# Trends in Educational Assortative Mating in Brazil: 1960-2015

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**Abstract**

Using both census and survey data, this study analyzes educational assortative mating trends over half a century in Brazil. Odds of both overall and group-specific homogamy, as well as odds of crossing educational barriers, are estimated. Results suggest that, after four decades of continuous decline, overall homogamy increased in the first decade of this century. This rebound stems from a shift in the balance between long-standing opposite trends: increasing odds of intermarriage among lower educational levels and more homogamy at the top of the educational distribution. The findings are interpreted in the light of several social, economic and demographic changes that are relevant to union formation. Particularly, I argue that, starting from a population with very low levels of schooling, educational expansion could initially have only a limited effect on marriage markets. As the expansion reached upper secondary and higher education, it has strengthened the link between schooling and partner choice, thus fostering homogamy.

## 1 Introduction

Assortative mating has long interested inequality researchers because of its close connection to stratification processes. Partner choice can be regarded as both cause and consequence of inequality, as it expresses and reinforces boundaries between social groups and contributes to the concentration or dispersion of resources across families (Kalmijn, 1998; Schwartz, 2013). One of the most relevant dimensions of assortative mating in contemporary societies is education, because it shapes both preferences regarding partners' characteristics and opportunities for social interaction over the life course.

The relationship between schooling and partner choice is intertwined with several topics of sociological interest, such as the timing of union formation and other life course transitions, economic returns to education and the gender division of labor (Blossfeld, 2009; Blossfeld & Timm, 2003a; Kalmijn, 1998; Lichter & Qian, 2019; Mare, 1991; Schwartz, 2013). Thus, changes in educational assortative mating can offer a window into how broad social trends shape intimate relationships.

Brazil provides a rich context for investigating those questions, as quite intense social change unfolded over a few decades (Arretche, 2019; Scalon, 2013). For example, in the early 1960s Brazil had a mostly rural population, with more than half of the labor force working in the primary sector. By the end of the 20th century, more than 80% of the population lived in cities; the share of manufacturing jobs, which peaked in the 1980s, was already in decline; and most workers, now including many more women than before, were employed in the service sector (Comin, 2019; Guimarães, Brito, & Barone, 2019; Scalon, 2013). Around the same period, cohabitation became widespread (Esteve, Lesthaeghe, et al., 2016; Esteve, Lesthaeghe, & López-Gay, 2012) and the total fertility rate decreased from more than 6 children per woman to below replacement level (Potter et al., 2010). Access to primary education became universal towards the end of the last century and, both in absolute and relative terms, enrollment in tertiary education more tripled between the 1990s and the 2010s (Lam & Marteleto, 2002; Salata, 2018); which means that spending a significant amount of time in the educational system, especially around ages when romantic relationships are formed, became much more common for younger cohorts. These trends represent important changes in many aspects of Brazilian society and, to the extent they have transformed patterns of social interaction and family formation, they are specifically relevant to assortative mating.

Despite those major changes, research on educational assortative mating in Brazil is limited, especially when it comes to long-term trends. Previous research has shown an overall decline in homogamy in the last decades of the 20th century, accompanied by more closure at the top of the educational distribution and mixed results regarding the least educated (Esteve & McCaa, 2007; Ribeiro & Silva, 2009; Silva, 2003). Several trends that may affect marriage markets continued to unfold in this century, including the substantial expansion of tertiary education, but no work has analyzed how assortative mating has changed since the 2000s and integrated recent developments with past findings. This paper updates and extends the literature on assortative mating in Brazil by: a) relying on both census and survey data to cover more than five decades of intense social change, from 1960 to 2015; b) describing gender asymmetries in trends; and c) estimating changes in both overall and group-specific homogamy, as well as in odds of crossing educational barriers. This allows for assessing how the combination of different forces and offsetting trends across the educational distribution has shaped educational assortative mating in Brazil over the last decades.

## 2 Explanations for patterns and trends of educational assortative mating

In contemporary societies, where direct control of third parties (family, churches) tends to be weaker, patterns of union formation are mostly shaped by the structure of opportunities for meeting potential partners and preferences regarding partners' characteristics (Kalmijn, 1998; Schwartz, 2013). Assortative mating is fundamentally multidimensional, both because individuals are part of different groups at the same time — so that a relationship might cross group boundaries in one dimension but not in others — and because people do not rely on a single trait when choosing a partner, instead evaluating a bundle of characteristics (England & Farkas, 1986; Lichter & Qian, 2019). But most of the literature has focused on a few group characteristics, namely education, race/ethnicity and religion (Kalmijn, 1998; Schwartz, 2013). Many of the same social forces shape intermarriage across these different dimensions, but in this review section I highlight the hypotheses, mechanisms and evidence more pertinent to educational intermarriage, which is the focus of my empirical analyses.

On a macrosociological level, educational assortative mating has been studied by relating marriage patterns to temporal and cross-national variation in levels of modernization, industrialization and other societal attributes (cf. Ultee & Luijkx, 1990; Smits, Ultee, & Lammers, 1998). In this literature, assortative mating is regarded primarily as an indicator of social fluidity and the substantive questions are similar to those in the long tradition of comparative social mobility research: what explains closure or openness of societies and which are the expected and observed trends of social fluidity. For example, Smits et al. (1998) showed that the literature on modernization and social fluidity allows for divergent hypotheses about trends in assortative mating. On the one hand, modernization could enable unions to be formed on the basis of "romantic love", free from both third-party control and socioeconomic considerations, which would cause homogamy to decrease. On the other hand, the "status attainment hypothesis" states that, to the extent that industrialization increases the effect of education on life chances, we can expect individuals to not only maximize their own educational attainment but also seek partners with high levels of schooling. This should drive homogamy up because "marrying down" would be less desirable for both men and women.

Smits et al. (1998) combined these hypotheses and suggested an inverted-U relationship between industrialization and homogamy, i.e. homogamy would increase in the first stages of industrialization but decline in advanced industrialized societies. Though they found support for this hypothesis in their cross-national study, the evidence for it is generally mixed and comparative research has found national trends to be quite heterogeneous (Blossfeld, 2009; Kalmijn, 1998; Raymo & Xie, 2000; Schwartz, 2013).

On another level of analysis, the focus is on life course mechanisms that influence partner choice (Blossfeld, 2009). In this regard, education systems play a key role in shaping both opportunities and preferences. On the side of opportunities, it is well known that education influences union formation both because schools and colleges function as "local markets" where people meet potential partners and because of the structural effects that create increasingly homogeneous social networks as one progresses through the educational system (Blossfeld & Timm, 2003a; Kalmijn & Flap, 2001; Mare, 1991). Education also shapes preferences in partner choice because it fosters similarity in life styles and, as expressed by the status attainment hypothesis above, schooling is a trait to which people might give considerable weight when evaluating potential mates. Thus, educational expansion is predicted to increase educational homogamy — especially among highly educated people — and has been shown to do so in some rich countries (Blossfeld, 2009; Blossfeld & Timm, 2003b; but see also Birkelund & Heldal, 2003; Katrňák & Manea, 2020; Uchikoshi & Raymo, 2021).

Much of the world experienced some sort of educational expansion in the last few decades and one important feature of this expansion is that it has not been gender-neutral (Esteve, Schwartz, et al., 2016). Schooling generally increased more for women than for men, which led to a reversal, or at least narrowing, of the gender gap in educational attainment in most countries by the first decade of the 21st century (Esteve, Schwartz, et al., 2016; Van Bavel, Schwartz, & Esteve, 2018). One major consequence of this trend is a global decline in (female) hypergamy, the arrangement in which the woman has less schooling than her partner. Although this decline is mostly a consequence of the changing sex-specific educational distributions — in other words, the sheer number of available partners with given characteristics — it can also be understood as part of a broader gender revolution (Goldscheider, Bernhardt, & Lappegård, 2015).

Another key trend in this gender revolution is the increase in female labor force participation in much of the world. In contexts with strong gender asymmetry in economic roles — following Becker's (1974) "specialization and trade" model, in which couples maximize their well-being with the husband obtaining market income and the wife focusing on housework — we can expect that men and women will look for different things in potential partners (Blossfeld & Timm, 2003a; England & Farkas, 1986). Under these circumstances, one's economic standing and prospects tend to strongly influence outcomes in marriage markets for men, but less so for women. As more women enter the labor force and it is increasingly expected that wives' earnings contribute to the household income — even if husbands remain as the primary breadwinners —, we should expect more symmetry in partner preferences of young men and women. In other words, changes in gender norms and the division of labor within marriages mean that the economic prospects of young women, of which education can be regarded as a good proxy, tend to become more relevant in marriage markets, thus fostering homogamy (Oppenheimer, 1988; Sweeney, 2002; Sweeney & Cancian, 2004).

Timing of life course transitions is also decisive in shaping educational assortative mating. A classic contribution in this regard is Mare's (1991) time gap hypothesis, which predicts that the shorter the gap between leaving the educational system and entering a union, the higher the odds of homogamy. When young people marry or cohabit while still in school or shortly after leaving it, they are more likely to have met their partners in the school itself or in other educationally homogeneous contexts. The shorter time gap between school completion and marriage is regarded as a major reason why the highly educated have higher odds of homogamy (Blossfeld & Timm, 2003a; Mare, 1991). Though on aggregate trends in homogamy might be inconsistent with trends in the average time gap (Mare, 2016), there is a fair amount of support for Mare's hypothesis on the individual level, even if accounting for some heterogeneity — by sex or race, for example — is necessary (Schwartz, 2013). When it comes to preferences, people who marry later may give more weight to, or be more able to assess, the socioeconomic standing and prospects of potential partners, which also promotes homogamy (Mare, 2016; Oppenheimer, 1988; Qian, 2017).

Finally, another important factor is the income gap between educational groups, which also influences both opportunities and preferences in union formation. Income inequality is closely linked to other forms of social distance, so the economic returns to education shape interaction opportunities between people with different levels of schooling by way of, for example, residential segregation and general differences in lifestyles (Mare, 2016; Schwartz & Mare, 2005; Torche, 2010). Inequality also affects the economic penalties or gains associated with intermarriage. The higher the inequality between educational levels, the more disadvantageous it is to have a lower status partner. Again, this fosters homogamy as both men and women would be less willing to "marry down".

# 3 The Brazilian context: previous research and relevant empirical trends

A few studies have analyzed patterns and trends of educational assortative mating in Brazil, enough to provide a broad picture of what changed over the last decades of the 20th century. Silva (2003) was the first to analyze these patterns and trends at the national level, using data from the National Household Sample Survey (PNAD) for 1981, 1990 and 1999. Fitting crossings models (see Data and Method section below), he identified some regularities previously established for other countries, most notably that the odds of intermarriage were lower the higher the educational level. Estimates were quite stable across years, but Silva (2003) did identify some weakening of the barrier to intermarriage at the bottom — no schooling versus primary education — in the 1980s and a strengthening of the top barrier — upper secondary versus tertiary education — in the 1990s.

Ribeiro & Silva (2009) analyzed educational and racial assortative mating using the 1960, 1980 and 2000 Censuses. They concluded that the Brazilian marriage market became much more fluid over the studied period, with the odds of crossing both the racial and the lower educational barriers to intermarriage rising significantly and independently of each other.[1] On the other hand, they also identified increasing closure among people with some tertiary education and attributed this to more women attaining higher education over the years.

