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Parental educational similarity and inequality implications for infant health in Chile: Evidence from administrative records, 1990–2015

Alejandra Abufhele [a,1], Luca Maria Pesando [b,c,*,2], Andrés F. Castro T. [d,3]

[a] Escuela de Gobierno, Universidad Adolfo Ibáñez, Chile
[b] Division of Social Science, New York University (AD), 1737 Cambridge Street, Cambridge, MA 02138, USA
[c] Weatherhead Center for International Affairs, Harvard University, United States
[d] Center for Demographic Studies, Universitat Autònoma de Barcelona, Spain

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ABSTRACT

This study expands existing scholarship on the relationship between parental educational similarity and infant health using rich administrative data from Chile covering births that occurred between 1990 and 2015. We test the relationship between parental educational similarity (*homogamy*) or dissimilarity (*heterogamy*) and two measures of infant health, namely low birth weight (LBW) and preterm birth (PB). We show that parental educational homogamy is associated with a reduced probability of low birth weight and preterm birth – particularly at the high end of the educational distribution – and the observed association is only partly driven by selection into homogamous couples, as demonstrated by complementary quasi-experimental analyses conducted on a subsample of matched step-siblings from same mothers but different fathers. We further show that couples where women outrank men in educational attainment (*hypogamy*) exhibit worse birth outcomes relative to their homogamous and hypergamous counterparts. Municipality-level analyses merging external information on female labor force participation (FLFP) prior to childbirth reveal that the association between hypogamy and children's outcomes is increasingly negative as FLFP increases, highlighting a strong work-life balance tension for educated women who are actively engaged in the labor force. Insights from this study contribute to a better understanding of the inequality debate surrounding the intergenerational transmission of advantage and disadvantage – a topical issue in a country that has recently joined the rank of the world's wealthiest nations yet maintains extreme levels of socioeconomic inequality.

1. Introduction

Educational assortative mating – the non-random matching of partners with respect to education – represents a critical interplay between the growing importance of education in contemporary societies and the role of the family in shaping children's life chances (Carlson, Mclanahan, & England, 2004; McLanahan, 2004; Schwartz, 2013). Traditional assortative mating scholarship has focused on analyzing the patterns of educational sorting and identifying the processes that generate such patterns. These lines of inquiry have documented an increase in the propensity of partners to resemble each other in educational attainment in high-income societies (Blossfeld & Timm, 2003; Qian & Preston, 1993) and, more recently, in low- and middle-income societies (Esteve, García-Román, & Permanyer, 2012; Gullickson & Torche, 2014; Hu & Qian, 2015; Pesando, 2021; Smits & Park, 2009).

Documenting patterns of spousal choice and examining their implications are two rather distinct analytic endeavors. In this respect, most studies to date have attempted to measure the contribution of educational homogamy – a scenario in which partners share the same level of education – to economic inequality (Breen & Salazar, 2011; Eika, Mogstad, & Zafar, 2019; Gottschalk & Danziger, 2005; Pesando, 2021), or the contribution of homogamy to relationship status and transitions (Goldstein & Harknett, 2006), in a predominantly *within-generation* perspective. Attempts to explore the relationship between parental

* Corresponding author at: Division of Social Science, New York University (AD), 1737 Cambridge Street, Cambridge, MA 02138, USA.
E-mail addresses: alejandra.abufhele@uai.cl (A. Abufhele), lucamaria.pesando@nyu.edu (L.M. Pesando), acastro@ced.uab.es (A.F. Castro T.).
[1] Avenida Diagonal las Torres 2640, Peñalolén. Oficina 255-A, edificio de Pregrado, Chile
[2] NYUAD, Saadiyat Campus, Social Science Building A5–1207, P.O. Box 129188, Abu Dhabi, United Arab Emirates
[3] Carrer de Ca n'Altayó, Edifici E2, 08193, Barcelona, Spain

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educational homogamy and children's outcomes – i.e., *cross-generationally* – have been rare or very much focused on the effects that a parent's status (mostly, the mother) has on the demographic mechanisms of assortative mating and differential fertility in the US (Maralani, 2013; Mare & Maralani, 2006). This is surprising, as one of the concerns behind couples' educational homogamy is its potential to widen disparities in the ability of families to invest in their children's development, health, and wellbeing, i.e., the potential to perpetuate social inequalities across generations (Fernandez & Rogerson, 2001). In simple terms, provided that both men and women have access to schooling opportunities, a society in which high-educated individuals marry high-educated individuals and low-educated marry low-educated will be more unequal than a society in which high-educated marry low-educated (or vice versa). This is rather intuitive within generations (e.g., societies become more polarized in terms of income and wealth), yet it might well be true across generations thinking, for instance, about how heterogeneity in parental resources translates into heterogeneity of outcomes of children born to different couple types, thus shaping their later-life outcomes (Bratsberg, Markussen, Raaum, Røed, & Røgeberg, 2018).

Both the absolute levels of individual educational attainment and the relative disparity between parents' education can be relevant for the organization of family life and investments in children. First, an accumulation logic suggests that the total level of resources available for such investments reflects each partner's contributions – or lack thereof – of economic, cultural, and social inputs. Second, sorting on education can be taken as an indicator of homogeneity in partners' preferences, and couples in which both partners have attained similar levels of education can be expected to suffer fewer frictions; that is, partners' relative similarity on these dimensions may interact positively with the level of household resources available and lead to less conflicting decision-making processes, in turn translating into higher or more efficient investments in children's health, schooling, and wellbeing. While accounting for the first channel, our interest here centers on this second dimension of relative parental similarity in education and its intergenerational implications.

An incipient line of research has attempted to link child outcomes to partners' similarity in parenting styles (Martin, Ryan, & Brooks-Gunn, 2007) or to the concordance between parenting and marital quality (Belsky & Fearon, 2004), and tends to find beneficial effects of parental harmony and concordance. Yet the evidence of interactive influences between mothers' and fathers' characteristics remains limited. Recently, Rauscher (2020) expanded the sociological scholarship on the topic by estimating the effects of parental educational similarity on infant health using birth records from the United States (US). Hypothesizing that educational similarity affects infant health through its influence on maternal stress and characteristics of the prenatal context, Rauscher's results suggest that parental educational similarity is beneficial for infant health (*homogamy-benefit hypothesis*), with significant variations by birth cohort and maternal education. Focusing on contexts other than the US, Pesando (2022) examined a similar research question using longitudinal data from Ethiopia, India, Peru, and Vietnam, and found evidence in favor of the homogamy-benefit hypothesis, yet only in the more developed and less gender unequal ones, namely Peru and Vietnam. Conversely, Behrman (2020) focused on a similar research question in Malawi, finding results similar to Pesando (2022) in Ethiopia and India, i.e., that children may be better off in non-homogamous (mostly, hypergamous) unions.

The present study seeks to expand the existing scholarship focusing on the relationship between parental educational similarity and children's outcomes in Chile. Chile has experienced rapid economic growth over the past 30 years, accompanied by changes in union formation practices, massive educational expansion, yet persistent gender disparities and sustained levels of inequality (Celhay & Gallegos, 2015; García & de Oliveira, 2011). Using rich and high-quality administrative data on births that occurred between 1990 and 2015, we address the above-stated research question focusing on two measures of infant health, namely, low birth weight and preterm birth. We document the intergenerational implications of parental educational similarity in Chile and advance some speculations on the complex interplay between couple and societal-level dynamics that might underlie the heterogeneity of our results. Drawing on a combination of *family systems* and *gender relations* perspectives, we stress that birth outcomes may be influenced not only by complex economic, social, and emotional interactions of the parents, but also by different micro-level household dynamics stemming from couples' relative similarities and the societal context in which these are embedded.

