The Association between Spouses' Earnings and Trends in Income Inequality in Brazil (1993-2015)

Weverthon Machado[a]

Carlos Costa Ribeiro[b]

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Abstract

In this paper, we investigate how the diffusion of dual-earner couples has affected aggregate levels of inequality in Brazil. More specifically, we analyze trends in the association between spouses' earnings and assess their implications for earnings inequality among couples from 1993 to 2015. For this purpose, we use log-linear models to distinguish three components of the association between spouses' earnings: a) the correlation between spouses' earnings among dual-earner couples; b) the relationship between husbands' earnings and wives' labor force participation; and c) the proportion of dual-earner couples. Counterfactual simulations allow us to estimate how inequality would change if the trends in the association between spouses' earnings and each of its components had been different. We show that changes in the gradient of wives' employment and compositional effects related to the increasing prevalence of dual-earner couples contributed to limit the decline in inequality over the studied period

[a] European University Institute, Via dei Roccettini, 9, 50014 San Domenico di Fiesole, weverthon.machado@eui.eu (Corresponding author)

[b] Instituto de Estudos Sociais e Políticos, Universidade do Estado do Rio de Janeiro Rua da Matriz, 82 – Rio de Janeiro, RJ, Brazil – 22260-100, carloscr@iesp.uerj.br

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Introduction

The traditional specialization and trade model of marriage – in which husbands and wives specialize, respectively, in paid work and household production – implies both vulnerabilities through the life course of women and a lack of flexibility for families to deal with critical events, such as the unemployment of the male breadwinner (Oppenheimer, 1994; Widmer & Spini, 2017). The move away from this model through the diffusion of dual-earner couples offers a valuable opportunity to understand the connections between individual life trajectories, family arrangements and broader social and economic changes. On the one hand, life-course transitions and family formation are embedded in larger societal contexts, both reflecting and constituting cultural, economic and political changes (Bernardi, Huinink, & Settersten, 2018; Levy & Bühlmann, 2016; Mills & Blossfeld, 2005). On the other hand, employment and income vary through the life course of individuals, while families can pool resources. Thus, considering the structuration of life courses and family arrangements — especially its gendered dynamics —can add to our understanding of cross-sectional inequality and the mechanisms underlying inequality trends (Esping-Andersen, 2007). Research in developed countries suggests that, while female employment has historically been an equalizing force, the expansion of dual-earner couples might increase household income inequality to the extent that spouses' attributes such as schooling, labor supply and earnings become more correlated (Blossfeld & Buchholz, 2009; Esping-Andersen, 2007; Schwartz, 2010).

At the core of this debate is the insight that patterns and trends in several dimensions of inequality are deeply influenced by population composition and dynamics and, more specifically, by the demography of families. The association between spouses' earnings, in particular, has been explored as a summary measure reflecting characteristics of household division of labor and financial arrangements, as well as of gender relations within and outside the household. For example, in contexts with low levels of wives' labor force participation, the correlation between spouses' earnings tends to be low, as most women will have zero earnings, or even negative, if wives of high-earning husbands are especially unlikely to work. The correlation tends to increase as more partnered women enter the labor force and dual-earner couples become more common, assuming that spouses tend to have similar earnings potential. The change from negative to positive and rising correlation is what happened, for example, in the United States

between the 1960s and the 1980s (Schwartz, 2010). More recently, comparative research has shown that spouses earnings' association follows different paths and trends across societies, and that these trajectories, as well as their impacts on inequality, are highly dependent on the dynamics and characteristics of wives' labor force participation (Boertien & Bouchet-Valat, 2020). One of the major drawbacks of this literature is that it is mostly restricted to developed and high-income countries, in which inequality has generally grown in the last decades, but vulnerability in terms of poverty and lack of resources is less critical. In contrast, in developing and middle-income countries the dynamics of female labor force participation is directly related to escape from poverty and avoidance of family vulnerability, while it also contributes to inequality trends. If trends in the association between spouses' earnings follow similar patterns in middle-income countries as those observed in highly developed nations, we would have stronger evidence about the mechanisms linking wives' labor force participation, dual-earner couples, spouses' earnings association, and inequality.

The Brazilian case is especially interesting for an investigation of the mechanisms linking income inequality to changes in the life course and the family. Between the 1990s and the early 2010s, while many changes in family life, especially in partnering, continued to unfold or even accelerated, income inequality declined. This decline has been analyzed by many researchers (Barros, Foguel, & Ulyssea, 2007; Carvalhaes, Barbosa, Souza, & Ribeiro, 2014; Ferreira, Leite, Litchfield, & Ulyssea, 2006; Menezes-Filho & Rodrigues, 2009; Soares, 2002; for a review of the literature, see Firpo & Portella, 2019) but the impact of the growing prevalence of dual-earner couples among younger cohorts, one of the most important trends in family life, have been largely neglected. Two recent studies, however, indicate that the rising participation of married women in the labor force has played an important role in trends in inequality, both because inequality declined more among women and because wives' earnings account for an increasing proportion of household income (Ribeiro & Machado, 2018; Hoffmann, 2019). On the other hand, the rise in wives' employment was also linked to a stronger association between spouses' earnings, which itself had a disequalizing effect that we aim to further investigate here.[1] These findings suggest not only that life course

[1] We use the term "effect" (sometimes impact) only to facilitate the descriptions of our results, but we do not make any causal inference in the paper.

and family life characteristics must be taken into account in order to explain the recent trend of declining inequality in Brazil, but also that the Brazilian case can help to establish the main mechanisms relating spouses' labor force participation and trends in income inequality in general.

In this paper, we use data from the National Households Surveys (PNADs) to analyze trends in the association between spouses' earnings and assess their effects on the trend of declining earnings inequality among Brazilian couples from 1993 to 2015. For this purpose, we construct contingency tables cross-classifying husbands and wives according to their relative position in the sex-specific earnings distribution each year. We then use log-linear models to distinguish three components of the association between spouses' earnings: a) the correlation between spouses' earnings among dual-earner couples, which we sometimes call simply *earnings similarity*; b) the *gradient of wives' employment*, i.e. the relationship between husbands' earnings and wives' labor force participation; and c) the *prevalence of dual-earner couples*. Counterfactual simulations allow us to estimate how inequality would change if the trends in each of these components had been different between 1993 and 2015.

During this period the correlation between spouses' earnings in Brazil increased by about 25%, which reduced the decline in inequality among all families by at least 12% (Ribeiro & Machado, 2018). Our results suggest that this increase in correlation is driven mostly by changes in the labor force participation of married (or cohabiting) women, rather than assortative mating on earnings — which would be mostly captured by the *earnings similarity* among dual earners, our first component. Actually, the association among dual-earner couples remained largely stable and actually contributed to the decline of inequality. We show that employment levels for partnered women increased unevenly across the husbands' earnings distributions and this trend in the *gradient of wives' employment* had a disequalizing effect. But our decomposition analyses also indicate that the sheer increase in the *prevalence of dual-earner couples* was the main factor driving the strengthening of the association between spouses' earnings and, thus, lessening the decline in inequality among couples.

In the next section, we present the main questions raised by the literature on marriage and inequality. This is followed by a presentation of the data, measures, and methods used. We then describe our main results in terms of descriptive measures, log-linear models estimation, and the elaboration of counterfactual scenarios. We conclude with a discussion of our findings.

Background

As widespread changes in family life have unfolded across contemporary societies, numerous studies have addressed the consequences of these changes for several forms of inequality (Blossfeld & Buchholz, 2009; Esping-Andersen, 2007; McLanahan, 2004; Western, Bloome, & Percheski, 2008). Much of these changes can be linked to the "gender revolution" that disrupted traditional gender roles and broadened opportunities for women, as shown by trends such as the reversal of the gender gap in educational attainment and the significant growth in female labor force participation (Goldscheider, Bernhardt, & Lappegård, 2015; Van Bavel, Schwartz, & Esteve, 2018). Particularly, the increased socioeconomic similarity of spouses has been pointed to as a contributing factor in the rise of household income inequality in developed countries (Blossfeld & Buchholz, 2009; Esping-Andersen, 2007; Schwartz, 2010). Two related mechanisms have been proposed as explanations for the increases in the economic similarity of spouses: assortative mating and a more equitable division of labor within marriages. (Gonalons-Pons & Schwartz, 2017).