Esteve & McCaa (2007) compared patterns and trends of educational assortative mating

[1]It is worth noting that Ribeiro & Silva (2009) did not find support for the status exchange hypothesis, i.e. the trading of racial and educational characteristics between spouses. But see Gullickson & Torche (2014) for a conceptual and methodological refinement of the exchange hypothesis and evidence for it in Brazil.

in Brazil and Mexico from 1970 to 2000 using harmonized Census data. They did not estimate crossing models, but did analyze how the odds of homogamy varied between educational levels. In Brazil, homogamy increased throughout the period for those with upper secondary education and, more strongly, for college graduates, while it diminished for those with lower secondary and remained basically stable for the least educated. Their estimates of stability of homogamy at the bottom of the distribution are at odds with the findings of Silva (2003) and Ribeiro & Silva (2009), as well as my own estimates presented below.[2] Results from Heaton & Mitchell (2012) — the only study including trends for this century — also suggest stability in homogamy for the least educated and a slight increase for the most educated, albeit for a different period (1991-2008). Furthermore, Heaton & Mitchell (2012) find that, net from changes in racial and religious assortative mating, overall educational homogamy declined during the 1990s but did not change between 2001 and 2008.

In sum, previous research on Brazil points to an overall increase in educational intermarriage coupled with more homogamy among the highly educated in the last decades of the 20th century. On the other hand, findings for trends in the bottom of the educational distribution are mixed. To contextualize these past findings and understand potential sources of changes and continuities, it is necessary to account for the social, economic and demographic trends underlying union formation over the fifty-five years covered in the present study. I focus on the factors reviewed in the last section, all of which have undergone profound changes in Brazil: the distribution of schooling, gender roles, timing of union formation, and income inequality.

The most consequential process, considering its direct and indirect effects on marriage markets, is the educational expansion that led to significant increases in schooling. Compared to the developed world and even other Latin American countries, Brazil was

[2]By obtaining their group-specific homogamy from a "corners model" (Hout, 1983) — which controls for intermarriage between adjacent groups at both extremes of the classification — and constraining year effects to be uniform, Esteve & McCaa (2007) likely underestimate how much homogamy at the bottom was replaced by intermarriage between the two lower levels of education.

slow to provide broad access to basic education. In 1960, only 30% of the population aged 21-25 had completed primary education (Ribeiro, Ceneviva, & Brito, 2019) and only in the 1990s the school enrollment rate for children surpassed 90% (Lam & Marteleto, 2002). Completion of upper secondary education is still far from universal, but among people of 21 to 25 years of age it increased from about 5% in 1960 to a little more than 50% in 2010 (Ribeiro et al., 2019). Fulfilling the demands of upper classes already served by secondary education, higher education had a first wave of growth in the 1970s. But since the late 1990s and especially the 2000s, a new expansion and a series of reforms have brought about a much bigger and more diverse tertiary student population (Marteleto, Marschner, & Carvalhaes, 2016; Salata, 2018). Hence, cohorts coming of age in the 21st century were the first to have near universal access to primary education, while facing both a major bottleneck in completing secondary education and unprecedented opportunities for getting into universities.

Inequality of educational opportunities has generally declined, while the expansion has produced a more dispersed distribution of schooling. In 1960, some two-thirds of Brazilian youth had little to no education. At this level of concentration, educational homogamy would necessarily be high even if schooling played no role in union formation (Blau, Blum, & Schwartz, 1982; Kalmijn, 1998). As a corollary, the increasing variation in schooling over the last decades should lower the observed prevalence of homogamy regardless of changes in the net propensity for intermarriage. In other words, educational expansion in Brazil made intermarriage more likely just by reshaping the distribution of schooling. This is not to say that changes in group sizes were the only driving force of the decrease in rates of homogamy, because previous research cited above shows an overall weakening of the association between spouses' education net from marginal changes. But this is still an important point because, for the reasons explained in the previous section, the literature on developed countries often highlights the homogamy-inducing effects of educational expansion (e.g. Blossfeld & Timm, 2003a)

The apparent divergence comes down to what kind of expansion we are talking about.

In developed countries, where enrollment in primary education was generally high by the first decades of the 20th century, research usually focuses on the expansion of upper secondary or higher education (Blossfeld & Timm, 2003b). Starting from very low levels of schooling, educational expansion in Brazil for most of the period analyzed here refers mainly to primary and lower secondary education (which together constitute the *Ensino Fundamental* in Brazil). It was only in the 21st century that upper secondary and higher education, which tend to be more closely related to the process of union formation, became the driving forces of educational expansion. This highlights the need to update trends of assortative mating to this century as well as to look closely at variation across educational levels.

Furthermore, educational expansion was accompanied by an increase in gender asymmetry in total schooling, inasmuch as, like in most of the world, women benefited more from it in Brazil. By the 1980s, young women had surpassed men in attaining upper secondary education and the same occurred in higher education in the 1990s (Beltrão & Alves, 2009). The effects of sex-specific trends in educational attainment can vary across groups, as well as be offset or reinforced by changes in preferences, social norms and interaction opportunities. At lower levels of education, the reversed gender gap should foster hipogamous unions — those with a more educated wife — while, as pointed out by Ribeiro & Silva (2009), increases in women's college education might reinforce homogamy at the top of the distribution.

Also meaningful for union formation is the rise in female labor force participation. In 1960, only 16.5% of working-age women were in the labor force, increasing to 52.6% (and 70% among younger women) in 2010 (Guimarães et al., 2019). This rise, which continued at least into the mid-2010s (Machado & Costa Ribeiro, 2021; Ribeiro & Machado, 2018), was accompanied by a transformation of the socioeconomic profile of women's employment: from being typical of poor and single women to increasingly include wives, mothers, and middle-class women, a process facilitated by the increased educational attainment and the expansion of the service sector (Itaboraí, 2017; Ribeiro &

Machado, 2018). These changes suggest a reconfiguration of gender attitudes and roles, which, as discussed in the previous section, might render women's economic prospects more relevant to partner choice and foster homogamy.

The shortening of the time gap between leaving school and union formation is another relevant trend. As Brazilian youth spend a longer part of their lives in school, it is more likely that their romantic relationships arise from educationally homogeneous social networks. Again, it is important to take note of the late expansion of secondary education in Brazil, as this level, along with higher education, should have a bigger impact on union formation. Educational and family trajectories are interdependent, so younger cohorts could at least partially compensate for the extra time spent at school by postponing entry into union. Nevertheless, while age at first marriage has indeed been steadily increasing, age at first union — i.e. also considering consensual unions — remained mostly stable between 1970 and 2010 (Esteve et al., 2013a; Fussell & Palloni, 2004; Vieira & Alves, 2016). Therefore, young people are, at least at the aggregate level, spending less time single after leaving the educational system, which should increase the odds of homogamy. The stability of the average age at first union, however, conceals offsetting trends and an increase in the variation of timing of union formation by class and education (Esteve et al., 2013a; Itaboraí, 2017). Entry into union, thus, has become more heterogeneous, which is part of a broader trend of life-course destandardization in Brazil (Camarano, 2006; Ribeiro, 2014; Vieira, 2008). This is another factor pointing to the importance of accounting for divergent trends across the educational distribution.

Very high returns to education have long been regarded as one of the proximate determinants of high income inequality in Brazil and Latin America in general. As one would expect, this is not without consequences for educational assortative mating. Torche (2010) showed that in Brazil, Chile and Mexico, the strength of barriers to intermarriage closely matched the earnings gap between educational levels. But, except for tertiary education, the educational wage premium has generally declined in the last decades, especially since the 1990s; the largest drop being in returns to primary education

(Menezes Filho & Kirschbaum, 2019). In fact, the decrease in returns to education was a major cause of the decline in income inequality in Brazil between the late 1990s and mid-2010s (Firpo & Portella, 2019; Lustig, Lopez-Calva, & Ortiz-Juarez, 2013). Moreover, research on class mobility has indicated diminishing returns to education as a key mechanism driving increases in social fluidity between the 1970s and the 2000s (Ribeiro, 2012; Torche & Costa-Ribeiro, 2010).

Brazil, therefore, presents a variety of trends that point to divergent, and maybe offsetting, effects on educational assortative mating, at least on the aggregate level. Educational expansion should both decrease homogamy at the bottom of the distribution and increase it at the top. Changes in women's roles and the gendered trends in educational attainment point to an overall increase of homogamy, but they can also facilitate unions with a more educated wife at lower levels of schooling. The diminishing time gap between leaving school and entering into unions would generally foster homogamy, but the timing of union formation has also become more heterogeneous. Finally, declines in returns to education reduced differences among lower levels of the distribution. By describing both aggregate trends and variation by sex and education, results presented here allow for the assessment of how the combination of these different factors shaped educational assortative mating in Brazil over the last decades.

# 4 Data and method

I use data from the six Brazilian Demographic Censuses conducted between 1960 and 2010 and the National Household Sample Survey (PNAD - *Pesquisa Nacional de Amostra por Domicílios*) from 1992 to 2015. The Census samples correspond to 1.25% of the population in 1960; 25% in 1970 and 1980; and about 10% from 1991 to 2010. PNAD is a cross-sectional survey conducted annually, except for Census years, for a nationally representative sample of Brazilian households. Furthermore, PNAD was not conducted in 1994, which leaves us 21 datasets for this survey between 1992 and 2015. Until 2007, PNAD did not include rural households in the North region — less than 3% of the population — so I excluded those cases from subsequent years to maintain comparability.

I selected all heterosexual couples in which the woman was 20 to 34 years old and the man was 20 to 39 years old. This yields sample sizes of about 55,000 couples in 1960; 1.2 to 2 million in other Census years (see Appendix); and about 18,000 to 24,000 in each PNAD year. The wider age range for men accounts for the fact that husbands are on average older than their wives.[3] Spouses within the selected age range are old enough to enter higher education and are most likely in their first union. Unfortunately, only the 1960 and 1991 censuses asked about the timing of union formation and only in the latter it is possible to ascertain whether it is the first union for either spouse. Longitudinal data or samples of newlyweds are more suitable for tracking trends in union formation, because the selective dissolution of unions, patterns of remarriage and education attained after the start of the union may bias estimates obtained from prevailing unions (Mare, 1991; Schwartz & Mare, 2005). Restricting samples to young couples is a common, if imperfect, way to minimize the bias (see, e.g., Halpin & Chan, 2003).[4]

The data include both married and cohabiting couples. As in many other Latin American countries (Esteve et al., 2012), cohabitation in Brazil increased sharply in the last few decades and in 2010 it comprised half of the couples within the selected age range. Furthermore, although regional and socioeconomic differentials persist, cohabitation became more common in all social classes and, with rising age at first marriage but stable age at first union, cohabiting is increasingly a substitute for marriage — or at least an extended experience before it — among younger cohorts (Covre-Sussai et al., 2015; Esteve, Lesthaeghe, et al., 2016; Laplante, Vieira, & Barnabé, 2019). Married and

[3]The median age difference was 3 or 4 years for most of the period. Not accounting for this difference would imply selecting positively on age homogamy, since a large share of couples in which the woman is near the upper limit of the age range would be left out of the sample.

[4]Schwartz & Mare (2012) examined the mechanisms of selective dissolution, remarriage and educational upgrading in detail and concluded that their net effect is small, but the accumulation of homogamous first marriages in the stock of marriages still causes prevailing marriages to have higher odds of homogamy than samples of newlyweds.

cohabiting couples in Latin America follow a similar pattern of educational assortative mating, but the latter are less likely to be homogamous (Esteve et al., 2013b). This homogamy gap diminished between 1970 and 2000, with the difference in odds of homogamy going from 23% to 11% in Brazil (computed from table 4 in Esteve et al., 2013b). Like several studies for Latin America and elsewhere (e.g. López-Ruiz, Esteve, & Cabré i Plá, 2008; Bouchet-Valat, 2015; Ribeiro & Silva, 2009; Solís, Pullum, & Bratter, 2007), I pool data for married and cohabiting couples and do not distinguish between types of union in the analysis.