Our focus on birth outcomes in the Chilean context relies on the general premise that health at birth is a strong predictor of later-life outcomes such as later-life health, education, and labor market outcomes (J. R. Behrman & Rosenzweig, 2004; Bharadwaj, Løken, & Neilson, 2013; Figlio, Guryan, Karbownik, & Roth, 2014; Torche & Echevarría, 2011). Most importantly, despite the rapid economic growth that Chile experienced over the last decades, the share of children born with less than 2500 g – the technical definition of low weight at birth (LBW) – and children born before 37 weeks of gestation – the technical definition of preterm birth (PB) – has increased over time, echoing recent worrisome evidence from the US (Rauscher & Rangel, 2020). Trends in Fig. 1 show that since the 1990 s the prevalence of these negative birth outcomes has increased significantly. In 1990, the proportion of LBW was 5.7 %, while this rose to 6.3 % in 2015. For PB the increase was even more marked: from 5.5 % in 1990 to 8.1 % in 2015. Although this pattern is not unique to Chile and partly a reflection of increased maternal age and attributable to the fact that very preterm babies are increasingly likely to survive (Chawanpaiboon et al., 2019; Zeitlin et al., 2013), these trends – inserted within a context of declining educational hypergamy and reversals in gender gaps in education (De Hauw et al., 2017; Esteve et al., 2016; Van Bavel et al., 2018) – make the study of the intergenerational implications of parental educational similarity in Chile particularly compelling and policy-relevant.

The causes for a baby to be born low weight or preterm are complex and likely the result of the interplay of biological, psychosocial, behavioral, sociodemographic, and environmental factors (Torche & Abufhele, 2021). Some of these include prenatal care, uterine infection, nutrition, economic resources, maternal stress and anxiety during pregnancy, lifestyle, diet, tobacco and/or alcohol consumption. All of these factors are in turn influenced by parents' individual educational attainment, alongside their combination and complex interplay. Furthermore, these individual-level factors are just one source of risk during pregnancy and childbirth, as system-level factors such as structural inequalities and biases, the social determinants of health, and

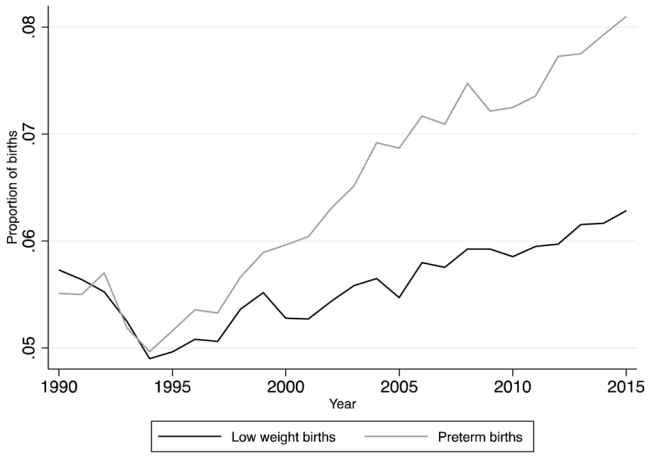

Fig. 1. Time trends in birth outcomes in Chile between 1990 and 2015
Source: 1990–2015 Birth records, Chilean Ministry of Health.

financing and policy decisions in the health system may exacerbate existing individual-level risk factors (National Academies of Sciences Engineering & Medicine, 2020).

Estimates from birth records in Chile support the idea that parental educational similarity is beneficial for children's outcomes, particularly at the high end of partners' joint educational distribution. Although the type of administrative data used does not allow to test explicit mechanisms at the individual level, we hypothesize that these benefits are due to reduced maternal stress, enhanced complementarity in parental inputs towards child production (e.g., more and higher-quality investments in children), better relationship quality including reduced conflict and frictions (resulting, ultimately, in less marital disruptions), and shared lifestyles (including, for instance, healthy habits such as physical activity, less smoking, drinking, substance use, etc.). Nonetheless, the above idea is only partially supported, as we also show that couples where women outrank men in educational attainment (*hypogamy*) exhibit worse birth outcomes relative to their homogamous counterparts, while couples where men outrank women (*hypergamy*) exhibit similar birth outcomes relative to a homogamy scenario. As such, the *homogamy-benefit hypothesis* only holds relative to an educational hypogamy scenario.

To compensate for the lack of identification of individual-level mechanisms, we push the analysis forward by resorting to municipality-level variables on female labor force participation – in years prior to childbirth – obtained from an ancillary Chilean survey. Taking municipality-level female labor force participation (FLFP) as a distal measure of the social role that women play in society, we conduct heterogeneity analyses to explore whether our results largely reflect differential gender norms. These additional analyses show that the association between hypogamy and children's outcomes is more negative as municipality-level FLFP increases (what we label as "*double burden*" of hypogamy).

Insights from this study contribute to the inequality debate on the intergenerational transmission of advantage and disadvantage (persistence of inequalities versus fading) and shed additional light on the relationship between joint parental characteristics and children's outcomes in a country that has recently joined the rank of the world's wealthiest nations yet maintains extreme levels of inequality and limited multigenerational educational mobility (Celhay & Gallegos, 2015; Daude & Robano, 2015; Torche, 2014).

2. Background

2.1. Parental education and children's outcomes

The quest for understanding the role of parental education on children's health outcomes has been prolific (Case & Paxson, 2002; Desai & Alva, 1998; Kemptner & Marcus, 2013; Lindeboom, Llena-Nozal, & van der Klaauw, 2009). Studies have documented a positive association between mother's educational attainment and birth-related outcomes including neonatal, post-neonatal, and infant mortality (Chou, Liu, Grossman, & Joyce, 2010), birth weight (Chevalier & O'Sullivan, 2007; Currie & Moretti, 2003; Güneş, 2015), antenatal, postnatal care, and gestational age (Cantarutti, Franchi, Monzio Compagnoni, Merlino, & Corrao, 2017; Ruiz et al., 2015). Although the importance of father's education is more often neglected in the literature, evidence also suggests that father's education matters for children's health (Chen & Li, 2009), yet to a slightly smaller degree than mother's (Cochrane, Leslie, & O'Hara, 1982).

However, the sole influence of individual characteristics does not tell the whole story. The familial and societal contexts can also influence birth outcomes. The association between maternal stress and birth outcomes has been well established in many and diverse contexts (Beijers, Jansen, Riksen-Walraven, & De Weerth, 2010; Dancause et al., 2011; Torche & Kleinhaus, 2012; Torche, 2011). The marital status and its changing nature in the context surrounding the family have also been shown to be important determinants of birth outcomes (Torche & Abufhele, 2021; Zeitlin, Saurel-Cubizolles, & Ancel, 2002). Additionally, prenatal care and unhealthy behaviors such as smoking or drinking alcohol during pregnancy could also be mechanisms that impact birth outcomes through partners' interaction; for instance, couples could provide emotional support, monitor, and promote attitudes and behaviors that translate into better child health outcomes at birth (Christakis & Fowler, 2011; Duncan, Wilkerson, & England, 2006; Torche & Abufhele, 2021). In what follows, we rely on a combination of theoretical perspectives to conceptualize how parents' interacting characteristics may play a role in shaping birth-related outcomes.

