the two periods. Tables 3.1 and 3.2 present the findings.

Table 3.1 Estimated Force of Attraction Across Age-Sex Groups, 1987-1996[16]

		Female Age Categories				
		15-19	**20-24**	**25-29**	**30-34**	**35-39**
Male Age Categories	**15-19**	0.7	0.57	0	0	0
	20-24	2.29	30.68	7.39	0	0
	25-29	0.96	28.61	45.24	1.17	0
	30-34	0.79	3.16	5.21	4.91	0.88
	35-39	0	0.82	1.67	2.22	1.18

As demonstrated by the diagonal cells in Tables 3.1 and 3.2, China's marriage sorting patterns are first and foremost characterized by a high degree of homogamy by age in both

16 To conserve space, in Table 3.1 through Table 3.4, the attraction parameters are not reported for age categories beyond 35-39. The full results are available from the author upon request.

1987-1996 and 1997-2006. The forces of attraction are the highest between men and women from the same age group. When comparing the results between the two periods, the forces of attraction between younger men and women (i.e. aged 15-19 and 20-24) are lower in the later (1997-2006) period, suggesting that marriage between younger individuals has become less likely. Such a trend is well aligned with recent findings (e.g. Yu & Xie 2015), which have demonstrated that entry into first marriage in China has been delayed over time.

Table 3.2 Estimated Force of Attraction Across Age-Sex Groups, 1997-2006

		Female Age Categories				
		15-19	**20-24**	**25-29**	**30-34**	**35-39**
Male Age Categories	**15-19**	0.48	0.266	0.09	0	0
	20-24	1.60	16.36	4.58	0.73	0
	25-29	0.74	22.40	41.66	3.46	0
	30-34	0.52	4.59	19.71	9.96	0.83
	35-39	0	0.46	3.72	5.80	1.19

Secondly, consistent with existing empirical results (e.g. Mu & Xie 2014), the assortative mating patterns in the Chinese context are largely hypergamous age-wise in both periods: compared to that between older women and younger men, the forces of attraction have consistently been higher between older men and younger women. Men are more likely to marry younger women, whereas the reverse scenario is less common.

However, one caveat remains. In both periods, when looking at the age-wise hypergamous cases, the forces of attraction are the largest for the two neighboring age categories. In other words, although it is more likely for men to marry younger spouses, the forces of attraction gradually diminish as the age gap between partners widens.

We now consider *hukou* origin in addition to the age-sex composition. Tables 3.3 and 3.4 present the estimated forces of attraction with respect to age-sex-*hukou* origin compositions for 1987-1996 and 1997-2006.

Table 3.3 Estimated Force of Attraction Across Age-Sex-*Hukou* Origin Groups, 1987-1996

		Female Age-*Hukou* Origin Categories									
		15-19 R	15-19 U	20-24 R	20-24 U	25-29 R	25-29 U	30-34 R	30-34 U	35-39 R	35-39 U
Male Age-*Hukou* Origin Categories	15-19 R	0.88	0.09	0.92	0	0	0	0	0	0	0
	15-19 U	0.11	0	0	0	0	0	0	0	0	0
	20-24 R	3.19	0	36.60	4.40	9.52	0.96	0	0	0	0
	20-24 U	0	0.54	6.55	9.90	0	2.01	0	0	0	0
	25-29 R	1.56	0	24.24	4.13	28.34	15.73	1.92	0	0	0
	25-29 U	0	0	5.98	23.26	12.29	40.75	0	0.69	0	0
	30-34 R	0.77	0.29	2.27	0	3.56	0	2.12	0.73	0.68	0
	30-34 U	0	0	0.89	5.47	5.25	3.86	1.67	8.00	0	1.46
	35-39 R	0	0	0.92	0	1.17	0	4.02	0.67	0.63	0
	35-39 U	0	0	0.61	0	1.55	1.01	0	0	0	2.36

Table 3.4 Estimated Force of Attraction Across Age-Sex-*Hukou* Origin Groups, 1997-2006

		Female Age-*Hukou* Origin Categories									
		15-19 R	15-19 U	20-24 R	20-24 U	25-29 R	25-29 U	30-34 R	30-34 U	35-39 R	35-39 U
Male Age-*Hukou* Origin Categories	15-19 R	0.59	0	0.36	0	0.17	0	0	0	0	0
	15-19 U	0	0.28	0	0.10	0	0	0	0	0	0
	20-24 R	2.11	0	21.32	1.35	5.57	0.71	1.73	0	0	0
	20-24 U	0.29	0.47	2.07	5.77	0.70	2.03	0	0.35	0	0
	25-29 R	1.07	0	20.08	2.48	28.70	10.30	6.31	0	0	0
	25-29 U	0	0.27	5.35	16.65	10.88	34.27	1.11	1.22	0	0
	30-34 R	0.72	0	3.49	0.52	10.69	1.57	11.56	2.12	1.27	0
	30-34 U	0	1	1.69	3.54	7.00	20.25	7.58	3.94	0	0.51
	35-39 R	0	0	0.59	0.31	1.61	0.41	3.29	1.15	0.68	0
	35-39 U	0	0	0	0	2.50	2.97	2.22	4.72	0	1.62

Here again, we see a high degree of homogamy, both in terms of individuals' age categories and *hukou* origins. The largest forces of attraction are between men and women of the same age category and with the same *hukou* origin in both 1987-1996 and 1997-2006. Moreover, for males and females of the same *hukou* origin status, the pattern of age hypergamy is prominent across both periods, similar to the results discussed above.

We now turn our attention specifically to the cases of age hypergamy and examine the effect of *hukou* origin status. When looking at the off-diagonal cells in each age-wise hypergamous configuration across the two periods, the results show that the forces of attraction are generally higher between older urban men and younger rural women, as compared to the opposite pairing scenario (i.e. older rural men and younger urban women)[17]. Such a pattern is more prominent in the 1997-2006 period. To put it differently, in age hypergamous cases, older urban-born men are more likely to be able to marry younger rural-born women, whereas the reverse (i.e. older rural men marrying younger urban women) is less probable. As younger age has generally been found to be a valued attribute for women in the mate selection process (e.g. Elder 1969; Taylor & Glenn 1976, see also Rosenfeld 2005), the findings demonstrate that men with urban *hukou* origin occupy a much more desirable and advantageous position in the marriage market. Furthermore, being able to marry younger rural-born women also means that older urban-born men enjoy a greater pool of potential partners as compared to their rural-born counterparts, who in contrast, are less likely to be able to marry younger urban-born women.

[17] It must be noted that in two age-wise hypergamous pairings in 1987-1996 and one in 1997-2006, the forces of attraction are indeed higher between older rural-born men and younger urban-born women. However, these pairings are either of much greater age difference or between older men and women. Based on the results presented in Tables 3.1 and 3.2, that is, in age-wise hypergamous pairings, forces of attraction diminish as the age gap widens. I argue that individuals who self-select into marriage pairings with large age differences are characterized by additional attributes that are unobserved and not captured here, which may account for this small observed anomaly.

In addition, when looking at the age-wise homogamous and hypogamous configurations in both periods, as compared to that of the rural-born men/urban-born women pairing, the attraction parameters are generally still higher for the urban-born men/rural-born women scenario. This result again demonstrates that urban-born men fare much better than their rural-born counterparts in terms of enjoying greater availability of possible mates. The implication of an overall *hukou* hypergamy observed across age parings is significant because it further points to a potential "marriage squeeze" (Mu & Xie 2014) for the disadvantaged rural-born men. In other words, not only are rural-born men less likely to be able to marry urban-born women, they also face competition from urban-born men when it comes to marrying rural-born women.

3.5.2 The Persistent Undesirability of Rural *Hukou* Origin: Forces of Attraction, *Hukou* Conversion, and Educational Attainment

The disadvantage and undesirability of rural *hukou* origin in China's marriage market is by no means a surprising finding. The question now becomes: to what extent does the adverse effect of rural *hukou* origin on individuals' marriage desirability persist, particularly for those who have successfully obtained urban *hukou* prior to marriage entry? To put it differently, I ask: to what extent are individuals able to move beyond their *hukou* origin in the marriage market through adulthood status attainment?

To answer these questions, I have distinguished *hukou* converters from those who have maintained their rural *hukou* origin in order to examine the forces of attraction by individuals' *hukou* trajectories in relation to another classic signifier of status attainment, i.e. education. Table 3.5 summarizes the findings.

Table 3.5 Estimated Force of Attraction Across Education-*Hukou* History Groups, 1997-2006

Male Education-Hukou History Categories	Female Education-*Hukou* History Categories											
	Prim. R	Lower Sec. R	Upper Sec. R	BA/+ R	Prim. C	Lower Sec. C	Upper Sec. C	BA/+ C	Prim. U	Lower Sec. U	Upper Sec. U	BA/+ U
Prim. R					0.11	0.00	0.07	0.00				
Lower Sec. R					0.00	0.09	0.19	0.06				
Upper Sec. R					0.00	0.10	**0.27**	0.06			**0.07**	
BA+/ R					0.00	0.00	0.21	**0.00**				**0.10**
Prim. C	0.00	0.09	0.00	0.00	0.13	0.12	0.00	0.00	0.00	0.00	0.09	0.00
Lower Sec. C	0.17	0.86	0.00	0.00	0.22	0.53	0.25	0.00	0.47	0.81	0.37	0.00
Upper Sec. C	0.18	0.45	**0.16**	0.00	0.00	0.17	**1.36**	0.30	0.00	0.12	**0.95**	0.26
BA+/ C	0.00	0.18	**0.33**	**0.11**	0.00	0.57	**1.94**	**2.67**	0.00	0.42	**0.69**	**1.13**
Prim. U					0.00	0.00	0.00	0.00				
Lower Sec. U					0.30	1.38	0.37	0.07				
Upper Sec. U			**0.29**		1.00	0.66	**1.13**	0.38			**1.93**	0.46
BA+/ U				**0.18**	0.00	0.13	0.66	**0.69**			0.63	**1.56**

Here, I examine the forces of attraction between *hukou* converters and their counterparts across the three *hukou* trajectory categories. Specifically I focus on *hukou* converters who have obtained some form of post-compulsory education (i.e. upper secondary and tertiary education)[18].

We start with educationally homogamous pairings. When we focus on *hukou* converters with high levels of educational attainment, it is evident that the "forces of attraction" are lowest between these individuals and those with unchanged rural *hukou*. This result, on its own, holds two implications: first, on the aggregate-level, this finding further corroborates the existence of a strong urban-rural boundary in the marriage market. For current urban *hukou* holders which includes both urban-born individuals and *hukou* converters, conditional on educational attainment, the more desirable partners are individuals with the same present-day urban *hukou*. Secondly, on the individual level, the lowest attraction parameters suggest that in the marriage market, *hukou* converters come closer to urban-born individuals, rather than to their unconverted rural counterparts.

Although the attraction parameters between *hukou* converters and their urban-born counterparts are higher than that between the converters and the educationally homogamous rural-born non-converters, for *hukou* converters, the highest attraction parameters are found in pairings with other educationally homogamous individuals who have also obtained urban *hukou* later in life (i.e. educationally homogamous converters). Furthermore, the attraction parameters between educationally homogamous urban-born individuals and *hukou* converters are also all smaller than that of educationally homogamous pairings in which both partners are

[18] Here, I focus on the attraction parameters at the post-compulsory educational level because educational attainment, particularly at the upper secondary and tertiary level, is one of the primary methods for rural-born individuals to obtain urban *hukou*. In other words, *hukou* converters with post-compulsory education make up the majority of this group.

urban-born. For example, when we examine the attraction parameters of pairings where both partners have completed some form of tertiary education, the attraction parameter between two urban-born individuals is 1.56, much higher than the 1.13 between male *hukou* converters and urban-born females and the 0.69 between female *hukou* converters and urban-born males. In other words, for urban-born individuals, although educationally homogamous *hukou* converters represent a more desirable option than their rural counterparts, such desirability is by no means equal to that of individuals who were born with urban *hukou*.

In educationally homogamous pairings, the highest attraction parameters found in pairings where both partners are of the same *hukou* trajectory category may reflect simply the tendency of *hukou* homogamy. We now turn to *hukou* converters that have marry "down" in term of education to further investigate the potential exchange between individuals' educational attainment and *hukou* origin status. Particularly, here I focus on the attraction parameters between *hukou* converters who have completed tertiary education and their counterparts across the three *hukou* trajectory categories that have upper secondary educational level. For male *hukou* converters, again, the highest attraction parameter is found in pairings where both partners have obtained urban *hukou* later in life. However, here the attraction parameter between male *hukou* converters with tertiary education and urban-born female upper secondary school graduates is higher (0.69) than that of similar educationally hypergamous pairing in which both partners are urban-born (0.63). Such a finding points to a compensatory exchange between individuals' educational attainment and *hukou* origin. As compared to urban-born men of the same educational level, *hukou* converters are more likely to marry urban-born females with lower educational attainment.

The attraction parameters tell a similar story when we turn to educationally advantageous female *hukou* converters. When looking at the attraction parameters between

educationally advantageous female *hukou* converters with males across the three *hukou* trajectory categories, the attraction parameter is the highest between female *hukou* converters and urban-born males (0.38, as compared to 0.30 for pairings where both partners are *hukou* converters and 0.06 for pairings with rural-born non-converter males). In other words, for educationally advantageous female converters, when marrying "down" in term of education, they are most likely to marry urban-born individuals. In this sense, educational advantage again serves to exchange for partner's urban *hukou* origin.

Taken together, the findings demonstrate that obtaining urban *hukou* later in life indeed increases individuals' desirability in the marriage market. Yet, such an improvement cannot fully erase the adverse effect of rural *hukou* origin, nor can it truly elevate *hukou* converters to be completely on par with their urban-born peers. Furthermore, for educationally advantageous *hukou* converters, the observed exchange between educational attainment and *hukou* origin in marrying urban-born individuals further points to the relatively disadvantageous positions of *hukou* converters in the marriage market, as compared to their urban-born peers. Although both appear to be "urban" on chapter, for *hukou* converters, the disadvantage of rural *hukou* origin persists.

3.5.3 Explaining the Lasting Adverse Effect of Rural *Hukou* Origin: Reasoning, Preference, and the Meaning of Marriage

To what extent is the disadvantage of rural *hukou* origin still present after 2006, and what accounts for the lasting adverse effect of rural *hukou* origin? In this section, I draw on 90 in-depth interviews to further triangulate and explain the observed undesirability of rural *hukou* origin.