Assortative mating refers to the matching of partners' characteristics at the time of union formation. It has been well established that, because of both opportunities and preferences, people tend to select partners similar to themselves in dimensions such as education, race and social origin (Schwartz, 2013), and this selection can lead to marriages between spouses with similar earnings potential. Educational assortative mating has received the most attention in this respect, as schooling is a proxy for economic prospects. Educational expansion around the world has strengthened the role of schools and colleges as marriage markets, thus fostering homogamy (Blossfeld & Timm, 2003). The reversal of the gender gap in educational attainment related to this expansion also contributed to homogamy, mainly by reducing the odds of female hypergamy – couples where the wife has less schooling than the husband (Esteve et al., 2016; Van Bavel et al., 2018). Gender asymmetry in partner preferences might also have been reduced and, as women are expected to contribute more to the household income, their economic prospects might play a bigger role in marriage markets (Sweeney & Cancian, 2004). Increasing age at first marriage is also conjectured to drive economic homogamy: as people marry older, they could give more weight or be more able to evaluate partners' economic standing and prospects (Oppenheimer, 1988; Qian, 2017).

The division of labor within couples is the other important factor to understand trends in economic homogamy. In particular, the massive entrance of wives into the labor market led researchers to challenge the predictions of Becker's specialization and trading model (Becker, 1974; Becker, Landes, & Michael, 1977), in which couples would be better off with husbands specializing in paid work and wives in housework. Oppenheimer (1994), for example, stressed the anachronism of the specialization model and its inadequacy at both family and societal levels in a context of low mortality and fertility. Research has pointed to the emergence, in recent decades, of a more collaborative form of marriage in which both partners work in the labor market, although the division of housework has been slower to change (Goldscheider et al., 2015; Sweeney, 2002).

The effects of educational assortative mating on inequality have been found to be mostly negligible or modest (Boertien & Permanyer, 2019; Breen & Andersen, 2012; Breen & Salazar, 2011). Though some authors have hypothesized that higher levels of female labor force participation would amplify the impact of educational homogamy on inequality (Blossfeld & Buchholz, 2009; Breen & Andersen, 2012), Boertien & Permanyer (2019) showed that the potential effect of educational assortative mating is actually larger in countries where female employment is relatively low. The reason for this is that women's labor supply and earnings might be more stratified by education in those contexts. Assortative mating also seems to be less important than shifts in the division of labor when looking directly into the association between spouses' earnings. Using longitudinal data, Gonalons-Pons & Schwartz (2017) have shown that most of the increase in economic homogamy in the U.S. since the 1970s is due to the changes in the correlation between spouses' earnings that occurred after the first year of marriage.

Independently of what explains changes in the association between spouses' earnings, some studies have explored its theoretical and empirical impact on income inequality, usually also taking into account trends in female labor force participation and the spread of dual-earner couples (see, e.g., Cancian & Reed, 1999; Hyslop, 2001). Most notably, Schwartz (2010) has shown that the strengthening association between spouses' earnings accounted for at least 25% of the increase in earnings inequality among married couples in the U.S. between 1967 and 2005. Sudo (2017) showed, with a mathematical model and simulations, an inverted U-pattern in which rising women's labor force participation increases household income inequality at early stages but is equalizing once a given level of employment is reached. Any disequalizing effects of

the association between spouses' earnings is, then, largely dependent on this trajectory. In a comparative study of 21 countries, Boertien & Bouchet-Valat (2020) concluded that, while it did have a disequalizing effect on some countries, the increase in the association of spouses' earnings is often related to general changes in employment (especially female) that contribute to the decline in inequality by other pathways.[2]

One important insight that arises from this literature is that levels and patterns of female employment are the key to understanding the impact of couples' earnings association on inequality, because of both the direct effect of women's contribution to the household income and the mediating role it plays for other factors, such as educational homogamy.

Most studies, however, focus on developed countries, while research in developing countries has been scant. A few existing studies about Latin American countries reveal that in Brazil and Mexico, for example, the pattern of increasing earnings association as part of a larger process of changes in female employment is also valid. And while in Mexico spouses earning correlation remained constant from 1988 to 2010, in Brazil the correlation increased since the 1990s, despite the fact that in both countries the increasing participation of wives in the labor market had an equalizing effect overall (Campos-Vázquez, Hincapié, & Rojas-Valdés, 2012; Ribeiro & Machado, 2018). Taking a different approach to the relationship between assortative mating and inequality, Torche (2010) showed that in Chile, Brazil and Mexico the strength of educational barriers to intermarriage was strongly associated with earnings inequality between educational levels.

In Brazil, and Latin America more generally, trends in overall inequality over recent decades have gone in the opposite direction of those in rich countries. Beginning in the 1990s, and especially between the 2000s and early 2010s, income inequality significantly declined in Brazil. Research into this trend has focused mostly on the effects of labor market dynamics and public policies and, indeed, the reduction of the skill premium and increases in the minimum wage are generally regarded as the key proximate determinants of the decline in inequality (Firpo & Portella, 2019). But how these labor market outcomes affect the distribution of household income is also a function of family structure and the division of labor: how many household members are employed,

[2] Boertien & Bouchet-Valat (2020) also provide a comprehensive review of the literature on earnings similarity and inequality and organize the many related research questions.

their relative contribution to the household income and so on. Though these factors have been largely neglected by the recent literature on income inequality in Brazil — the few exceptions include Maia & Sakamoto (2016) and Wajnman, Turra, & Agostinho (2007) —, they have also gone through intense changes.

For example, Ribeiro & Machado (2018) showed that, since the 1990s, married and cohabiting women have been driving the increase in female employment in Brazil. Indeed, virtually all of the increase in female labor force participation in the last few decades can be attributed to partnered women. Using the decomposition properties of the coefficient of variation – as specified by Cancian & Reed (1999) – they decomposed trends in household income inequality into parts: changes in inequality among husbands and among wives, wives' increasing proportion of couples' income, and the correlation between wives' and husbands' earnings. They found that the reduction in inequality among wives and their increasing contribution to household income were major forces contributing to the decline in inequality among couples and all families. But they also identified an increase in the correlation between spouses' earnings that had an opposite and disequalizing effect, and contributed to restricting the trend of declining inequality. These findings highlight the relevance of a demographic perspective to understand how family dynamics interacts with trends in the labor market and public policy in shaping the distribution of household income.

One important limitation of the decomposition of the coefficient of variation as proposed by Cancian & Reed (1999) is that it assumes that changes in a single correlation coefficient can adequately describe trends in the association between spouses' earnings. The coefficient of correlation is a simple and straightforward way to measure the association between spouses' earnings, but, as Schwartz (2010) has shown, it actually obscures different processes that may offset each other, especially in a context of relevant increases in female labor force participation (see also Boertien & Bouchet-Valat, 2020; Bouchet-Valat, 2017; Sudo, 2017). The overall association between spouses' earnings might change as a result of the following mechanisms: a) changes in the *earning similarity* among dual-earners; (b) changes in the relationship between husbands' earnings and the odds that wives work (*gradient of women's employment*); and (c) changes in the *prevalence of dual-earner* couples. Therefore, to assess the impact of the trends of association between spouses' earnings on couples' earnings inequality, we adopt the following analytical strategy, based on Schwartz's work: (1) we estimate log-linear models to decompose the association into different components, and (2) we use

the expected frequencies from these models to compute counterfactual trends of earnings inequality using the coefficient of variation (CV).

Data, measurement and methods

Data

We use data from the *Pesquisa Nacional por Amostra de Domicílios* (PNAD) covering the period 1993 to 2015. PNAD is a nationally representative household survey that, during this period, was conducted annually except for Census years (2000 and 2010) and 1994, leaving us with twenty years of data.[3] We select all heterosexual couples that include the household head and in which the wife was 25 to 55 years old and the husband 25 to 59 years old at the time of the interview, thus comprising individuals approximately in the prime working age. The different age range for husbands reflects the fact that they are usually older than their wives, with a median difference of 3 years throughout the period. Failing to account for this gap would select for age homogamy at the top end of wives' age range and possibly introduce bias. As a robustness check, we also replicate our main analysis using a wider age range — both spouses with 18 to 65 years — which comprises most of the working-age population.