2.2. Parental educational similarity and health outcomes at birth: Theoretical perspectives and potential mechanisms

Family systems and *gender relations* perspectives complement each other as they conceptualize women-to-men relations at two different levels. First, at the couple level, *family systems* theory describes how men and women interact when they live together. This perspective focuses primarily on within-couple dynamics, including the degree of interdependencies between partners and partners' characteristics (Kerr, 2000). Second, at the society level, *gender relations* theory describes how intra-couple dynamics (including within-couple bargaining and decision making processes) are influenced by social norms and perceptions that hinder gender equality (Acker, 1992). Gendered institutions and social norms, and the differential perceptions on women and men's roles within society, manifest in sex gaps in educational attainment, income, distribution of care work, and labor force participation. These societal-level disparities exacerbate within-couple inequalities as they undermine women's conditions, for instance, in terms of bargaining power and income vis-à-vis men (Agarwal, 1997). We capitalize on the intersection of these two theories to elaborate a micro-meso comprehensive view of couples as complex units, embedded in specific gendered contexts.

From a *family systems* perspective, families function based on complex economic and emotional interactions, e.g., for pooling resources, sharing credit, deciding about purchases, or jointly organizing parental practices (Furstenberg, 2005; Kerr, 2000; Minuchin, 1985). Differences in the socioeconomic background between spouses could be a source of disagreement and conflict due to knowledge and information asymmetries and reliance on different systems of values and beliefs. Simple examples could be spouses who observe different religions, or spouses with very different levels of education (Rauscher, 2020). Conversely, between-partner resemblance could favor agreement, comfort, and more aligned decision-making concerning parental practices (Garfinkel, Glei, & McLanahan, 2002; Goldstein & Harknett, 2006; Schwartz, 2013), and therefore potentially affect daily behavior during the prenatal period (e.g., smoking, diet, physical activity, etc.). Although not focused on health outcomes, Beck and González-Sancho (2009) found evidence in support of these mechanisms using US data from the Fragile Families and Child Wellbeing Study. They documented positive associations between parental educational similarity and children's school readiness at age five, postulating enhanced levels of parental agreement about the organization of family life and symmetry in the allocation of time devoted to childcare as underlying mechanisms.

The *gender relations* perspective recognizes that micro-level household dynamics are gendered, i.e., that the role of partners' (dis)similarities on intra-household dynamics interacts with the power imbalances between men and women already at play in society due to rooted social norms and perceptions (Agarwal, 1997). For instance, this theory suggests that in patriarchal contexts women's intrahousehold bargaining power is undermined by societal norms that confine their role to care work. Where male breadwinner models are prevalent, men are expected to financially provide for the family; therefore, they are expected to have access to wealth-generating property including productive assets, land, educational credentials, social/professional

networks, government support, and labor-market skills (Agarwal, 1997). Conformity to these expectations is socially rewarded as several institutions act upon gendered premises (Acker, 1992). In contrast, couples that do not fit into this pattern "threaten" gender norms, are more often subject to social accountability, and risk incurring into negative societal judgments (Brines, 1994).

In addition, although in high-income societies differences between men and women in socioeconomic outcomes such as educational attainment have narrowed and even reversed – including in Chile (OECD, 2021) – sex-differences in salaries, labor force participation rates, and the propensity of having part-time jobs persist, suggesting that traditional gender roles and expectations are still present and pressing in contemporary societies (Bittman, England, Sayer, Folbre, & Matheson, 2003; England, Levine, & Mishel, 2020; Litman et al., 2020). These may diminish both the overall level of resources and the societal acceptance of couples where women perform traditionally 'male' roles, and may further translate into negative societal inputs for mothers in these positions (Blossfeld, 2009). In other words, there might be a tension – or at least a lag – between increasing gender equality in institutions – what Goldscheider, Bernhardt, and Lappegård (2015) define as the "first phase" of the gender revolution – and shifting gender roles within the household – the "second phase" of such revolution.

Hence, *family systems* and *gender relations* theoretical perspectives combined suggest that birth outcomes may be influenced not only by individual characteristics of the parents, but also by the different micro-level household dynamics stemming from couples' relative similarities and the societal context in which these are embedded. Take educational attainment as an example – the wealth-generating characteristic we measure in our analysis due to data availability and to its relevance for the Chilean context. Under this perspective, educational attainment is a fundamentally different resource for men and women within a couple. For the former, high educational attainment is somewhat "expected," and its lack may be viewed as a personal failure. For the latter, instead, high educational attainment could be seen as an "achievement," as well as a feature that threatens gender norms and creates strong status inconsistencies within the household. As such, high educational attainment for women may be conducive to sources of distress that accentuate the gendered nature of intrahousehold dynamics. Among couples with different educational backgrounds, women's educational attainment relative to men's substantially affects the resources, knowledge, and practices that may eventually boost or hinder infant health, including birth outcomes via the prenatal context. Sex-differences in labor-market returns to education – higher for men, on average, including in Chile (Blagrave & Santoro, 2017; Sánchez, Finot, & Villena, 2020) – suggest that the availability of resources differs between couples of highly-educated women and less-educated men (hypogamy) and couples of highly-educated men and less-educated women (hypergamy). If women have, on average, lower salaries than men conditional on educational attainment and type of job, hypogamous couples will have fewer resources than hypergamous ones.

When thinking about status inconsistencies between partners, research has shown how higher socioeconomic status among female partners, measured in terms of relative educational attainment, employment status, and share of earnings, may be associated with higher instances of intimate partner violence (Behrman, 2019; Weitzman, 2014). In these two cases, the central idea is that men feel threatened by women with relatively higher levels of achievement and they try to regain status within the couple by, for instance, exerting violence, a series of phenomena referred to as 'backlash effects' or 'gender deviance neutralization' (Brines, 1994; Weitzman, 2014). Although evidence of this specific phenomenon for Latin America is scant, the high levels of intimate partner violence in the region suggest that intrahousehold dynamics in Chile are likely to be gendered, and that a higher relative socioeconomic status among female partners may trigger unexpected reactions on the part of their male partners (WHO, 2013).

To summarize, the interaction between intrahousehold dynamics and broader societal forces creates diverse configurations of resource-availability, union (in)stability, and exposure to stress/discomfort across couples with different educational composition (homogamous vs. heterogamous). These diverse configurations are relevant for understanding variability and inequality in infant health outcomes because, during the prenatal period, partners' differences in decision-making processes likely accentuate, and social accountability increases (Rauscher, 2020). Pregnancies imply changes in couples' daily lives and behaviors (e.g., dietary restrictions, less physical activity, higher hormone levels, etc.), as well as in the degree of attention that partners receive from family members, close relatives, friends, and society.

