



Revista Latinoamericana de Población

E-ISSN: 2393-6401

alap.revista@alapop.org

Asociación Latinoamericana de Población
Organismo Internacional

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Space and Interracial Marriage: How Does the Racial Distribution of a Local Marriage
Market Change the Analysis of Interracial Marriage in Brazil?

Revista Latinoamericana de Población, vol. 11, núm. 21, julio-diciembre, 2017, pp. 113-
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Asociación Latinoamericana de Población
Buenos Aires, Organismo Internacional

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Space and Interracial Marriage: How Does the Racial Distribution of a Local Marriage Market Change the Analysis of Interracial Marriage in Brazil?¹

*El espacio y el matrimonio interracial:
¿cómo la distribución racial de
un mercado local cambia el análisis
del matrimonio interracial en Brasil?*

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*Revista
Latino-
americana
de Población*

Año 11
Número 21

Primer
semestre

Enero
a junio
de 2017

Abstract

This article focuses on the following question: How would interracial marriage rates change when considering the racial distribution of the local marriage market? I used data from the Brazilian Census for the years 1991 and 2000 and loglinear models. The results show that homogamy-heterogamy rates have traditionally been overestimated, as demonstrated by a change that ranges between 15.3 percent and

Resumen

Este artículo se centra en la siguiente pregunta: ¿Cómo las tasas de matrimonios raciales cambiarían al considerar la distribución racial del mercado matrimonial local? Se utilizan datos de los censos brasileños de 1991 y 2000 y se estiman modelos log-lineales. Los resultados muestran que las tasas de homogamia-heterogamia han sido tradicionalmente sobreestimadas, como lo demuestra un cambio

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- 1 This paper is part of the author's dissertation entitled "Interracial Marriage in Brazil: a discussion about local marriage market, parents' characteristics, and household chores" concluded in December 2012. Some discussions and reflections have been added since then, however by that time the 2010 Brazilian Census data were not available, which is why the paper focuses on 1991 and 2000 years.
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43.2 percent, when the local racial distribution of spouses is considered. The gap between the percentage differences is smaller in 2000 than in 1991. When analyzing the homogamy-heterogamy rates for each marriage market, one observes that the interaction between a spouse's race and the marriage market is important, with very few exceptions. In addition, although most meso-regions have homogamy-heterogamy rates similar to the average, there are some important regional differences, especially in the South, where the levels are higher than the average.

Keywords: Interracial marriage. Local marriage market. Loglinear models. Brazil.

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entre el 15,3% al 43,16%, cuando se considera la distribución racial local de los cónyuges. La diferencia entre las diferencias porcentuales es menor en 2000 que en 1991. Al analizar las tasas de heterogamia y homogamia para cada mercado matrimonial, se observa que la interacción entre la raza de un cónyuge y el mercado matrimonial es importante, con muy pocas excepciones. Además, aunque la mayoría de las mesorregiones tienen tasas de homogamia-heterogamia iguales al nivel promedio, existen algunas diferencias regionales importantes, especialmente en el Sur, donde los niveles son más altos que el promedio.

Palabras clave: Matrimonio interracial. Mercado matrimonial local. Modelos loglineales. Brasil.

Recibido: 3/5/2017. **Aceptado:** 19/12/2017

Introduction

How would interracial marriage rates and their analysis change when considering the racial distribution of the local marriage market? Most studies about interracial marriage, especially in Brazil, calculate rates of homogamy and heterogamy using national data. When national data are used, possible differences in local marriage markets are not considered, including racial distribution and cultural factors. In this case, researchers assume that there is either one national marriage market or no variation across local marriage markets (Harris and Ono 2005). Another implication of using this approach is the fact that this method assumes that the probability of marrying someone from the local marriage market is the same as marrying someone far away. In this article, I used Census data for the years 1991 and 2000 to calculate the homogamy-heterogamy rates, including information on the local racial distribution of wives and husbands. This analysis also sheds light on whether the explanations for interracial marriage, besides racial distributions, are the same or different among local marriage markets. In other words, this analysis will examine whether there are specific differences within local markets, such as, cultural, economic, and social.

In regard to the United States, Harris and Ono (2005) found that national estimates of race effects on partnering declined by about 19 to 53 percent once they controlled for the racial composition of local marriage markets (Consolidated Metropolitan Statistical Areas and Metropolitan Statistical Areas). For the Brazilian marriage market, it is very important to consider local racial distributions because there are great geographical differences in racial distribution with a higher concentration of blacks and browns in the North and Northeast and the majority of the population being white in the South. Therefore, the consideration of local racial distribution differences might lead to a different interpretation of national intermarriage rates.