3.5.3.1 Ideal Partner: Emotional vs. Economic Support

While describing his/her ideal spouse, nearly all respondents adopted a narrative filled with highly emotional language. The overall majority of the respondents have utilized framings such as "companion" or "best friend". For example, when I asked Ya, a 23-year old single woman, what she would value the most in a potential spouse, without missing a beat, she stated:

> "He needs to be my best friend, like we could hang out together, travel to different places, and just have fun all the time."

It is not only the younger respondents that hold such a rosy ideal. Consider Chu (female, age 32, never married). When asked to describe her ideal spouse, she stated:

> "Chu: It's hard to say, and there are no special requirements. We just need to have that feeling.
> Interviewer: What do you mean by 'that feeling'?
> Chu: It's hard to verbalize, like if we have chemistry, that would be ideal."

Male respondents also utilize a similar framing that emphasizes the emotional aspect of marriage. A telling example is Qun, a 26-year-old single man. When asked to describe his ideal spouse, Qun stated:

> "The best is if we can be complementary, like if we have mutual understanding and can each take a step back [in arguments]. But mostly it's how we feel about each other."

Furthermore, when asked explicitly to evaluate the relative importance of a series of tangible socio-economic and demographic attributes in potential partners, overall, the respondents' stated reasoning for their preferences follows an emotional rather than economic logic. Consistent with the previously discussed quantitative findings, most respondents stated that they would strongly prefer partners within a similar age range or educational background. Unsurprisingly, female respondents are less accepting towards marrying younger men. When further probed about the preference for a homogamous pairing in terms of age and education,

across the board respondents put forth explanations suggesting that having a similar educational background will enable them to "have had similar experience growing up". Many also emphasized that they would be more likely to "share similar worldviews and life values" or "understand each other better". In other words, the stated preference for a certain educational level has little to do with the socio-economic advantages that education can produce. Instead, the stated reasoning for preferring an educationally homogamous spouse follows closely an emotional rather than economic rationale.

In addition, the majority of respondents, both men and women, state that they do *not* have preferences for potential spouse's occupation. Nor do they hold minimum requirements for partner's income. For example, Bao (female, age 26, never married) states that she does not care about her future spouse's occupation, "as long as he is happy and fulfilled doing that job". This sentiment is echoed by a large majority of the respondents.

The qualitative data thus suggest that the desirability of a potential spouse is largely conceptualized within an emotional, rather than economic, narrative. The logic that regards marriage as a utility-maximizing exchange of economic resources is conspicuously absent in interviewees' stated framing of their marriage ideals. Rather, the ideal marriage is thought to be a highly emotional give-and-take of companionship and mutual attraction. At face value, these findings seem to further complicate the apparent undesirability of rural *hukou* origin. If individuals' marriage decisions are primarily driven by a highly emotional logic, why would rural-born individuals, even after *hukou* conversion, still fare worse than their urban-born peers in the marriage market? In the following section, I adjudicate such seeming contradictions. I parse out the *meaning* attributed to and imagined for rural *hukou* in order to explain the lasting adverse effect of rural *hukou* origin, particularly for individuals who have, on paper, successfully crossed the rural-urban boundary through *hukou* conversion.

3.5.3.2 Marrying a Rural-Born Person: Social vs. Symbolic Distinctions

When asked whether they would consider marrying someone with rural *hukou* origin, nearly all respondents, both men and women, quickly stated that they would. However, this seemingly forthright acceptance is not without equally quick qualifications. Consider the response from Leiya (female, age 25, never married). After saying that "rural boys are fine", she quickly added:

> "As long as we hold similar world views. However, I do think it would be less likely [that we would hold similar world views], given how different his family, the rural environment he grew up in must be. If I'm attracted to him, that's fine. But I don't think I will be attracted to someone like that in the first place."

Similar statements were expressed by a large majority of the never-married urban-born respondents.

Consistent with findings from the previous section, the undesirability of rural *hukou* origin has little to do with the less advantageous socioeconomic positions commonly associated with rural *hukou*. Rather, rural-born individuals are viewed as being different and lacking shared values and experiences. However, it is possible that respondents are merely referring to "lacking shared values and experience" or "having different world views" as socially desirable reasons to reject rural-born prospective partners, thereby masking the unspoken reasoning that follows the economic competition logic and centers around rural-born individuals' less advantageous socioeconomic positions. To alleviate this concern, I presented the respondents with descriptions of various hypothetical partners. These vignette-like probes provide different configurations of rural *hukou* origin alongside other achieved traits, e.g. a much higher educational and/or income level than the respondent, prestigious occupation etc. If individuals' unspoken reasoning for mate selection indeed follows the logic of economic competition, respondents will be more accepting towards hypothetical rural-born

individuals with more attractive achieved traits. However, for respondents who have previously expressed hesitation in marrying someone of rural *hukou* origin, making the hypothetical rural-born partners more attractive on the achieved traits did not ease such hesitation. To put it differently, when the respondents evaluate the attractiveness of a hypothetical spouse, more advantageous socioeconomic positions do not seem to offset the undesirability of rural *hukou* origin.

A telling example is Nana (female, 28 years old, never married), who grew up in an affluent family and has a well-paying job herself. Nana has described her parents as "hands-off" and her upbringing as "relaxed and independent". When asked about whether she would accept a spouse of rural *hukou* origin, Nana stated:

> "Nana: I don't think they are for me.
> Interviewer: Could you tell me why?
> Nana: I think the parent-child relationship in rural China is just so different from what I am used to. My parents weren't really involved in my life. I'm used to being really independent. In rural communities it's more close-knit… parents are more involved. So even if his family is financially well-off, I still would say no…I wouldn't be able to get along with his parents. Our values are different, and it would be difficult."

Here, the hesitation to marry a rural-born partner stems from a perceived lack of shared values, norms, and habitus, which cannot be negated by economic resources.

Together, these findings show that for urban-born respondents, the experience of growing up in a rural community is imagined to be completely foreign, thereby offering little possibility of having shared experiences. Individuals of rural *hukou* origin are viewed as having distinct values. Such perceived differences contribute to the undesirability of rural *hukou* origin, which cannot be offset even with adulthood status attainment.

Of course, not all never-married urban-born respondents reject the possibility of marrying someone of rural *hukou* origin. Among these respondents, a pattern emerges. Specifically, when discussing their potential acceptance of a rural-born spouse, these

respondents have highlighted their affinity with individuals of rural *hukou* origin, often by pointing out a rural connection in the family or the childhood experience of growing up in a small town. For example, when discussing her ideal spouse, Mu (female, age 28, never-married) has stated that:

> "Mu: Yes, a rural-born man would be OK.
> Interviewer: Could you tell me why?
> Mu: I am not exactly an urban girl myself. I grew up in a very small town and my parents are just your average blue-collar workers. It's not like I come from a fancy family. It's really not that different."

Like the second side to the same coin, individuals' reasoning for accepting partners of rural *hukou* origin follows a similar logic that highlights the importance of shared experience and perceived small social distance.

Drawing on 90 in-depth interviews, these qualitative findings seek to explain the undesirability of rural *hukou* origin in China's marriage market to this day. When describing marriage ideals, the overall majority of respondents view marriage as an emotional give-and-take of companionship and attraction. Similarly, when looking at individuals' reasoning for their mate selection preferences, the apparent undesirability of rural *hukou* origin appear not to be driven by the socio-economic disadvantages commonly associated with rural *hukou*. Rather, individuals of rural *hukou* origin are viewed as having distinct values, norms, and habitus by their urban peers. What is more, findings from the vignette-like probes suggest that such perceived lack of common values and experience cannot be fully compensated by rural-born individuals' present-day status attainment. In this sense, marriage sorting in contemporary China is largely driven by the logic of cultural matching. The rural-urban boundary in China's marriage market is not only a social distinction, but a symbolic divide as well (Lamont & Molnár, 2002). For *hukou* converters that have successfully transcended the rural-urban gap on paper, such a symbolic distinction is still largely present and visible.

3.6 DISCUSSION AND CONCLUSION

Relying on a mixed-methods approach that combines large-scale surveys and in-depth interviews, I have described and explained the trends and patterns of assortative mating in China's marriage market from 1987 onward, paying special attention to the lasting adverse effect of rural *hukou* origin. The results show that a strong rural-urban differential in marriage desirability exists. In particular, urban-born men fare much better than their rural-born counterparts in terms of having a greater pool of potential mates. There exists a compensatory exchange between individuals' hukou origin status and educational attainment. Rural-born *hukou* converters are able to trade their educational advantage in marrying urban-born individuals with a lower educational level. However, in educationally homogamous pairings, for individuals who have successfully obtained urban *hukou* prior to marriage entry, the adverse effect of rural *hukou* origin persists and cannot be fully negated by adulthood status attainment.

Qualitative data from the in-depth interviews are particularly well equipped for uncovering individuals' deep-held values, reasoning, and emotion in the mate selection process. Contrary to the existing theorizations of marriage that highlight the role of economic resources and incentives in driving marriage outcomes, findings from the in-depth interviews have revealed individuals' mate selection choice, preference and reasoning to be heavily imbued with emotional meanings and narratives. The desirability of a spouse is conceptualized not solely on the dimension of economic resources. Instead, individuals highlight the importance of shared norms, values, and habitus. Therefore, for individuals who have successfully crossed the rural-urban gap through *hukou* conversion, their *hukou* origin continues to be salient and acts as a source of lasting symbolic distinction in the marriage market. In this sense, even with the possibility of rural-to-urban *hukou* mobility, the rural-urban cleavage created by the *hukou* system continues to be deeply entrenched.

On the theoretical front, this chapter gives greater primacy to the theoretical framework of cultural matching in understanding marriage sorting processes and outcomes. As demonstrated by the in-depth interviews, much of individuals' stated marriage ideals and mate selection preferences carry deep cultural and emotional meanings. On the empirical front, with this chapter, I highlight the fruitfulness of combining multiple lines of methodological inquiry. While quantitative analysis of survey data is suitable for uncovering patterns of association on the macro-level, qualitative analysis is particularly well-equipped to uncover the *meaning* behind the observed associations through elucidating individuals' deep-held values and underlying reasoning and emotions. In this sense, each method provides a unique vantage point in uncovering pieces of the whole puzzle.

Of course, some limitations remain that warrant future scholarly attention. In particular, the qualitative sample in this chapter is mainly comprised of unmarried urban-born individuals. The story told through the interviews thus largely focuses on how urban-born individuals construct boundaries between themselves and their rural-born peers in the mate selection process. Additional interviews are needed with rural-born individuals (both *hukou* converters and non-converters) in order to examine how this group navigates the marriage market and understands their rurality in marriage sorting, as compared to their urban-born peers. In addition, future research is needed to more thoroughly examine married individuals, particularly those in rural-urban pairings. A more systematic incorporation of individuals already in rural-urban marriages can help answer the question "who marries across the rural-urban line". Through investigating the reasoning and logic in mate selection among this group of married individuals, it will be possible to further elucidate the selection process in marriages across the rural-urban gap.

Chapter 4

Individual Preferences Under Structural Constraints: An Agent-Based Model for Inter-Racial/Ethnic Mate-Search Heuristics in the United States

4.1 INTRODUCTION

Marriage lies at the intersection of the private and the public spheres. For individuals, getting married is an important life course milestone. On the aggregate level, marriage is consequential for the reproduction of families and populations (Mare 2000). Similarly, racial/ethnic intermarriage holds important implications for both individuals and societies. On the micro level, scholars have regarded marriages between members of different racial/ethnic groups as signifying the acceptance of outsiders into one's own group as social equals (Lichter et al. 2015). On the macro level, racial/ethnic intermarriage has long been seen as a barometer of a society's degree of segregation vis-à-vis integration, immigrant assimilation, and group boundary permeability (e.g. Gordon 1964; Lieberson & Waters 1988; Kalmijn 1991). To some extent, as some scholars have argued, racial/ethnic intermarriage can be viewed as an expression of globalization in private lives (Beck & Beck-Gernsheim 2014; Collet 2015).

Correspondingly, research on assortative marriage has been approached from both the micro and macro perspectives. On the macro front, a large body of literature has analyzed population data to document aggregate patterns of marriage sorting along a multitude of dimensions across place and time. On the micro front, some studies, mostly quantitative, have turned to the individual-level processes of mate-search and decision-making (e.g. Rosenfeld 2007; Todd 1997, 2000; Todd & Miller 1999). However, as Todd & Billari (2003) perceptively note, existing research that takes both perspectives remains rare. On the one hand, the macro-level descriptions of aggregate marriage sorting patterns have failed to consider individuals' (often heterogeneous) decision-making processes. On the other hand, micro-level analyses

often "omit the patterns that emerge in a group of such deciding individuals" (Todd & Billari 2003: 118).

Such a disjuncture between the micro and the macro perspectives is evident in studies on racial/ethnic intermarriage as well. Existing research on racial/ethnic intermarriage has largely relied on quantitative analyses of large-scale cross-sectional data[19] in order to examine the differential endogamy/intermarriage rates on the racial/ethnic group level. Researchers are interested in questions along the lines of "which groups are more/less likely to out-marry, and with whom". In the context of the United States, a long line of studies has considered the intermarriage patterns between blacks or non-white minority groups and non-Hispanic whites (e.g. Alba & Foner 2015; Fu 2001; Gullickson 2006; Hwang et al. 1997; Jacobs & Labov 2002; Labov & Jacobs 1986; Lee & Bean 2004; Lee & Fernandez 1998; Litcher et al. 2015; Qian 1997; Wong 1989).