2.3. Geographical context

Socioeconomic and demographic transformations, along with persistent levels of inequality and slowly-changing gender roles, are likely to play a role in the extent to which parental educational similarity or dissimilarity are associated with children's outcomes in the Chilean context. Cross-sectional evidence indicates that Chile features very strong barriers to intermarriage at the top of the educational distribution but a more fluid exchange elsewhere (Torche, 2010). Evidence regarding the evolution of assortative mating is, however, scant. Using data from the Chilean National Socioeconomic Characterization Survey (CASEN), Bucca and Urbina (2016) found that educational homogamy decreased between 1990 and 2013, and the combination of college expansion and higher labor-force participation of women favored the formation of highly educated and high-earner couples. Esteve, McCaa, and López (2013) used census data from the Integrated Public Use Microdata Series (IPUMS) and showed that educational homogamy in Chile increased since the 2000 s, being highest among college graduates, yet it did not increase among individuals with less than primary education. These studies provide a good background, yet assortative mating patterns for couples with children – the analytical focus of this paper – may differ from the above-documented trends. Table 1 suggests that births from homogamous parents modestly increased over the period (69.6 % in 1990 and 71.6 % in 2015). Births from hypogamous couples also increased over time, from 11. 7 % in 1990 to 15.2 % in 2015, while births from hypergamous couples decreased from 18.7 % in 1990 to 13.2 % in 2015. If, as hypothesized, children from these different couple configurations (homogamous, hypogamous, hypergamous) feature differential outcomes at birth, the above trends could directly affect the intergenerational transmission of disadvantage. For instance, as the prevalence of hypogamy is increasing (Table 1), if children from hypogamous couples feature worse infant heallth relative to their homogamous counterparts, this could amplify the intergenerational transmission of inequalities.

Even though over the last 30 years Chile has excelled for its high levels of socioeconomic development accompanied by dramatic educational expansion (Torche, 2005), gender inequality is still a pressing issue in the Chilean society, where traditional gender-role beliefs persist (Center for Reproductive Rights, 2010; Contreras & Plaza, 2010). A 2010 study by the United Nations Development Programme (UNDP) reported that 62 % of Chileans were opposed to full gender equality.

Table 1
Distribution of births according to couples' educational similarity in Chile, percentage of couples with children in each group by selected years.

Year	Homogamy	Hypogamy	Hypergamy
1990	69.6	11.7	18.7
1995	69.8	12.4	17.8
2000	69.7	13.1	17.2
2005	69.7	13.5	16.8
2010	71.2	13.8	15.0
2015	71.6	15.2	13.2

Source: 1990–2015 Birth records, Chilean Ministry of Health.

Many of those surveyed – around 18 % – expressed the belief that women should limit themselves to the traditional roles of mother and wife (Estrada, 2010). Also, Boncompte and Paredes (2020) showed that while Chilean men and women positively value their partner's income, women give a far higher valuation to their partner's earnings than men do. As far as educational expansion is concerned, efforts have been made to reduce the gender gap, which has been narrowing between 1990 and 2015 (Ministerio de Desarrollo Social, 2018). Attendance rates increased for all levels of education, and existing gender differences in attendance tend to favor – albeit marginally – women (ComunidadMujer, 2018; OECD, 2021). When focusing on women with children only – the group of interest in the current study – we observe that educational attainment among mothers in Chile has improved over the last 25 years. In 1990, 36.5 % of mothers had primary education, and only 9.5 % had tertiary education, while these same percentages were 9.3 % and 37.5 % in 2015, respectively (Fig. 2).

Moreover, gender inequalities within the household are starker (Contreras & Plaza, 2010). Since childhood, women disproportionately suffer from the unpaid care work burden. Limited existing data suggest that between the ages of 5 and 17, girls spend 50 % more hours per week than boys doing housework and that this pattern does not improve over time. Work-inactive women continue to be much more numerous than their male counterparts, and the main reason women report to explain their inability to study or hold a paid job is related to domestic chores (ComunidadMujer, 2018).

The reduction in the gender gap in education and labor force participation, combined with the persistence of gender inequalities within and outside of households make Chile an interesting case study for this analysis. This confluence of circumstances allows us to examine whether parental educational similarity is associated with children's outcomes, and whether the evidence is consistent with the mechanisms outlined through the combination of theoretical perspectives outlined above. Slowly-changing gender roles make Chile a peculiar setting compared to, for instance, contexts in which narrowing gender gaps in education and labor force participation have also been accompanied by gradual changes towards more equal social norms regarding the status of women in society, such as the United States. As such, the study by Rauscher (2020) constitutes a key point of reference for our work, yet there is no a priori reason to expect our findings to align with those documented in the US context. Given that Chile still features very high gender inequalities both within households and outside of households, which suggests that Chile is far from an "ideal" of gender equality, we expect social norms to play a stronger role in the Chilean context, thus leading to an array of different potential outcomes relative to evidence from other contexts.

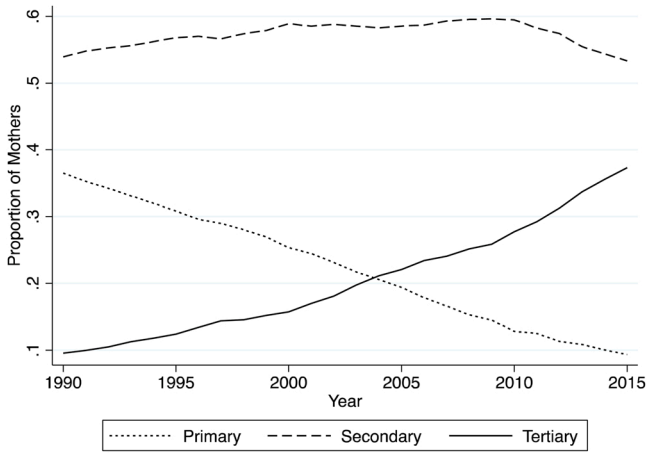

Fig. 2. Time trends in mothers' educational attainment in Chile between 1990 and 2015
Source: 1990–2015 Birth records, Chilean Ministry of Health.

2.4. Hypotheses

Exploiting (i) heterogeneity across parents' average level of education, (ii) variation across different couple configurations in terms of educational attainment (hypogamy/homogamy/hypergamy), and (iii) municipality-level information on female labor force participation (FLFP), we empirically evaluate the following hypotheses:

H1. (*Homogamy-benefit*): Educational homogamy is positively associated with desirable birth outcomes relative to educational heterogamy. Specifically, parental educational homogamy is negatively associated with the probability of having low-weight and preterm births. If this is confirmed by the data, we speculate that the positive association may ensue from enhanced complementarity in parental inputs towards child production, better relationship quality and stability, and less conflicting decision-making processes among partners with similar educational backgrounds.

H2. (*Homogamy-heterogeneity*): As the existing literature suggests that higher socioeconomic status (SES) couples in Chile are increasingly homogamous and higher-SES couples hold a higher level of (pooled) resources, we hypothesize that couples' educational similarity may matter differently for people at different places in the educational distribution. Specifically, educational homogamy is more positively associated with desirable birth outcomes at the higher end of the educational ladder.

H3. (*Heterogamy-heterogeneity*): As the group of educationally-heterogamous couples is heterogeneous, we hypothesize that the association between parental educational similarity and birth outcomes may differ depending on the couple configuration, with a relationship that is contingent on the sex of the most-educated parent:

H3a. : If the mother is the more-educated parent (hypogamy), we expect a negative association between parental educational dissimilarity and infant health. In line with the aforementioned theoretical perspectives, this negative association may be due to lower combined household resources (driven by lower labor-market returns for women) and less conformity to traditional gender norms.

H3b. : In line with dose-response and boundary-crossing approaches (Mare, 1991), we expect a stronger association (in absolute value) between parental educational dissimilarity and infant health the wider the differences in spouses' educational levels.