The main result is that when analyzing the local racial distribution, the odds ratios for intermarriage drop about 15.3 percent to 43.16 percent depending on the racial group, type of union, and year. The main conclusion is that without considering the local racial distribution, previous research has overestimated homogamy-heterogamy rates and overemphasized the role of racial boundaries and racial preferences in the marriage market. The gap between the percentage differences is smaller for 2000 compared to 1991. Therefore, changes over time are important for explaining the higher increase of unions between whites and blacks than between whites and browns. This increase was due more to changes in cultural norms and racial composition. Moreover it is worth highlighting the possible changes due to racial reclassification between Censuses (Miranda, 2017). The article is divided into five sections, including this introduction. The second section addresses background research on racial classification, interracial marriage, and the local marriage market in Brazil. The third section presents the data and method I used. Section four discusses the results and the article concludes with some final considerations.

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In 1998, 78 percent of all marriages were racially endogamous, with rates being higher among whites (83.2 percent) and lower among blacks (60.7 percent). When controlling for the size of the population, this relationship inverts and blacks have the highest rate

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When considering Brazil, all analyses of interracial marriages using loglinear models utilized national level data (i.e., Silva, 1987; Ribeiro and Silva, 2009; Heaton, 2010; Longo, 2011). The main assumptions in this approach, are: i) race is distributed equally across the country or ii) the probability of marrying someone that lives close or further away is the same (Harris and Ono, 2005). Another assumption is that race classification is the same in the whole country. However, the racial classification of people can vary across the country, and in this sense, racial self and the perception of others is influenced by exposure and local social norms. A fourth factor that may alter across the country is the geographical difference in the acceptability of having a nonwhite in one's own family. Telles (2004) cites Degler's work who discussed a series of studies showing that there are important geographical differences in this regard. In a research project conducted among college students, the acceptability rate of a brown or a black person in one's own family ranges from 14 to 24 percent in Recife, and from 10 to 14 percent in São Paulo. Amongst a sample

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The consideration of local characteristics is also important for helping to elucidate the main reason for intermarriage. Kalmijn (1998) indicates that intermarriage rates in smaller areas might be due more to preferences than opportunities. Therefore, this article sheds light on to what extent previous national rates of intermarriage in Brazil are related to opportunities, while answering the question: how would homogamy rates be affected if the racial distribution in different areas was considered in the analysis? In other words,

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Finally, it is relevant to highlight that discussing local marriage markets is difficult because there is no common agreement on the definition of a marriage market. Spouses can meet one another in their neighborhood, but also outside of their community. However, studies have shown that people are more likely to find a spouse in their local context (Blau, Blum, and Schwartz, 1982; Lewis and Oppenheimer 2000); even people who often travel (Harris and Ono, 2005). The other problem is that it is often difficult to determine where people meet because many databases do not have data on marriage history. Different studies have used varying concepts of what constitutes a local marriage market, including schools (Blossfeld and Timm, 2003; Mare, 1991), workplaces (i.e., Svarer, 2007), and small

geographic areas (i.e., Blau *et al.*, 1982; Lewis, 2000; Harris and Ono, 2005). In this sense, another important reason for considering the geographical factor when analyzing inter-marriage, is the possible effect of neighborhood or school related peer groups (Holmlund, 2006). However, the effect of these groups is not evaluated in my work. Moreover, it is also significant to mention that residential segregation, which is an indicator of how racial groups relate to each other, reflects racial tolerance and in some extension racial economic inequality. Therefore, identifying areas with more nonwhite people may indicate a lower tolerance for this racial group. Although a lack of exposure decreases the likelihood of whites out-marrying, the ultimate cause of this phenomenon is not only a result of exposure or the composition of the population, but is directly related to racial segregation.

Data and Method

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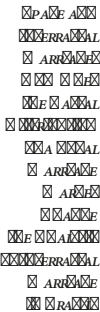
Data

The data are from the Brazilian Census from the Integrated Public Use Microdata Series (IPUMS), for the years 1991 and 2000. I linked the head of the family with his/her spouse and considered each one's race and the mesoregion where they lived at the time of the Census. I used family as an identifier instead of household, because a household can consist of multiple families. Married and cohabiting couples were considered together, because no significant differences when the models were done separated in preliminary analysis. The total number of mesoregions is 137 and they all correspond to the same areas during the two periods. For this analysis I am considering black, brown, and white people and the six possible combinations among them: white/white, brown/brown, black/black, brown/black, white/brown, and white/black couples.

In order to minimize the effect of migration after marriage, I limited my sample to couples in which both women and men are between twenty and thirty-four years of age. Spouses in this age range are more likely to be in their first marriage and less likely to have moved away from where they met. This selection also decrease the potential effect of characteristics associated with second or higher order marriages (See Mare, 1991; Kalmijn, 1994; Qian, 1997). Mare (1991) noted that the educational pattern of a higher order marriage is different from that of a first marriage. However, Blackwell and Lichter (2004) did not find substantive differences in terms of racial assortative mating.

I am using mesoregion as an indicator of the local marriage market. Mesoregions are combinations of municipalities. They are geographically stable throughout time, with minor exceptions, and divide the entire country into relatively coherent geographic units beneath the state level (Minnesota Population Center, 2011). Internally, they are socially and economically homogenous. They have transportation linking the cities within each mesoregion and do not cross state boundaries.