Spouses' educational attainment was coded in five levels, taking into account relevant transitions in the Brazilian educational system: less than primary education (0 to 3 years of schooling); primary to incomplete lower secondary education (4 to 7 years); lower secondary education (8); complete or incomplete upper secondary education (9-11 years); and at least some tertiary education (12 or more years).

Trends in couples' joint educational distribution are driven partially by the marginal changes in the sex-specific educational distributions, i.e., the size of the groups used in the analysis. To distinguish between the net association of spouses' education and marginal effects, I fit log-linear models to the contingency table created by cross-classifying wife's education by husband's education by year (5 × 5 × 6 = 150 cells for Census; 5 × 5 × 21 = 525 cells for PNAD). Log-linear models have long been used to study assortative mating and social mobility because they are very flexible and allow for detailed specifications of the association between categorical variables. An independence model that includes the effects of groups' sizes and their change over time, but no association between spouses' schooling has the following equation:

$$\ln\left(\frac{F_{ijk}}{t_{ijk}}\right) = \lambda + \lambda_i^H + \lambda_j^W + \lambda_k^Y + \lambda_{ik}^{HY} + \lambda_{jk}^{WY}$$

where $i$ is an index to husband's education (H), $j$ to wife's education (W) and $k$ to year (Y); $F_{ijk}$ is the expected frequency of cell $_{ijk}$; $\lambda_i^H$, $\lambda_j^W$ and $\lambda_k^Y$ are the main effects of husband's education, wife's education and year; and $\lambda_{ik}^{HY}$ e $\lambda_{jk}^{WY}$ are interaction terms that fit the changes in group sizes across years. Weights provided with Census and PNAD data were normalized to preserve sample sizes and included by means of the offset $t_{ijk}$, which is equal to the inverse of the ratio of each cell's weighted frequency to its unweighted frequency (Clogg & Eliason, 1987; Schwartz & Mare, 2005). For the 1960 sample, which is self-weighting, $t_{ijk} = 1$. Patterns and trends of assortative mating can be analyzed by means of different parameterizations of the interaction between spouses' education ($\lambda_{ij}^{HW}$) and its variation through time ($\lambda_{ijk}^{HWY}$).

I focus on three types of parameter to describe trends in assortative mating: overall homogamy, group-specific homogamy and crossings parameters. The overall homogamy model captures the association between spouses' education with a single parameter that contrasts cells on and off the main diagonal of the contingency table for each year. The group-specific homogamy model extends this specification by assigning different parameters to each main diagonal cell, thus allowing the level and trends of homogamy to vary between educational groups. The crossings model is especially interesting and has been widely used to study assortative mating (Mare, 1991; Schwartz & Mare, 2005). It assumes that the pattern of assortative mating is a function of a series of barriers between adjacent groups, with varying degrees of permeability. Thus, the odds of a specific combination of spouses' education is determined by not only *how many* but also *which* barriers are crossed: a union that crosses the barrier between primary and secondary education may be more or less common than one that crosses the barrier between secondary and college. With five educational levels, there are four crossings to be estimated. More details on model specification and selection are provided in the results section below.

Because of population growth and different sample fractions, sample sizes vary substantially across Census years. This variation may create problems for model selection, because residuals from years with bigger samples would have disproportional impact on goodness of fit statistics. To avoid this problem, I adopted a common strategy of standardizing sample sizes (Raymo & Xie, 2000; Ribeiro & Silva, 2009; Ultee & Luijkx, 1990), multiplying the frequencies of each year by a constant so that all years had the same sample size (5.000 cases). The interaction coefficients of log-linear models are invariant to sample size, so this procedure does not compromise the analysis of association in the table. I do not standardize PNAD sample sizes because they are of similar magnitude across years.

# 5 Results

## 5.1 Trends in absolute rates

(Figure 1 here)

Figure 1 plots the cross-tabulation of spouses' education for the six Census years, revealing the substantial change in the joint educational distribution of couples over five decades. Squares' sizes are proportional to the weighted frequency in the correspondent cell each year — exact values are shown in the Appendix.[5] The low levels of schooling of the Brazilian population in 1960 translate into extreme concentration at the upper left corner. For 65% of couples that year, both the man and the woman were in the first educational group, with very little to no schooling. Couples in which both spouses had up to 7 years of schooling — the four cells at the upper left corner — comprised a full 92% of the sample.

The following decades were marked by an overall dispersion of this distribution. By 2015 the most frequent combination, both spouses with 9 to 11 years of schooling, amounted to 32% of couples (data not shown) and even the sum of all homogamous

[5]See Halpin & Chan (2003) for a similiar visualization.

couples comprised a smaller percentage than the one observed in 1960 in the single cell at the bottom of the educational hierarchy. In other words, the increased levels of schooling in the population resulted, not surprisingly, in much greater heterogeneity in the educational composition of unions.

(Figure 2 here)

These changes are summarized in Figure 2, which plots, over time, the percentages of homogamous and, given different educational levels for the spouses (heterogamy), hypergamous and hypogamous couples.[6] Values for PNAD data are plotted in lighter shades. A first noteworthy result is that, after four decades of sustained decline, the percentage of homogamous couples increased in the early twenty-first century. Starting from 79.5% in 1960, it reached a low of 47.8% in 2000 and rose to 53.7% in 2010. Data from PNAD, which otherwise suggests stability from the 1990s to early 2000s, also presents an upward trend beginning in 2008. The downward trend up to 2000 had already been established by previous research (Esteve & McCaa, 2007; Ribeiro & Silva, 2009; Silva, 2003) but, to the best of my knowledge, this is the first time an increase in the percent of homogamous couples in Brazil is reported.

Another remarkable trend is the strong drop in hypergamy, which comprised 61% of heterogamous couples in 1960 and only 31% in 2015. This fits into the global trend of decline of hypergamy, led mainly by the educational expansion and the accompanying reversal of the gender gap in educational attainment (Esteve, Schwartz, et al., 2016). But hypergamy declined faster than we would expect only from changes in the sex-specific educational distributions and became less common than it would be if coupes matched

[6] As is standard in the literature, hypergamy and hypogamy are defined here from the perspective of women. Therefore, throughout the text, hypergamy always refer to couples in which the woman has less schooling than her partner — and vice-versa for hypogamy.

randomly (see next section for a model that includes a hypergamy parameter). This suggests that changes in social norms and individual preferences regarding partner characteristics reinforced the structural effect of shifting educational distributions. Nevertheless, it must be noted that, due to the decrease of homogamy, the proportion of hypergamy among all couples was actually higher in 2015 than in 1960.

These aggregate trends, however, may look different from the perspective of men and women in distinct parts of the educational distribution. Because of gender stratification in educational attainment and other life course transitions, young men and women face may face, at any given point in time, quite asymmetrical pools of potential different-sex partners. There are also "floor" and "ceiling" effects that limit the combinations available for those in either extreme of the educational distribution (Mare, 1991) — i.e., under any given educational classification, someone with the least amount of schooling by definition can only have an equally or more educated partner. So even under the unrealistic assumption that preferences do not vary by gender and educational level, group sizes imply that the chances of finding a partner with the same amount of schooling in a given year were not the same for, say, a woman with secondary education versus a man with secondary education versus a woman with tertiary education. And, crucially for the analyses presented here, *trends* in the educational distribution are also gendered, again because women benefited more from educational expansion.

(Figure 3 here)

Figure 3 illustrates this heterogeneity by breaking down percentages of homogamy, hypergamy and hypogamy by husbands' and wives' education. This added level of detail allows us to note some interesting patterns. One trend shared by men and women is that homogamy in the bottom two educational groups decreased almost continuously over the entire period. From the perspective of the least educated men, homogamy was replaced largely by (female) hypogamy, so that by 2000 being the less educated partner was the most common arrangement for them. As a matter of fact, hypergamy declined and hypogamy increased, with varying intensity, for all educational levels of husbands for which these arrangements are possible.

There is no switch from hypergamy to hypogamy if we look from the perspective of women, in part because the distribution of the three possible arrangements (homogamy, hypergamy, hypogamy) has been, for most of the period, somewhat more heterogeneous for women than men in each educational level — compare, for example, the panels for husbands and wives with 8 years of schooling. The prevalence of hypergamy actually increased over the years for women at the bottom two educational groups. Thus, having a partner with more schooling became more common for both men and women at lower levels of the distribution. Also shared by men and women is the uninterrupted growth of homogamy in the group with at least some upper secondary education (9-11 years), which in 2010 was at a similar level to that observed among the most educated.

On the other hand, it is at the top of the educational distribution that the gender asymmetry and the effects of shifting educational distributions are more pronounced. In 1960, about 90% of the few partnered men with at least some tertiary education had wives with less schooling, because that level of educational attainment was even rarer for women. But most wives (69%) with some tertiary education were in a homogamous union. As the share of women with higher education approached that of men, surpassing it in the 1990s, sex-specific trends diverge: for men, homogamy increases continuously; for women, it decreases for most of the period and rises a little between 2000 and 2010. Thus, homogamy at the top of the educational hierarchy became more common for men than for women. In other words, because of the reversal of the gender gap, finding a partner with the same educational level is now easier for highly educated men than for highly educated women. Note that trends in PNAD data generally agree with the censuses, but there are a few visible differences: most notably, the PNAD series is not

**Table 1:** Log-linear models for trends in educational assortative mating

| | Model | Census | | | Pnad | | |
|---|---|---|---|---|---|---|---|
| | | $G^2$ | df | BIC | $G^2$ | df | BIC |
| 1 | HY + WY | 16241.5 | 96 | 15251.8 | 55103.6 | 336 | 51218.9 |
| 2 | Model 1 + HW | 801.1 | 80 | -23.6 | 472.4 | 320 | -3227.3 |
| 3 | Model 2 + OY | 469.5 | 75 | -303.7 | 427.8 | 300 | -3040.7 |
| 4 | Model 2 + DY | 233.2 | 55 | -333.8 | 199.6 | 220 | -2344.0 |
| 5 | Model 2 + CY | 181.9 | 60 | -436.7 | 180.0 | 240 | -2594.9 |
| 6 | Model 2 + CY + IY | 30.9 | 45 | -433.0 | 103.9 | 180 | -1977.2 |
| 7 | Model 2 + CY + IY + PY | 15.2 | 40 | -397.2 | 76.1 | 160 | -1773.8 |

*Notes*:
Census: $N$ (standardized) = 30,000; $N$ (original) = 7,414,412; cells = 150.
Pnad: $N$ = 465,083; cells = 525.
Model terms (number of parameters in parenthesis): H = husband's education (4); W = wife's education (4); Y = Year (5 for Census, 20 for Pnad); O = Overall homogamy (1); D = Main diagonal/specific homogamy (5); C = Crossings (4); I = homogamy in the three intermediary educational levels (3); P = hypergamy (1).

consistent with the increase in homogamy between 2000 and 2010 for men and women with 8 years of schooling and for women with 0 to 3 years of schooling.

## 5.2 Log-linear models

Table 1 presents fit statistics for several log-linear models describing trends in educational assortative mating. Models were estimated separately for census and PNAD data. The $G^2$ statistic, or likelihood ratio, is a measure of deviance — i.e. incongruence between observed and predicted frequencies — that follows approximately a chi-square distribution. Model selection is based on the Bayesian Information Criterion (BIC), which adjusts $G^2$ by sample size and degrees of freedom consumed by the model, favoring parsimonious models (Raftery, 1995). Smaller, or more negative, BIC statistics indicate better model fit.