Although valuable, such analyses of racial/ethnic intermarriage patterns on the aggregate level obscure key mechanisms and processes regarding mate selection and marriage entry. Successfully finding a partner is driven by not only individuals' characteristics and preferences, but also by the opportunity structure for contacts (Kalmijn 1998). Getting married is not only about to whom one is attracted, but also depends on whom one is able to meet in the first place. Scholars have acknowledged that a variety of meso- and macro-level factors, such as individual network structure, neighborhood segregation pattern, group size/composition etc., make up the preconditions for forming inter-racial/ethnic social ties that may lead to marriage (e.g. Beck-Gernsheim 2007; Lichter et al. 2015; Qian 2005; Qian & Lichter 2001, 2007, 2011; Song 2009). For example, Qian (2005) noted that intermarriage rates

[19] For example, 5% censuses from 1980 to 2000, American Community Surveys, and current population surveys are widely used for research in the U.S. context.

partially depend on group sizes. Specifically, members of larger racial/ethnic groups are more likely to succeed in finding partners of their own race because the opportunities for contact may be greater. Similarly, Qian & Lichter (2001) posit that immigrants in the United States with higher socioeconomic status are more likely to marry whites because they may live in predominantly white neighborhoods. Correspondingly, immigrants with less education and low-skilled jobs are more likely to marry other co-ethnics (Qian & Lichter 2007). The majority of existing studies that investigate the differential rates of racial/ethnic intermarriage on the group level cannot fully disentangle individuals' preferences from such structural constraints. Nor can such research account for the heterogeneity in individuals' mate search preferences and elucidate the feedback between micro-level preferences and meso- and macro-level preconditions, that is, how individuals may also (differently) adapt their preferences while facing various structural conditions. Therefore, while inferences drawn from observed marriage sorting outcomes about meso- and macro-level constraints are quite plausible, it is nonetheless difficult to evaluate *how* various structural constraints play out for different individuals in the marriage market.

Such a limitation is partially due to the availability of data. Although increasingly common, racial/ethnic intermarriage still makes up a small percentage of all marriages. For adequate analytical leverage, research on racial/ethnic intermarriage often must rely on large-scale cross-sectional population data, such as censuses and current population surveys. These data capture a static snapshot of individuals' characteristics at the time of the survey rather than *at the time of marriage* (or right before marriage). In addition, more detailed information of interest (e.g. individuals' stated mate selection preferences, neighborhood characteristics, or

network structure) is often omitted from the data and analysis[20]. Taken together, it is thus difficult to evaluate racial marriage sorting *as it happens* and draw the link between micro-level preferences, meso-level constraints, and macro-level population outcomes.

In recent years, agent-based computational methods have been developed and utilized in order to overcome the disjuncture between the micro- and the macro-level in demographic research (see Todd & Billari 2003). Given its unique strength in linking micro-level processes, meso-level constraints, and macro-level population outcomes, agent-based computational models have been applied to the study of different aspects of the marriage market, family life, and population dynamics, such as changes in age at first marriage, diffusion of marriage norms, and distortions across time in sex ratio at birth (e.g. Billari et al. 2007; Hills & Todd 2008; Kashyap & Villavicencio 2016; Todd 1997; Todd & Billari 2003). However, while a similar disjuncture is present in racial/ethnic intermarriage research, agent-based modeling remains an underappreciated and underutilized tool to address such an issue.

Racial/ethnic intermarriage, like all marriages, is not only a fixed entry point with binary outcomes (i.e. successfully married or not), but also a search *process* with difficult decision-making under uncertainty (Todd & Miller 1999). To fully interrogate the interplay between individual-level characteristics and preferences vis-à-vis structural constraints and preconditions, inter-racial/ethnic mate selection needs to be operationalized as a search *process* in the analyses. I rely on agent-based modeling to bridge the micro-macro gap (Todd & Billari 2003). Specifically, I ask: how do individuals' various preferences for spousal race/ethnicity lead to population-level intermarriage outcomes under various local marriage market contexts

[20] Surveys that include information on respondents at the time of marriage (such as National Survey of Family Growth and NLSY79) or capture more detailed information (such as General Social Surveys) generally have too small a sample for adequate statistical power for studying racial/ethnic intermarriage.

with heterogeneous demographic compositions?

In the following sections, I first discuss current efforts in theorizing and analyzing racial/ethnic intermarriage in the United States. These existing theorizations and analyses of racial/ethnic intermarriage serve as the theoretical and empirical basis for the proposed agent-based model. I further highlight the gaps in the current empirical findings in understanding racial/ethnic intermarriage patterns. I then present my model of simulating the inter-racial/ethnic mate selection process, paying special attention to the different population outcomes produced by various combinations of individual preferences, structural conditions, and demographic compositions of the local marriage market. In doing so, I present findings that demonstrate how micro-level processes and meso-level constraints jointly shape macro-level population outcomes.

4.2 THEORETICAL CONSIDERATIONS AND EMPIRICAL APPROACHES

4.2.1 Theorizing Individual Preferences in Racial/Ethnic Intermarriages

Abundant studies have documented assortative mating patterns along a variety of dimensions. In explaining the observed (mis)match between couples' characteristics, scholars have largely put forth two lines of explanation as general theorizations of marriage sorting. Both theoretical frameworks focus on individual preferences in mate selection from the "bottom-up" perspective, and highlight the respective roles of economic resources and cultural capital (Kalmijn 1994) in driving assortative mating outcomes. The economic and cultural explanations further correspond to specific theoretical models in the context of racial/ethnic intermarriage.

Economic Competition and Status-Caste Exchange. Marriage has long been examined through the metaphor of the market (Becker 1991; Oppenheimer 1997). Here, scholars have

highlighted the logic of economic competition and exchange in driving mate selection outcomes. Marriage is viewed as a form of mutual dependency and exchange of resources between members with specialized roles in the family and the labor market (Raymo & Iwasawa 2005; Yu & Xie 2015) for the purpose of joint utility maximization (Becker 1973, 1974, 1991). The economic competition and exchange logic is used to explain both patterns of observed homogamy and mismatch based on certain spousal characteristics. On the one hand, the logic of economic competition would posit that high status and more desirable individuals are better able to compete for and attract other high status individuals, thereby producing patterns of homogamy. On the other hand, as Fu (2001: 148) aptly noted, given that "the individuals' total resources are equivalent, but the pieces composing the total for each individual may differ", individuals may compensate for an imperfect match along one dimension by exchanging resources in another aspect.

Proposed by Davis (1941) and Merton (1941), status-caste exchange is a theorization of racial/ethnic intermarriage that follows closely the logic of economic competition and exchange. Merton (1941) hypothesized that blacks with lower socioeconomic status can seldom marry withes with higher socioeconomic status, whereas the reverse pairing is more probable. In other words, marriage between members of lower-status racial groups with higher socioeconomic status and members of higher-status racial groups with lower socioeconomic status represent a trade-off of status (Rosenfeld 2005). Higher socioeconomic status serves as a form of compensation to make up for the "imperfect" match by race/ethnicity. In addition, the exchange between racial and socioeconomic status further points to an implicit ordering of a racial status hierarchy, with whites trumping non-white minority groups.

Cultural Matching and In-Group Preference. Different from the economic competition and exchange logic, the second strand of theoretical explanations of assortative mating highlights

the importance of shared norms, values, and cultural capital between spouses in marriage sorting (Kalmijn 1994). Scholars have argued that cultural similarities act as the basis for shared tastes and lifestyles between partners, thereby enhancing mutual support, reducing friction, and facilitating the formation of intimate relationships (DiMaggio & Mohr 1985; Fu 2001; Kalmijn 1994; Streib 2015).

Correspondingly, in the context of racial/ethnic intermarriage, a competing theoretical model to the status-caste exchange theorization is in-group preference (Gordon 1964; Kalmijn 1998). Here, racial/ethnic identity is regarded as a form of "cultural resources" (Kalmijn, 1998) and individuals, whenever possible, would always prefer "the comfort of [one's own group's] communal institutions" (Gordon 1964: 111, see also Fu 2001). The in-group preference model posits that with all else equal, individuals prefer marrying members from their own racial/ethnic groups to marrying "outsiders". Higher status and more desirable individuals are therefore more likely to succeed in marrying within their group.

Endogamous Intermarriage. The third competing theoretical model of racial/ethnic intermarriage is endogamous intermarriage (see Fu 2001). Here, racial/ethnic intermarriage is conceptualized as following the same logic as racial/ethnic endogamy. Crossing the racial/ethnic boundary or not, individuals' preferences and decisions in mate selection are driven by the same mechanisms (e.g. assortative mating by age, education, occupation, socioeconomic status, parental background, cultural capital, etc.) of marriage sorting in general.

Scholars have argued that endogamous intermarriage would represent a scenario of intermarriage in which individuals of different racial/ethnic groups are truly social equals (Fu 2001). Potential marital partners are considered neither because of nor despite of their race/ethnicity. In other words, individuals neither prefer members of their own groups to entering inter-racial/ethnic unions, nor seek to trade one's own higher socioeconomic status

for potential spouse's higher racial status. Under the scenario of endogamous intermarriage, racial identities of the searching individual and the (potential) spouse bear no effects on individuals' decision-making process and mate selection outcomes.

4.2.2 Understanding Structural Constraints in Racial/Ethnic Intermarriages

Despite the differences in their respective empirical implications, the theoretical models of status-caste exchange, in-group preference, and endogamous intermarriage all focus on the roles of individual characteristics and preferences in inter-racial/ethnic marriage sorting. The success of finding a marriage partner is not only a function of micro-level attributes and propensities, but also depends on a variety of meso-level conditions that shape meeting opportunities for individuals. Recent studies of racial/ethnic intermarriage have been paying increasing attention to structural constraints in understanding patterns of racial/ethnic intermarriage. Group sizes, differential exposure and contact opportunities, and "third party constraints" (Kalmijn 1998) such as various forms of formal and informal social sanctions barring inter-racial/ethnic intimate ties have been identified as the key structural conditions that may shape racial/ethnic intermarriage outcomes (see also a review by Lichter et al. 2015). Among them, group sizes and contact opportunities have received relatively the most empirical attention.

Immigration, Group Size, and Contact Opportunities. Immigration has increased the racial/ethnic diversity in the United States over the last several decades (Lee & Bean 2004). The unprecedented immigration influx, with approximately 1 million additional newcomers each year over the past decade (Lichter 2013), has posed significant implications for racial/ethnic intermarriage. On the one hand, the propensity for intermarriage is believed to be inversely correlated with group population size, because members of smaller racial/ethnic

groups have more limited opportunities in finding co-ethnic partners (Blau et al. 1982; Kalmijn & van Tubergen 2010; Lichter et al. 2015). In this sense, the arrival of large numbers of newcomers is likely to increase the pool of potential co-ethnic partners and subsequently dampen the intermarriage rates between members of different racial/ethnic groups. Indeed, with the rises in immigrant inflows from Asia and Latin America to the United States, some empirical studies have found that there is an observed "retreat from intermarriage" among certain Hispanic and Asian groups in the last twenty years (Lichter et al. 2011, 2015; Qian & Lichter 2011).

On the other hand, immigration also contributes to the growing diversity in social spaces from neighborhood to school and workplace, which in turn heightens the contact opportunities among members of different racial/ethnic groups (Lichter et al. 2015). Studies have shown intermarriage patterns to be stratified by social class (Alba & Foner 2015; Rodriguez-Garcia et al. 2015). Immigrants with higher socioeconomic status and educational attainment are more likely to marry native-born whites (Qian & Lichter 2001) whereas their counterparts with lower educational attainment, skill levels, and socioeconomic status are more likely marry other co-ethnics (Qian & Lichter 2007). Some scholars have thus argued that the increasing inflow of highly educated immigrants has contributed to the growing out-marriage rates for native-born whites (Choi et al. 2012; Schwartz 2013, see also Lichter et al. 2015).

Furthermore, the unparalleled immigration influx into the United States and its potential effects on racial/ethnic intermarriage are further complicated by profound regional variations. Contemporary immigration to the United States is characterized by changes in immigrant destinations from the traditional gateways (e.g. New York, Illinois, and California) to the "new destinations" in the Midwestern and Southern states (Waters & Jiménez 2005).

Scholars have further classified U.S. metropolitans into six categories with respect to immigrant reception, viz. former, continuous, post-WWII, pre-emerging, re-emerging, and emerging destinations (Singer 2004; Singer et al. 2009). Not only do immigrants' national origins, educational levels, and language abilities vary across receiving contexts, the heterogeneity in the arrival and settlement patterns of immigrants further differentially shape the population growth trajectories across regions. Specifically, pre-emerging, re-emerging, and emerging destinations are characterized by growth in both native-born and immigrant populations, whereas in continuous destinations, immigrant inflows are the major driving force for population growth (Singer et al. 2009). Given the changing geography of U.S. immigration reception, it is thus imperative to fully consider the regional heterogeneity in demographic compositions and examine racial/ethnic intermarriage within the context of the *local marriage market*. Yet it is precisely here where the current gap in the literature lies.

Gap in Empirical Findings: Local Marriage Market. With a few exceptions (e.g. Choi & Tienda 2015; Fu 2003; Lichter et al. 2007; Rosenfeld 2001), existing research has largely failed to consider racial/ethnic intermarriage in the context of the local marriage market. Intermarriage patterns have mostly been understood on the national level as differences in each group's overall endogamy vs. intermarriage rates. Without fully considering regional variations in the local marriage market contexts, current empirical research has overlooked the heterogeneity in how various micro-level mate selection preferences and heuristics may be differentially constrained by and realized within a variety of meso-level structural conditions, and how such differences may subsequently lead to variations in the macro-level population outcomes. What is more, even when regional variation in the local marriage markets is taken into consideration, these empirical exceptions have mostly relied on post hoc quantitative analysis of the established unions. By focusing solely on already married individuals and

treating marital status as a static individual attribute, these studies still obscure the dynamic link and feedback between individual preferences and heuristics and structural conditions. Taken together, although existing studies have established that structural conditions (such as population group sizes and contact opportunities) matter for racial/ethnic intermarriage, it is less clear as to *how* they matter.

These limitations are partially due to the conventional methods adopted in the field to analyze existing data. As racial/ethnic intermarriage makes up a small proportion of all marriages contracted, for sufficient analytical power, quantitative studies of racial/ethnic intermarriage have largely relied to date on log-linear and log-multiplicative models to analyze large-N survey data such as censuses and current population surveys. On the data front, censuses and current population surveys offer little information on individuals' characteristics at the time of marriage. Nor do they include information on individuals' marriage search history or stated mate selection preferences. On the methods front, the widely utilized log-linear and log-multiplicative models include only married individuals in the models, thereby excluding entirely from the analyses the population at risk of marriage. Furthermore, due to the constraints of dimensionality in log-linear and log-multiplicative models, only limited individual-level characteristics and attributes can be examined. In sum, using the current standard approach in the field, it is extremely difficult to accurately elucidate how various meso-level constraints interact with micro-level preferences, characteristics, and heuristic, as individuals move through the process of finding partners. Quantitative analysis of survey data cannot fully answer how individuals' preferences and structural conditions jointly shape racial/ethnic intermarriage outcomes at the population level.