Spouses are identified by the relationship to the household head and both married and cohabiting couples are included. Consensual unions are widespread in Brazil and, though historically more prevalent in lower social strata, have become increasingly common among younger and more educated cohorts (Covre-Sussai, Meuleman, Botterman, & Matthijs, 2015; Esteve, Lesthaeghe, & López-Gay, 2012; Laplante, Vieira, & Barnabé, 2019). We do not distinguish between types of union, as this information is not available for most of the years in our data, but they do differ in relevant aspects such as the level of educational homogamy and women's labor force participation (Covre-Sussai, 2016; Esteve, McCaa, & López, 2013; Laplante et al., 2019).[4] To maintain comparability across years, we dropped couples who lived in rural portions of the Northern region, which were not covered by PNAD before 2004. Our final sample

[3] In 2016 the annual PNAD was replaced by a continuous version and the extent of methodological changes hampers comparability.

[4] When referring to the couples in our sample, we use the terms "partners", "spouses" and "wives/husbands" interchangeably.

includes 929,798 couples with non-missing values on the variables of interest, with a minimum of 39,257 couples per year.

Measurement

PNAD collects data on several sources of income and we use monthly earnings received by spouses in their main job. By focusing on earnings, we leave out other sources of income, such as capital income, retirement benefits (very rare in the selected age range) and cash transfer programs. The latter became relevant in the 2000s, with the expansion and unification of several federal benefits under *Bolsa Família*, a large program with monthly cash transfers to poor families, mostly assigned to the adult woman in the household. Although *Bolsa Família* is credited with a big reduction in poverty, research has shown that its influence on trends in inequality has been modest (Barros, Foguel, & Ulyssea, 2007). Furthermore, among the couples in our selected sample, spouses' joint earnings correspond to about 80% of the household's total income. Therefore, it makes sense to focus on earnings, both because the mechanisms and family changes we investigate are related to labor force participation and because earnings are more relevant than other sources of income to the dynamics of inequality during the period under study. Earnings were inflation-adjusted to September 2015 using the deflators proposed by Corseuil & Foguel (2002).

Inequality among couples is measured using the coefficient of variation (CV) of couples' joint earnings (i.e. the sum of both spouses' earnings) and computed from grouped data (see below). The coefficient of variation is a flexible, decomposable measure and has the advantage of including people with zero income, which is useful since we analyze the impact of the declining proportions of wives with zero earnings on inequality.

Methods

To investigate trends in the association between spouses' earnings and decompose their impact on inequality, we use log-linear models. This class of models has a long history in social mobility and assortative mating research and some unique properties that are useful for dealing with our research questions. They can be formulated as generalized linear models for count data (i.e., with a Poisson distribution and a log link), so that the modeled outcome is the frequency of certain combinations of categorical variables — in our case, spouses' earnings bracket. In this way, they allow for the speci-

fication of complex association patterns while controlling for compositional effects (e.g. the size of groups). Finally, they also make simulation straightforward, because the predicted frequencies from alternative specifications for the association can be used as weights for computing counterfactual statistics. A decomposition of the effects of earnings' association on inequality using log-linear models was first proposed by Schwartz (2010) and similar strategies have since been employed in a few other works (Boertien & Bouchet-Valat, 2020; Bouchet-Valat, 2017; Schwartz, 2010).[5]

Our analytical strategy is as follows: first, we classify each spouse according to their relative position in the sex- and year-specific earnings distribution, using ventiles (i.e. twenty equal-sized groups) for those with non-zero earnings and a separate category for those without earnings. Thus, in each year couples can be assigned to one of the 441 (21 x 21) possible combinations between his and her relative position in the earnings distribution. We then use log-linear models to analyze the contingency tables formed by cross-classifying wives' earnings by husbands' earnings by year (21 x 21 x 20 = 8.820 cells). We also compute scores defined as the median of absolute earnings for each sex and year-specific ventile — i.e. zero for those without earnings, the median earnings for the bottom 5% of women in a given year, then for the next 5% and so on. These scores serve two purposes: first, we use transformations of them in some model specifications to capture either absolute differences or a linear association between spouses' earnings. Second, the scores are used to calculate the coefficient of variation from the contingency tables: for each cell (i.e. combination of spouses' earnings groups), we sum the relevant sex- and year-specific scores to obtain an estimate of couples' joint earnings, which are then used for computing weighted means and standard deviations where the weights are the corresponding cell frequencies (observed or predicted by the models).

The log-linear models, which we describe in detail in the Results section, aim to capture the different ways in which the association between couples' earnings might have changed and by using their predicted frequencies we can estimate distinct scenari-

[5] This approach is also closely related to, and more flexible than, simulations based on the Deming-Stephan algorithm — othewise known as iterative proportional fitting (IPF) — that are also used in the literature about assortative mating and inequality (Boertien & Permanyer, 2019; Breen & Andersen, 2012; Breen & Salazar, 2011). More specifically, a poisson GLM with log link (i.e., a log-linear model) and offsets can be used to standardize a contingency table to a given set of row and columns totals, achieving the same result as IPF (Agresti, 2002, pp. 343–346).

os for trends in inequality. A basic log-linear model that accounts for group sizes and their change over time can be written as

$$\ln\left(\frac{F_{ijk}}{z_{ijk}}\right) = \lambda + \lambda_i^H + \lambda_j^W + \lambda_k^Y + \lambda_{ik}^{HY} + \lambda_{jk}^{WY} \quad (1)$$

where F_{ijk} is the expected frequency for couples in year *k* with husbands in the *i*th earnings group and wives in the *j*th earnings group; λ is a grand mean; λ_i^H, λ_j^W and λ_k^Y are the main effects for husband's earnings, wife's earnings and year, respectively; λ_{ik}^{HY} and λ_{jk}^{WY} fit changes in group sizes across years. The pattern and trends in the association between spouses' earnings can be captured by modeling the husband-wife (*HW*) and husband-wife-year (*HWY)* interactions, respectively. As we explain below, we choose a model with full interaction for the cross-sectional association (λ_{ij}^{HW}) as a baseline and focus on parsimonious specifications for the trends. In a subsequent model we add a term (ZH_lY, described below) that captures the trends in the odds of wives entering the labor market according to the earning levels of their husbands (see Figure 4 below). Thereafter, we test different specifications to model the association between spouses' earnings in dual-earner couples. To incorporate sample weights we use z_{ijk}, computed as the inverse of the ratio between each cell's weighted and unweighted frequencies, as an offset (Clogg & Eliason, 1987; Schwartz & Mare, 2005).

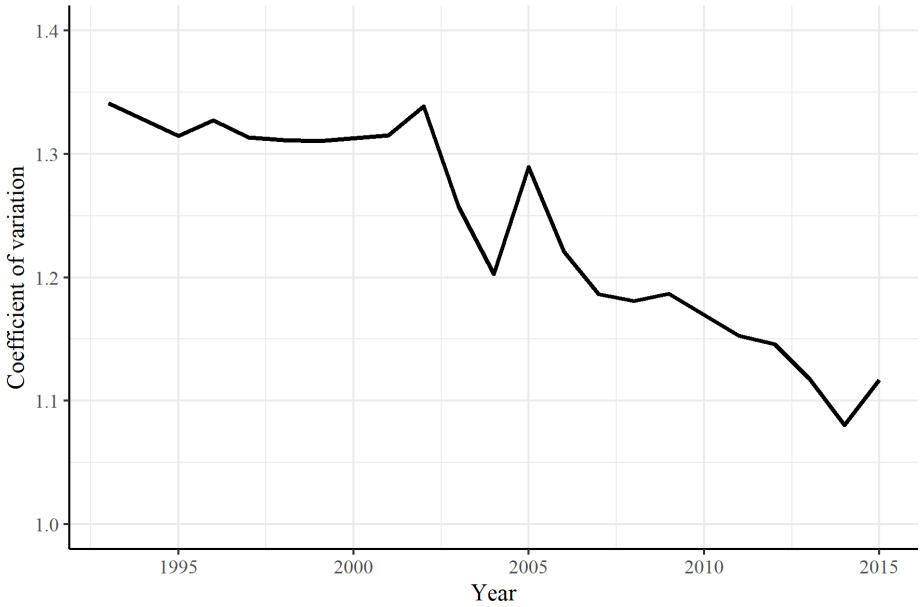
Results

Descriptive results

Figure 1 plots the trend in the coefficient of variation (CV) of couples' earnings between 1993 and 2015, showing what amounts to a 16.7% decrease in inequality. In fact, this decrease occurred almost entirely in this century: the CV declined by only 1.9% between 1993 and 2001, and then by 15.1% from 2001 to 2015. Because of this trajectory, we present some of our results considering these two subperiods. The trend shown in Figure 1 is consistent with those observed in many different studies (Brito,