Model 1 is the independence model, which fits group sizes and their change across years but assumes no association between spouses' education. Thus, it tests the hypothesis that assortative mating patterns and trends are determined solely by the sex-specific educational distributions in each year. Not surprisingly, this model does not fit the data well. Model 2 allows for full interaction between spouses' education, but constrains it to be constant over time. It greatly improves the fit and explains most of the association between spouses' education, as shown by the decrease in the $G^2$ statistic. This suggests that the overall pattern of educational assortative mating in Brazil is quite stable. In fact, PNAD data, which cover the period from 1992 to 2015, favor this model (see BIC statistic), indicating that further reductions of $G^2$ in subsequent models are not worth the added constraints.

Bear in mind that by allowing the interaction $HW$ to vary freely, model 2 captures every possible pattern of cross-sectional association between spouses' education. If we added the $HWY$ interaction, we would have a saturated model, which perfectly reproduces the observed data. It is possible to describe the cross-sectional association with fewer parameters (cf. Silva, 2003; Ribeiro & Silva, 2009), but because my main goal is to analyze changes in the strength of the association I take model 2 as baseline and focus on more parsimonious specifications for the trends.[7] In the following paragraphs, I proceed with assessing model fit for census data. Parameter estimates for PNAD data presented in the next two sections show that, though model fit point to stability, trends in odds of homogamy and crossings are nonetheless discernible and offer useful information.

Model 3 adds the trend for overall homogamy, the general propensity to form unions within the same educational group. This trend improves the fit and reduces the deviance by about 40%. Model 4, in turn, interacts year with each diagonal cell, hence allowing for changes in group-specific homogamy. The fit is again better than the previous model's, suggesting that trends in the odds of homogamy differ according to educational level.

Changing the focus from homogamous to heterogamous unions, model 5 — the crossings model — parameterizes trends in assortative mating as changes in the odds of crossing the four barriers separating adjacent groups. This model reduces the $G^2$ statistic even more and improves fit considerably overall. The fact that this model also fits, indirectly, the first and last cells of the main diagonal contributes to its good explanatory power

[7] Mare (1991) and Schwartz & Mare (2005), among others, use the same approach.

(Hout, 1983). In other words, the crossings model accounts not only for the permeability of educational barriers but also for homogamy at both extremes of the educational hierarchy. Extending on this specification, model 6 adds to model 5 the trends in specific homogamy for the three intermediary educational groups. Model 6 reduces the $G^2$ statistic, but it is not better than the previous one according to the BIC statistic. That is to say, the explanatory power gained with homogamy trends for the intermediary educational groups is not enough to compensate for the added complexity.

Finally, model 7 adds an asymmetrical dimension to model 6 by including the trend for odds of hypergamy, the general propensity for unions in which the woman has less schooling than the man. Although its fit is much worse by the BIC statistic, model 7 is interesting because it tests forcefully the decrease of hypergamy and confirms its striking trajectory. By this model, the odds of hypergamy dropped by 50% between 1960 and 2010, even after controlling for changes in the educational distribution, strength of homogamy and educational barriers (results not shown).

Model 5 is, thus, the preferred model for census data by the BIC statistic, which amounts to saying that trends in educational assortative mating in Brazil between 1960 and 2010 are best described by changes in the strength of barriers between adjacent educational groups and in the strength of homogamy at the top and the bottom of the educational distribution. Besides the estimated crossings parameters, in the next two sections I also present results from models 3 (overall homogamy) and 4 (group-specific homogamy) even though they do not fit the data as well as the crossings model. Precisely because they do not make distinctions among off-diagonal cells, models 3 and 4 allow for useful comparisons between, on one side, homogamous unions and, on the other side, heterogamous unions taken as a whole. In other words, trends in odds of homogamy — be it overall or group-specific — are not enough to explain changes in assortative mating in Brazil, but are still of substantive interest.

Owing to the full cross-sectional association term ($HW$), the coefficients of homogamy and crossings for the base year (i.e. the reference category for $OA$, $DA$ and $CA$) in models 3, 4 and 5 are not interpretable. I follow Schwartz & Mare (2005, fn. 8) and compute the odds in a few steps. First, coefficients for the *trends* of homogamy and crossings — i.e. changes in the log odds compared to the base year — are obtained from the full models presented in Table 1. Next, coefficients for the *level* of association — log odds of homogamy or crossings in the base year — are obtained from reduced versions of these models, in which the $HW$ term is dropped. Finally, odds for each year are obtained by adding trend coefficients to the respective level coefficient and taking the exponential. The choice of reference year has no bearing on estimated trends, but it does change the estimated level of odds. I use 1991 and 1992 as base years for census and PNAD data, respectively, because they are around the middle of the entire period covered by the two data sources.[8] Furthermore, the coefficients were estimated using original frequencies — instead of the standardized ones used for model selection, which, again, do not affect point estimates — in order to obtain meaningful standard errors and confidence intervals. Uncertainty is not very relevant for results with Census data because of the very large samples, but it is important in assessing estimates for PNAD data.

### 5.3 Odds of homogamy: the end of a decades-long decline

(Figure 4 here)

Figures 4 and 5 show the trends in odds of overall homogamy and group-specific homogamy estimated by models 3 and 4, respectively. From Figure 4, it is clear that, net from changes in the distribution of schooling of the Brazilian population, homogamy

[8] In practice, only the odds of group-specific homogamy have relevant changes in level with different base years. Note that the choice of a base level is meant only to provide a more meaningful interpretation to the trends. An alternative approach would be to set the odds for the base year as 100, so that the trends could be interpreted as percent changes.

decreased steadily from 1960 to at least the 1990s. At the start of the period, forming unions within the same educational level was seven times more likely than intermarriage; four decades later, homogamy was still more likely, but by a factor of three. Most of the decrease happened between 1960 and 1980. The estimate for 2010 suggests the odds of homogamy increased in this century, similarly to the percentages shown in Figure 2. As a matter of fact, odds homogamy in 2010 were about the same as in 1980 and 26% higher than in 2000. This result lends support to the hypothesis that the expansion of higher education increased homogamy and possibly points towards a U-shaped trend that has been found for other societies that have undergone major educational changes (Hu & Qian, 2016; Mare, 2016).

In contrast, PNAD data do not indicate an increase in the odds of homogamy, instead showing the association to be quite stable since the 1990s. Divergence between Census and PNAD data for recent years, with increasing odds of homogamy in the former and stability in the latter, persists with alternative model specifications, such as the log-multiplicative layer effect ("unidiff") model (Xie, 1992) — see Figure A1 in the Appendix. This divergence is, thus, likely due to differences in coverage and sample design. Therefore, from PNAD data the increase in the absolute rates of homogamy shown in Figure 2 must be attributed solely to shifts in the educational distribution.

(Figure 5 here)

Figure 5 illustrates how trends in homogamy vary by educational group. The most striking changes are in the extremes of the distribution. Among the least educated, homogamy dropped sharply throughout the period and, in census data, they are the only group in which homogamy continued to decline in this century. As in overall homogamy, most of the decrease took place between 1960 and 1980. It is clear that the drop in homogamy at the lower end of the distribution was the main factor driving the decades-long decrease in overall association between spouses' education. Among the most educated, on the other hand, odds of homogamy were already high at the start of the period and had more than tripled by 2015. Interestingly, the increase is quite constant and does not look particularly steep during the two periods of expansion in higher education (1970s and 2000s-2010s).

Trends shown in Figure 5 generally agree between data sources, except for the more recent increase in homogamy among those with 8 or 9-11 years of schooling shown by census data and not corroborated by PNAD. For the latter group, the increase is small (a 14% change in the odds between 2000 and 2010) but can influence considerably the overall association because this educational level comprises the largest share of the population in 2010: about 43% of wives and 37% of husbands. And since estimates from PNAD suggest, by contrast, that homogamy for the 9-11 group continued to decrease in the 21st century, this might account for the difference between data sources shown in Figure 4.

## 5.4 Odds of crossing educational barriers: fluidity at the bottom, increasing closure at the top

Trends in the odds of crossing the four educational barriers, estimated from model 5, are presented in Figure 6. These parameters measure the permeability of the boundaries between adjacent educational groups, so that larger values indicate higher chances of crossing a specific barrier — relative to homogamy at the adjacent groups — and, thus, more fluidity at that point of the educational distribution. For example, a value of 0.5 for the odds of crossing a barrier means that intermarriage between the adjacent groups is half as likely as homogamy. Heterogamous unions can cross one or more barriers: a couple in which one spouse has 0 to 3 years of schooling and the other has 4 to 7 years of schooling crosses only one barrier; if one spouse has lower secondary (8 years) and the other has at least some tertiary education, two different barriers are crossed, and so on. The odds of a union that crosses more than one barrier correspond to the product of the odds for each crossed barrier (i.e. the exponentiated crossings coefficients). Table A2, in the Appendix, illustrates this by presenting odds of crossings for all possible heterogamous unions in 1960, 1991 and 2010.

(Figure 6 here)

Figure 6 is quite revealing of the major increase in fluidity at the bottom of the educational hierarchy, which was also indicated by the odds of group-specific homogamy shown in Figure 5. The odds of crossing the first barrier increased threefold (0.20 to 0.61) between 1960 and 2015. Intermarriage between those with 4-7 years of schooling and those with 8 years also became much more common, increasing from 0.27 to 0.59 times the odds of homogamy. This rise in the odds of crossing the two first barriers was mostly uninterrupted throughout the period and, especially for the first barrier, does not show signs of stopping.

By contrast, the other two barriers — separating those with lower secondary education (8) from those with at least some upper secondary (9-11), and the latter from those with at least some tertiary — became more rigid over time. Intermarriage between the most educated and those with 9 to 11 years of schooling was 0.36 times the odds of homogamy in 1960 and 0.23 in 2015. Interestingly, until the 1970s it was easier to cross the barrier between upper secondary education and college than the two barriers at the bottom, presumably because there were so few women in higher education. As shown by Figure 3, hypergamy was the norm for highly educated men until the 1980s. Even though the gender gap in higher education has reversed, it is smaller now than six decades ago, so it became easier to form unions at the top of the distribution. Again, estimates from Census and PNAD mostly agree, except for the decrease, after 2000, in the odds of crossing the two top barriers, which is shown by census but not by PNAD.

Taken together, trends in group-specific homogamy and barriers to intermarriage clearly show the consolidation of a pattern already pointed out by previous research on educational assortative mating in Brazil (Ribeiro & Silva, 2009): a lot of fluidity at the bottom with increasing closure at the top. When it comes to union formation, boundaries among people with up to 8 years of schooling seem certain to become quite unimportant. It is straightforward to understand this trend given the fact that educational expansion has not only reduced the size of groups at the bottom of the distribution, but also progressively diminished the life-course consequences of relatively small differences at lower levels of schooling. Furthermore, it is worth noting that significant fluidity among lower strata coupled with relative closure at the top has been historically a feature of occupational mobility in Brazil and in Latin America more broadly (Ribeiro, 2007; Torche, 2014).

# 6 Summary and conclusions

This paper has documented educational assortative mating trends in Brazil over fifty-five years, covering a longer period than previous studies and estimating both odds of homogamy and odds of intermarriage between adjacent educational groups. These trends have been shaped by the intense demographic and socioeconomic changes taking place during the studied period. After four decades of continuous decline, both the percentage and the odds of homogamy increased in Brazil between 2000 and 2010, according to estimates from census data. Estimates from survey data corroborate the increase in the percentage but not the odds of overall homogamy in this century, and other trends are generally consistent between data sources.