H4. (*Heterogamy heterogeneity, by municipality*): Lastly, we complement hypotheses at the individual level using a meso-level indicator of FLFP at the municipality level proxying for women's social roles and position within society. As further discussed below, previous research has shown that differences in FLFP across contexts constitute a reasonable proxy for gender norms in the Chilean context (Contreras & Plaza, 2010; Ramírez & Ruben, 2015). If social norms surrounding gender are the driving factor underlying the *negative* association between hypogamy and children's outcomes, we might expect to observe worse outcomes the higher the FLFP in the municipality before childbirth. A negative gradient over the FLFP distribution would corroborate the idea of a "double burden" for women that are more educated than their husbands, facing increasing access to labor-market opportunities unaccompanied by more equitable opportunities within the household. A scenario of this kind would be consistent with the idea of breadwinner mothers-to-be experiencing more stress, intra-household conflict, and relationship instability ("double burden" of hypogamy, henceforth).

3. Data and methods

3.1. Data

For this study, we use the birth registry database available through

the Chilean Ministry of Health. The data contain all registered births in Chile from 1990 to 2015 from mothers born between 1950 and 1990. This dataset includes information on children's date of birth, sex, birth weight, birth length, and weeks of gestation. The database also provides information on parents, including age, educational attainment, marital status, municipality of residence, and area of residence (urban versus rural). We focus on singleton births (127,698 out of the 6,583,493 births are multiple births, which corresponds to 2.0 %) to mothers between 25 and 40 years old (2,734,105 are not within this age range, which corresponds to 41.5 % of the total), and we restrict the analysis to cases where information on father's educational attainment is complete (738,510 fathers without information, which corresponds to 11.2 % of the total).

This analytical sample provides an appropriate set of births to test our hypotheses. We restrict the analysis to singleton births because the aetiology of birth outcomes is different for multiple births – e.g., multiple births are more likely to have adverse outcomes such as perinatal mortality (Payne, Campbell, DaSilva, & Koval, 2002). The range for mothers' age allows us to build consistent measures of educational attainment, as by age 25 most women have reached the completion of their educational careers. After age 40, births are uncommon (2 % of the sample). Additionally, fathers' information is necessary to measure couples' educational composition. Children of couples where information on the father was missing (7.3 % of the analytical sample) have a higher prevalence of low birth weight and preterm births (as shown in Appendix Table A1), yet these births are out of the scope of the paper since our analytical focus is on parental educational similarity – a variable which requires both parents' education.

For the last part of the analysis (i.e., to test *H4*), we augment birth records from the Chilean Ministry of Health with data from the National Socioeconomic Characterization Survey (CASEN), a multi-purpose survey providing information about the socioeconomic conditions of the country's different social sectors, its most essential deficiencies, the dimensions and characteristics of poverty, and income distribution of households (Bravo & Valderrama Torres, 2011). The survey is conducted at non-regular intervals (approximately every two years). We obtain information on FLFP and merge it with birth records at the municipality level using the year – preceding the birth – closest to the birth year of the child.

3.2. Measures and summary statistics

We examine two infant health measures, namely LBW, defined as births below 2500 g, and PB, defined as births occurring before 37 weeks of gestation. Analogous outcomes have been investigated in related literature on the topic (Rauscher, 2020; Torche, 2011). We measure parents' educational attainment using a five-category variable based on parents' completed years of education: primary (1–8 years), some high school (9–11 years), high school graduate (12 years), some college (13–16 years) and college graduate (17 years or more). Analogous classifications have been previously adopted and have proven to well adapt to the Chilean society (Bucca & Urbina, 2019).

To measure couples' educational similarity, we construct three related variables, all built through the five-category educational variables for both mothers and fathers. The first one distinguishes educational homogamy from educational heterogamy, i.e., partners who have the same level of education from partners who have different levels of education – irrespective of the specific levels. The second variable has three categories: homogamy (partners who have the same educational attainment), hypogamy (mothers having higher educational attainment than fathers), and hypergamy (fathers having higher educational attainment than mothers). The third variable further splits hypergamous and hypogamous couples into two groups. When the difference in educational attainment is two levels or more, we classify the couple as 'strongly hypogamous' and 'strongly hypergamous.' For example, a couple where the mother has primary education and the father has a high school degree (i.e., two-level difference favoring the father) is classified as 'strongly hypergamous.' Conversely, a couple where the mother has a college education and the father has secondary education is classified as 'strongly hypogamous.' Cases where the difference in educational attainment is just one level (primary vs. some high school, or high school graduate vs. college) are classified as hypogamous and hypergamous. This classification permits to better capture the complexity of crossing educational boundaries in a highly stratified society like Chile (Torche, 2010). In line with *H3b*, we expect the association of hypogamy and strong hypogamy (and hypergamy and strong hypergamy) with birth outcomes to be in the same direction. Yet, we expect the associations to be magnified following a gradient, i.e., exhibiting larger coefficients in absolute values for the groups defined as strong hypogamy (relative to hypogamy) and strong hypergamy (relative to hypergamy).

To assess whether parental educational similarity matters similarly for people at different places in the educational distribution (in line with *H2*), we also construct a measure of average SES at the couple level using completed years of education. We first take the average between spouses and then build terciles by average parental education, or average parental SES. We take this variable as a proxy for the pooled earnings-potential of the couple.

We control for several factors that could be associated with both parental educational similarity and infant health. These include: mother's age, grouped in categories (25–29 years old, 30–34 and 35–40), average parental education using completed years of education and the squared term of this variable to capture potential nonlinearities, parity of the birth (0, 1, 2 and 3 or more), age difference between father and mother, rural/urban residence, region of residence, infant's sex, and year of birth. The region fixed effects account for time-constant region differences in infant health. For instance, if there are regions that have better prenatal programs or regions that have better hospitals, this will be accounted for in the models. Similarly, the year of birth dummies address potential changes over time in infant health; for example, public-policy efforts to reduce smoking during pregnancy could improve birth weight over time.

Table 2 presents mean and percentages of the variables of interest. The first column displays descriptive statistics for the analytical sample.

Table 2
Descriptive statistics – analytical sample and by educational similarity groups.

	Mean or Percent	Mean or Percent		
		Homogamy	Hypogamy	Hypergamy
Low birth weight	4.3	4.3	4.5	4.2
Preterm birth	5.4	5.4	5.6	5.4
Average parental education	11.8	11.8	11.6	12.0
Married	63.3	65.6	59.9	61.3
Mother's age				
25–29	42.9	42.4	44.3	42.9
30–34	35.5	36.0	34.7	35.2
35–40	21.6	21.6	20.9	21.9
Parity				
0	24.3	25.1	28.0	19.4
1	37.7	37.5	39.9	36.2
2	23.9	23.1	21.8	27.2
3 or more	14.1	14.2	10.3	17.3
Father - mother age difference (years)	2.4	2.4	2.1	2.9
Male infant	52.1	51.2	51.1	51.1
Urban residence	89.8	88.5	89.9	92.8
Obs.	3,481,584	1,884,290	741,018	856,276

Note: Mother's education in this table is reported in three categories, as that is how we use it as control. However, the main variable in the analysis – parental educational similarity – is built using a five-category education variable for both mothers and fathers.

The other three columns disaggregate descriptive statistics according to couples' educational similarity. On average, there were 134 thousand births per year to couples where information for fathers and mothers is available. Among these total births, 54.1 % occurred to homogamous couples, 21.3 % to hypogamous couples, and the remaining 24.6 % to hypergamous couples. The prevalence of low weight and preterm births in the overall sample is 4.3 % and 5.4 %, respectively. These low prevalences are in line with Chile's level of development and improvements over time in prenatal and maternal care (Gonzalez et al., 2009; Lopez & Bréart, 2012).