In the following sections, I present an agent-based modeling approach to investigate inter-racial/ethnic mate selection in the United States in order to fill this gap. I start by

outlining the general assumptions underlying the mate selection process. I then describe in greater detail the set-up of agents and their interacting environment, focusing particularly on the theory-driven initializations of agents' racial/ethnic preferences for partners and the empirically grounded parameterizations of various local marriage market scenarios. After describing the agent-based computational process, I then present and discuss my simulation results.

4.3 AN AGENT-BASED MODEL

4.3.1 Model Assumptions

Within the agent-based modeling framework, marriage is conceptualized as a sequential search process (Todd & Billari 2003). At the core of the model construction is a set of simulated individuals of marriageable age looking for partners. Each agent goes through the following general steps sequentially[21]: 1) beginning partner search, 2) if a partner is found, getting married and dropping out of the pool, and 3) if a partner is not found, returning to search, possibly with adjusted strategies and preference thresholds[22]. Conceptualizing the search process thus requires certain assumptions about the nature of the marriage market and individuals' decision-making heuristics. Scholars across disciplines have proposed different assumptions with varying degree of realism (Gigerenzer & Todd 1999). In this section, drawing on a discussion of the existing literature, I propose the following assumptions.

[21] These three steps reflect the general sequence of marriage search. In model implementations, additional steps are added to simulate a more realistic mate search process. For example, after the initial partner search and before marriage, a dating period and a probability to break up can be further simulated for agents.

[22] That is, after repeated failures in finding suitable mates, agents may widen their preference ranges.

Marriage Market: Perfect vs. Imperfect Knowledge. The key assumption of how potential partners are encountered has to do with the nature of the marriage market. One assumption proposed by some economists is that all potential partners are simultaneously available to a searching agent. An individual seeking partners compares and ranks all prospective mates before picking out the best match (Bergstrom & Real 2000; see also Blossfeld & Prein 1998). This assumption, however, does not apply to mate selection in large and diverse societies where individuals generally cannot have perfect information on *all* potential mates. Instead, it is much more realistic to assume that an agent encounters prospective mates one by one. Information is not available for the unseen options. Furthermore, once a prospective mate is rejected, s/he can no longer be recalled[23] (Todd & Billari 2003; Ferguson 1989). With this assumption, the mate selection process becomes a problem of optimal stopping (Simon 1999; Todd & Miller 1999). In other words, the question now is: what search heuristic can an agent use to decide when to stop looking and settle down with the current partner (Todd & Billari 2003)?

Search Heuristic: Unbounded vs. Bounded Rationality. Optimal stopping has been widely studied in probability theory, applied statistics, and economics (Ferguson 1989; Seale & Rapoport 1997). In the sociological literature on marriage sorting, scholars often draw on Simon's (1956, 1999) concept of *satisficing* (see also Blossfeld & Timm 2003; Todd & Billari 2003; Todd & Miller 1999). Satisficing is a heuristic for making a choice from a sequential set of possible alternatives with little information on future options beyond the present one (Simon 1999). Here, one does not assume an optimal stopping point or a perfect solution. Instead, search is stopped as soon as the option encountered meets the aspiration level (Simon 1956, see also Blossfeld & Timm 2003; Todd & Billari 2003). In other words, in the mate

[23] That is, people who break up generally do not get back together.

selection context, it is assumed that individuals will settle down with a partner that is "good enough", rather than keep on looking and waiting for the "perfect" one.

Satisficing is acting under bounded as opposed to unbounded rationality (Simon 1990). Such an assumption is reasonable because individuals engaging in sequential searches have a finite amount of time and resources (Todd 2000) and often make decisions using simple rules (Hey 1982; Moon 1990; Seale & Rapoport 1997; see also Todd & Billari 2003).

Search Heuristic: One-sided vs. Two-sided Search. The third assumption deals with the nature of the marriage market with respect to one-sided vs. two-sided search. Although the market has long been used as a metaphor for mate selection, different from shopping, a marital union is formed when a partner is both *acceptable* and *agreeing* (Todd & Billari 2003). To put it differently, a union can only be established when both sides consent to it. Therefore, the one-sided search model where one partner has no say in the search and decision-making process is not a realistic model for mate selection and marriage sorting. In the marriage market, both sides make decisions and are simultaneously evaluating prospective partners while being evaluated themselves. Furthermore, the marriage market is also a competitive setting with "winners" and "losers". Therefore, it is plausible to further assume that individuals' search heuristics are adaptive. That is, individuals who are unsuccessful at first will adjust their search strategies, such as lowering their aspiration level and widening their preference range.

Taken together, I make the following general assumptions on individuals' mate selection heuristics in the sequential search process:

a. Agents have *imperfect knowledge* of the marriage market and all available prospective partners. Potential options are encountered sequentially, with no information available on the future options that are yet to be seen. Once an option is rejected, it cannot be recalled.

b. Agents act under *bounded rationality*. Search is stopped as soon as a potential partner that meets the aspiration level is encountered. The existence of an optimal stopping point/solution is not assumed.

c. The search is *two-sided* and *competitive*. Agents evaluate prospective options while simultaneously being evaluated themselves. Agents' search heuristic is also adaptive. After unsuccessful searches, agents lower their aspiration levels and widen their preference ranges.

4.3.2 Model Implementation

Setting up Agents and Their Worlds. Given that individuals often search for partners within the local marriage market, rather than thinking about gender, racial/ethnic, and educational compositions of pools of potential partners based on the United States as a whole, it is more fruitful and realistic to consider smaller geographical areas. Drawing on the discussion of the changing geography of the immigration flow into the United States (e.g. Leach & Bean 2008; Lichter & Johnson 2006; Marrow 2005, 2009, 2011; Massey 1995; Massey & Capoferro 2008), using the 2015 American Community Survey (ACS) 1-year sample, I have constructed three local marriage market scenarios based on the demographic compositions of Chicago, Los Angeles, and Phoenix. The three cities are selected to represent three distinct types of immigrant gateways, i.e. continuous (Chicago), post-WWII (Los Angeles), and re-emerging (Phoenix) (Singer 2005)[24].

[24] Sample size is another consideration when selecting the three metropolises. All three cities were identified in the 2015 ACS with large N, allowing accurate calculations for various demographic percentage breakdowns. While emerging gateway cities such as Austin and Raleigh-Durham would be conceptually fruitful to investigate, they are not adequately represented in the 2015 ACS.

For each of the three marriage market scenarios, I have simulated heterosexual, non-married agents of marriageable age between ages 18 and 35. Agents are simulated for the following four racial/ethnic groups: non-Hispanic whites and non-Hispanic blacks as well as the largest Hispanic and Asian groups (i.e. Mexican and Chinese Americans respectively) in each city[25]. Based on the 2015 ACS instrument, each agent has an educational level between 1 and 5, with the lowest being junior high school graduate or below and the highest being graduate degree holder[26]. In addition to gender, age, educational level, and race/ethnicity, following Meyer et al. (2014), each agent also has a "compatibility" score randomly drawn from a normal distribution with mean 0.5 and standard deviation 0.2. This score is designed to capture the innate unobserved compatibility between any two given agents. It is normalized and constrained between 0 and 1, allowing for easy probabilistic interpretation later.

For each local marriage market, I have obtained from the 2015 ACS the gender-race-education compositions for non-married individuals of the four included racial/ethnic groups between ages 18-35. Agents' initial age, gender, race/ethnicity, and educational distributions are then parameterized based on these empirically derived demographic compositions. Table 4.1 presents the age, gender, race, and education compositions of the three local marriage markets.

[25] The population percentage for Chinese Americans is too small for Phoenix and is thus excluded from the simulations in this case.

[26] 1= Junior high school and below; 2= High school and some high school; 3=Some college; 4=College graduates; 5=Postgraduate

Table 4.1 Empirically Derived Population Compositions in Three Local Marriage Markets

	LA	Chicago	Phoenix
Racial/Ethnic Composition %			
White	38.48	47.66	44.64
Black	10.74	28.49	8.95
Hispanic	45.93	20.79	46.41
Chinese	4.84	3.05	-
Gender-Race Composition			
White (% Male)	54.04	50.93	54.36
Black (% Male)	52.72	46.00	50.28
Hispanic (% Male)	52.49	53.40	51.42
Chinese (% Male)	44.63	44.78	-
Age Composition			
18-20	22.10	17.30	21.18
21-25	32.57	32.05	32.61
26-30	27.45	29.88	26.90
31-35	17.88	20.77	19.31
Gender-Race-Education Composition %			
Male-White			
Junior high and below	0.38	0.47	1.04
High school	25.11	17.28	45.42
Some college	30.42	20.56	28.12
BA	35.89	46.57	22.29
Postgraduate	8.19	15.12	3.12
Male-Black			
Junior high and below	1.67	1.39	3.37
High school	50.14	63.83	65.17
Some college	33.15	22.43	21.35
BA	13.65	9.39	8.99
Postgraduate	1.39	2.96	1.12
Male-Hispanic			
Junior high and below	5.56	5.95	6.57
High school	59.29	57.91	70.13
Some college	27.62	24.23	18.43
BA	6.54	9.45	4.66
Postgraduate	0.98	2.46	0.21
Male-Chinese			
Junior high and below	0	1.67	-
High school	18.98	23.33	-
Some college	31.39	20.00	-
BA	35.04	33.33	-
Postgraduate	14.60	21.67	-
Female-White			
Junior high and below	0.18	0.10	1.74
High school	19.54	13.35	31.02
Some college	29.17	18.52	30.27
BA	38.27	48.83	27.05
Postgraduate	12.85	19.20	9.93
Female-Black			
Junior high and below	0.93	1.63	4.55
High school	42.86	47.56	44.32
Some college	33.23	34.22	38.64
BA	18.32	10.67	9.09

Table 4.1 (Continued)

Postgraduate	4.66	5.93	3.41
Female-Hispanic			
Junior high and below	5.06	4.24	6.95
High school	50.90	46.82	57.17
Some college	32.10	32.47	26.46
BA	9.83	13.88	7.85
Postgraduate	2.10	2.59	1.57
Female-Chinese			
Junior high and below	0	1.35	-
High school	18.82	21.62	-
Some college	39.41	18.92	-
BA	30.59	41.89	-
Postgraduate	11.18	16.22	-

Data Source: 2015 American Community Survey

At first blush, the racial compositions of the three local marriage markets differ sharply, and each represents a unique context with distinct implications for racial relations. In Chicago, a continuous gateway, non-Hispanic whites make up the majority (47.66%) of the unmarried population between ages 18-35. The non-Hispanic black population is larger than that of the Mexican Americans, yet the difference is moderate (28.49% vs. 20.79%). The largest Asian group in Chicago (Chinese American), in contrast, makes up only a small fraction (3.05%) of the total unmarried population between ages 18-35. For both Los Angeles and Phoenix, in addition to non-Hispanic whites, it is Mexican Americans, rather than non-Hispanic blacks, that make up the majority of the unmarried population. It is worth noting that in both Los Angeles and Phoenix, Mexican Americans have also surpassed non-Hispanic whites and become the largest sized population group (45.93% and 46.41% respectively) in this age and marital status category. However, Los Angeles and Phoenix differ on another key aspect: specifically, in Los Angeles, Chinese Americans make up a non-negligible proportion (4.84%) of the total unmarried population between ages 18-35.

Across the three local marriage markets, we further observe differences in gender and education compositions across the four racial/ethnic groups. Overall, non-Hispanic whites

and Chinese Americans, both men and women, have higher educational attainment levels than their non-Hispanic black and Latino counterparts. For both non-Hispanic blacks and Mexican Americans, women overall have slightly higher educational levels than their male counterparts. What is more, we further observe gender imbalances in the three marriage markets within certain racial/ethnic groups. Specifically, there is a shortage of non-Hispanic black men of marriageable age in Chicago. The same pattern is evident for Chinese American men in Chicago as well as in Los Angeles. In comparison, there appears to be a surplus of non-Hispanic white men in Los Angeles and Phoenix. Mexican American men in all three marriage markets outnumber their female counterparts.

Inducing Variations in Structural Constraints. Using the 2015 ACS, I have first parameterized the demographic composition in each of the three local marriage markets. However, the opportunities for contact between members of different groups are not only a function of the absolute group sizes, but also depend on the spatial distribution of groups. In other words, when group population shares are held to be constant, a segregated vs. an integrated marriage market will still lead to differential degrees of exposure among members of different groups. I thus further rely on Schelling's (1971) classic agent-based model of racial/ethnic segregation to simulate two scenarios of group segregation vis-à-vis integration for each of the three marriage markets.

Schelling's model assigns a "tolerance" threshold value for all agents. At the start of the model process, each agent is assigned to an initial location. If the percentage of the agent's nearest neighbors[27] without acceptable attributes is below the agent's tolerance threshold, the agent stays in the assigned location. Otherwise, the agent moves until the tolerance threshold value is satisfied. Following Meyers et al. (2014), Schelling segregation is executed based on

[27] The distance between two agents is measured in terms of Euclidean distance.

agent's age and race/ethnicity, thereby capturing both racial/ethnic residential segregation and possible mixing through schooling. For each of the three local marriage markets, I simulate a segregated (threshold value = 0.1) and an integrated (threshold value = 0.35) scenario respectively[28].

How do such varying demographic compositions and opportunities for contact within the three local marriage markets interact with individuals' (heterogeneous) preferences for potential partners in shaping population-level racial/ethnic intermarriage outcomes? We now move to the initializations of agents' mate selection preferences.

Setting up Agents' Mate Selection Preferences. Following existing research, agents are simulated as preferring age-homogamous partners[29]. Similarly, agents are simulated as preferring partners of similar educational background. Different from some of the existing agent-based models of mate selection (e.g. Meyer et al. 2014; Todd & Billari 2003), I take into consideration the gendered nature of individuals' preference for spousal educational attainment level. Specifically, female agents are simulated as preferring males with similar or higher educational levels than themselves, in order to capture the gendered patterns of hypergamy commonly observed (e.g. Esteve et al. 2012)[30].