Over the years, the Brazilian marriage market has become significantly more fluid at the bottom of the educational distribution, with a strong decline in the odds of homogamy among the least educated and an increase in the odds of crossing the two barriers at the lower end of the distribution. Nevertheless, these trends at the bottom were not sufficient to sustain the decline in overall homogamy after 2000. In the early 21st century, the balance between opposite trends in the different parts of the educational distribution seems to have shifted. The increase in homogamy among the most educated and the strengthening of the two barriers at the top have been going on for a long time, but until 2000 it was offset by the growing fluidity among lower levels of schooling.

These findings qualify the assertion, based on the trajectory of developed countries since the last century, that educational expansion leads to increases in homogamy (Blossfeld, 2009; Blossfeld & Timm, 2003a). In fact, the net effect of educational expansion on homogamy in Brazil seems to have changed over time. Starting from a population in which most people had little to no formal education, it first had the effect of making the educational distribution more heterogeneous and fostering intermarriage. Expansion of primary and lower secondary education could have only a limited impact on structuring partner choice, because people at these levels are too young to enter into partnerships. This is also part of the explanation as to why age at first union remained stable as schooling increased in Latin America (Esteve et al., 2013a). As the expansion reached upper secondary and higher education, it has strengthened the link between schooling and partner choice, because upper secondary schools and universities work as local marriage markets and, more generally, structure people's social networks at ages where union formation is more common. It is likely that the percentage, if not the odds, of homogamy will continue to increase in the near future, as younger cohorts that experienced the recent expansion of higher education, accelerated in the late 2000s, enter into unions.

A relevant implication of the increased fluidity at the bottom of the educational distribution relates to the interpretation of assortative mating as an indicator of group boundaries. The increase in odds of crossing the first barriers and the declining homogamy for the least educated point to the diminishing significance of relatively small differences in schooling among those with up to lower secondary education (8 years of schooling). This is consistent with the decrease of economic returns to education at those levels. Having primary education instead of no diploma, or even a lower secondary education instead of only primary, matters less and less in terms of life chances and life styles.

This also entails a recommendation for future research: the educational coding used here will be less adequate to capture patterns of assortative mating in Brazil in the years to come. It is a feature of research covering periods of rapid social transformation that the usefulness of certain definitions changes over time. Just as it did not make sense to lump together people with less than secondary education in 1960, and thus ignore distinctions that used to be consequential, keeping much disaggregation at the bottom while ignoring finer distinctions at the top may hamper the understanding of union formation in the 21st century.

# 7 References


Arretche, M. (Ed.). (2019). *Paths of Inequality in Brazil: A Half-Century of Changes*. Cham: Springer International Publishing. https://doi.org/10.1007/978-3-319-78184-6

Becker, G. S. (1974). A Theory of Marriage. In T. W. Schultz (Ed.), *Economics of the family: Marriage, children, and human capital volume*. Chicago: University of Chicago Press.

Beltrão, K. I., & Alves, J. E. D. (2009). A reversão do hiato de gênero na educação brasileira no século XX. *Cadernos de Pesquisa*, *39*(136), 125–156. https://doi.org/10.1590/S0100-15742009000100007

Birkelund, G. E., & Heldal, J. (2003). Who marries whom? Educational homogamy in Norway. *Demographic Research*, *8*, 1–30. https://doi.org/10.4054/DemRes.2003.8.1

Blau, P. M., Blum, T. C., & Schwartz, J. E. (1982). Heterogeneity and Intermarriage. *American Sociological Review*, *47*(1), 45. https://doi.org/10.2307/2095041

Blossfeld, H.-P. (2009). Educational Assortative Marriage in Comparative Perspective. *Annual Review of Sociology*, *35*, 513–530. https://doi.org/10.1146/annurev-soc-070308-115913

Blossfeld, H.-P., & Timm, A. (2003a). Educational Systems as Marriage Markets in Modern Societies: A Conceptual Framework. In H.-P. Blossfeld & A. Timm (Eds.), *Who marries whom? Educational systems as marriage markets in modern societies*. Dordrecht: Springer Netherlands.

Blossfeld, H.-P., & Timm, A. (Eds.). (2003b). *Who Marries Whom? Educational Systems as Marriage Markets in Modern Societies*. Dordrecht: Springer Netherlands.

Bouchet-Valat, M. (2015). Fewer Singles among Highly Educated Women. A Gender Reversal of Hypergamy Across Cohorts in France. *Population-E*, *70*(4), 665–688. https://doi.org/10.3917/pope.1504.0665

Camarano, A. A. (2006). *Transição para a Vida Adulta ou Vida Adulta em Transição?* Rio de Janeiro: IPEA.

Clogg, C. C., & Eliason, S. R. (1987). Some Common Problems in Log-Linear Analysis. *Sociological Methods & Research*, *16*(1), 8–44. https://doi.org/10.1177/0049124187016001002

Comin, A. A. (2019). Economic Development and Inequalities in Brazil: 1960–2010. In M. Arretche (Ed.), *Paths of inequality in brazil: A half-century of changes* (pp. 287–307). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-319-78184-6_13

Covre-Sussai, M., Meuleman, B., Botterman, S., & Matthijs, K. (2015). Traditional and modern cohabitation in Latin America : A comparative typology. *Demographic Research*, *32*(May), 873–914. https://doi.org/10.4054/DemRes.2015.32.32

England, P., & Farkas, G. (1986). *Households, Employment, and Gender: a Social, Economic, and Demographic View*. New York: Aldine.

Esteve, A., Lesthaeghe, R. J., López-Colás, J., López-Gay, A., & Covre-Sussai, M. (2016). Cohabitation in Brazil: Historical Legacy and Recent Evolution. In A. Esteve & R. J. Lesthaeghe (Eds.), *Cohabitation and marriage in the americas: Geo-historical legacies and new trends* (pp. 217–245). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-319-31442-6_8

Esteve, A., Lesthaeghe, R., & López-Gay, A. (2012). The Latin American Cohabitation Boom, 1970-2007. *Population and Development Review*, *38*(1), 55–81. https://doi.org/10.1111/j.1728-4457.2012.00472.x

Esteve, A., López-Ruiz, L. Á., & Spijker, J. (2013a). Disentangling how educational expansion did not increase women's age at union formation in Latin America from 1970 to 2000. *Demographic Research*, *28*, 63–76. https://doi.org/10.4054/DemRes.2013.28.3

Esteve, A., & McCaa, R. (2007). Homogamia educacional en México y Brasil, 1970-2000: Pautas y tendencias. *Latin American Research Review*, *42*(2), 56–85. https://doi.org/10.1353/lar.2007.0020

Esteve, A., McCaa, R., & López, L. Á. (2013b). The Educational Homogamy Gap Between Married and Cohabiting Couples in Latin America. *Population Research and Policy Review*, *32*(1), 81–102. https://doi.org/10.1007/s11113-012-9263-4

Esteve, A., Schwartz, C. R., Van Bavel, J., Permanyer, I., Klesment, M., & García-Román, J. (2016). The End of Hypergamy: Global Trends and Implications. *Population and Development Review*, *42*(4), 1–11. https://doi.org/10.1111/padr.12012

Firpo, S., & Portella, A. (2019). Decline in Wage Inequality in Brazil: A Survey. *World Bank - Policy Research Working Paper 9096*.

Fussell, E., & Palloni, A. (2004). Persistent marriage regimes in changing times. *Journal of Marriage and Family*, *66*(5), 1201–1213. https://doi.org/10.1111/j.0022-2445.2004.00087.x

Goldscheider, F., Bernhardt, E., & Lappegård, T. (2015). The Gender Revolution: A Framework for Understanding Changing Family and Demographic Behavior. *Population and Development Review*, *41*(2), 207–239. https://doi.org/10.1111/j.1728-4457.2015.00045.x

Guimarães, N. A., Brito, M. M. A. de, & Barone, L. S. (2019). Commodification of Labor in Brazil's Labor Market (1960–2010). In M. Arretche (Ed.), *Paths of inequality in brazil: A half-century of changes* (pp. 309–329). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-319-78184-6_14

Gullickson, A., & Torche, F. (2014). Patterns of Racial and Educational Assortative Mating in Brazil. *Demography*, *51*(3), 835–856. https://doi.org/10.1007/s13524-014-0300-2

Halpin, B., & Chan, T. W. (2003). Educational homogamy in Ireland and Britain: trends and patterns. *British Journal of Sociology*, *54*(4), 473–496. https://doi.org/10.1080/0007131032000143546

Heaton, T. B., & Mitchell, C. (2012). Changing Intergroup Boundaries in Brazilian Marriages: 1991-2008. *Journal of Comparative Family Studies*, *43*(4), 461–482. https://doi.org/10.3138/jcfs.43.4.461

Hout, M. (1983). *Mobility tables*. Beverly Hills: Sage Publications.

Hu, A., & Qian, Z. (2016). Does higher education expansion promote educational homogamy? Evidence from married couples of the post-80s generation in Shanghai, China. *Social Science Research*, *60*, 148–162. https://doi.org/10.1016/j.ssresearch.2016.05.001

Itaboraí, N. R. (2017). *Mudanças nas famílias brasileiras (1976-2012): Uma perspectiva de classe e gênero*. Rio de Janeiro: Garamond.

Kalmijn, M. (1998). Intermarriage and Homogamy: Causes, Patterns, Trends. *Annual Review of Sociology*, *24*(1), 395–421. https://doi.org/10.1146/annurev.soc.24.1.395

Kalmijn, M., & Flap, H. (2001). Assortative Meeting and Mating: Unintended Consequences of Organized Settings for Partner Choices. *Social Forces*, *79*(4), 1289–1312. https://doi.org/10.1353/sof.2001.0044

Katrňák, T., & Manea, B. C. (2020). Change in prevalence or preference? Trends in educational homogamy in six European countries in a time of educational expansion. *Social Science Research*, *91*, 102460. https://doi.org/10.1016/j.ssresearch.2020.102460

Lam, D., & Marteleto, L. (2002). Small Families and Large Cohorts: The Impact of the Demographic Transition on Schooling in Brazil. *PSC Research Report*, (02-519).

Laplante, B., Vieira, J. M., & Barnabé, G. C. F. R. R. (2019). Consensual Union and Marriage in Brazil, 1970–2010. Gender Equality, Legal Issues and Social Context. In R. Schoen (Ed.), *Analytical family demography* (pp. 57–98). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-319-93227-9_4

Lichter, D. T., & Qian, Z. (2019). The Study of Assortative Mating: Theory, Data, and Analysis. In R. Schoen (Ed.), *Analytical family demography* (pp. 303–337). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-319-93227-9_13

López-Ruiz, L. Á., Esteve, A., & Cabré i Plá, A. (2008). Distancia social y uniones conyugales en América Latina. *Revista Latinoamericana de Población*, *1*(2), 47–71.

Lustig, N., Lopez-Calva, L. F., & Ortiz-Juarez, E. (2013). Deconstructing the Decline in Inequality in Latin America. *Policy Research Working Paper*.