Foguel, & Kerstenetzky, 2017) and the magnitude of the reduction is comparable to other ways of measuring inequality.[6]

Figure 1 – Trends in the coefficient of variation of couples' earnings



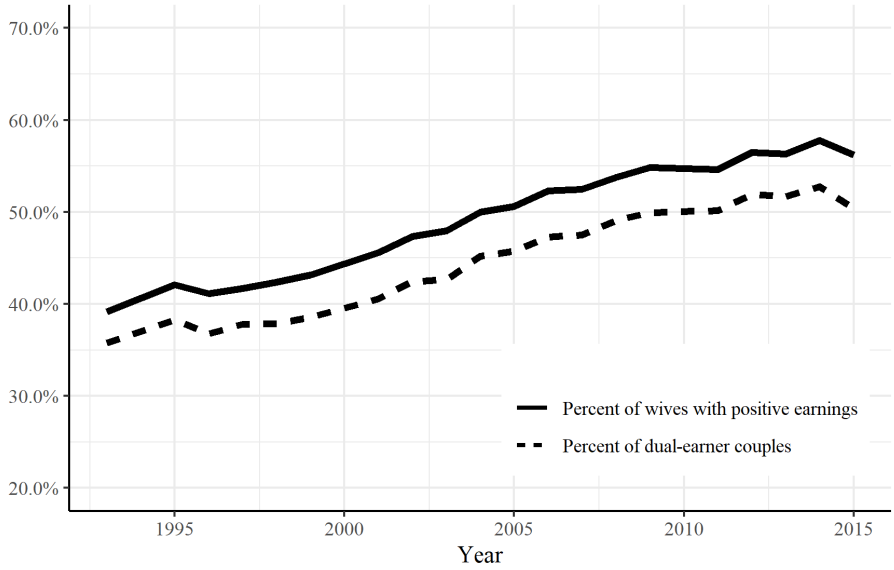
Source: Pesquisa Nacional por Amostra de Domicílios (PNAD)
Note: Coefficient of variation computed from grouped data, using observed (weighted) frequencies. See text for sample.

Trends in inequality unfolded against the background of important changes in the economic organization of the household, most notably the increasing labor force participation of wives. This trend is depicted by the solid line in Figure 2, which shows that the share of partnered women in our sample who had earnings of their own surpassed 50% in the 2000s. Because levels of employment changed little for partnered men, the increase in wives' employment effectively resulted in a corresponding increase in the share of dual-earner couples. This is clear from Figure 2, where the two trends

[6] For example, the Gini coefficient of household income per capita, computed from individual-level data, dropped by about 15% between 1993 and 2015.

look virtually identical — notwithstanding the difference in levels that correspond to the small share of couples in which only the woman is gainfully employed.

Figure 2 – Trends in wives' employment and the prevalence of dual-earner couples



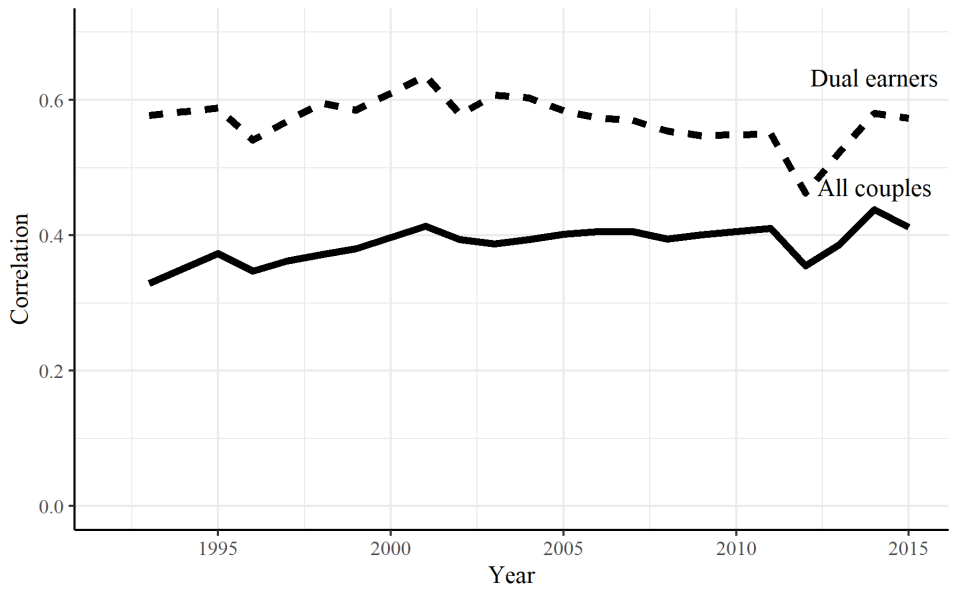
Source: Pesquisa Nacional por Amostra de Domicílios (PNAD)

The reduction of inequality presented in Figure 1 could have been larger – at least 12% larger according to Ribeiro & Machado (2018) – if the association between spouses' earnings did not increase across the period. This modest increase is depicted by the line for all couples in Figure 3. As discussed above, we intend to decompose the impacts on the inequality of trends in three factors that are combined in the correlation coefficient for all couples: a) the association among dual-earner couples (*earnings similarity)*, b) the *gradient of wives' employmen*t and c) the *prevalence of dual-earner* cou-

ples. This decomposition is relevant because it can show how each of the three components contributes to the overall trend of inequality among all couples.

In fact, Figure 3 also shows that among dual-earner couples the correlation between spouses' earnings even diminished slightly in the late 2000s, but is virtually stable when we compare 1993 to 2015. This is a clear illustration that the overall correlation is affected by more than the *spouses' earnings similarity* per se. The correlation for all couples can increase while the correlation for dual-earner is stable (or even declining) as long as the latter remains stronger than the former and the share of dual-earners increases. This is exactly what seems to have happened in Brazil and, as we show below in our decomposition analysis, is consequential for understanding trends in couples' inequality.

Figure 3 – Trends in the correlation between spouses' earnings

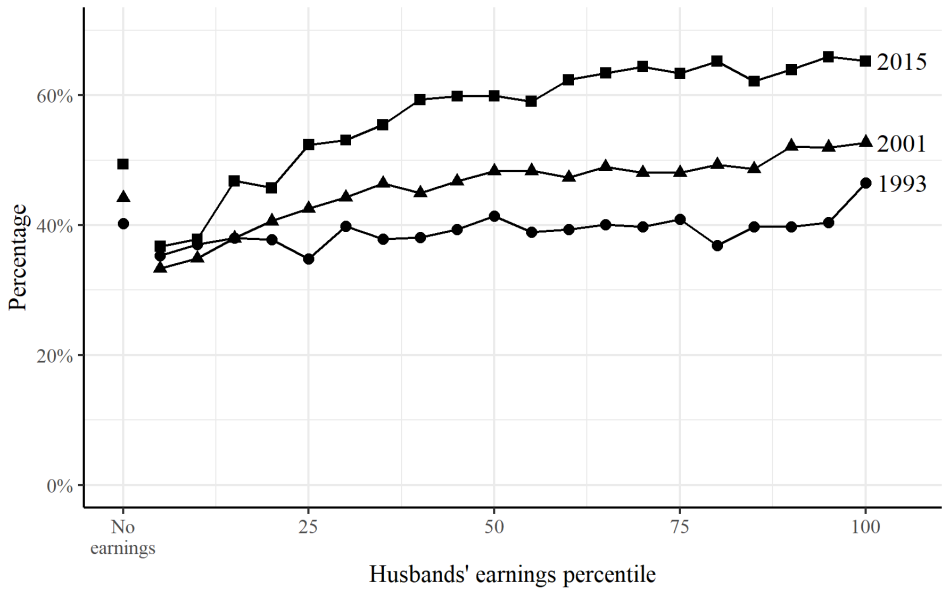


Source: Pesquisa Nacional por Amostra de Domicílios (PNAD)
Note: Pearson correlation coefficients computed using real earnings from couple-level data (wives 25-55 years, husbands 25-59 years; see text for further details on sample). The correlation for all couples includes those in which either spouse (or both) have zero earnings.