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[28] When the threshold value is 0.10, an agent moves if more than 10% of his/her nearest neighbors are of a different race/ethnicity and age range, thereby producing a higher level of segregation. When the threshold value is increased to 0.35, the agent moves if the percentage exceeds 35%. The limitation of the Schelling model is that the threshold value is constrained a priori to be the same for each agent. In reality, individuals have different tolerance thresholds and preferences for homogeneous/heterogeneous neighbors. Figures A1 and A2 in the Appendix shows what a segregated vs. an integrated initial environment look like.

[29] Drawing on the analysis and simulations by Hitsch et al. (2010), the initial acceptable age range of potential partners is simulated randomly from a normal distribution with a mean of 1.26 and a standard deviation of 7.48 years.

[30] The preference for educational difference between the agent and a potential partner is simulated from a normal distribution with standard deviation equal to 1. For male agents, the mean is set to 0 to reflect a preference for educationally homogamous partners. For female agents the mean is set to 1 in order to capture the preference for educationally hypergamous partners.

Drawing on the three theoretical models of racial/ethnic intermarriage as basis for parameterizing agents' preferences for spousal race/ethnicity, I simulate three scenarios of agents' preferences for potential partner's race/ethnicity. First, the status-caste exchange model posits that individuals of a lower-status racial group would trade their higher socioeconomic status in marrying members of higher-status racial groups. This theoretical model implicitly assumes a racial status hierarchy in mate selection that favors whites. In order to operationalize the status-caste exchange theorization, the initial preference values for each of the included race/ethnicity are randomly drawn from a uniform distribution between 0 and 1, while at the same time, the preference value for whites is always set to be the highest. This means that non-Hispanic whites would always prefer marrying within their own group, whereas non-white groups would always prefer marrying whites. Agents' preferences for the remaining racial/ethnic groups are simulated to be heterogeneous and assume no particular ordering.

Secondly, the in-group preference model hypothesizes that individuals will always choose racial/ethnic endogamy over intermarriage, as members from one's own racial/ethnic group make the most desirable partners. To operationalize the in-group preference model, agents' preferences for potential partner's race/ethnicity are set to always favor one's own group. In other words, the racial/ethnic preference parameters are first drawn randomly from a uniform distribution between 0 and 1 and the parameter for a given agent's own group is then set to be the highest. In doing so, while all simulated agents prefer racial/ethnic endogamy, preferences for members of different racial/ethnic groups remain heterogeneous.

Thirdly, the endogamous intermarriage model highlights the non-significance of both self's and partner's racial/ethnic identity in driving mate selection processes and outcomes.

Here, agents' initial preference values for potential partner's race/ethnicity are thus all drawn randomly from a uniform distribution between 0 and 1. For each agent, no constraints are imposed with respect to the ordering of the racial/ethnic preference values. In other words, the preferences for potential partner's race/ethnicity are simulated to distribute randomly among agents.

4.3.3 Model Process

Following Meyer et al. (2014), after initialization, each agent starts from their own immediate social links to find potential partners before expanding their search range to include second-degree contacts (i.e. "friend of friend"). Based on the assumption of satisficing and bounded rationality, an agent is "satisfied" with an encounter if the potential partner's traits fall within the agent's preference range. Mutually satisfied agents start dating and stop searching for new partners[31]. Once the dating agents reach the end of their dating period, agents make the decision to get married (success) or to break up (failure). The outcome is determined by the compatibility scores of the two agents:

$$\Pr(\text{Getting Married}) = 1 - \left|\text{Compatibility Score}_{\text{agent1}} - \text{Compatibility Score}_{\text{agent2}}\right|$$

Greater similarity in compatibility scores represents more compatible agents. Thus, agents who are more compatible (i.e. smaller difference between compatibility scores) are more likely to get married, as the probability is closer to 1 (Gilbert & Troitzsch 2005; Meyer

[31] Agents' dating length is simulated from a normal distribution with mean equals to 2.5 years and standard deviation equals to 1 year. As a robustness check, I also run iterations with the mean changed to 1 and 3 years respectively. Reducing the mean increases the total marriage rates at the beginning of the simulated period, and vice versa. Yet over time, intermarriage marriage rates approach equilibrium.

et al. 2014; Todd 1997). Married agents are permanently dropped from the pool of searchers and potential partners, whereas when a pair of agents breaks up, both reenter the pool and begin the sequential search process again. Following the characterization of the marriage market as two-sided and competitive, an agent's preference range is updated to be slightly wider after a certain number of unsuccessful partnering attempts[32].

For each of the three racial/ethnic preference scenarios in the three local marriage market contexts, simulations were run with 5000 agents for a period of 60 months and 120 months. In the next section, I present the results of the macro-level racial/ethnic intermarriage outcomes at the end of the simulated time frame.

4.4 RESULTS

4.4.1 Racial/Ethnic Preference and Intermarriage Rates

To start, we examine the overall intermarriage rates in the three local marriage markets. For each preference scenario, 10 simulations were first run for a simulated period of 10 years under the integrated condition (Schelling threshold value = 0.35). The overall intermarriage rates after each year is recorded.

Figure 4.1 presents a visualization of the results.

Here we observe that under the three preference scenarios and across the three local marriage market contexts, intermarriage rates approach equilibrium towards the end of the simulated period. This pattern is particularly salient under the in-group preference model: In fact, the overall intermarriage rates have remained largely stable after the five-year time point.

[32] The preference update threshold is set at 5. That is, agents update their preference ranges for potential partner's race/ethnicity, age, and educational level after five unsuccessful partnering attempts. As a robustness check, I also run iterations with the preference update threshold set at 1 and 10. Alternating the preference update threshold did not introduce noticeable changes in the simulation results.

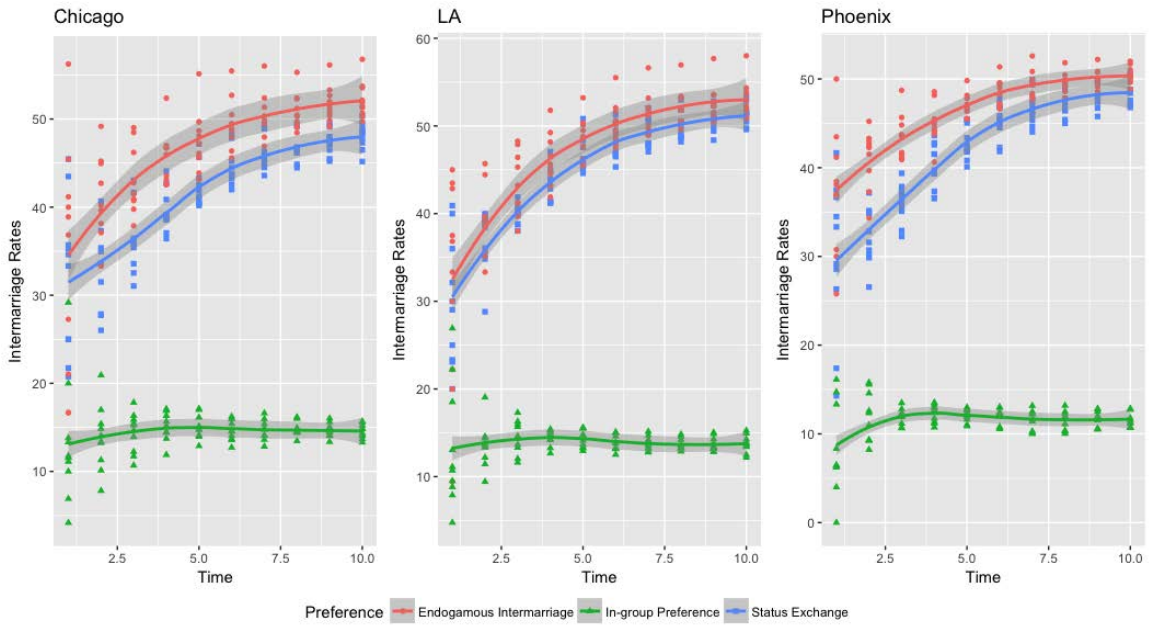

Figure 4.1 Intermarriage Rates in Three Local Marriage Markets Across Three Preference Scenarios Across Ten Years, Ten Iterations

Furthermore, the deviations across iterations are the largest at the beginning of the simulated period. However, results from each iteration fall closer to one another as time progresses. Table 4.2 presents the intermarriage rates at the end of the five- and ten-year period respectively.

The following findings are particularly noteworthy.

First, when intermarriage search heuristics are governed by the logic of in-group preference, the overall intermarriage rates are the lowest, regardless of the demographic make-up in the local marriage markets. At the end of the five-year period, the intermarriage rates under the in-group preference scenario hover around 14 percent, despite the differences in the racial/ethnic and educational compositions across the three simulated cities. At the end of the 10-year period, across the board, the intermarriage rates under the in-group preference scenario decline slightly. Yet overall, intermarriage rates have remained stable over time. In

addition, under the in-group preference scenario, the simulated results closely resemble recent observed overall racial/ethnic intermarriage rate in the United States- it is estimated that intermarriage accounts for 15% of all new marriages in 2010 [33] (Wang 2012). By contrast, across the three marriage market contexts, when intermarriage search heuristics are governed by the logic of endogamous intermarriage or status-caste exchange, approximately half of the marriages contracted are between members of different racial/ethnic groups. The simulated intermarriage rates under the latter two scenarios represent largely biased overestimates of the reality of racial/ethnic intermarriage in the contemporary United States.

Table 4.2 Intermarriage Rates in Three Local Marriage Markets Across Three Preference Scenarios at Five- and Ten-Year Marks, Ten Iterations

	LA	Chicago	Phoenix
Total Intermarriage Rates % Five-year Mark			
Status Caste Exchange	46.54	42.36	42.84
	(1.89)	(2.38)	(1.91)
In-group Preference	14.35	15.01	12.05
	(1.02)	(1.34)	(0.71)
Endogamous Intermarriage	48.50	47.72	47.14
	(2.37)	(3.45)	(1.32)
Total Intermarriage Rates % Ten-year Mark			
Status Caste Exchange	51.27	48.11	48.58
	(1.23)	(1.48)	(1.46)
In-group Preference	13.76	14.57	11.63
	(0.95)	(0.80)	(0.87)
Endogamous Intermarriage	53.07	52.16	50.43
	(2.08)	(2.07)	(0.97)

Standard deviation in the parentheses

Taken together, the simulation results hold two implications for understanding the interplay between individuals' racial/ethnic preferences and the local marriage market conditions in shaping intermarriage outcomes. To start, the simulation results have shown that

[33] This figure accounts for intermarriage among all racial/ethnic groups in all U.S. regions.

giving preferential consideration to white partners as well as disregarding race/ethnicity in the search process both produce highly inflated intermarriage rates, as compared to recent empirical findings in the United States. Instead, the simulation results of intermarriage rates under the in-group preference scenario most closely resemble the current real-world observations. This suggests that racial/ethnic intermarriage in the United States is most plausibly governed by the logic of in-group preference. When looking for potential partners, individuals are more likely to prioritize members of their own racial/ethnic groups. In addition, the simulation findings further show that individuals' search heuristics are robust to the demographic composition in local marriage markets. Under various spousal racial/ethnic preference scenarios, we observe overall similarity in intermarriage rates across the three simulated contexts that differ in their respective demographic compositions.

At first blush, the apparent non-significance of the local marriage markets' demographic compositions seems puzzling. Does such a finding mean that we have overemphasized the importance of population group sizes and contact opportunities in driving intermarriage outcomes? Exposure to members of different racial/ethnic groups are shaped not only by the variations in group sizes, but also by the spatial distribution of each group. We now turn to examine how individuals' preferences interact with different levels of segregation vs. integration in the local marriage market in driving intermarriage outcomes.

4.4.2 Segregation, Integration and Intermarriage Rates

Given that the simulated intermarriage rates under the in-group preference scenario most closely resemble current empirical findings, here, I focus on the in-group preference scenario and examine the intermarriage rates across the three local marriage markets under segregated (Schelling threshold value = 0.10) vs. integrated (Schelling threshold value = 0.35)

conditions respectively. Again, 10 simulations were run for a simulated period of 10 years for each scenario. The intermarriage rates after each year are recorded.

Figure 4.2 presents a visualization of the results.

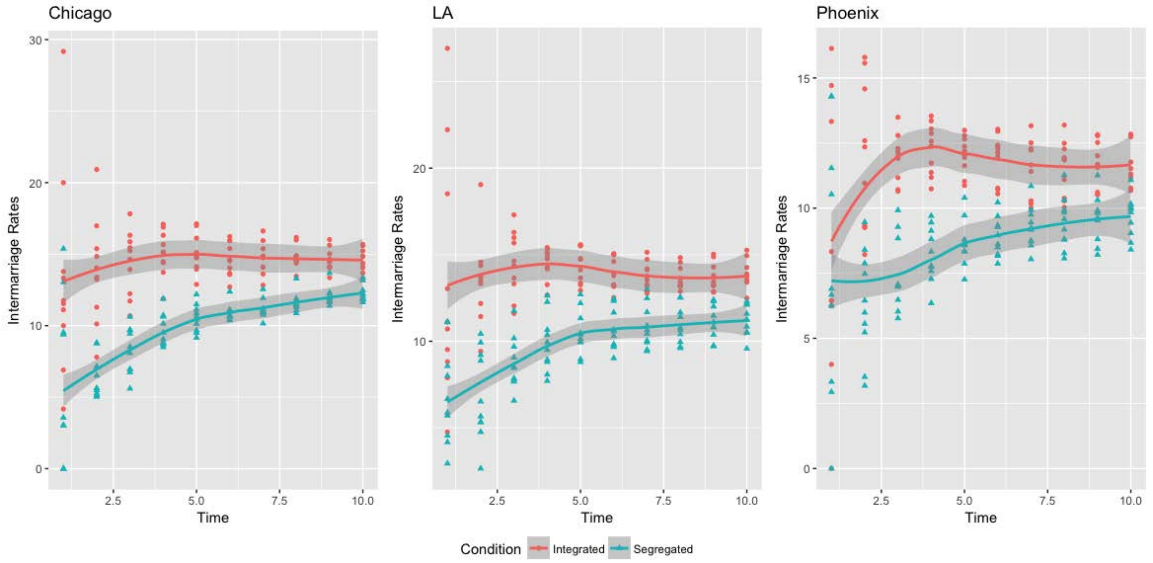

Figure 4.2 Intermarriage Rates Under In-Group Preference in Three Local Marriage Markets by Segregation Levels Across Ten Years, Ten Iterations

Similar to previous findings, intermarriage rates approach equilibrium as time progresses. Again, greater deviations across iterations are only observed at the beginning of the simulated period. Table 4.3 summarizes the intermarriage rates at the end of the five- and ten-year periods respectively.