Machado, W., & Costa Ribeiro, C. (2021). The association between spouses' earnings and trends in income inequality in Brazil (1993 – 2015). *Advances in Life Course Research*, (100413). https://doi.org/10.1016/j.alcr.2021.100413

Mare, R. D. (1991). Five Decades of Educational Assortative Mating. *American Sociological Review*, *56*(1), 15–32. https://doi.org/10.2307/2095670

Mare, R. D. (2016). Educational Homogamy in Two Gilded Ages: Evidence from Inter-generational Social Mobility Data. *The Annals of the American Academy of Political and Social Science*, *663*(1), 117–139. https://doi.org/10.1177/0002716215596967

Marteleto, L., Marschner, M., & Carvalhaes, F. (2016). Educational stratification after a decade of reforms on higher education access in Brazil. *Research in Social*

*Stratification and Mobility*, *46*, 99–111. https://doi.org/10.1016/j.rssm.2016.08.004

Menezes Filho, N., & Kirschbaum, C. (2019). Education and Inequality in Brazil. In M. Arretche (Ed.), *Paths of inequality in brazil: A half-century of changes* (pp. 69–88). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-319-78184-6_4

Oppenheimer, V. K. (1988). A Theory of Marriage Timing. *American Journal of Sociology*, *94*(3), 563–591. https://doi.org/10.1086/229030

Potter, J. E., Schmertmann, C. P., Assunção, R. M., & Cavenaghi, S. M. (2010). Mapping the Timing, Pace, and Scale of the Fertility Transition in Brazil. *Population and Development Review*, *36*(2), 283–307. https://doi.org/10.1111/j.1728-4457.2010.00330.x

Qian, Y. (2017). Gender Asymmetry in Educational and Income Assortative Marriage. *Journal of Marriage and Family*, *79*(2), 318–336. https://doi.org/10.1111/jomf.12372

Raftery, A. E. (1995). Bayesian Model Selection in Social Research. *Sociological Methodology*, *25*, 111–163. https://doi.org/10.2307/271063

Raymo, J. M., & Xie, Y. (2000). Temporal and Regional Variation in the Strength of Educational Homogamy. *American Sociological Review*, *65*(5), 773. https://doi.org/10.2307/2657546

Ribeiro, C. A. C. (2007). *Estrutura de Classe e Mobilidade Social no Brasil*. Bauru: EDUSC.

Ribeiro, C. A. C. (2012). Quatro décadas de mobilidade social no Brasil. *Dados*, *55*(3), 641–679. https://doi.org/10.1590/S0011-52582012000300003

Ribeiro, C. A. C. (2014). *Juventudes e educação: escola e transições para a vida adulta no Brasil*. Rio de Janeiro: Azougue editorial.

Ribeiro, C. A. C., Ceneviva, R., & Brito, M. M. A. de. (2019). Educational Stratification Among Youth in Brazil: 1960–2010. In M. Arretche (Ed.), *Paths of inequality in brazil: A half-century of changes* (pp. 47–68). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-319-78184-6_3

Ribeiro, C. A. C., & Machado, W. (2018). Rendimento do Trabalho das Esposas e Tendências da Desigualdade de Renda no Brasil (1992-2014). *Dados*, *61*(1), 103–135. https://doi.org/10.1590/001152582018148

Ribeiro, C. A. C., & Silva, N. do V. (2009). Cor, educação e casamento: tendências da seletividade marital no Brasil, 1960 a 2000. *Dados*, *52*(1), 7–51. https://doi.org/10.1590/S0011-52582009000100001

Salata, A. (2018). Ensino Superior no Brasil das últimas décadas: redução nas desigualdades de acesso? *Tempo Social*, *30*(2), 219–253. https://doi.org/10.11606/0103-2070.ts.2018.125482

Scalon, C. (2013). Social Stratification and Its Transformation in Brazil. In L. Peilin, M. K. Gorshkov, C. Scalon, & K. L. Sharma (Eds.), *Handbook on social stratification in the bric countries: Change and perspective* (pp. 3–19). Singapore: World Scientific Publishing. https://doi.org/10.1142/9789814390422_0001

Schwartz, C. R. (2013). Trends and Variation in Assortative Mating: Causes and Consequences. *Annual Review of Sociology*, *39*, 451–470. https://doi.org/10.1146/annurev-soc-071312-145544

Schwartz, C. R., & Mare, R. D. (2005). Trends in Educational Assortative Marriage From 1940 to 2003. *Demography*, *42*(4), 621–646. https://doi.org/10.1353/dem.2005.0036

Schwartz, C. R., & Mare, R. D. (2012). The Proximate Determinants of Educational Homogamy: The Effects of First Marriage, Marital Dissolution, Remarriage, and Educational Upgrading. *Demography*, *49*(2), 629–650. https://doi.org/10.1007/s13524-012-0093-0

Silva, N. do V. (2003). Duas décadas de seletividade marital educacional no Brasil. In C. Hasenbalg & N. do V. Silva (Eds.), *Origens e destinos: Desigualdades sociais ao longo da vida*. Rio de Janeiro: Topbooks.

Smits, J., Ultee, W., & Lammers, J. (1998). Educational Homogamy in 65 Countries: An Explanation of Differences in Openness Using Country-Level Explanatory Variables. *American Sociological Review*, *63*(2), 264. https://doi.org/10.2307/2657327

Solís, P., Pullum, T. W., & Bratter, J. (2007). Homogamy by education and migration status in Monterrey, Mexico: Changes and continuities over time. *Population Research and Policy Review*, *26*(3), 279–298. https://doi.org/10.1007/s11113-007-9032-y

Sweeney, M. M. (2002). Two Decades of Family Change: The Shifting Economic Foundations of Marriage. *American Sociological Review*, *67*(1), 132–147.

Sweeney, M. M., & Cancian, M. (2004). The Changing Importance of White Women ' s Economic Prospects for Assortative Mating. *Journal of Marriage and Family*, *66*(November), 1015–1028. https://doi.org/10.1111/j.0022-2445.2004.00073.x

Torche, F. (2010). Educational assortative mating and economic inequality: a comparative analysis of three Latin American countries. *Demography*, *47*(2), 481–502. https://doi.org/10.1353/dem.0.0109

Torche, F. (2014). Intergenerational Mobility and Inequality: The Latin American Case. *Annual Review of Sociology*, *40*, 619–642. https://doi.org/10.1146/annurev-soc-071811-145521

Torche, F., & Costa-Ribeiro, C. (2010). Pathways of change in social mobility: Industrialization, education and growing fluidity in Brazil. *Research in Social Stratification and Mobility*, *28*(3), 291–307. https://doi.org/10.1016/j.rssm.2010.03.005

Uchikoshi, F., & Raymo, J. M. (2021). *Educational Assortative Mating in Japan: Insights into Social Change and Stratification*. Singapore: Springer.

Ultee, W., & Luijkx, R. (1990). Educational heterogamy and father–to–son occupational mobility in 23 industrial nations: General societal openness or compensatory strategies of reproduction? *European Sociological Review*, *6*(2), 125–149. https://doi.org/10.1093/oxfordjournals.esr.a036554

Van Bavel, J., Schwartz, C. R., & Esteve, A. (2018). The Reversal of the Gender Gap in Education and Its Consequences for Family Life. *Annual Review of Sociology*, *44*(1), 341–360. https://doi.org/10.1146/annurev-soc-073117-041215

Vieira, J. M. (2008). Transição para a vida adulta no Brasil: análise comparada entre 1970 e 2000. *Revista Brasileira de Estudos de População*, *25*(1), 27–48. https://doi.org/10.1590/S0102-30982008000100003

Vieira, J. M., & Alves, L. C. (2016). O comportamento da idade média à união e ao casamento no Brasil em 2000 e 2010. *Revista Latinoamericana de Población*, *10*(19), 107–126. https://doi.org/10.31406/relap2016.v10.i2.n19.5

Xie, Y. (1992). The Log-Multiplicative Layer Effect Model for Comparing Mobility Tables. *American Sociological Review*, *57*(3), 380. https://doi.org/10.2307/2096242

# A Appendix

**Table A1:** Percentage distribution of spouse's education, by year - Brazil, 1960-2010

| Husband's education | Wife's education | | | | | |
|---|---|---|---|---|---|---|
| | *0-3* | *4-7* | *8* | *9-11* | *12+* | *Total* |
| **1960** | | | | | | |
| ( N = 55,081) | | | | | | |
| *0-3* | 64.5 | 6.0 | 0.2 | 0.1 | 0.0 | *70.8* |
| *4-7* | 7.9 | 13.5 | 0.8 | 0.6 | 0.0 | *22.8* |
| *8* | 0.3 | 1.3 | 0.7 | 0.3 | 0.0 | *2.6* |
| *9-11* | 0.1 | 1.0 | 0.5 | 0.6 | 0.0 | *2.3* |
| *12+* | 0.0 | 0.4 | 0.4 | 0.5 | 0.2 | *1.5* |
| *Total* | *72.9* | *22.1* | *2.6* | *2.2* | *0.2* | *100.0* |
| **1970** | | | | | | |
| (N = 1,500,967) | | | | | | |
| *0-3* | 55.8 | 7.3 | 0.2 | 0.2 | 0.0 | *63.5* |
| *4-7* | 9.0 | 15.0 | 1.0 | 1.3 | 0.1 | *26.3* |
| *8* | 0.4 | 1.6 | 0.7 | 0.6 | 0.1 | *3.4* |
| *9-11* | 0.2 | 1.5 | 0.8 | 1.5 | 0.2 | *4.1* |
| *12+* | 0.0 | 0.4 | 0.4 | 1.2 | 0.6 | *2.7* |
| *Total* | *65.4* | *25.8* | *3.1* | *4.8* | *1.0* | *100.0* |
| **1980** | | | | | | |
| (N = 2,080,605) | | | | | | |
| *0-3* | 31.5 | 10.0 | 0.7 | 0.6 | 0.1 | *42.9* |
| *4-7* | 9.2 | 19.4 | 2.4 | 2.6 | 0.4 | *34.1* |
| *8* | 0.8 | 2.8 | 1.5 | 1.3 | 0.3 | *6.6* |
| *9-11* | 0.5 | 2.5 | 1.4 | 3.8 | 1.0 | *9.2* |
| *12+* | 0.1 | 0.6 | 0.6 | 2.5 | 3.4 | *7.2* |
| *Total* | *42.1* | *35.3* | *6.6* | *10.9* | *5.2* | *100.0* |
| **1991** | | | | | | |
| (N = 1,174,637) | | | | | | |
| *0-3* | 17.1 | 9.5 | 1.2 | 1.1 | 0.1 | *29.0* |
| *4-7* | 7.3 | 18.7 | 3.8 | 4.4 | 0.5 | *34.6* |
| *8* | 1.0 | 4.1 | 2.6 | 2.7 | 0.4 | *10.8* |
| *9-11* | 0.7 | 3.8 | 2.7 | 8.5 | 2.0 | *17.7* |
| *12+* | 0.1 | 0.5 | 0.5 | 2.8 | 4.0 | *7.9* |
| *Total* | *26.2* | *36.4* | *10.8* | *19.6* | *7.0* | *100.0* |
| **2000** | | | | | | |
| (N = 1,316,582) | | | | | | |
| *0-3* | 10.8 | 9.1 | 1.1 | 2.1 | 0.2 | *23.3* |
| *4-7* | 5.9 | 17.8 | 3.7 | 7.0 | 0.6 | *34.9* |
| *8* | 0.9 | 3.6 | 2.3 | 3.4 | 0.4 | *10.6* |
| *9-11* | 1.2 | 4.7 | 2.7 | 12.8 | 2.4 | *23.8* |
| *12+* | 0.1 | 0.4 | 0.3 | 2.6 | 4.0 | *7.4* |
| *Total* | *18.9* | *35.6* | *10.1* | *27.9* | *7.6* | *100.0* |
| **2010** | | | | | | |
| (N = 1,286,540) | | | | | | |
| *0-3* | 7.3 | 4.5 | 1.7 | 3.6 | 0.4 | *17.5* |
| *4-7* | 2.5 | 7.9 | 2.4 | 7.0 | 0.7 | *20.5* |
| *8* | 0.8 | 1.6 | 4.1 | 3.7 | 0.8 | *11.0* |

| | | | | | | |
|---|---|---|---|---|---|---|
| *9-11* | 1.4 | 3.2 | 2.2 | 24.9 | 5.5 | *37.1* |
| *12+* | 0.2 | 0.2 | 0.3 | 3.7 | 9.6 | *14.0* |
| *Total* | *12.1* | *17.3* | *10.6* | *42.8* | *17.1* | *100.0* |

*Note*: Sample sizes shown in parenthesis. Percents are weighted and may not sum to 100 due to rounding error. There is no empty cell, but some percentages are zero when rounded to one decimal.
*Source*: Brazilian Demographic Census 1960-2010.