Table 2 also provides the first indication that children from hypogamous couples exhibit worse health outcomes, i.e., higher prevalence of LBW and PB, compared to homogamous and hypergamous couples. Homogamous couples are more likely to be married and to live in rural areas than couples with unequal levels of education. In line with what we might expect on the relationship between educational homogamy and age homogamy, the group with the biggest age difference between the father and the mother is the hypergamous group. In contrast, the hypogamous group presents the smallest age gap.

Although the overall percentages of LBW and PB and the differences across couples' educational similarity groups are low, the significance of our results should be assessed in light of the total number of births. For example, for the overall sample, the 0.02 %-point difference in the prevalence of LBW between births to homogamous and hypogamous couples (4.5–4.3 % = 0.02) represents, on average, 570 births under 2500 g per year. Over 15 years, we see this difference as constituting a source of concern for health-related public policies, as it involves more than eight thousand births.

3.3. Analytical approach

We estimate a series of logistic regression models predicting (1) the probability of LBW and (2) the probability of PB, separately. We run three different specifications depending on the measure of educational similarity used. The first specification includes a two-category variable of educational similarity (homogamy vs. heterogamy). This specification provides a first simple test of the *homogamy-benefit hypothesis* (*H1*) and the homogamy-benefit hypothesis by average parental SES (*H2*). In the second specification, we use a the three-category educational-similarity variable (homogamy, hypogamy, and hypergamy) to examine further the role of couples' educational composition and within-couple gender dynamics (*H3*). This specification tells us whether and, if so, how the direction of the difference in educational attainment – whether it favors the mother or the father – is related to birth outcomes (*H3a*). In the third specification, we test the sensitivity of the results obtained using a five-category variable of educational similarity to compare health outcomes across homogamous, hypogamous and strongly hypogamous, and hypergamous and strongly hypergamous couples (*H3b*). To test whether the association between hypogamy and children's outcomes is more negative as FLFP increases, we rely on the second specification – homogamy/hypogamy/hypergamy – and interact this couple-level educational composition with municipality-level FLFP (*H4*).

We present results from models controlling for average parental education, average parental education squared, mother's age at birth, marital status, age difference between father and mother, parity, child sex, year of birth of the child, area (urban/rural), and region of residence of the mother. The following equation presents the generic form of the models we estimate:

$$\text{logit}(p_{it}) = \ln\left(\frac{p_{it}}{1-p_{it}}\right) = \alpha + \beta educ\_sim_i + \gamma x_i + y_t \quad (1)$$

where $p_{it} = \Pr(D_{it} = 1|X_i)$ and D_{it} is the dichotomous birth outcome (low-weight birth, preterm birth) for the child born to couple i in year t, $educ\_sim_i$ is the couple's educational similarity at the time of birth (two-, three- and five-category variables); x_i is a vector of observed characteristics of the child and the mother at the time of delivery (including the region of residence), and y_t is a year-of-birth fixed effect. We estimate robust standard errors, yet note that given the use of data for the entire population of Chilean births, significance tests are used mostly heuristically (in line with the discussion included in Torche, 2011).

For the models interacting couples' educational composition with municipality-level FLFP, besides the controls mentioned above we added a variable for the poverty level in the municipality (to capture contextual economic conditions) and the female-to-male ratio in earnings in the municipality (to capture gender inequalities in pay). To show these results, we display predicted probabilities of low birth weight and pre-term birth at different levels of municipality FLFP, while full analyses and coefficient estimates are provided in the Appendix.

To test the sensitivity of our results to potential confounding and/or selection concerns, we also (i) rerun analyses restricted to first births, and (ii) run analyses on a restricted sample of step-siblings to account for the fact that maternal preferences for particular characteristics in a partner could influence educational similarity and infant health simultaneously, thus biasing our estimates. The sub-sample of step-siblings is a matched sample of infants born to the same mother but a different father, meant to isolate maternal characteristics and allowing to estimate the educational-similarity coefficient more accurately, arguably reducing selection effects.[4] To identify changes in father, we use the father's age and mothers' identification number. If the father is the same for two (or more) records with the same mother's id number, his age must be consistent at the time of each birth (e.g., if two children were born three years apart, the father must be three years older by the time of the second birth). Inconsistencies in father's age may indicate that the father is a different person. We acknowledge that age inconsistencies may also be due to misreporting and lack of precision when reporting fathers' age. To minimize the influence of misreporting, we only consider different fathers in cases where the inconsistency is larger than five years.

4. Results

4.1. Educational homogamy

Table 3 presents odds ratios from logistic regressions predicting LBW (1) and PB (2) as a function of parental educational similarity (homogamy vs. heterogamy). Our results provide evidence aligned with the *homogamy-benefit hypothesis* (*H1*) when the whole heterogamy category is taken as reference. Parental educational homogamy is associated with a reduced probability of LBW and PB, i.e., positive birth-related outcomes. Specifically, the odds of being LBW and PB for an infant born to a homogamous couple are 2.0 % and 2.2 % lower than those of an infant born to an heterogamous couple. Coefficients on control variables display expected associations with birth outcomes in terms of magnitude and direction. For instance, LBW is less prevalent among more educated parents and the relastionship is not linear (for PB average parental education is not statistically significant). Maternal age is negatively associated with birth outcomes. Compared to first births, being in higher parity groups is associated with a lower probability of having LBW and PB. In contrast, a wider age difference between parents is associated with a higher probability of experiencing adverse birth outcomes. Lastly, boys face a lower probability of being low birth weight but a higher probability of being born before 37 weeks of gestation, in line with the literature (Eriksson, Kajantie, Osmond, Thornburg, & Barker, 2010). Appendix Table A2 reports the same specification separating mothers by birth cohort and shows that the *homogamy-benefit hypothesis* holds more

[4] We nonetheless acknowledge that the stepsibling analyses cannot fully address selection into relationships, as maternal preferences for particular characteristics also shape the choice of a second partner.

Table 3
Logit models on the association between parental educational homogamy and birth-related outcomes (odds ratios reported).

	(1) Low birth weight	(2) Preterm birth
Homogamy (ref.: Heterogamy)	0.980 ***	0.978 ***
	(0.005)	(0.005)
Average parental education	0.958 ***	1.005
	(0.004)	(0.004)
Average parental education squared	1.000 *	0.999 ***
	(0.000)	(0.000)
Married	0.998	1.033 ***
	(0.006)	(0.005)
Age mother 30–34 (ref.: 25–29)	1.165 ***	1.155 ***
	(0.007)	(0.007)
Age mother 35–40 (ref.: 25–29)	1.523 ***	1.481 ***
	(0.011)	(0.010)
Parity 1 (ref.: 0)	0.622 ***	0.760 ***
	(0.004)	(0.005)
Parity 2 (ref.: 0)	0.634 ***	0.852 ***
	(0.005)	(0.006)
Parity 3 or more (ref.: 0)	0.652 ***	0.938 ***
	(0.006)	(0.008)
Father - mother age difference	1.002 ***	1.003 ***
	(0.000)	(0.000)
Sex child: Boy (ref.: Girl)	0.942 ***	1.181 ***
	(0.005)	(0.006)
Urban (ref.: Rural)	1.041 ***	1.093 ***
	(0.010)	(0.010)
Constant	0.078 ***	0.037 ***
	(0.003)	(0.001)
Obs.	3481,584	3481,584

Notes: Odds ratios reported. Robust standard errors in parentheses.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

strongly for more recent birth cohorts.