Across the three cities under the in-group preference scenario, the intermarriage rates are consistently lower when the local marriage market is more segregated. However, the gap in rates diminishes as time progresses. Specifically, at the end of the five-year period, the difference in the overall intermarriage rates between the segregated vs. the integrated conditions is around four percentage points for all three cities, whereas at the end of the ten-year period, the gap in the overall intermarriage rates falls to about two percentage points. In

other words, while the overall intermarriage rates under the integrated marriage market condition remain relatively stable over time, in the segregated marriage market, regardless of demographic compositions, there exists a noticeable upward tick in the overall intermarriage rates over the simulated time period.

Table 4.3 Intermarriage Rates in Three Local Marriage Markets Under In-Group Preference Scenario by Segregation Levels at Five- and Ten-Year Marks, Ten Iterations

	LA	Chicago	Phoenix
Total Intermarriage Rates % Five-year Mark			
High Segregation	10.49	10.52	8.65
	(1.27)	(0.94)	(0.88)
Moderate Integration	14.35	15.01	12.05
	(1.02)	(1.34)	(0.71)
Total Intermarriage Rates % Ten-year Mark			
High Segregation	11.21	12.24	9.68
	(0.87)	(0.59)	(0.80)
Moderate Integration	13.76	14.57	11.63
	(0.95)	(0.80)	(0.87)

Standard deviation in the parentheses

Here, we see the dynamic feedback and linkage between individual-level search heuristics and behavior and meso-level structural conditions. In a segregated marriage market, by design, each agent initially has a lower chance of meeting potential partners belonging to different racial/ethnic groups. Therefore, at the beginning of the simulated period, we observe comparatively much lower racial/ethnic intermarriage rates. As agents start the search from their immediate contact and gradually expand their search range to include second-degree contacts, with the progression of time, agents continue searching for potential partners and getting to know new contacts through "friends", their networks grow, thereby contributing to

the integration of the marriage market. In other words, a segregated marriage market gradually becomes more integrated through agents' mate search process. This, in turn, further increases agents' chance of meeting members outside of their own racial/ethnic groups. Taken together, we observe an upward trend in the overall intermarriage rates under the segregated marriage market condition[34].

Thus far, the simulation results highlight the following implications for understanding micro-level heuristics vis-à-vis meso-level constraints in racial/ethnic marriage sorting. First, across all simulated local marriage markets, the in-group preference scenario produce overall intermarriage rates that most closely resemble recent observed empirical findings in the United States, despite the differences in the demographic compositions across local marriage markets. Correspondingly, demographic composition matters more in term of the spatial distribution of different racial/ethnic groups. The simulated intermarriage rates are consistently lower when the degree of segregation is higher in the local marriage markets. While the overall intermarriage rates remain stable over time under the integrated marriage market condition, under the segregated marriage market condition, agents' mate search process over time serves as an integrating force through the growth of agents' social networks, which in turn, produces an upward tick in the overall intermarriage rates.

Solely considering the overall intermarriage rates hides variations on the group level. We now turn to the endogamy and intermarriage rates by group for each of the three local marriage markets. Again, I focus on the in-group preference scenario. I present simulation

[34] As a robustness check, I also run iterations with the search range set as first-degree contact (i.e. immediate friend) and third-degree contact (i.e. "friend of friend of friend"). When the search range is set as first-degree contact, in a segregated marriage market, intermarriage rate overtime remains lower than that of an integrated marriage market. When the search range is set as third-degree contact, the overtime intermarriage rates in segregated and integrated marriage markets exhibit a similar trend as the trends discussed in text here. This further corroborates the findings that when individuals search range include contacts beyond their immediate links in the network, the search process overtime serves as an integrating force.

results across the three marriage markets under the integrated condition at the end of a five-year period[35]. In presenting the simulation results, I highlight the racial/ethnic variations in group size and educational compositions. In doing so, the results further elucidate the link and feedback between micro-level preferences and heuristics and meso-level structural conditions, and how the two jointly shape macro-level population outcomes.

4.4.3 Group Size, Educational Level, and Intermarriage Rates by Group

Tables 4.4 and 4.5 summarize the simulation results. Table 4.4 presents the in- and out-marriage rates for men. It shows the percentage make-up of wives' race/ethnicity for husbands in each racial/ethnic group. Table 4.5 correspondingly presents the endogamy and intermarriage rates for women. It shows the composition of their husbands' race/ethnicity for wives in each racial/ethnic group.

Table 4.4 Percentage Make-Up of Wives' Race/Ethnicity for Males in Three Local Marriage Markets Under In-Group Preference

	LA	Chicago	Phoenix
White Endogamy	84.18	86.99	85.57
	(2.56)	(2.32)	(2.31)
White-Black	3.55	6.80	3.71
	(1.26)	(1.92)	(1.32)
White-Hispanic	9.70	4.33	10.72
	(2.65)	(1.37)	(1.51)
White-Chinese	2.58	1.87	-
	(0.76)	(0.36)	
Black Endogamy	73.32	87.44	78.11
	(5.17)	(2.04)	(4.04)
Black-White	8.22	6.89	8.90
	(2.74)	(2.38)	(3.52)
Black-Hispanic	16.15	4.38	12.99
	(4.49)	(1.48)	(3.85)
Black-Chinese	2.31	1.30	-
	(1.30	(0.84)	

[35] The overall intermarriage rates remain largely stable after the five-year time point under the integrated marriage market condition. A segregated marriage market becomes more integrated over time through agents' mate search processes.

Table 4.4 (Continued)

Hispanic Endogamy	90.49	78.05	91.87
	(1.61)	(3.27)	(1.59)
Hispanic-White	4.98	7.70	5.96
	(1.10)	(2.16)	(0.89)
Hispanic-Black	2.93	12.42	2.17
	(0.92)	(2.33)	(0.91)
Hispanic-Chinese	1.60	1.82	-
	(0.48)	(1.79)	
Chinese Endogamy	71.65	68.41	-
	(6.80)	(11.05)	
Chinese-White	10.12	13.58	-
	(5.11)	(5.99)	
Chinese-Black	3.85	11.86	-
	(2.27)	(9.20)	
Chinese - Hispanic	14.39	6.16	-
	(5.03)	(7.66)	

Standard deviation in the parentheses

Consistent with existing research (e.g. Qian 2005), for both men and women, the propensity to out-marry is generally inversely related to group size. In Chicago and Los Angeles, Chinese American men and women, the smallest groups, have the lowest endogamy rates. In other words, Chinese men and women in these two cities have the highest tendency for intermarriage. By contrast, in Los Angeles and Phoenix, Mexican Americans and non-Hispanic whites, the two largest racial/ethnic groups, have the highest endogamy rates. Mexican American men in these two cities also have higher endogamy rates than their non-Hispanic white counterparts. Non-Hispanic blacks make up the smallest proportion in Phoenix. Correspondingly, here, the endogamy rates are the lowest for both non-Hispanic black men and women. Furthermore, non-Hispanic blacks and Mexican Americans make up similar population proportions in Chicago (28.49% and 20.79% respectively). Such a pattern is again reflected in the respective endogamy rates of the two groups, particularly for men. The endogamy rate for male non-Hispanic blacks in Chicago is 87.44%, whereas the figure is 78.05% for Mexican American men.

Table 4.5 Percentage Make-Up of Husbands' Race/Ethnicity for Females in Three Local Marriage Markets Under In-Group Preference

	LA	Chicago	Phoenix
White Endogamy	90.25	92.39	91.36
	(1.15)	(0.87)	(1.55)
White-Black	2.25	3.79	1.62
	(0.75)	(1.28)	(0.60)
White-Hispanic	6.37	3.26	7.02
	(1.32)	(0.95)	(1.20)
White-Chinese	1.12	0.55	-
	(0.51)	(0.28)	
Black Endogamy	71.67	79.03	69.13
	(4.99)	(2.34)	(8.37)
Black-White	13.38	11.63	18.75
	(4.00)	(2.64)	(4.92)
Black-Hispanic	12.17	8.52	12.13
	(3.88)	(1.44)	(4.12)
Black-Chinese	1.61	0.82	-
	(1.43)	(0.68)	
Hispanic Endogamy	87.64	81.96	88.57
	(2.14)	(3.91)	(1.35)
Hispanic-White	7.82	11.35	9.40
	(1.95)	(3.13)	(1.32)
Hispanic-Black	3.31	6.13	2.04
	(0.84)	(2.20)	(0.93)
Hispanic-Chinese	1.24	0.56	-
	(0.47)	(0.70)	
Chinese Endogamy	60.44	44.17	-
	(6.63)	(8.29)	
Chinese-White	19.98	32.25	-
	(4.51)	(7.55)	
Chinese-Black	4.34	11.65	-
	(2.16)	(7.26)	
Chinese - Hispanic	15.24	11.92	-
	(4.15)	(11.12)	

Standard deviation in the parentheses

Opportunities for contact with co-ethnics may explain the positive relationship between racial/ethnic group sizes and endogamy rates that we have observed across the local marriage market contexts. By definition, members of larger racial/ethnic groups have a greater

pool of potential co-ethnic partners. However, the association becomes more nuanced when we examine the intermarriage rates between members of different groups. On this note, we turn to consider the role of educational compositions.

On the one hand, the intermarriage rates between members of different racial/ethnic groups to some extent still correspond to the relative racial/ethnic group sizes. As an example, Chinese Americans partners make up the smallest percentages when we examine the intermarriage rates for out-marrying non-Hispanic whites, blacks, and Mexican Americans. However, several anomalies exist.

First, Mexican American and non-Hispanic whites are the two largest groups within the unmarried population between ages 18-35 in Los Angeles, with Mexican Americans trumping non-Hispanic whites in population size (45.93% and 38.48% respectively). However, for out-marrying Chinese American women in Los Angeles, the simulation results show that nearly 20% of their husbands are whites whereas only 15% are Mexican Americans. Furthermore, for non-Hispanic white males in Los Angeles, the percentages of black wives and Chinese American wives are similar (3.55% and 2.58% respectively), even though the population of non-Hispanic blacks is nearly double in size as compared to that of Chinese Americans. Similarly, non-Hispanic whites account for the majority of Chicago's unmarried population between ages 18-35. Yet for Mexican American men in Chicago, the simulation results show that 12.42% of their wives are black, whereas only 7.70% are white.

Such observed anomalies in the simulation results cannot be fully accounted for by group size shares and opportunities for contact alone. Instead, the anomalous patterns found here mirror the differential educational compositions of the four racial/ethnic groups in the three local marriage market contexts. As demonstrated earlier in Table 4.1, Chinese Americans and non-Hispanic whites share similar educational attainment levels that are higher than that

of blacks and Mexican Americans. Given that the model has incorporated a gendered pattern of educational assortative mating into the design, conditional upon group sizes, the comparatively higher intermarriage rates between whites and Chinese Americans, as well as those between blacks and Hispanics, particularly for men, reflect a degree of educational sorting. Another piece of corroborative evidence is that when female agents' preferences for potential partner's educational level is constrained to be hypergamous, for black and Mexican American wives, we indeed observe a higher share of white husbands. Taken together, the simulation results show that as compared to the overall intermarriage rates, variations in demographic compositions in terms of gender, racial/ethnic, and educational distributions across the local marriage markets matter more when we consider endogamy/intermarriage rates on the racial/ethnic group level. On the one hand, group sizes constrain the propensities of endogamy vs. intermarriage for each racial/ethnic group, as the pool of potential co-ethnic partners is greater for larger racial/ethnic groups. On the other hand, variations in educational attainment levels by racial/ethnic groups further shape intermarriage outcomes through agents' preferences for educationally homogamous/hypergamous spouses.

4.5 DISCUSSION AND CONCLUSION

Given its significance as a signifier of immigrant integration, group boundary permeability, and societal openness, racial/ethnic intermarriage has received abundant attention from scholars of race, ethnicity, immigration, marriage, and family. Existing studies of racial/ethnic intermarriage have largely relied on quantitative analysis of large-N survey data to examine intermarriage and endogamy rates on the aggregate level. On the one hand, scholars have proposed various theorizations to account for individuals' preferences for forming inter-racial vis-à-vis endogamous intimate ties. On the other hand, existing studies

have considered various structural preconditions in shaping individuals' opportunities for contact with members of various racial/ethnic groups. However, the two foci remain largely separate in the current literature. The process through which individual-level characteristics, preferences, and heuristics interact with structural preconditions and constraints in shaping intermarriage outcomes is still under-investigated.

In this chapter, I have adopted an agent-based modeling approach to investigate how various scenarios of individual-level preferences play out across different local marriage market contexts under heterogeneous structural conditions. I have created three marriage market scenarios drawing on the real-world demographic compositions (i.e. gender, racial/ethnic, and educational distributions) of three cities in the United States. I consider not only the group sizes, but also the spatial distribution of groups in each local marriage market. Agents are simulated with search heuristics derived from the competing theoretical models of intermarriage. The simulation results lead to several key findings. First, compared to theorizations that either assume greater desirability of whites (i.e. the status-caste exchange model) or insignificance of racial/ethnic identity (i.e. the endogamous intermarriage model) in mate selection, individuals' inter-racial/ethnic search heuristics most closely follow the logic of in-group preference. Simulation results based on the in-group preference model, regardless of the simulated population compositions, best match the current observed intermarriage rates in the United States.

Secondly, the overall intermarriage rates are initially lower when the level of segregation is higher in the marriage market. However, as agents' search range encompass not only their immediate social links, but also second-degree contacts, over time individuals continue making new contacts through the "friend of friend" which in turn leads to expansion of agents' original social networks. In a segregated marriage market, the mate search process

thus serves as an integrating force itself. With the progression of time, there exists a noticeable upward trend in the overall intermarriage rates even as the initial condition of the local marriage market is segregated.