I am using three of IBGE's official racial categories: white, black, and brown. The racial classification is self declared, therefore, the categories reflect whether people consider themselves to be branco (white), preto (black), or pardo (brown). The brown category usually includes a larger range of skin color variation, including moreno and its variants. Interracial marriages are the combination of whites and browns, whites and blacks, and browns and blacks. I do consider blacks and browns as separate groups due to the fact that they have different probabilities of marrying whites. These probabilities even differ by sex.



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In the third model, two interaction terms are added. One term is added between husband's race and mesoregion and one between wife's race and local marriage market,

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The coefficient of the loglinear model is the natural logarithm of the ratio of the observed value and its predicted value, called the log odds ratio. A positive coefficient means that there are more unions in the specific table cell compared to how many there would be in cases where unions were randomly assigned. A negative coefficient means that there are fewer unions than if the spouse's characteristics were independent. In other words, a positive coefficient indicates that the probability of marrying a brown or black person is greater than a marriage with a white spouse (reference category). If the coefficient refers to an interaction term and is positive it shows that the married between the racial groups, for instance, a black wife and a brown husband, or a brown wife and a brown husband, are more likely than the marriage between a white wife and a white husband. The coefficients can be expressed by the odds ratio e^{β} or as percentages $1-e^{\beta}$. Therefore, the odds ratio allows us to interpret each logit as the odds of marrying a black or a brown spouse as opposed to a white spouse (reference category). The white category is the baseline, which means that this category's coefficients are equal to zero.

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$$\exp \beta_{h=2, w=2}^{WH} \quad \exp \beta_{h=3, w=3}^{WH}$$

Odds ratios larger than 1 indicate a greater likelihood of intraracial marriage as opposed to interracial marriage. The equation for calculating the homogamy-heterogamy rates is below and follows the course established by Powers and Xie (2000).

$$\frac{[\exp(\beta_{i=1,j=1}^{WH}) * \exp(\beta_{i=2,j=2}^{WH})]}{[\exp(\beta_{i=1,j=2}^{WH}) * \exp(\beta_{i=2,j=1}^{WH})]} \quad (4)$$

One example that demonstrates this equation is a coefficient of black/brown equal to 1.7, a coefficient of brown/black equal to 1.99, a coefficient of black/black equal to 4.76, and a coefficient of brown/brown equal to 2.57. The odds ratio (or homogamy-heterogamy rates) is

$$\frac{\exp(4.76) * \exp(2.57)}{\exp(1.7) * \exp(1.99)} = 38.32$$

This result indicates that intraracial unions among blacks and among browns (black/black or brown/brown marriages) are 38.32 more likely to happen than interracial unions (browns marrying blacks).

In order to analyze the model adjustment or judge to what extent model 3 is better than model 2, I report the Likelihood-Ratio Chi-Square Statistic (L^2), the Pearson Chi-Square Statistic (X^2), and the Bayesian Information Criterion (BIC) for each model. The first two measures follow the Chi-Square distribution and in order to choose the better model it is necessary to consider the difference in degrees of freedom from the compared models and judge this difference against the Chi-Square distribution. When analyzing the BIC, a more negative BIC indicates a better model (Raftery, 1995). A better model means that it is the most appropriate model given the data. In other words, it is the model that best describes the data.

Results and Discussion

Descriptive Analysis

The final sample represents 454,616 couples, in which both spouses were between 20 and 34 years of age in 1991, and 492,957 couples, who were also between this same age range, in 2000. Most of these couples were in racially endogamous unions: 75.43 percent in 1991 and 68.89 percent in 2000. White-white couples made-up the majority of these unions, representing 43.85 percent of all couples in 1991 and 39.97 percent of all couples in 2000. Among interracial couples, the white/brown union represented the majority (Table 1).

An important regional difference³ emerges in terms of racial distribution. Table 2 shows that in the South a little more than 80 percent of the population was white in 1991 and in 2000, whereas in the North, where there are fewer whites, about 70 percent were brown in 1991 and 64.82 percent were brown in 2000. The region with a more balanced distribution between whites and nonwhites is the Central area of Brazil. There are a few

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Couples	1991		2000	
	N	%	N	%
Total	454,616	100	492,957	100
Mixed race couples	111,718	24.57	153,349	31.11
Black/Brown	12,020	2.64	17,490	3.55
White/Brown	91,283	20.08	117,452	23.83
White/Black	8,415	1.85	18,407	3.73
Same race couples	342,898	75.43	339,608	68.89
Black-Black couples	9,911	2.18	12,490	2.53
Brown-Brown couples	133,632	29.39	130,064	26.38
White-White couples	199,355	43.85	197,054	39.97