**Table A2:** Odds of crossing educational barriers - Brazil, 1960, 1991 and 2010

| Husband's education | Wife's education | | | |
|---|---|---|---|---|
| | *0-3* | *4-7* | *8* | *9-11* |
| **1960** | | | | |
| *4-7* | 0.200 | | | |
| *8* | 0.054 | 0.270 | | |
| *9-11* | 0.036 | 0.182 | 0.673 | |
| *12+* | 0.013 | 0.066 | 0.246 | 0.365 |
| **1991** | | | | |
| *4-7* | 0.408 | | | |
| *8* | 0.199 | 0.487 | | |
| *9-11* | 0.101 | 0.247 | 0.506 | |
| *12+* | 0.031 | 0.076 | 0.156 | 0.308 |
| **2010** | | | | |
| *4-7* | 0.514 | | | |
| *8* | 0.314 | 0.611 | | |
| *9-11* | 0.143 | 0.278 | 0.455 | |
| *12+* | 0.034 | 0.066 | 0.107 | 0.236 |

Note: Odds of crossing from Model 5 are symmetric with respect to sex, so only below-diagonal cells are presented.

(Figure A1 here)

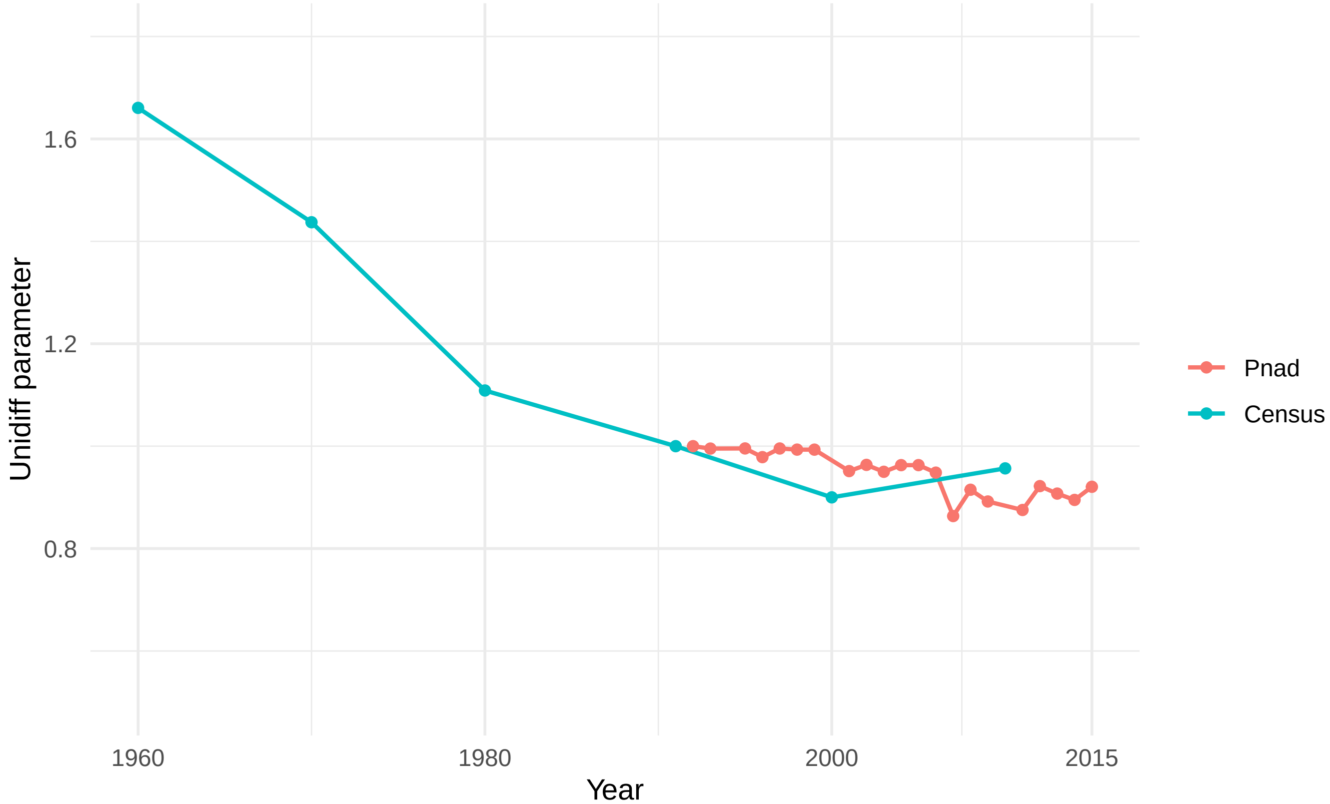


**Figure A1:** Unidiff parameters for change over time in the association between spouses' education

Note: Models run separately for Census and Pnad, with parameters set to 1 for 1991 and 1992, respectively.

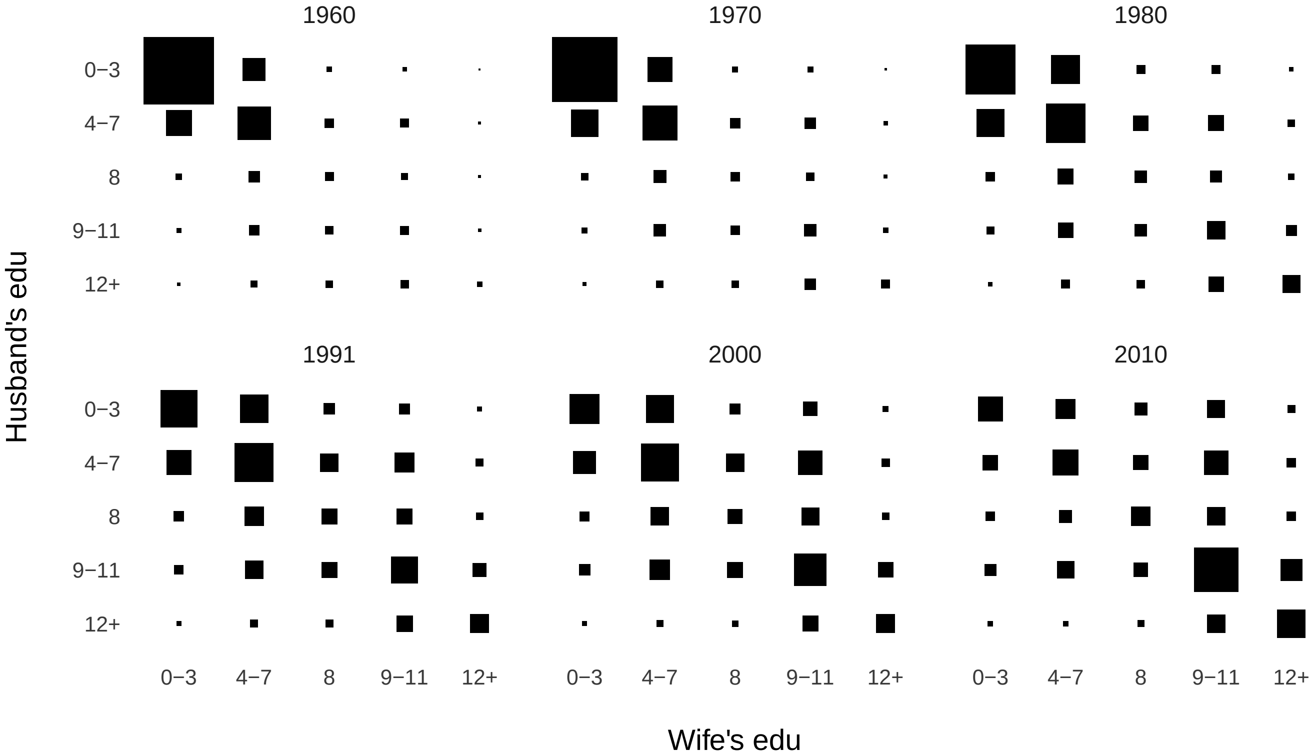


**Figure 1:** Cross-classification of spouses' education, by year - Brazil, 1960-2010 (Census data).

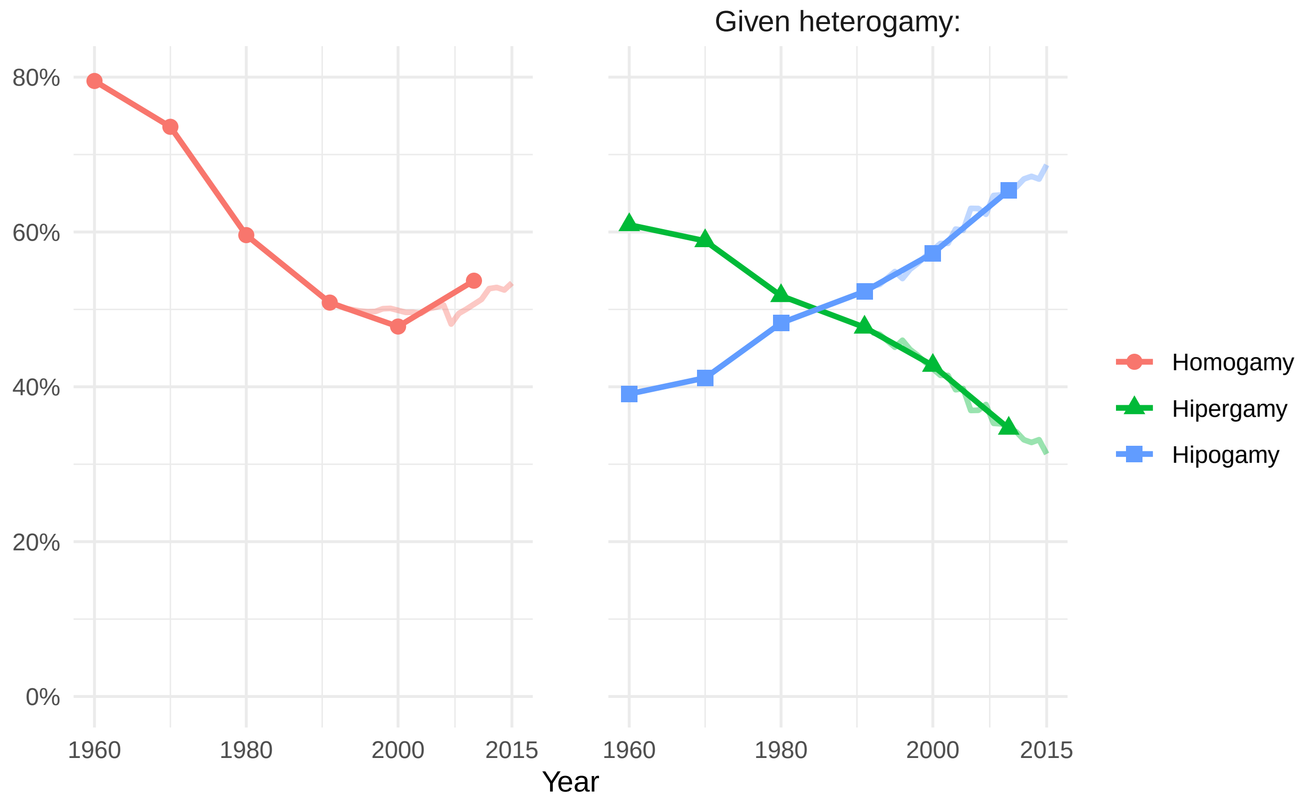


**Figure 2:** Trends in couples' educational arrangements - Brazil, 1960-2015

Note: Percentages for (female) hypergamy and hypogamy were computed only for heterogamous couples and thus sum to 100%. Census and PNAD data are shown in darker and lighter shades, respectively.