Thirdly, although the overall intermarriage rates under various preference scenarios remain stable across marriage markets with different demographic compositions, such demographic heterogeneity matters when we consider intermarriage/endogamy rates on the racial/ethnic group level. Consistent with existing studies, the simulation results have demonstrated that members of small racial/ethnic groups are more likely to out-marry. However, there is a caveat to this: In the context of racial/ethnic intermarriage, sorting by education remains a forceful mechanism in driving marriage outcomes. The implication of this finding is that a racially diverse yet educationally stratified population may not necessarily lead to greater boundary crossing through intermarriage.

The unprecedented immigration influx into the United States over the past several decades has further propelled racial relations among members of different groups into the foreground of academic and public discussions, with intermarriage between members of different groups often being treated as a barometer for assimilation, integration, and boundary permeability. The findings in this chapter hold several implications. First, across the board, preference for members of one's group remains a strong force in driving marriage outcomes. Across various demographic contexts, mate search heuristics governed by the logic of in-group preference consistently produce population outcomes that best resemble existing empirical observations. Secondly, even when a racial/ethnic boundary is transcended, a boundary along additional dimensions (e.g. education) may remain rigid. Therefore, in a racially diverse population, if there are significant between-group variations in educational attainment, these differences will continue to hamper intermarriage between members of different racial/ethnic

groups. As educational (dis)advantages are concentrated by race, intermarriage is likely to further strengthen and transmit, rather than break down, existing educational differences across groups.

Existing research on racial/ethnic intermarriage has largely relied on post hoc quantitative analysis of survey data. Starting from analyzing observed marriages, the results are then taken as evidence supporting various theoretical models. In this chapter, I start from the opposite direction by simulating and demonstrating how various individual heuristics and preferences would lead to specific population outcomes under different structural conditions. One unresolved issue and several limitations remain that warrant future research. First, empirical analysis of established inter-racial/ethnic unions has supported the theoretical model of status-caste exchange (e.g. Kalmijn 1993; Qian 1997; Fu 2001). However, giving preferential consideration to white partners in the agent-based modeling environment consistently produces highly inflated overall intermarriage rates. More work is needed to further consider and refine various operationalization methods of status-caste exchange within the agent-based modeling framework. Secondly, in this chapter, I have only considered intermarriage patterns with respect to individuals' race/ethnicity. In future work, the model needs to be further extended to account for the role of nativity in inter-racial/ethnic mate search and union formation. In addition, the current agent-based model of intermarriage is based on a closed system with no population additions or attrition. As a next step, I plan to incorporate a simulated immigration inflow into the model, in order to better understand the dynamic patterns of racial/ethnic intermarriage and their implications in the context of contemporary immigration in the United States.

Chapter 5

Conclusion

5.1 SUMMARY OF FINDINGS

In this chapter, I start by summarizing findings and conclusions from Chapters 2-4. I then discuss directions for future research. Using a combination of regression-based statistical modeling, in-depth qualitative interviews, and agent-based computational simulations, Chapters 2-4 each address an aspect of cross-boundary marriage sorting and its implications for understanding social openness and closure.

Chapter 2 investigates intermarriage patterns among six racial/ethnic groups in the contemporary United States. I focus on unions with spousal educational mismatch. The findings show that racial/ethnic intermarriage in the United States is characterized by status-caste exchange and in-group preference. Mexican Americans, and to a lesser extent, Puerto Ricans, rather than non-Hispanic blacks, occupy the lowest positions on the racial status hierarchy in the context of the marriage market. East Asian Americans fall in between non-Hispanic blacks and whites, whereas Cuban Americans fall closer to blacks on the racial status hierarchy. The highly significant endogamy rates for all groups show that in-group preference is salient. However, rather than individuals with higher educational attainment having a greater likelihood of successfully marrying partners within their own groups, higher education is a facilitator of intermarriage. Furthermore, although Mexican Americans occupy the lowest position on the racial status hierarchy, they have the highest intermarriage rates. The findings support the conceptual distinction between group boundaries and status hierarchy. Moreover, as the unprecedented immigration influx, particularly from countries in Asia, Latin America, and the Caribbean, further complicates the existing black-white divide, the findings of racial status ordering speak to the puzzle of the "changing color line". Specifically, Chapter 2 contradicts the theorization of the color line as a non-black/ black divide. Instead, the findings suggest that the contemporary U.S.

color line is characterized by a form of "tri-racial hierarchy", with whites and honorary whites (i.e. East Asian Americans) on the top, followed by (collective) blacks, and certain Latino groups on the bottom.

Chapter 3 investigates marital sorting by education and *hukou* status in China from 1987 onward. Analysis based on both nationally representative surveys and in-depth interviews shows a strong urban-rural differential in marriage desirability. Urban-born men fare better than their rural-born counterparts and have a larger pool of potential mates. For individuals who have obtained urban *hukou* later in life but prior to marriage entry, the adverse effect of rural *hukou* origin persists and cannot be fully negated by adult educational attainment. Conditional on educational level, although *hukou* converters fare better than their unconverted rural peers, they are by no means on par with their urban-born counterparts. Qualitative findings based on in-depth interviews further find support for the notion of cultural matching rather than economic competition in explaining marriage sorting outcomes. Specifically, the results show that when evaluating potential partners, individuals make sense of the under-desirability of rural *hukou* origin using the logic of cultural matching. Individuals of rural *hukou* are viewed as having distinct values, tastes, habitus, and cultural capital. Such differences cannot be erased by more advantageous socioeconomic status and resources. Thus, even as rural-born individuals successfully cross the rural-urban gap through *hukou* conversion prior to marriage entry, their *hukou* origin acts as a lasting symbolic divide. The rural-urban cleavage created by the *hukou* system continues to be entrenched.

Chapter 4 investigates the interplay between micro-level individual preferences and heuristics and meso-level structural preconditions and constraints in shaping macro-level inter-racial/ethnic mate search outcomes. Drawing on the theoretical discussions of Chapters 2 and 3, I rely on agent-based computational models to simulate the racial/ethnic intermarriage search process within three local marriage market contexts under three preference scenarios. For each marriage market, I consider

two conditions with respect to the spatial distributions of different racial/ethnic groups that vary in the levels of segregation. The results show that under the preference scenario of in-group preference, the simulated overall intermarriage rates most closely resemble the current rates found in empirical research, regardless of the demographic compositions of the local marriage markets. In addition, when a local marriage market is more segregated, intermarriage rates are lower initially, yet there exists an upward trend over time. In other words, individuals' mate searches serve as an integrating force, as individuals make new contacts throughout the search process. Furthermore, group size and educational composition matter when considering the endogamy vs. intermarriage rates on the group level. The propensity for endogamy is inversely related to racial/ethnic group size, as members of larger groups have greater pools of potential co-ethnic partners. However, as marriage sorting by education remains a powerful mechanism in driving assortative mating outcomes, a racially diverse yet educationally stratified population may not necessarily lead to greater boundary crossing through intermarriage.

5.2 AREAS FOR FUTURE RESEARCH

Assortative marriage by various ascriptive and achieved characteristics on the individual level is a field that has been well traversed. In this section, I identify five areas for future research.

Cross-Boundary Partnership Beyond Marriage. Marriage represents the form of intimate relationship that has received the most scholarly attention. As cohabitation becomes increasingly common in contemporary societies, it is worthwhile to further explore the patterns of cross-boundary partnering beyond different-sex marital unions, and the implications for group boundaries vis-à-vis status hierarchy. Future studies are needed to identify whether the formation of various cross-boundary partnerships (such as cohabitation) may be qualitatively different from that of marital unions. In addition, research is needed to further explore whether there exist differential transition rates into

marriage between partnerships that transcend some forms of social boundaries vs. the ones that do not. Intuitively, if individuals in cross-boundary partnerships have lower likelihoods of success in transitioning into marriage, such a selection process may hold additional implications for our understanding of social openness and boundary rigidity. Furthermore, any observed trend of cross-boundary marriage, without being calibrated by the corresponding trend of cross-boundary partnership, tells only a partial story of group boundary permeability. For example, if individuals in cross-boundary partnership are less likely to transition into marriage, or the increase in cross-boundary partnership exceeds that of cross-boundary marriage, such patterns could very well mean that while members of different social groups are accepted as dating partners, they remain less desirable as spouses, thereby pointing to a continued separation of different social groups and rigidity in group boundaries.

Compensation and Exchange Beyond Educational Attainment. Existing research on achieved assortative mating has largely been concerned with sorting along the dimension of educational attainment. When examining the patterns of compensation and exchange among various individual-level characteristics, scholars have generally turned to education in order to operationalize socioeconomic status attainment. However, such an operationalization needs to be further investigated for a nuanced understanding. While educational attainment is one of the determinants of labor market success, individuals' educational level, to some extent, is also the product of their social origin status and family backgrounds (Jencks et al. 1979; Mare 1991). Furthermore, individuals with similar schooling may share not only standing in socioeconomic status, but also taste, habitus, and cultural capital. In Chapter 2, I have further incorporated individuals' income as an achieved characteristic when analyzing spousal status mismatch in racial/ethnic intermarriage. For future research that highlights the roles of ascriptive vs. achieved characteristics in marriage sorting, it is

worthwhile to consider patterns of compensation and exchange along additional matching dimensions beyond educational attainment, such as income and occupation.

Consequences of Cross-Boundary Marriage Sorting. Marriage is crucial for the reproduction of populations. As aptly pointed out by Mare (2000), on the individual level, the kinds of marriages formed determine the family background and may affect the eventual social standing of children, whereas on the cohort and population levels, "the joint distribution of parents' characteristics affects the level and distribution of offspring's characteristics" (Mare, 2000:1). Therefore, the consequences of various forms of cross-boundary marriage warrant future attention. In the context of racial/ethnic intermarriage specifically, one of the demographic consequences of inter-racial/ethnic unions is the growth in populations with multi-racial identifications. Future studies are needed to further examine the (inter)marriage patterns of this group. Theoretically, it is worthwhile to consider what crossing racial/ethnic boundary through marriage means for multi-racial populations. Empirically and socially, it is worthwhile to consider how the growth of multi-racial populations further implicates contemporary racial relations in a multi-group society. In addition, a handful of recent studies have examined the effects of racial/ethnic intermarriage on children's social integration (e.g. Kalmijn 2010). Future studies should extend this line of inquiry further to examine the effects of various forms of cross-boundary marriage sorting on offspring.

Cross-boundary Marriage Sorting Across the Life Course. Due to the methodological consideration of differential marital dissolution rates, scholars of cross-boundary marriage sorting, particularly of racial/ethnic intermarriage, have rightly mainly focused on recently contracted marriages and/or individuals in their first marriage. Future work is needed to further explore the heterogeneity in selection, search, and outcome of cross-boundary marriage sorting across individuals' entire life course. Are individuals more/less likely to form cross-boundary intimate ties in later age or later marriages (e.g. second-plus marriages)? If so, what form of boundary is more/less likely to be transcended, and

by whom? Because marriage is not only a static individual attribute fixed in time, examining cross-boundary marriage patterns across individuals' life course thus recognizes marriage sorting as a dynamic process.

Mixed-Methods Research on Marriage Sorting. Existing research on assortative mating has long been dominated by a singular methodological approach, i.e. quantitative analysis of survey data. With this dissertation, I highlight the fruitfulness of adopting multiple lines of methodological inquiry in the study of marriage sorting. Conventionally regression-based modeling using nationally representative data is particularly suitable for uncovering and examining associations among various factors at the macro-level. Qualitative analysis based on-depth interviews is well equipped to elucidate individuals' deep-held values, emotions, and meaning-making processes. The strength of agent-based computational modeling lies in its ability to link micro-level characteristics and heuristics with meso-level preconditions and constraints in order to demonstrate macro-level population outcomes and processes. Each method is uniquely equipped to uncover a piece of the whole puzzle. The growing prominence of mixed-methods research in the field of sociology thus provides an exciting direction in which future studies on marriage sorting should move.

Appendixes

Chapter 2 Appendix

Table A1 Husband's Income Decile by Wife's Race/Ethnicity, ACS 2011-2015 Five ear Sample

	Wife's Race					
Husband's Income Decile	**White**	**East Asian**	**Mexican**	**Puerto Rican**	**Cuban**	**Black**
1	10.05	13.64	15.52	13.57	12.22	19.75
2	8.53	8.05	17.78	13.12	7.78	12.74
3	9.05	6.82	16.05	10.41	6.67	10.43
4	11.4	7.09	13.1	10.41	14.44	12.82
5	11.77	6.55	10.88	13.57	10	11.23
6	11.02	8.87	7.09	14.93	14.44	10.03
7	11.5	8.46	6.48	4.52	13.33	7.09
8	10.71	11.46	5.75	6.33	12.22	7.48
9	9.75	15.96	4.56	7.24	5.56	5.65
10	6.22	13.1	2.8	5.88	3.33	2.79
Total	100	100	100	100	100	100

Table A2 Parameters for Stereotype Ordered Regression for Hypergamous Unions Excluding Top Income Decile, ACS 2011-2015 Five Year Sample

	Full Model Hypergamous Unions
Scaling metric for spouse's racial/ethnic category (φ)[a]	
White	1
East Asian	0.83
Mexican American	-2.23
Puerto Rican	-1.53
Cuban American	0.24
Black	0.00
Endogamy parameter (γ)	
White	1.83***
	(0.12)
East Asian	5.15***
	(0.18)
Mexican American	3.30***
	(0.16)
Puerto Rican	3.21***
	(0.18)
Cuban American	4.47***
	(0.27)
Black	4.45***
	(0.13)
The stereotype ordered effects of covariates (β)	
Self Education: High School	0.11
	(0.01)
Self Education: Some college	0.20**
	(0.10)
Self Education: BA and above	0.32***
	(0.10)
Spousal Educational Gap	-0.11***
	(0.01)
Self Income Decile	0.009**
	(0.005)
Spousal Race/Ethnicity Association (μ)	
Overall association	0.18***
	(0.03)
Association*Self Education	-0.06***
	(0.01)
Model fit statistics:	
Log likelihood	-7378.25
Pseudo R2	0.78
Df	25

***p<0.01 **p<0.05 *p<0.1
SE in parentheses
[a] No SEs for scaling parameters

Table A3 Parameters for Stereotype Ordered Regression of Intermarriage Tables Excluding Unions If Either Partner Immigrated to the U.S. After Marriage, ACS 2011-2015 Five Year Sample