Table 2

	1991					2000				
	North	Northeast	Southeast	South	Central	North	Northeast	Southeast	South	Central
Wife's Race										
White	27.00	29.40	65.90	86.19	49.63	30.42	33.99	62.69	84.75	50.01
Brown	70.14	66.02	29.37	11.50	47.97	65.07	59.07	31.47	11.92	45.83
Black	2.86	4.58	4.74	2.31	2040	4.51	6.94	5.85	3.34	4.15
Husband's Race										
White	24.14	25.64	62.16	83.35	46.18	28.40	31.20	59.45	82.60	47.72
Brown	72.03	68.53	32.10	13.85	50.66	65.28	60.25	33.16	13.44	47.03
Black	3.83	5.83	5.74	2.79	3.17	6.32	8.55	7.39	3.96	5.25
Population's Race										
White	22.34	26.34	62.64	82.78	46.59	27.95	32.76	62.29	83.64	49.77
Brown	72.78	67.80	30.4	13.64	49.28	64.82	59.07	30.24	12.02	44.18
Black	3.40	5.67	5.98	3.06	3.24	5.23	7.67	6.60	3.59	4.72

Table 3 presents the analysis of the distribution of interracial couples among the mesoregions. Because there are more than one hundred regions, the table shows only the maximum, the minimum and the average proportion, so the mesoregions are identified in the text. In Vale do Itajai (Santa Catarina), only 4.30 percent of unions are interracial in 1991. On the other hand, in Central Potiguar (Rio Grande do Norte) 35.54 percent of the couples are mixed race in 1991. It is worth highlighting that Vale do Itajai is in the South,

where most of the population is white, and Central Potiguar is in the Northeast region, where there is a concentration of blacks and browns in Brazil. In 2000, the lowest percentage of interracial unions was in Sul Catarinense (6.63 percent) and the highest was in Baixadas (40.88 percent),. which is in Southeast region, where there are also more browns and blacks than in the South.

The white/black couples range from zero (Norte do Amapá) to 4.93 percent (Centro Fulminenses) in 1991, the average proportion for this period was 1.7 percent; and it ranged from 1.35 percent (Sertão Sergipano) to 7.42 percent (Baixadas) in 2000, with an average of 7.42 percent. When comparing unions between whites and browns one can observe that in 1991 the minimum was 2.94 percent (Sul Catarinense) and the maximum was 32.74 percent (Pantanaís Sul Mato Grossense). These proportions are much higher than for black/white couples. The percentage of black/black couples in 1991 ranged from zero (Norte do Amapá -North) to 8.08 percent (Centro-Fluminense) and in 2000, the variation was from 0.51 percent (Centro Oriental Paranaense) to 11.33 percent (Metropolitana de Salvador). In contrast, for white/white couples in 1991, the minimum was 2.45 percent in Norte Amazonense and the maximum was 94.11 percent in Vale do Itajaí, located in the South of Brazil. In 2000, the minimum was 4.76 percent (Norte Amapá) and the maximum was 94.11 percent (also in Vale do Itajaí). The increase of white/black couples was much higher than any other mixed race couples.

The changes over time (1991–2000) were not the same for all groups. Considering the average proportion, same race couples decreased from 74.96 percent in 1991 to 68.83 percent in 2000. Brown/brown and white/white couples decreased to 14.81 percent and 3.33 percent respectively. However, the average proportion of black/black couples increased to 21.4 percent. The proportions of all mixed race couples increased-white/black (107.38 percent); followed by black/brown (33.22 percent); and white/brown (only 16.63 percent).

Table 3
Minimum, maximum, and mean proportion of unions in mesoregions by couple's races. Brazil, 1991 and 2000

Couples		1991	2000	Couples		1991	2000
Mixed race	min	4.30	6.63	Same race	min	64.46	59.12
	max	35.54	40.88		max	95.70	93.37
	mean	25.04	31.17		mean	74.96	68.83
Black/ Brown	min	0.14	0.18	Black/ Black	min	0.00	0.51
	max	12.37	16.02		max	8.08	11.33
	mean	2.54	3.38		mean	1.98	2.41
White/ Black	min	0.00	1.35	Brown/ Brown	min	1.12	1.18
	max	4.93	7.42		max	86.53	74.57
	mean	1.70	3.53		mean	35.93	30.61
White/ Brown	min	2.94	3.73	White/ White	min	2.45	4.76
	max	32.74	33.87		max	94.11	90.66
	mean	20.80	24.26		mean	37.04	35.81

Data source: Census 1991 and 2000.

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These descriptive results confirm the importance of considering geographical differences when analyzing interracial marriage in Brazil. In the following section, I discuss the results of the loglinear models. It is worth highlighting that where there is a concentration of whites, the interracial marriage rates are lower. Both, racial tolerance and population composition or exposure, can be the explanation, however it is clear that local racial distribution play an important role, a good example is how small is the white/black union in the North area, but is also the place with lower rates of black/black marriages.