To show where in the distribution wives are entering over the period, Figure 4 plots the percentage of wives with non-zero earnings in 1993, 2001 and 2015 by husbands' relative position in the earnings distribution. In 1993, around 40% of wives across the husbands' distribution had earnings of their own. By 2001, levels of employment had increased more for women whose partners were above the 20th percentile

of the men's earnings distribution. By 2015, this trend was more pronounced and we can see a clear positive relationship between her employment and his earnings. Between 1993 and 2015, the employment of wives whose husbands were in the 80th percentile increased by almost 80% (or 28 percentage points). In contrast, the participation of wives whose husbands were at the top of the distribution grew by 40% (19 p.p.), and wives whose husbands were at the 20th percentile increased their employment level by only 21% (8 p.p.) in the same period. This highlights a significant trend: despite its overall increase, the employment level of partnered women became more stratified by their partners' earnings. In other words, the change from male breadwinner to dual-earner couples was uneven across the husbands' earnings distribution.

Figure 4 – Wives' employment, by husbands' earnings

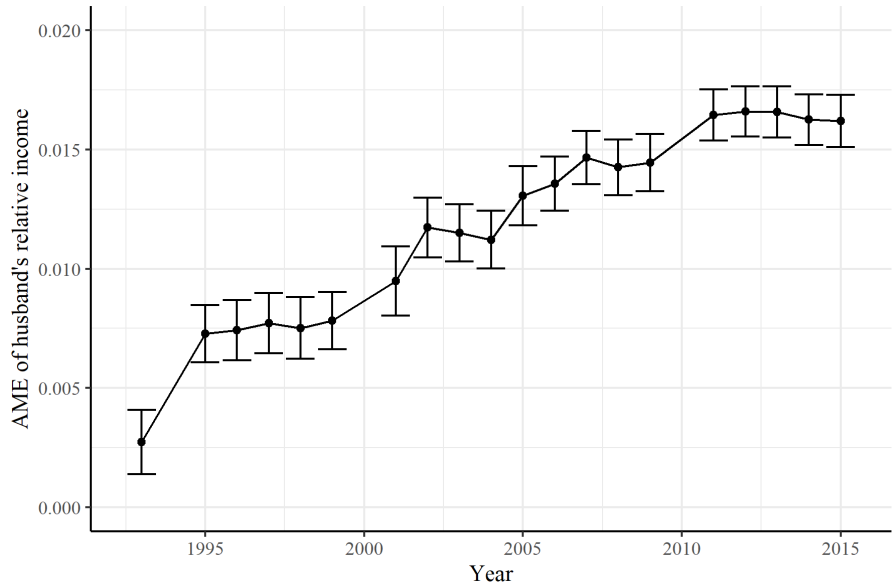


Source: Pesquisa Nacional por Amostra de Domicílios (PNAD)

To further illustrate this trend, Figure 5 plots the average marginal effects of husbands' relative earnings position on wives' probability of having earnings. Marginal effects were obtained from a simple logit model using couple-level data and including the following covariates: husband's relative position in the earnings distribution (linear and quadratic terms for earnings ventile and a dummy for zero earnings), year (as a fac-

tor), and interactions between year and husband's earnings group.[7] The marginal effects pertain to the earnings ventile variable and thus, capture how the probability of being employed for a woman whose husband has nonzero earnings is predicted to change given a 1 unit difference in his earnings position (e.g. being in the second instead of the first ventile). For example, the estimated marginal effect in 2015 is 0.0162, which means that a woman whose husband was at the top of the earnings distribution (20th ventile) had an employment probability 16.2 percentage points greater ([20 – 10] x 0,0162 x 100) than a woman whose husbands was close to the median (10th ventile). It is quite clear that the husband's earnings have become more influential over time — the difference in employment probability in the example above would be of only 2.7 percentage points in 1993 — even though the trend seems to have stabilized in the last few years of the studied period.

Figure 5 – Marginal effects of husband's relative earnings on the probability that the wife works, by year



Source: Pesquisa Nacional por Amostra de Domicílios (PNAD)
Note: Error bars correspond to 95% confidence intervals.

In sum, these descriptive results highlight that looking at the different components of the association between spouses' earnings is relevant from an inequality perspective because these components do not necessarily follow the same equalizing or

[7] This is only intended to offer a summary measure of the the relationship between his earnings and her employment and not to capture the determinants of wives' employment.

disequalizing trend. These different trends might have offsetting or mutually reinforcing effects on inequality, exactly what we set out to unpack using log-linear models in the next sections.

Log-linear models

Table 1 presents fit statistics for log-linear models describing trends in the association between spouses' earnings. The likelihood ratio G^2 summarizes the deviation of predicted from observed frequencies and follows the X^2 distribution. The dissimilarity index measures the percentage of observations misclassified by the model. Model selection is based on the Bayesian Information Criterion (BIC), which favors parsimonious models by adjusting the G^2 statistic by sample size and degrees of freedom consumed by the model (Raftery, 1995). The smaller the BIC statistic, the better a model describes the data. We start with a model that posits no association between spouses' earnings: model 1, which corresponds to Equation 1 above, accounts for the marginal distribution of husbands' and wives' earnings and their temporal change but does not include a term for their interaction. As expected, it does not fit the data according to BIC. Adding a term for the general pattern of association between husbands' and wives' relative positions in the sex-specific earnings distribution, we get the following model:

$$\ln\left(\frac{F_{ijk}}{z_{ijk}}\right) = \lambda + \lambda_i^H + \lambda_j^W + \lambda_k^Y + \lambda_{ik}^{HY} + \lambda_{jk}^{WY} + \lambda_{ij}^{HW} \qquad (2)$$

In Eq. 2, λ_{ij}^{HW} allows for an unrestricted cross-sectional interaction between spouses' earnings groups while holding it constant over time, i.e. there is no three-way association including the survey year. In other words, it captures an arbitrarily complex, yet time-invariant, pattern of association. The constant association term greatly improves fit if we consider both BIC and the hierarchical comparison of G^2. Note that it is possible to specify a more parsimonious pattern of association, but we chose to saturate on the cross-sectional and focus on parsimonious specifications for the time trends. Therefore, taking model 2 as a baseline for further models amounts to focusing on trends instead of patterns of association.

Table 1 – Fit statistics for log-linear models describing trends in the association between spouses' earnings

Model	G^2	Df	p	BIC	Dissimilarity %
1: HY + WY	302776.2	8000	0.000	192834.5	17.7
2: HY + WY + HW (Baseline)	22067.3	7600	0.000	-82377.4	4.8
3: Baseline + ZH_lY	20438.9	7562	0.000	-83483.6	4.3
4: Baseline + ZH_lY + LY	19517.7	7542	0.000	-84129.9	4.1
5: Baseline + ZH_lY + DY	20112.4	7542	0.000	-83535.3	4.3
6: Baseline + ZH_lY + CY	20201.2	7543	0.000	-83460.1	4.3
7: Baseline + ZH_lY + DY + CY	19930.7	7523	0.000	-83455.9	4.3

N (couples) = 929,798; cells = 8,820. Terms (number of parameters): *H* = husband's earnings group (20); *W* = wife's earnings group; *Y* = year (19); *Z* = wife has non-zero earnings (1); H_l = husband's earnings group, as a linear term (1); *L* = linear-by-linear association (1); *D* = absolute difference between spouses' log cores (1); *C* = number of barriers crossed by spouses (1).