Results in Table 4 explore heterogeneity in the applicability of the *homogamy-benefit hypothesis* by average parental SES as measured by average education grouped in terciles. Findings partially align with the idea that educational homogamy is more positively associated with desirable birth outcomes at the higher end of the educational ladder (*H2*), with a clear gradient across terciles for PB. Coefficients for the third tercile suggest that the odds of being PB for an infant born to a homogamous couple are 4.1 % lower than those of an infant born to a heterogamous couple, compared to the 2.6 % in the first tercile.

4.2. Educational hypergamy and hypogamy

Recognizing that the group of heterogamous couples is heterogeneous, models presented in Table 5 (Panel A) separate heterogamous couples into two groups, hypogamous and hypergamous. These models show that, relative to homogamy, hypogamy is negatively associated with measures of infant health (*H3a*). Specifically, the odds of being LBW and PB for an infant born to a hypogamous couple are 3.7 % and 3.8 % higher than those of an infant born to a homogamous couple, respectively. Relative to homogamy, hypergamy is not statistically significant for LBW or PB, suggesting that homogamous and hypergamous couples are statistically similar when it comes to infant health. For full-model estimates reporting all controls, see Appendix Table A3.

Estimates in Figure 5, Panel B show that these findings are consistent under a stricter definition of hypergamy and hypogamy that separates strong hypogamy from hypogamy, and strong hypergamy from hypergamy. According to these latter results, hypogamy is negatively associated with both infant health outcomes, while hypergamy is not statistically significant. As expected, the larger the differences in the educational levels of the parents for hypogamous couples, the stronger the association in absolute value between couple educational composition and birth-related outcomes (*H3b*). For instance, the *negative hypogamy gradient* is such that the odds of being LBW for an infant born to a hypogamous and strongly hypogamous couple are 3.1 % and 4.9 % higher, respectively, than those of an infant born to a homogamous couple. For PB, the negative hypogamy gradient is such that the odds of being PB for an infant born to a hypogamous and strongly hypogamous couple are 2.7 % and 6.6 % higher, respectively than those of an infant born to a homogamous couple. For full-model estimates reporting all controls, see Appendix Table A4.

In light of the well-established positive relationship between parental education and child health (Chou et al., 2010; Currie & Moretti, 2003), the finding that when mothers outrank their partners in terms of educational attainment their babies are more likely to face adverse health conditions at birth is worth some reflections. One mechanism that could be driving this negative association – note that with administrative records we have no way to explicitly test this mechanism – is the high stress that breadwinner mothers in this group might face during the prenatal period. Higher stress levels could eventually translate into worse outcomes for newborns. There is reason to suspect that in Chile women in hypogamous relationships might face challenges that are unique to their position within the couple. These challenges exacerbate in a context where hypergamy and homogamy have been more prevalent couple configurations. At the couple-level, a hypogamous setting may imply a double burden for the woman. Being more educated makes women more likely to be the leading financial providers of the household, while gender roles and expectations are still such that a high share of housework and childcare remains under women's responsibility.

4.3. Hypogamy/hypergamy and female labor force participation

To compensate for the lack of adequate data enabling to test mechanisms at the individual level using administrative data, we provide some empirical tests of the idea that women having children in hypogamous couples might be facing a double burden driven by increased participation in the labor market unaccompanied by equitable gender dynamics within the household. In a gender-unequal society such as Chile, stringent social norms around gender may be such that women do not participate in the labor force at all or actively participate in the labor force yet maintain high housework and childcare responsibilities. If this tension exists, we might expect the outcomes of children born to hypogamous couples to be even worse in those municipalities where FLFP before childbirth is higher (*H4*).

Ideally, we would like to have a more precise indicator of societal gender beliefs (e.g., information on norms and values surrounding gender). We resorted to municipality-level FLFP as the former are not available in this data setting.[5] Existing evidence has shown that municipality-level variables such as FLFP are well correlated with societal beliefs and have been used to proxy for gender norms both in Chile (Contreras & Plaza, 2010; Ramírez & Ruben, 2015) and elsewhere (Jayachandran, 2020). Municipalities are geographic and administrative units that act like socio-spatial settings where the main social interactions occur and that in Chile are recognized as important markers of socioeconomic status (Torche & Abufhele, 2021). Nonetheless, to further show that FLFP is a good-enough proxy for social norms around gender, we used external data from the Encuesta Longitudinal de la Primera Infancia (ELPI) from the 2012 and 2017 waves to show that as FLFP (coded in quintiles) increases, views and beliefs around the role of women and mothers in childcare and housework responsibilities become less conservative, following a rather clear gradient between the quintile

[5] We do acknowledge that many other drivers/factors may play a relevant role in explaining the level of heterogeneity we document, such as the role of the local economy and governance, local differences in fertility, culture and norms, differential access to hospitals and specialty care, pollution, travel times, etc. However, the nature of our data (administrative records) does not allow us to test for these channels, which we hope to explore in future research on the topic.

Table 4
Logit models on the association between parental educational similarity and birth-related outcomes, by average parental education terciles.

Average parental education	1st Tercile		2nd Tercile		3rd Tercile	
	Low birth weight	Preterm birth	Low birth weight	Preterm birth	Low birth weight	Preterm birth
Homogamy (ref.: Heterogamy)	0.970 ***	0.974 ***	0.994	1.002	0.980 *	0.959 ***
	(0.009)	(0.008)	(0.011)	(0.010)	(0.011)	(0.009)
Average parental education	0.950 ***	0.986	0.884	1.043	0.966	1.031
	(0.009)	(0.010)	(0.073)	(0.078)	(0.063)	(0.060)
Average parental education squared	1.001	1.000	1.003	0.998	1.000	0.999
	(0.001)	(0.001)	(0.003)	(0.003)	(0.002)	(0.002)
Married	1.023 ***	1.052 ***	0.994	1.041 ***	0.967 ***	1.007
	(0.009)	(0.008)	(0.011)	(0.010)	(0.011)	(0.010)
Age mother 30–34 (ref.: 25–29)	1.170 ***	1.160 ***	1.178 ***	1.175 ***	1.141 ***	1.124 * **
	(0.012)	(0.011)	(0.014)	(0.012)	(0.013)	(0.012)
Age mother 35–40 (ref.: 25–29)	1.523 ***	1.494 ***	1.546 ***	1.511 ***	1.480 ***	1.405 * **
	(0.017)	(0.015)	(0.021)	(0.018)	(0.021)	(0.017)
Parity 1 (ref.: 0)	0.593 ***	0.686 ***	0.619 ***	0.737 ***	0.644 ***	0.820 * **
	(0.007)	(0.008)	(0.008)	(0.008)	(0.007)	(0.008)
Parity 2 (ref.: 0)	0.589 ***	0.743 ***	0.644 ***	0.848 ***	0.675 ***	0.955 * **
	(0.008)	(0.009)	(0.009)	(0.011)	(0.010)	(0.012)
Parity 3 or more (ref.: 0)	0.600 ***	0.811 ***	0.701 ***	0.980	0.699 ***	1.084 * **
	(0.008)	(0.011)	(0.013)	(0.016)	(0.016)	(0.020)
Father-mother age difference	1.004 ***	1.004 ***	1.002 **	1.003 ***	1.000	1.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Sex child: Boy (ref.: Girl)	0.953 ***	1.170 ***	0.959 ***	1.195 ***	0.909 ***	1.182 * **
	(0.008)	(0.009)	(0.009)	(0.010)	(0.009)	(0.010)
Urban (ref.: Rural)	1.038 ***	1.091 ***	1.033	1.071 ***	1.031	1.014
	(0.012)	(0.012)	(0.025)	(0.024)	(0.028)	(0.024)
Constant	0.088 ***	0.047 ***	0.137 ***	0.030 ***	0.067 ***	0.029 ***
	(0.005)	(0.003)	(0.067)	(0.013)	(0.033)	(0.013)
Obs.	1,339,827	1,339,827	1,069,429	1,069,429	1,072,328	1,072,328

Notes: Odds ratios reported. Robust standard errors in parentheses.
*** p < 0.01, ** p < 0.05, * p < 0.1.