Loglinear models

Table 4 shows the adjustment measures for the three models in order to analyze which one better adjusts to the data. The main conclusion is that the third model (that includes two interaction terms: one between a wife's race and mesoregion, and the other between a husband's race and mesoregion) has a better fit in both 1991 and 2000. This result indicates that a spouse's race and the local marriage market are associated, which reassures the importance of considering the local marriage market racial distribution when analyzing the partner choice process. Considering the difference in the degrees of freedom (1088-544=544) and the critical chi-squared test (599.37 for alpha=0.05) the L² and the X² are statistically significant. This means that the third model is more effective than the second model. Moreover, the BIC is negative for the third equation. As a result of the fact that the coefficients of model three are significant and statistically different from the second model,⁴ the statement can be made that local racial characteristics influence the level of intermarriage. This information indicates that the assumption that there is only one national marriage market, which is made in equation 2, is not correct, but I will present the results of both models (2 and 3) for comparison.

Table 4
Adjustment measures for all models. Brazil, 1991 and 2000

Models	1991			2000		
	L2	X2	BIC	L2	X2	BIC
{H} {W} {M}	352937	532702	338711,021	286078	400926	271764
{HW} {M}	169899	160657	155726	152490	146440	138229
{HW} {HM} {WM}	4448	4558	-2639	4377	4469	-2753

Data source: Census 1991 and 2000.

In table 5, I present the coefficients (log odds ratios) for models 2 and 3 for both periods. The coefficients are the increase in the log of the predicted frequency, taking, for example, the result for black/black couples of model 2 in 2000, 3.393 it means that a black/black couple about 3.4 times more likely to happen than a white/white couple (reference). The odds ratio, representing the homogamy-heterogamy rates, at the bottom of the table for each year, indicate whether a union between two racial groups, black and brown for instance, is more likely to be homogamous, meaning between black and black or brown and brown, or heterogamous. I also included the difference in the odds ratio for models 2

4 All coefficients were tested and are statistically different at the one percent level. The interaction between a brown woman and a black man in 1991 is the only coefficient that is statistically significant at the five percent level.

and 3 in order to better understand how the inclusion of the interaction terms changes the interpretation of the homogamy-heterogamy rates.

By analyzing this table, I find that in 1991 unions involving whites and blacks are nearly nine times more likely to be homogamous than marriages among whites and browns (116.98 versus 13.105). When the local racial distribution is considered this difference is 11.5 times more likely (85.89 versus 7.45). In 2000, whites and blacks were about four times more likely to be homogamous and 4.6 times more likely when considering the spouse's racial distribution. These results confirm that whites prefer to marry a brown spouse as opposed to a black spouse, although blacks and brown are socially and economically closer. Browns seem to be in an intermediary position within the marriage market. Moreover, endogamy is more pronounced at the end of the color spectrum, among blacks and among whites (Berquó, 1987; Longo, 2011; Silva, 1987; Telles, 2004).

Changes over time are also important. Comparing both periods, it is clear that the differences are smaller in 2000, except for white/black couples that have a little higher difference. This result can be explained by more homogeneity of the population across regions or a decrease in the importance of local marriage market characteristics over time, for black/brown and white/brown couples. Despite the decrease over time, the rates between model 2 and model 3 are still very different, meaning that local racial distribution is still important for explaining intermarriage in Brazil. The results also confirm the descriptive analysis by showing that, between 1991 and 2000, the proportion of black/white couples increased much more than the proportion of brown/white couples. Moreover, this increase seems to be due to changes in cultural norms because the difference from equation 2 to equation 3 was not drastic between 1991 and 2000, like in the case of white/brown couples. It may raise the hypothesis of influence of racial declaration across Census. There is actually an increase in the difference for black/white homogamy-heterogamy rates, meaning that the differences over time depend more on racial distribution.

The overall results point to the importance of local marriage markets but since homogamy is more common than heterogamy, especially when considering blacks, social distance also plays an important role in Brazil. The changes in 2000 show that local racial distribution has decreased importance while racial tolerance may have increased over time, or that the differences may also be an effect of racial classification changes, as analyzed by Miranda (2017). Furthermore, these results strongly suggest that intermarriages rates have been overestimated in past research because of the lack of consideration of racial composition in the local marriage market. However, it is worth noting that the adoption of a different concept of the marriage market would likely change the results, which does not mean that the substantive conclusions would be altered. In sum, the differences in homogamy-heterogamy rates between models 2 and 3 are all negative (see Graph 1), which specifies that after taking into account the local racial distribution of husbands and wives, the odds ratios of marrying homogamously compared to marrying heterogamously are lower.

The main importance of these results is the fact that racial distribution which is an indicator of opportunities and constraints in the marriage market reduces in 15.3 to 43 percent (depending on the year and spouses' race). Therefore, although it does not fully explain the rates it is an important explicative factor to be considered. It is also worth noting that other local characteristics need to be added in order to better understand interracial marriage in Brazil, moreover the differences among the couples show that

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different factors, such as tolerance, influence differently the racial pairings, also the racial distribution is not random in the country being also affected by cultural and social factors. Changes over time demonstrate a decrease of importance of local racial distribution and higher racial tolerance and also may indicate differences in racial classification. These highlight the importance of the documentation of more recent data.