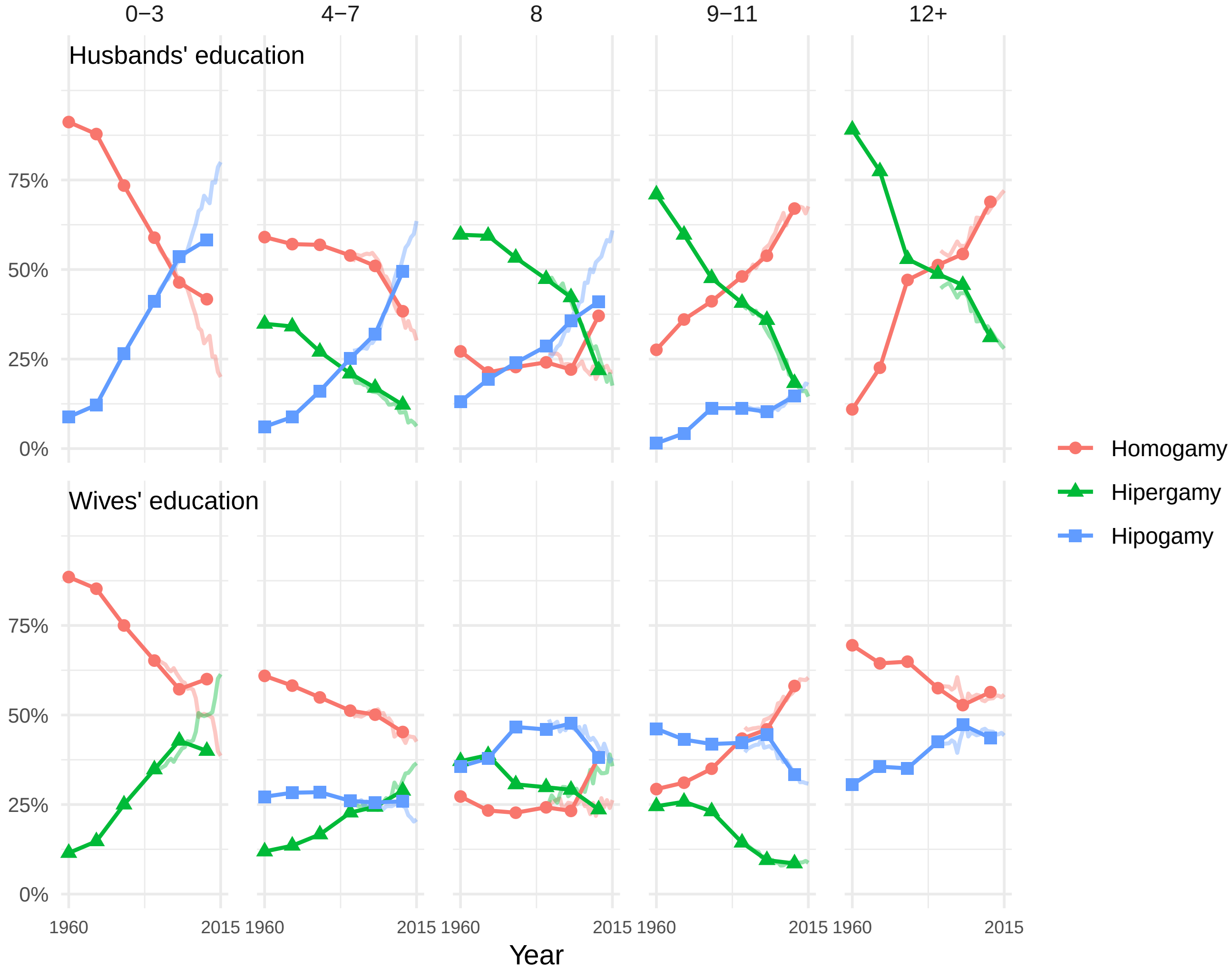


**Figure 3:** Trends in couples' educational arrangements, by husbands' and wives' education - Brazil, 1960-2015

Note: Census and PNAD data are shown in darker and lighter shades, respectively.

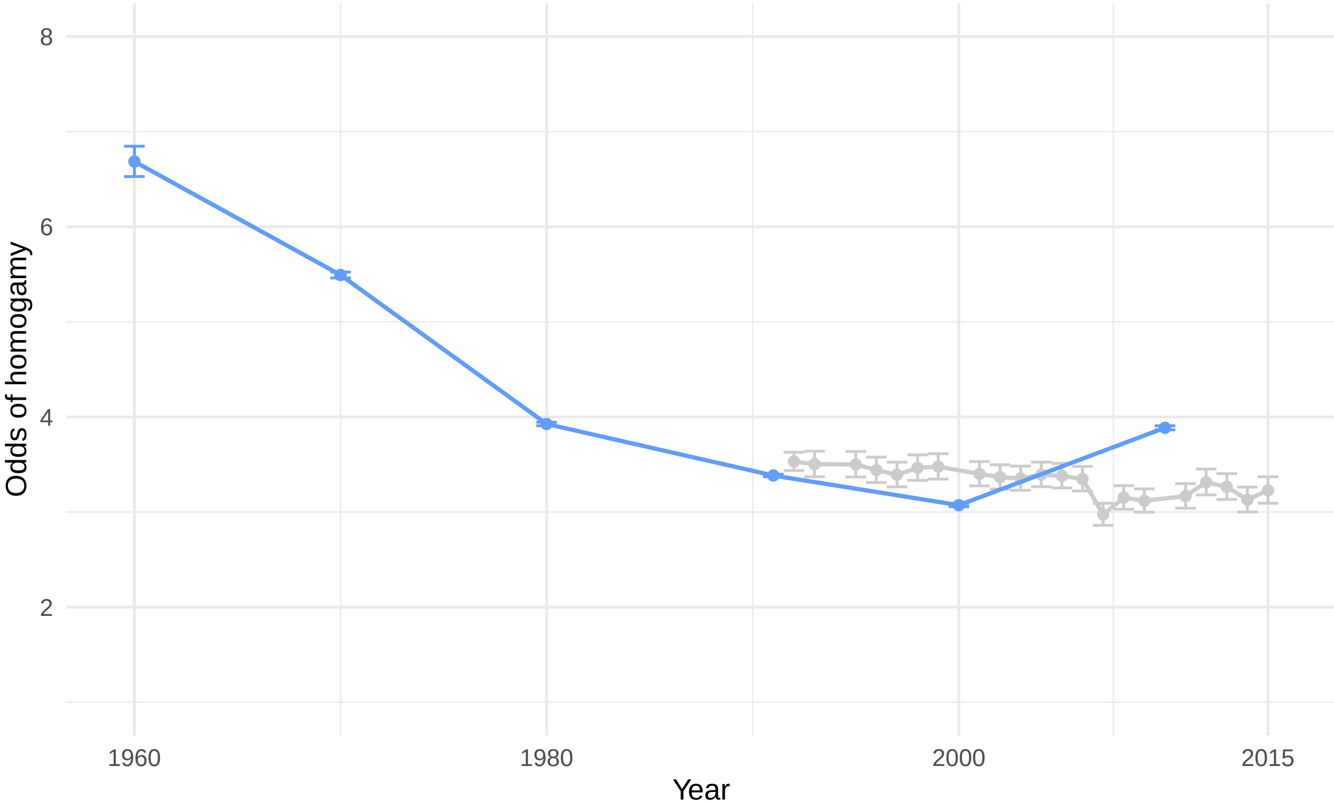


**Figure 4:** Odds of homogamy, by year - Brazil, 1960-2015

Note: Error bars correspond to 95% CI. Estimates for PNAD data shown in grey.

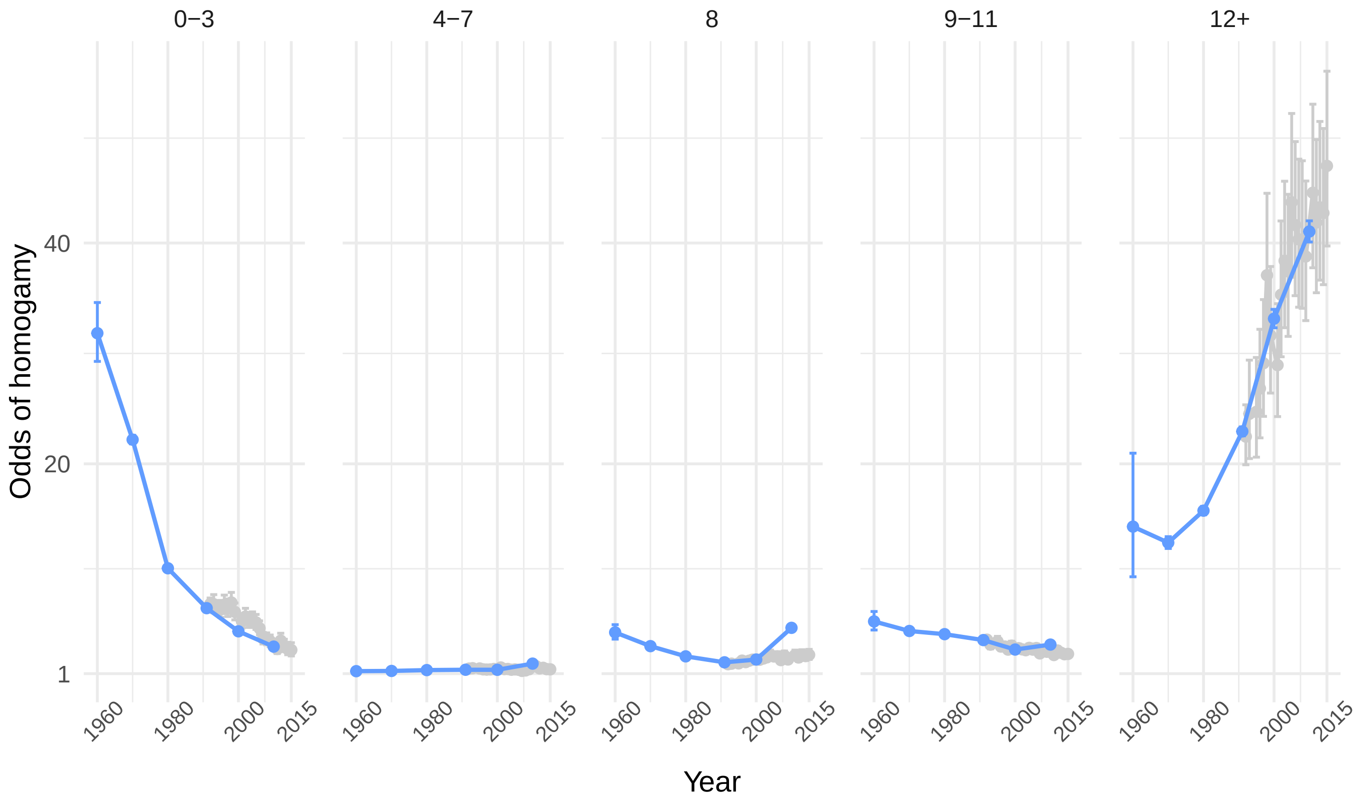


**Figure 5:** Odds of homogamy, by educational level and year - Brazil, 1960-2015

Note: Error bars correspond to 95% CI. Estimates for PNAD data shown in grey.


**Figure 6:** Odds of crossing educational barriers, by year - Brazil, 1960-2015

Note: Error bars correspond to 95% CI. Estimates for PNAD data shown in grey.