	Model 1a (Hypergamous Unions)	Model 1b (Hypogamous Unions)	Model 2a (Hypergamous Unions)	Model 2b (Hypogamous Unions)
Scaling metric for spouse's racial/ethnic category (φ)[a]				
White	1	1	1	1
East Asian	4.03	0.15	0.91	0.13
Mexican American	-3.30	-0.61	-2.03	-0.66
Puerto Rican	-2.17	0.18	-1.45	0.18
Cuban American	-0.44	0.08	0.10	0.07
Black	0.00	0	0	0
Endogamy parameter (γ)				
White	1.39***	3.77***	1.74***	3.72***
	(0.11)	(0.22)	(0.11)	(0.21)
East Asian	4.98***	4.84***	4.80***	4.88***
	(0.16)	(0.15)	(0.17)	(0.15)
Mexican American	2.67***	4.59***	3.26***	4.62***
	(0.15)	(0.22)	(0.16)	(0.23)
Puerto Rican	3.09***	2.22***	3.18***	2.23***
	(0.18)	(0.14)	(0.18)	(0.14)
Cuban American	4.51***	4.03***	4.62***	4.03***
	(0.27)	(0.20)	(0.27)	(0.20)
Black	4.74***	4.08***	4.50***	4.07***
	(0.13)	(0.10)	(0.13)	(0.10)
The stereotype ordered effects of covariates (β)				
Self Education: High School	0.14**	0.84***	0.09	0.80***
	(0.07)	(0.17)	(0.10)	(0.17)
Self Education: Some college	0.25**	1.46***	0.17*	1.38***
	(0.07)	(0.17)	(0.10)	(0.16)
Self Education: BA and above	0.41***	2.14***	0.29***	2.01***
	(0.06)	(0.17)	(0.10)	(0.17)
Spousal Educational Gap	-0.08***	-0.32***	-0.13***	-0.31***
	(0.01)	(0.02)	(0.01)	(0.02)
Self Income Decile			0.003	0.02***
			(0.004)	(0.01)
Spousal Race/Ethnicity Association (μ)				
Overall association	0.33***	-0.18	0.13***	-0.17
	(0.04)	(0.18)	(0.02)	(0.17)
Association*Self Education	-0.08***	-0.32***	-0.05***	-0.31***
	(0.01)	(0.03)	(0.01)	(0.03)
Model fit statistics:				
Log likelihood	-7242.59	-12333.95	-7243.92	-12300.21
Pseudo R2	0.78	0.80	0.78	0.80
Df	25	25	26	26

***p<0.01 **p<0.05 *p<0.1
SE in parentheses
[a] No SEs for scaling parameters

Table A4 Parameters for Stereotype Ordered Regression of Intermarriage Tables with Educational Attainment Specified in Three Categories, ACS 2011-2015 Five Year Sample

	Model 1a (Hypergamous Unions)	Model 1b (Hypogamous Unions)	Model 2a (Hypergamous Unions)	Model 2b (Hypogamous Unions)
Scaling metric for spouse's racial/ethnic category (φ)[a]				
White	1	1	1	1
East Asian	0.38	0.16	0.52	0.13
Mexican American	-2.21	-0.65	-1.98	-0.71
Puerto Rican	-1.50	0.19	-1.34	0.19
Cuban American	-0.10	0.06	0.19	0.06
Black	0.00	0	0	0
Endogamy parameter (γ)				
White	1.78***	3.77***	1.78***	3.63***
	(0.12)	(0.21)	(0.12)	(0.29)
East Asian	5.03***	4.84***	4.99***	4.87***
	(0.16)	(0.14)	(0.16)	(0.14)
Mexican American	3.23***	4.67***	3.24***	4.72***
	(0.14)	(0.23)	(0.14)	(0.23)
Puerto Rican	3.20***	2.25***	3.21***	2.26***
	(0.17)	(0.14)	(0.17)	(0.14)
Cuban American	4.52***	4.06***	4.51***	4.06***
	(0.26)	(0.20)	(0.26)	(0.20)
Black	4.51***	4.09***	4.51***	4.08***
	(0.13)	(0.10)	(0.13)	(0.10)
The stereotype ordered effects of covariates (β)				
Self Education: Some college	0.20**	1.19***	0.20**	1.10***
	(0.09)	(0.15)	(0.10)	(0.14)
Self Education: BA and above	0.37***	1.98***	0.37***	1.81***
	(0.09)	(0.15)	(0.10)	(0.15)
Spousal Educational Gap	-0.12***	-0.32***	-0.13***	-0.31***
	(0.01)	(0.02)	(0.01)	(0.02)
Self Income Decile			0.004	0.02***
			(0.004)	(0.01)
Spousal Race/Ethnicity Association (μ)				
Overall association	0.27***	-0.30**	0.25***	-0.28*
	(0.03)	(0.17)	(0.03)	(0.16)
Association*Self Education	-0.12***	-0.38***	-0.11***	-0.35***
	(0.01)	(0.04)	(0.01)	(0.03)
Model fit statistics:				
Log likelihood	-7386.92	-12515.40	-7386.56	-12509.00
Pseudo R2	0.78	0.80	0.78	0.80
Df	25	25	26	26

***p<0.01 **p<0.05 *p<0.1
SE in parentheses
[a] No SEs for scaling parameters

Table A5 Parameters for Stereotype Ordered Regression of Intermarriage Tables for Educationally Homogamous Unions, ACS 2011-2015 Five Year Sample

	Model 1	Model 2
Scaling metric for spouse's racial/ethnic category (φ)[a]		
White	1	1
East Asian	6.02	6.08
Mexican American	-1.12	-1.11
Puerto Rican	-0.37	-0.35
Cuban American	-0.35	-0.34
Black	0.00	0
Endogamy parameter (γ)		
White	1.44***	1.45***
	(0.06)	(0.06)
East Asian	4.50***	4.50***
	(0.14)	(0.14)
Mexican American	2.35***	2.35***
	(0.09)	(0.09)
Puerto Rican	3.15***	3.15***
	(0.11)	(0.11)
Cuban American	4.18***	4.18***
	(0.17)	(0.17)
Black	4.95***	4.95***
	(0.08)	(0.08)
The stereotype ordered effects of covariates (β)		
Self Education: High School	0.27***	0.27***
	(0.05)	(0.04)
Self Education: Some college	0.37***	0.36***
	(0.04)	(0.05)
Self Education: BA and above	0.73***	0.70***
	(0.04)	(0.04)
Self Income Decile		0.005**
		(0.02)
Spousal Race/Ethnicity Association (μ)		
Overall association	0.36***	0.35***
	(0.02)	(0.02)
Association*Self Education	-0.09***	-0.09***
	(0.004)	(0.004)
Model fit statistics:		
Log likelihood	-16368.43	-16365.82
Pseudo R2	0.80	0.80
Df	25	26

***p<0.01 **p<0.05 *p<0.1
SE in parentheses
[a] No SEs for scaling parameters

Chapter 3 Appendix

The Harmonic Mean Marriage Function: Data and Variable Construction

In addition to resolving the "two-sex problem", Schoen's method offers three key advantages. To start, unlike log-linear models, the harmonic mean marriage function explicitly incorporates the at-risk population. Furthermore, although on the surface, the harmonic mean marriage function deals only with groups i and j and ignores competitions from other possible groups, given that groups i and j are not independent from the overall population composition, Schoen's method is shown to be sensitive to the "competitive context" of the marriage market (Kashyap et al. 2015; Schoen 1988). Finally, the harmonic mean marriage function is non-parametric and flexible. The simplest form of age-sex composition can easily be extended to incorporate additional variables. Furthermore, Schoen (1988) has made the distinction between marriage *preferencse* vis-à-vis marriage *propensities*: The "force of attraction" parameter α, i.e. marriage propensities, is the realized marriage preferences, that is, mutual attractions and marriage desirability constrained by the context of the population composition.

To estimate the attraction parameter (α), micro-level data are required for both the married population and the population at risk. The variables of interest here are 1) age, 2) *hukou* origin, 3) *hukou* trajectory and 4) educational level.

In addition to the observed heterosexual marriages, the harmonic mean marriage function requires information on the population at risk *in the middle of* the base period (Kashyap et al. 2015). For the purpose of this study, populations at risk were thus defined as unmarried individuals in 1991 and 2001 respectively. Similarly, the relevant variables were specified as in 1991 and 2001. In addition to never-married individuals, the populations at risk include divorced and widowed men and women. The numbers of cases in these latter two categories are negligible in both periods. As a robustness check, I have also estimated the force of attraction parameters with only never-married individuals

included in the models. The overall trends and patterns remain stable, and the results are available upon request.

The 1996 Life History Survey and the 2006 CGSS provide most of the relevant individual-level information at the time of marriage for both spouses. However, the sample and variable constructions for the at-risk populations were less straightforward. Both the 1996 Life History Survey and the 2006 CGSS are cross-sectional. Constructing unmarried samples in 1991 and 2001 retrospectively from these two datasets would therefore inevitably introduce biases. However, to the best of my knowledge, no other nationally representative dataset with adequate information necessary for this study exists that would allow estimation of the 1991 unmarried population. To alleviate some of the retrospective biases, the 2001 sample of the at-risk urban population was constructed from the urban-only 2003 CGSS, and then harmonized with the at-risk rural sample constructed from the 2006 CGSS.

Age is specified as an ordinal variable with a 5-year interval (15-19, 20-24, until 55, with the last age category covers a 6-year interval between 50 and 55). Educational level is ordered in the following four categories: 1) primary education and below, 2) lower secondary education, 3) upper secondary and vocational education and 4) some tertiary education and above. The missing values on educational levels are rare and do not exhibit any apparent patterns, thus the complete-case analysis approach has been adopted (e.g. Gelman & Hill 2007). As a robustness check, I have also tried the nearest-neighbor hot-deck procedure (e.g. Little & Rubin 2014) where each missing value is imputed from the most similar complete case. The improvement in data quality is negligible.

Hukou origin is defined as a binary variable (rural vs. urban). When respondents' own *hukou* origin information is missing, *hukou* origin is extrapolated from respondents' parental *hukou* backgrounds. The most sensible approximation in the Chinese context is using mother's *hukou* when respondent was 14 or 18 (depending on the question asked in the dataset), as child's *hukou* status was

inherited from mother prior to 1998. When mother's *hukou* information is also missing, father's *hukou* when respondent was 14 or 18 was used. If the information on parental *hukou* when respondent was 14 or 18 is missing altogether, present-day parental *hukou* was used. As previously noted, *hukou* trajectory is specified as a three-category variable: 1) rural-born unconverted, 2) rural converted to urban prior to marriage entry and 3) urban-born.

Main Characteristics of Interview Respondents

Table A6 Age Distribution of Interview Respondents

	Female		Male	
	Unmarried	First Marriage	Unmarried	First Marriage
Mean Age	26.8	30.7	27.5	32.1

Table A7 *Hukou* Status of Interview Respondents

	Hukou at age 14		Present *hukou*	
	Urban	Rural	Urban	Rural
Female	50	3	52	1
Male	28	9	35	2
Total	78	12	87	3

Table A8 Respondents in First Marriages: *Hukou* Origin Homogamy

		Husband *hukou* at age 14	
		Rural	Urban
Wife *hukou* at age 14	Rural	1	2
	Urban	4	22

Chapter 4 Appendix

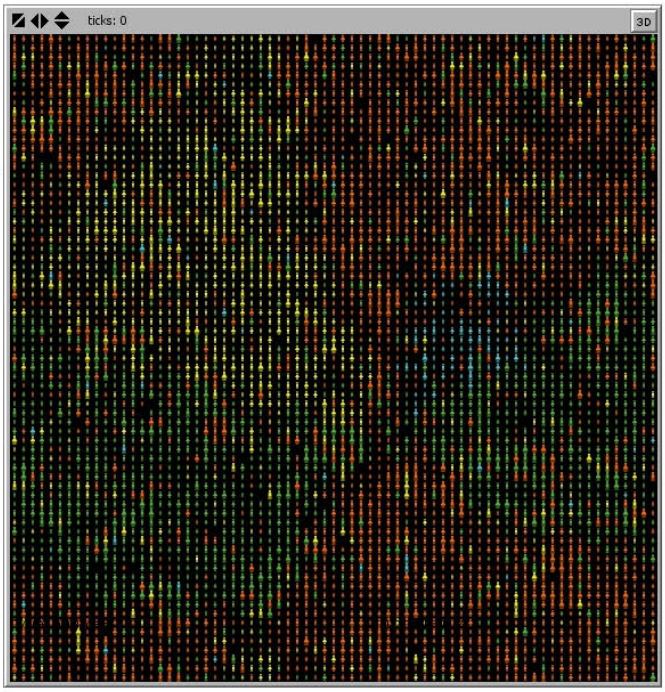

Figure A1 Visual Demonstration of an Integrated Marriage Market

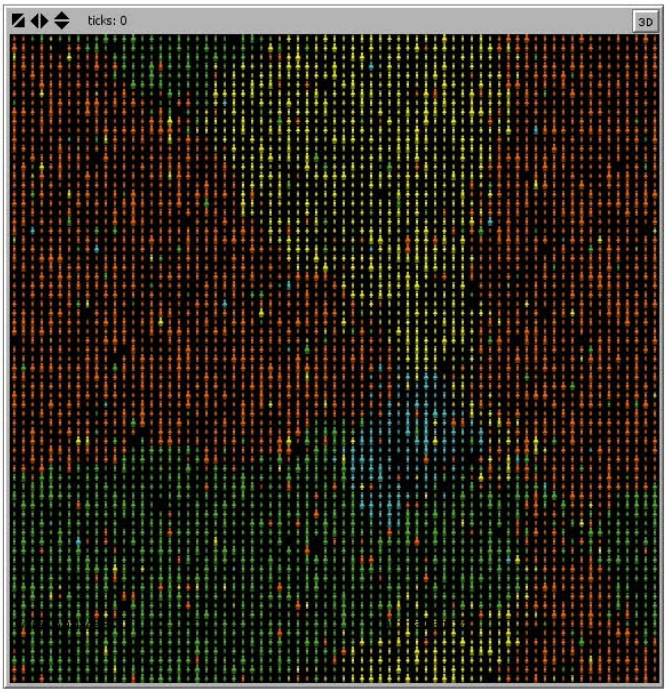

Figure A2 Visual Demonstration of a Segregated Marriage Market

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