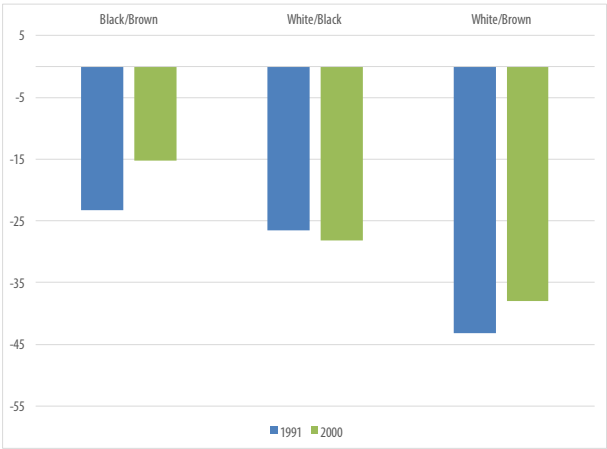
Table 5
Loglineare results for the interaction between husband's and wife's race. Brazil, 1991 and 2000

	1991		2000	
	Model 2	Model 3	Model 2	Model 3
Log odds ratios				
Black*Black	4,762	4,453	3,393	3,063
Black*Brown	1,696	1,427	0,975	0,673
Brown*Black	1,993	1,652	1,321	0,981
Brown*Brown	2,573	2,008	2,014	1,536
Odds Ratio				
Difference (%)				
Black/Brown	38,321	29,430	22,443	19,011
White/Brown	13,105	7,448	7,493	4,646
White/Black	116,980	85,884	29,755	21,392

Data source: Census 1991 and 2000.

Graph 1

Differences in homogamy-heterogamy rates between equation 2 and equation 3. Brazil, 1991 and 2000 (%)



Data source: Census 1991 and 2000.

Note: All differences are negative, which indicates that there is a decrease in the homogamy-heterogamy rate after considering the interaction between the racial compositions of the local marriage market.

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The main results discussed previously showed that overall the inclusion of the interaction terms between spouses' race and mesoregions has a statistically significant impact on how to interpret interracial marriage rates in Brazil. In addition, it is important to investigate if including these interaction terms is significant for all mesoregions or only for a select group of them. In order to answer this question, I calculated the homogamy-heterogamy rates for each mesoregion and tested whether each result was statistically significant different from zero. Figure 1 shows the distribution of these rates. Values around zero indicate that there is no significant difference from model 2 and model 3 in a specific local marriage market. If this result occurs, the effect of the racial distribution is not important in that specific area. There are few mesoregions where the homogamy-heterogamy rates are not statistically different from zero. In 1991 these areas include: Norte do Amapá (North region) for all three types of couples; Litoral Sul Paulista (Southeast Region) and Sudeste Paranaense (South region) for brown/black couples; and Norte Amazonense (North region) for white/black couples; note that most of these mesoregions are in the North region, where there is a concentration of browns. For 2000, the areas where the homogamy-heterogamy rates are not statistically significant are: Norte Amazonense for black/brown couples; and Sul de Roraima for black/brown and white/black couples; and both mesoregions in the North region. The main message from this result is that racial distribution is not an important factor to explain interracial marriage in some areas, especially some mesoregions in the North of the country. Knowing that the rates are not random the explanation in these areas may be more a factor of local cultural and historical values. These cases are exceptions and not the rules. Therefore, the main message that can be derived from figure 1 is that, with very few exceptions, the consideration of the local distribution of spouses' race is statistically significant for each mesoregion.

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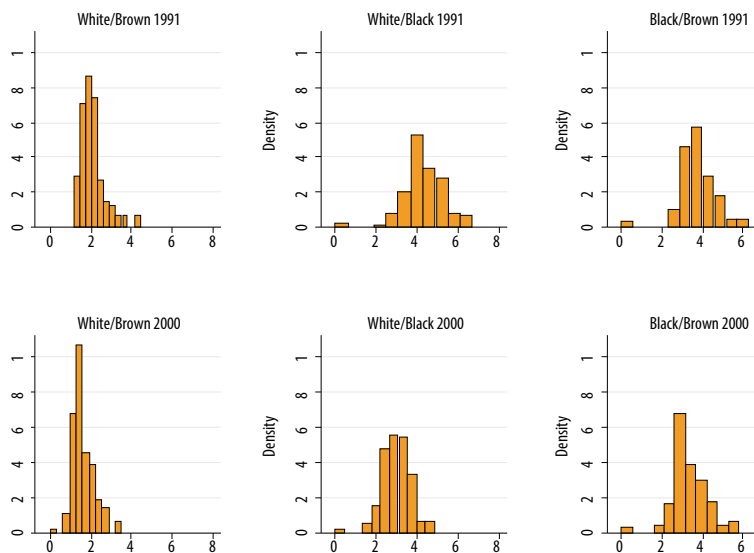
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Data source: Census 1991 and 2000.

Note: values equal zero are not statistically significant.