Model 3 expands the previous one by adding the term ZH_lY, an interaction between a binary indicator for wives that have positive earnings (*Z)*, husband's earnings group as a continuous variable (H_l) and year (*Y*). This captures changes in wives' employment according to their husband's relative position in men's earnings distribution, or the *gradient of wives' employment* — in other words, the trends depicted in Figures 4 and 5. The added term clearly improves model fit by lowering the BIC statistic. Model 4 then adds to model 3 the variation over time of a linear-by-linear association parameter (*L*), which was constructed as follows: we took the log of spouse's earnings scores (i.e. the median earnings in each sex and year-specific earnings ventile, as described in the Methods section) then standardized them to sex and year-specific z-scores. *L* is then the product of these logged and standardized scores. Because individuals without earnings are assigned a score of zero — and, thus, have missing values when logged — the linear-by-linear term applies only to dual-earner couples. This is a measure of the relative distance in spouses' earnings and, constructed in this way, is conceptually and mathematically close to the correlation coefficient (Hout, 1983; Schwartz, 2010). Therefore, this term captures the trends in the association between dual-earner couples (*earnings similarity*) displayed in Figure 3. As shown by the BIC statistic, the inclusion of the linear-by-linear term improves the fit of model 4 over model 3.

Model 5 takes a different direction: it also includes the constant association (λ_{ij}^{HW}) and the trends in the odds of wives working by husbands' earnings (ZH_lY), but parameterizes the trend in the association among dual-earners as the simple year-specific difference (*D*) between husbands' and wives' log-scores, thus modeling chang-

es in the absolute distance between spouses' earnings. Though it consumes the same number of degrees of freedom as the previous one, model 5 does not fit the data as well as model 4 according to BIC. Model 6 switches back to trends in the relative distance between spouses' earnings, this time expressed as the number of "barriers" a given couple crosses (*C*), i.e. the difference between his and her earnings ventile. This ranges from zero for couples in which spouses have the same relative position to 20 if spouses are on opposite extremes of the distributions (e.g. wife with no earnings and husband at the top men's ventile). Finally, model 7 includes both the difference in log-scores and the number of percentiles separating positions, thus accounting for both relative and absolute distances in spouses' earnings. Neither model 6 nor model 7 improves the fit over model 4, and they actually have worse fit than model 5.

Therefore, model 4 is our preferred model, which amounts to saying that, given a baseline pattern of cross-sectional association between spouses' earnings, trends in this association *net from compositional effects* (i.e. effects due to changes in group sizes) are best described by (a) changes in the relationship between wives' labor force participation and husbands' earnings (*gradient of wives' employment*) and (b) changes in the relative distance between the earnings of dual earners (*earnings similarity*). In other words, trends in spouses' earning association are described both by changes in dual-earners' earnings association and on the gradient of wives' employment — thus both assortative mating on earnings and the division of labor within couples are of relevance. As discussed in further detail below, the observed association — and its impact on inequality — might also change as a function of compositional factors.

Decomposing trends in the association between spouses' earnings

Having an adequate representation of the data with Model 4, we can now investigate how different components of the association have affected trends in inequality among couples. We do this by successively removing from our chosen model the terms that account for changes in that association and using the predicted frequencies to estimate counterfactual trends for the coefficient of variation of couples' joint earnings.

We start by removing the trends in the linear-by-linear association (*LY*) from Model 4, which effectively leaves us with Model 3. We call this counterfactual 1 (CF1). The predicted frequencies thus obtained represent how the distribution of couples would be like if there was no change in the correlation among dual earners. Therefore, the dif-

ference between inequality trends predicted by CF1 expresses the influence of changes in the association between spouses' earnings among dual-earner couples, the *earnings similarity* component. Counterfactual 2 (CF2) is obtained by further dropping the term that accounts for changes in the relationship between wives' labor force participation and husbands' earnings (ZH_lY), which gives us model 2, the constant association model. Comparing the trends in inequality predicted by CF1 and CF2 allows us to estimate the impact of changes in what we have termed the *gradient of wives' employment*.

The constant association model predicts, by definition, no changes in the *net* association between spouses' earnings — i.e. the association left after controlling for the effects of group sizes. But, as Schwartz (2010) aptly points out, the *observed* association — as expressed, e.g., in the correlation coefficient — can still change as a product of the compositional effects of trends in the marginal distributions of spouses' earnings, as couples migrate to parts of the table where the association is stronger or weaker. Because individuals with non-zero earnings are classified in equal-sized groups for each year, changes in marginal distributions mainly capture changes in the proportion of men and —empirically more important — women without earnings. In practice, thus, the relevant "migration" within the contingency table that can occur due to marginal changes over the years is the transition from sole (usually male) breadwinner to dual-earner couples. With the constant association term (*HW*) in our baseline model, the association is time-invariant but allowed to vary between parts of the table and, more specifically, be stronger among dual-earner couples. By dropping this term in our counterfactual 3 (CF3), we thus eliminate any change in the overall association that might result from trends in the *prevalence of dual-earner couples*.

Table 2 – Decomposition of trends in the coefficient of variation of couples' earnings

	Full model	CF1	CF2	CF3
Coefficient of Variation				
1993	1.358	1.347	1.364	1.198
2001	1.338	1.329	1.334	1.153
2015	1.126	1.134	1.125	0.947
Decomposition				
1993-2015				
A) Change in CV (Δ)	-0.233	-0.213	-0.239	-0.250
B) %Δ	-17.1%	-15.8%	-17.5%	-20.9%
C) (%Δ) - (%Δ in full model)		1.3%	-0.4%	-3.8%
D) (%Δ) - (%Δ in previous model)		1.3%	-1.7%	-3.4%
1993-2001				
A) Change in CV (Δ)	-0.020	-0.018	-0.030	-0.045
B) %Δ	-1.5%	-1.4%	-2.2%	-3.7%
C) (%Δ) - (%Δ in full model)		0.1%	-0.8%	-2.3%
D) (%Δ) - (%Δ in previous model)		0.1%	-0.9%	-1.5%
2001-2015				
A) Change in CV (Δ)	-0.21	-0.20	-0.21	-0.21
B) %Δ	-15.9%	-14.7%	-15.6%	-17.9%
C) (%Δ) - (%Δ in full model)		1.2%	0.3%	-2.0%
D) (%Δ) - (%Δ in previous model)		1.2%	-0.9%	-2.2%

Source: Pesquisa Nacional por Amostra de Domicílios (PNAD)
Note 1: CF1 = no change in the association among dual-earners; CF2 = no changes in the association among dual-earners and in the gradient of wives' employment; CF3 = no changes in the association among dual-earners, in the gradient of wives' employment and in the prevalence of dual-earner couples. See Appendix for 95% confidence intervals.
Note 2: The observed CV values are a little different from those presented in Column 1 (Full Model).

Observed CV values for 1993, 2001 and 2015 are respectively 1.341, 1.315, and 1.117.

Table 2 presents the results of the decomposition exercise for our entire studied period and two subperiods. Bootstrapped confidence intervals for our key estimates (lines B, C and D), obtained from 600 replicates, are provided in Table A1 of the Appendix. First, we see that, under the model that best represents the data, the coefficient of variation decreased by 0.23 between 1993 and 2015, amounting to a reduction of 17% in inequality of couples' joint earnings.[8] Indeed, the CV would have decreased under any one of our simulated scenarios (see lines A and B), which further confirms that changes in the association between spouses' earnings, even if disequalizing, could not cancel out the reduction in inequality sustained by other trends, e.g., in the earnings distribution of men and women considered separately.