In order to assess whether the differences among the mesoregions are statistically significant. I tested whether the rate for each mesoregion is different from the average level. This test is very important because if all of the areas have the same difference, the results would suggest that although the homogamy-heterogamy rates, when considering the local racial distribution, differ from zero, they are the same throughout the country. Rates that do not differ from each other, suggest that other possible explanations, besides local racial distribution, are the same everywhere. On the other hand, if there are statistically significant differences among the mesoregions, the explanations and preferences within the marriage market are also different between the local marriage markets, since the model considers the racial composition. This indicates that an investigation about what these differences are would be worth for future research. Figure 3 presents the maps with results for values statistically significant below the average, equal to the average, and above the average. The averages are specific for each type of couple for each year. If the value is below the average, this means that there are more mixed unions than the average. Values above the average level indicate that there are fewer interracial unions than the average.

The main results show that most areas have rates equal to the average. However, there are some important clusters, especially in the South region. These clusters refer to white/brown and white/black couples in 1991 and 2000, and black/brown couples in 1991. The values that are below the average are more dispersed throughout the country, with some evidence of clustering in the Central and Northeast regions for white/brown couples during both periods. Although some important differences arise from the analysis, it is worth noting that the values of the homogamy-heterogamy rates are close to each other. The lowest values are approximately two and the highest are about five. In some cases, such as for white/brown couples in 2000, the range is even smaller 1.35 to 3.5. Therefore, although the differences are statistically significant they may not necessarily be large.

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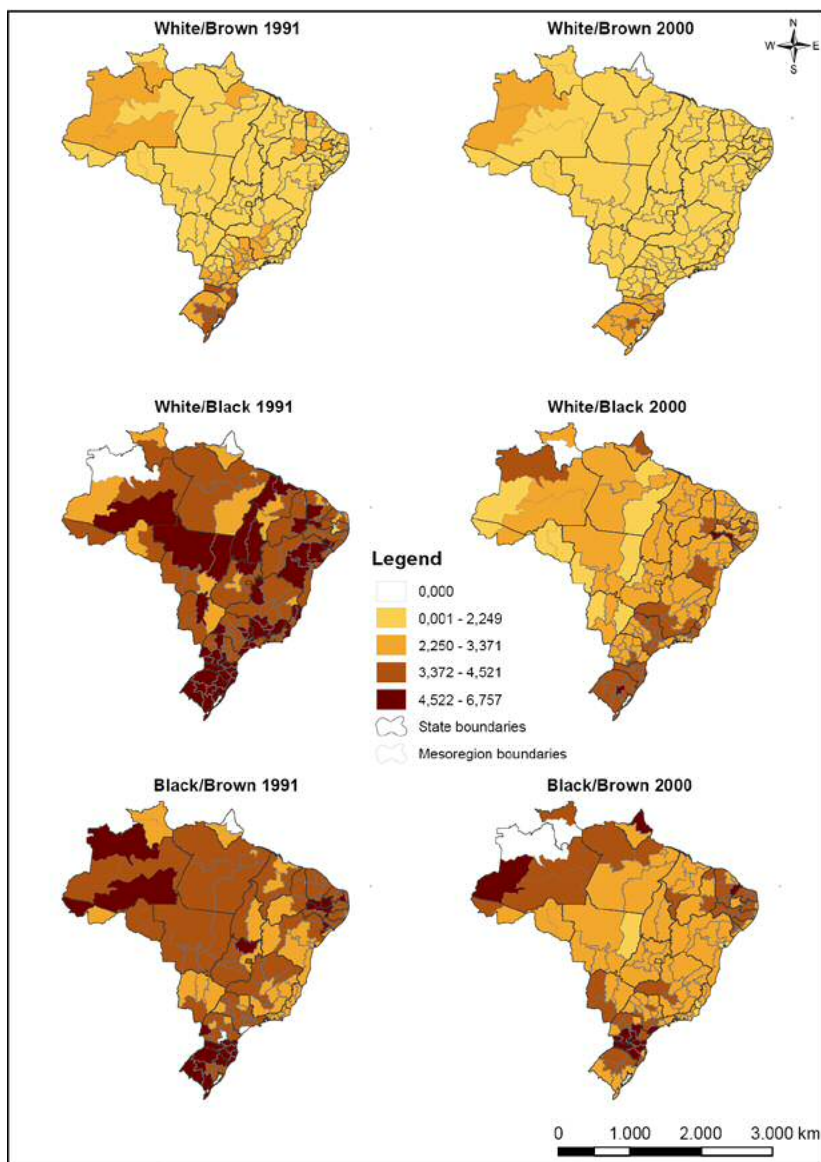
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Figure 2
Maps of the log odds for mesoregions by interracial unions. Brazil, 1991 and 2000



Projection: Latitude/Longitude Sistema de Referência Geocêntrico para as Américas (SIRGAS) 2000

Data source: Census 1991 and 2000.

Note: Places where the coefficient is not statistically significant are considered zero and are identified by white.

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Maps of the t-test for mesoregions by interracial unions. Brazil. 1991 and 2000



Note: Places where the coefficient is not statistically significant are considered zero and are identified by white.