When comparing our scenarios, we focus on the predicted percent change (line B in each panel) instead of the absolute change (line A) because the models imply different levels for the CV in a same given year. The difference between the percent change predicted by each counterfactual with the one predicted by the full model is presented in line C. Note that, because we are dealing with negative numbers (the CV is always smaller in more recent years), a positive number in line C implies that inequality would *decline less* in the given scenario — therefore, the excluded term(s) had an *equalizing* influence in inequality trends. This is the case for the first counterfactual (CF1): without the trend in the association between spouses' earnings among dual-earners, inequality would have dropped by 15.8% instead of 17.1% — thus, a difference of 1.3 percentage points ([-15.8%]-[-17,1%]). This is a surprising result: the association among dual earners (*earnings similarity)*, our best indicator of assortative mating on earnings, actually contributed to the decrease in inequality. This equalizing effect can be roughly mapped to the slight decrease in the correlation among dual-earners in part of the period, as shown in Figure 3.

The other two counterfactuals point in the opposite direction, showing that the components they refer to contributed to increasing the association and, thus, limited the decline in inequality. When neither the association among dual-earners (*earnings simi-*

[8] This is close to the actually observed reduction of 16.8%. In fact, the 95% confidence interval for the percent change predicted by the full model ranges from -18.1 to -16.2% (see Table A1 in the Appendix for bootstrapped CIs).

larity) nor the relationship between wives' employment and husbands' earnings (*gradient of wives' employment*) are allowed to vary over time, as in CF2, the predicted change is 0.4 percentage points more negative compared to the full model, and thus a bigger decline in inequality is predicted. With the trends for all components of the association dropped in CF3, the change in inequality is 3.8 p.p. more negative than what is predicted by the full model.

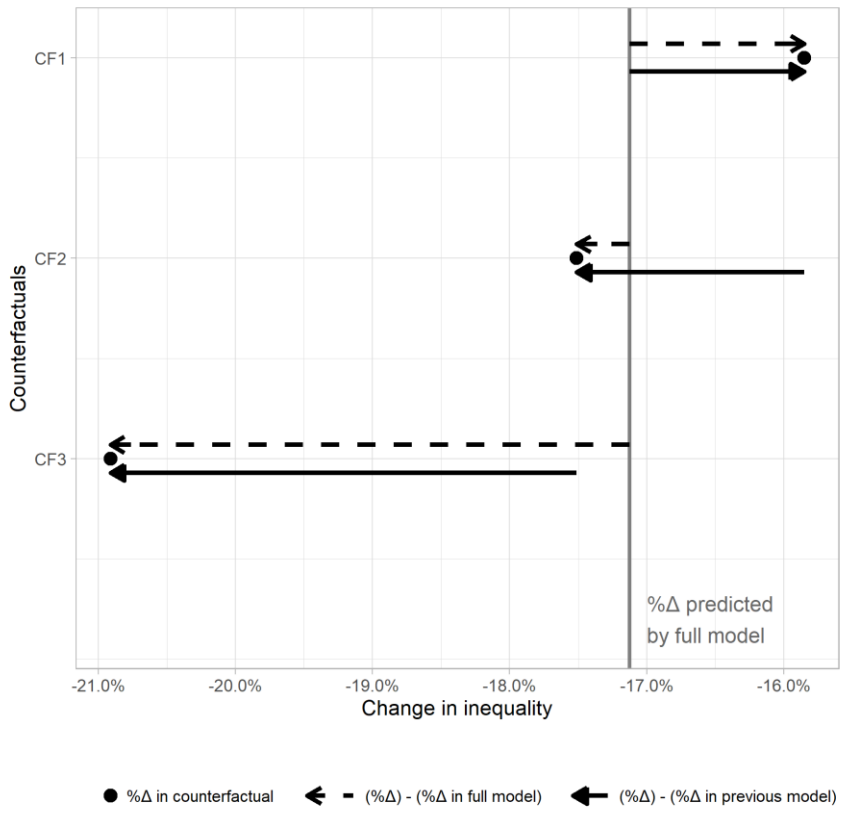
Note that comparing each counterfactual to the full model provides an estimate of the cumulative effect of the dropped components, e.g. the difference between CF3 and the full model includes the effects of the previous two counterfactuals. To assess the impact of each component, it is more useful to compare the percent change predicted by a given counterfactual to the one predicted by the adjacent scenario, i.e. CF1 versus full model, CF2 versus CF1, and CF3 versus CF2. This is shown in lines D of Table 2. The first comparison is the same as above: by dropping the trends in the association among dual-earners, CF1 reduces the predicted change in CV by 1.3 p.p when compared to the full model. The second counterfactual then pushes the trend in inequality by 1.7 p.p. in the other direction, effectively canceling out the equalizing effect of the first component. Finally, excluding the trend in the prevalence of dual-earners with CF3 further pushes the predicted change by minus 3.4 p.p. when compared to the previous scenario. Accumulating the three effects (1.3%, -1.7%, -3.4%), we get the net difference of -3.8% between the scenario where no component of the association between spouses' earnings have changed and the full model

Therefore, the single largest difference in the predicted change of the CV is obtained when eliminating the trends in the prevalence of dual-earner couples. In other words, the association between spouses' earnings impacted the trends in inequality mainly through the simple increase in the share of dual-earner couples. The second-largest effect, also disequalizing, was from changes in the gradient of wives' employment.

Figure 6 helps visualize the relative importance and offsetting effects of the different components by plotting the key results for the 1993 to 2015 period. Points show the percent change in CV predicted by each counterfactual (line B in table 2). The lengths of dashed and solid arrows correspond to the differences between the predictions of the counterfactual and, respectively, the full model or the previous scenario (lines C and D). An arrow pointing to the right (CF1) shows that the decrease in ine-

quality would be smaller without the excluded component and, thus, it had an equalizing effect.

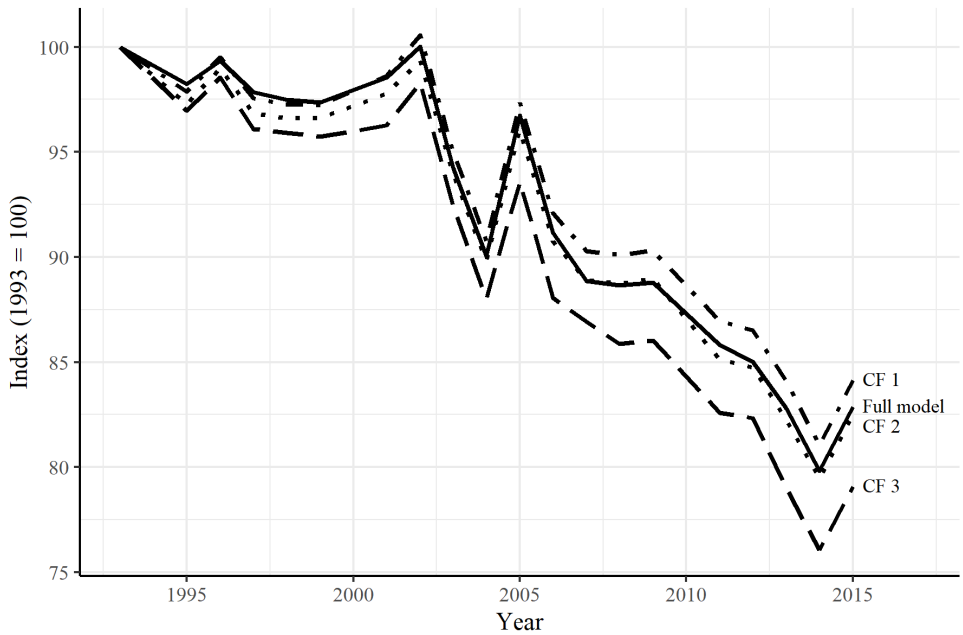
Figure 6 – Percent change in inequality predicted by counterfactuals and difference from other scenarios



Source: Pesquisa Nacional por Amostra de Domicílios (PNAD)
Note: Arrows pointing rightward indicate an equalizing effect (and vice-versa) of the dropped component in each counterfactual. See text for details.

The substantive conclusions are the same when we look separately at the 1993-2001 and 2001-2015 periods: the association among dual earners (*earnings similarity*) has an equalizing impact, the opposite is true for the *gradient of wives' employment* and *the prevalence of dual-earners*, but the latter has the largest impact. The main difference is that numbers are generally smaller for the first period because the change in CV was quite modest. For example, the percent changes predicted by CF1 and the full model are virtually the same: there is only 0.1 p.p. difference which is not statistically different from zero at the 95% level. These can also be seen from Figure 7, which plots, over the entire period, the percent change in inequality predicted by the full model and each of the counterfactuals. The predictions diverge little up until the early 2000s. After that, it is clear that the steepest decline in inequality would be observed under CF3, where nothing changes in the association between spouses' earnings, and the smallest reduction would be observed under CF1. The decline under the full model can then be understood as a middle ground between these two extremes.

Figure 7 – Predicted percent change in the coefficient of variation of couples' earnings under different scenarios



Source: Pesquisa Nacional por Amostra de Domicílios (PNAD)

To check if the results presented above are robust to our definitions, we replicated the analysis using alternative age ranges and earnings classifications. Table A2, in the Appendix, presents the results according to three different definitions of age and earnings: (1) one using the same age range we used above, but only ten earning categories (plus a zero earnings category) for wives and husbands; (2) another using a wider age range (18 to 65 years old) and 20 earning categories (plus another category for zero earnings); and (3) the last one using 10 earning categories (plus zero earnings) and the wider age range (18 to 65 years old). A quick comparison of Table A2 with Table 2 confirms that the results are remarkably similar independently of the earning categories or the age range used.

Summary and conclusion

Previous research has shown that changes in the economic organization of families in Brazil, notably the increasing labor force participation of married and cohabiting women, had equalizing effects on household income inequality, while also encompassing offsetting trends. More specifically, the rise in wives' employment had the side effect of strengthening the association between spouses' earnings, which worked as a counteracting — even if weak — force in the overall trend of decreasing inequality. In this paper, we go a step further and unpack the changes in the association to show that they also comprise offsetting trends and are adequately described by a model that split them into three components. One of these components, trends in the association among dual-earners (*earnings similarity*), actually acted to diminish the overall correlation and, thus, had an equalizing effect on the couples' earnings distribution. But this was completely offset by the other two components, which had a disequalizing influence: the *changing gradient of wives' employment* and the compositional effects of the increase in the *prevalence of dual-earner couples*. In the most extreme scenario, with no changes in the association between spouses' earnings from any of its components, inequality in couples' joint earnings would have decreased by about 21%, instead of the observed 17% drop.

Although the magnitude of changes is generally larger in Brazil, the relative importance of the components is consistent with those observed for several developed countries in comparative research (Boertien & Bouchet-Valat, 2020), as well as with more general conclusions regarding the relationship between homogamy, female em-

ployment and income inequality (Boertien & Permanyer, 2019; Sudo, 2017). More specifically, our results add to the conclusion that levels and patterns of employment for partnered women, which are closely related to the prevalence of dual-earner couples, are usually more important for the economic similarity of spouses — and its impact on inequality— than assortative mating on earnings. This is generally good news because female employment frequently diminishes household inequality by other pathways, e.g. changing the income distribution of women. We, therefore, provide evidence of similar patterns for the relationship between unions and income inequality for an unique – or at least rare – context: a highly unequal developing country that, contrary to most of the developed world, experienced a significant decline in income inequality in the last few decades while also undergoing key family changes that are comparable to those of rich nations.

It is then important to stress that the trends reported here were not enough to cancel out the overall equalizing effects of the increasing labor force participation of wives, let alone the broader social and economic changes that helped decrease income inequality in Brazil between the 1990s and the 2010s. Furthermore, this kind of accounting exercise by way of counterfactuals, though a useful tool to untangle mechanisms underlying aggregate trends, cannot reveal people's behavior in terms of partner choice and labor force participation. It is unlikely that the different components of the association between spouses' earnings can move completely independent of each other. For example, educational homogamy might influence both the likelihood of wives' employment and the correlation between spouses' earnings. Growing levels of female employment, in its turn, can influence marriage-market dynamics and partner choice.

The most important limitation of our contribution is arguably our focus on households headed by couples, which leaves out one quarter to one third of all households depending on the year and the age range considered. Other household arrangements (e.g. single parents with their children, young or elderly people leaving alone) are arguably of utmost importance for understanding inequality and vulnerability. Our focus on spouses' earnings further restricts the scope of our conclusions by ignoring other sources of household income that might offset or reinforce the patterns we observed here. When accounting for all of these selection filters, our analysis is restricted to about 40% of the total income of all households in the later years of data – it is worth mentioning, however, that other studies in the literature are also based on similar proportions of the income distribution. Therefore, on the one hand, we study a narrow aspect

of the family demography and thus do not account for other trends (e.g. changing household arrangements) that might be relevant from an inequality perspective. On the other hand, the dynamics we do study apply to only part of the overall income distribution. Nevertheless, the mechanisms we are untangling are very general and point to a recent turn in the literature towards better integrating the study of wives' labor force participation, the spread of dual-earner couples and its consequences for inequality.

In fact, our results highlight mechanisms that might have long-term consequences for inequality. Dual-earner households not only concentrate more income, but can also better adjust to new economic circumstances and are less exposed to, or more able to recover from, income loss and unemployment. Thus, the strengthening positive association between wives' labor force participation and husbands' earnings adds yet another dimension to family inequality in Brazil. This is especially important because the overall equalizing trend has reversed and wage inequality has been on the rise since 2015 (Barbosa, 2019). Though this shift is mostly a result of a deep economic recession, there are signs of structural changes in the Brazilian labor markets, such as more scarce and concentrated employment benefits, owing in large part to the deregulation of labor relations. Changing economic and policy contexts can of course affect family formation and the division of labor within couples, but the trends we describe here, should they persist, may reinforce and amplify the increase in inequality.

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Appendix

Table A1 – Confidence intervals for the decomposition of trends in the coefficient of variation

	1993-2015		1993-2001		2001-2015	
	Lower	Upper	Lower	Upper	Lower	Upper
%Δ in CV						
Full model	-18.1%	-16.2%	-2.5%	-0.5%	-16.8%	-15.0%
CF1	-16.8%	-14.9%	-2.3%	-0.4%	-15.6%	-13.8%
CF2	-18.4%	-16.6%	-3.2%	-1.3%	-16.5%	-14.8%
CF3	-21.6%	-20.1%	-4.6%	-2.8%	-18.6%	-17.1%
(%Δ) - (%Δ in full model)						
CF1	0.9%	1.6%	-0.3%	0.5%	0.8%	1.5%
CF2	-0.8%	0.0%	-1.2%	-0.3%	-0.2%	0.6%
CF3	-4.3%	-3.1%	-2.9%	-1.5%	-2.5%	-1.3%
(%Δ) - (%Δ in previous model)						
CF1	0.9%	1.6%	-0.3%	0.5%	0.8%	1.5%
CF2	-1.9%	-1.4%	-1.1%	-0.6%	-1.1%	-0.7%
CF3	-3.8%	-2.9%	-2.0%	-0.9%	-2.6%	-1.7%

Source: Pesquisa Nacional por Amostra de Domicílios (PNAD)
Note: 95% CIs obtained via bootstrap with 600 replications.

Table A2 – Decomposition of trends the coefficient of variation with alternative age ranges and earnings classification

	Wives 25-55 years, husbands 25-59 years, 10 earnings quantiles	Wives and husbands 18-65 years old, 20 earnings quantiles	Wives and husbands 18-65 years old, 10 earnings quantiles
%Δ in CV			
Full model	-15.7%	-17.9%	-14.2%
CF1	-14.4%	-16.5%	-12.7%
CF2	-16.3%	-18.0%	-14.6%
CF3	-19.6%	-21.9%	-18.4%
(%Δ) - (%Δ in full model)			
CF1	1.3%	1.5%	1.5%
CF2	-0.7%	-0.1%	-0.4%
CF3	-3.9%	-3.9%	-4.2%
(%Δ) - (%Δ in previous model)			
CF1	1.3%	1.5%	1.5%
CF2	-2.0%	-1.6%	-1.9%
CF3	-3.2%	-3.8%	-3.8%

Source: Pesquisa Nacional por Amostra de Domicílios (PNAD)