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Final Comments

This article aimed to answer the question of whether it is important to consider local racial distributions when analyzing interracial marriage in Brazil. Racial distribution and racial classification vary across the country, and these differences influence the formation of interracial unions locally because of exposure, which affects opportunity in the sense of who people may find in their marriage market. It is also known that most people marry someone who lives nearby (Blau *et al.*, 1982; Lewis and Oppenheimer, 2000). Therefore, it is unreasonable to assume that everyone shares a national marriage market with the same likelihood of marrying or cohabiting with a person who lives within a close proximity versus someone who lives in a more distant location, as the national analyses have been doing. Another issue that needs to be considered is that it is not correct to assume that all local marriage markets have the same racial distribution, since it is already known that in the South of Brazil there is a concentration of whites and in the Northeast, concentration of blacks.

Given these reasons, this article analyzed local marriage markets, considering mesoregions as its definition. These are socially and economically homogeneous geographic areas that are constrained by a state's boundaries. It is difficult to establish an agreement between researchers of what constitutes a local marriage market. Therefore, I opted for a large area that would include the most important places where people find spouses and receive influence about whom to marry. These places include schools, residential neighborhoods, and places of work.

The results of the loglinear models show that when considering the interaction term between wives' race and mesoregion; and the interaction term between husbands' race and mesoregion, the homogamy-heterogamy rates drop 15.3 percent (black/brown - unions in 2000) and the change is even greater among white/brown couples in 1991; 43.16 percent, confirming the importance of considering local racial composition in the analyses of intermarriage. These results are similar to the ones found by Harris and Ono (2005) for the USA. They used Census data for 1990 and the national estimates of race effects on partnering decline by between 19 and 53 percent once controlled for the racial composition of local marriage markets, as opposed to the racial composition of the US. In this sense, the main conclusion is that without considering the local racial distribution, previous research has overestimated homogamy-heterogamy rates and overemphasized the role of racial boundaries and racial preferences in the marriage market. However, more than 50 percent of the difference between models 2 and 3 is not explained, suggesting that other local characteristics, such as racial tolerance may better explain the racial assortative mating process. Telles (1993) found that industrialization level helps to explain the rates. In addition, my analysis also noted that changes over time were important for explaining the higher increase of unions between whites and blacks than between whites and browns. This increase was due more to changes in cultural norms and racial composition. Between 1991 and 2000, there is a decrease in the difference of the homogamy-heterogamy rates from model 2 to model 3, except for white/black couples.

The analysis of the homogamy-heterogamy rates by mesoregion showed that, with very few exceptions, the consideration of the local racial distribution is important when evaluating local homogamy-heterogamy rates. There are also significant differences throughout the country. This means that there are notable regional differences, other than just racial composition, for explaining variation in intermarriage levels in Brazil. The

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South region stands out because that is where the homogamy-heterogamy rates are higher for any type of racial combination and for both periods, this result corroborates with the hypothesis that in the South, where there is a concentration of whites the social distance between whites and blacks and whites and browns are higher.

In conclusion, as was already noted by Telles (1993), although racial distribution largely influences interracial marriage rates, it does not fully explain regional differences and marriage is far from being random. Therefore, other factors contribute to a better understanding of the role of the marriage market. Moreover, it is worth highlighting that the changes over time indicate two important characteristics of the Brazilian marriage market that are very important to be further discussed: 1) a decrease of importance of the local racial distribution, which may be explained by differences in racial classification (Miranda, 2017) and/or changes in the marriage market, meaning that over time there is an increase in the use of social media networks for finding a spouse. Balistreri *et al.* (2017) have showed the increase of cross border marriages and documented how it affects age. this phenomenon may affect interracial marriage in Brazil, in the sense that people may find their spouse in a different state or even in a distinct country.

And. 2) the indication of an increase of racial tolerance, other studies have documented an increase in interracial marriage over time in Brazil (i.e.: Bailey, 2008; Heaton, 2010; Longo, 2011; Ribeiro and Silva, 2009). with a lower rate for marriages involving blacks, which indicates once more the preference and higher tolerance towards browns. Even this interpretation can also be mixed with possible racial reclassification across Census. Both characteristics show the importance of including more recent data, in order to verify these hypotheses and to localize this topic in a broader framework of social stratification, in the sense that marriage market is not an isolated entity in society, and that even the localization and concentration of racial groups in some specific areas are not a random event. Historical and cultural backgrounds need to be taken into account and in this sense the cultural norms, and racial distance or tolerance would have a more clear understanding.

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Figure 1A
Brazilian geographical regions



Source: IBGE (http://www.ibge.gov.br/ibgeteen/mapas/imagens/brasil_regioes_gde.gif)

Mesoregions by regions in Brazil

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The author is grateful to Professors Michael Hout, Kenneth Wachter, Jane Mauldon and Bernardo Lanza for reading and commenting previous drafts, and to the two anonymous reviewers who made important contributions.

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