Table 5
Logit models on the association between parental educational dissimilarity and birth-related outcomes (odds ratios reported).

Panel A		
	Low birth weight	Preterm birth
Hypogamy (ref. homogamy)	1.037 ***	1.038 ***
	(0.007)	(0.006)
Hypergamy (ref. homogamy)	1.005	1.008
	(0.007)	(0.006)
Constant	0.076 ***	0.036 ***
	(0.003)	(0.001)
Obs.	3,481,584	3,481,584
Panel B		
	Low birth weight	Preterm birth
Hypogamy (ref. homogamy)	1.031 ***	1.027 ***
	(0.008)	(0.007)
Hypogamy strong (ref. homogamy)	1.049 ***	1.066 ***
	(0.011)	(0.011)
Hypergamy (ref. homogamy)	1.009	1.008
	(0.007)	(0.007)
Hypergamy strong (ref. homogamy)	0.995	1.008
	(0.011)	(0.010)
Constant	0.076 ***	0.036 ***
	(0.003)	(0.001)
Obs.	3,481,584	3,481,584

Notes: Robust standard errors in parentheses. Odds ratios reported. Controls for average parental education, average parental education squared, mother's age, married, parity, father-mother age difference, infant's sex, urban residence, region of residence, and year of birth included but not shown. Full models reported in Appendix Table A3 and Table A4.
*** p < 0.01, ** p < 0.05, * p < 0.1

with more FLFP and the quintile with less FLFP (see Table A5 for these additional analyses).

Fig. 3 plotting predicted probabilities of low birth weight (panel a) and pre-term birth (panel b) resulting from the interaction of couple educational composition and municipality-level FLFP provides evidence in line with our expectations.[6] Focusing on panel a, we observe that children born in hypogamous unions have worse LBW than homogamous couples and these outcome worsen as FLFP increases. As FLFP increases from 0.27 to 0.52, the risk of a hypogamous couple to have a LBW infant increases from 0.045 to 0.047. Focusing on panel b, children born in hypogamous unions have worse PB than homogamous couples and these outcomes worsen as FLFP increases (from 0.055 to 0.059), yet these differences are not statistically significant as demonstrated by overlapping confidence intervals. Overall, heterogeneous analyses by FLFP would seem to reflect a gender-norms story that applies to hypogamous couples, confirming the idea of a double burden faced by women. For full-model estimates reporting all controls, see Appendix Table A6 (Table A7 also provides results for hypergamy).

5. Sensitivity analyses

5.1. First births, multi-partnership, and educational upgrading

First births are unique in that, compared to subsequent births, couples face an important life-course milestone with the first child, having had no previous direct experience with childbearing. This uniqueness makes the prenatal context of first births more likely to be influenced by the couple- and community-level mechanisms discussed in this paper. This is also empirically confirmed by the substantially higher prevalence of LBW and PB among first births compared to higher parities (see, for instance, Table 3).

These considerations suggest that the experience gained through a first birth might translate in couples' ability to deliver better health

[6] Note that these are municipality-level averages, hence there are lots of women who do not report *any* work outside of the household in these estimates (out of the labor force).

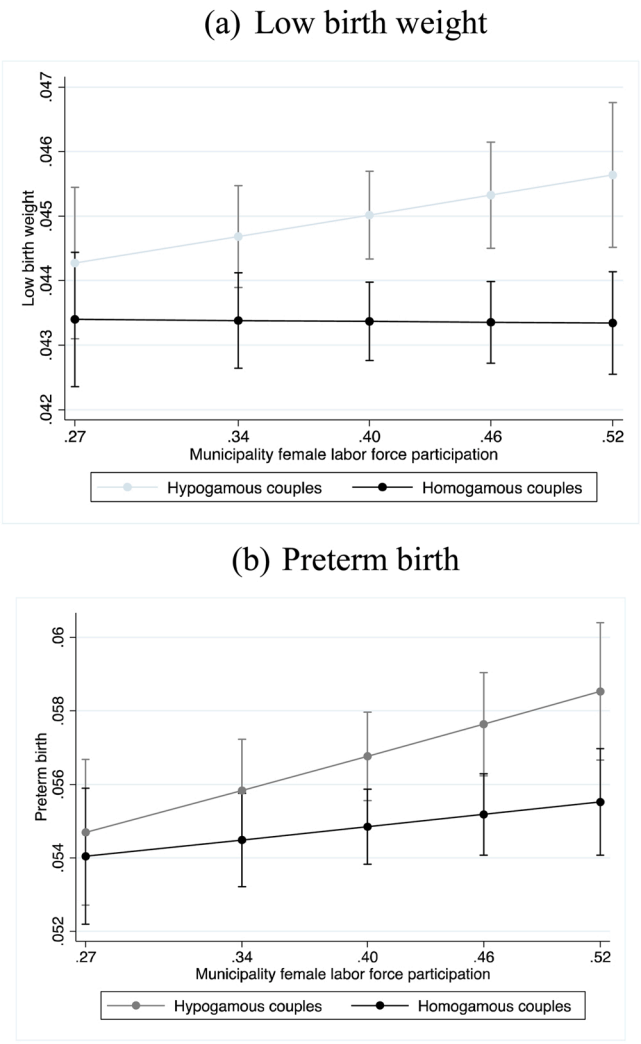

Fig. 3. Interaction effects between hypogamy - homogamy and municipality-level FLFP, predicted health outcomes *Notes:* Predicted probabilities of low birth weight (panel a) and pre-term birth (panel b) resulting from the interaction of couples' educational composition and municipality-level FLFP, for different levels of municipality female labor force participation. Models control for average parental education, average parental education squared, mother's age at birth, marital status, age difference between father and mother, parity, child sex, year of birth of the child, area (urban/rural), region of residence of the mother, poverty level of the municipality, and female-to-male ratio in earnings in the municipality. Statistically significant differences are shown by (non)overlapping confidence intervals in the figures. Corresponding full estimates provided in Appendix Table A6. *Source*: 1990–2015 Birth records, Chilean Ministry of Health, merged with municipality-level information on female labor force participation from the Chile National Socioeconomic Characterization Survey (CASEN).

outcomes for their subsequent children at birth (thus, focusing on first births would represent an "extreme-case scenario"). After first birth, couples are better equipped to deal with differential preferences and informational asymmetries when they move on to have a second or third child. Indeed, gaps in preferences and information may disappear as couples continue to live together and decide to have more children. In short, higher-order births take place in substantially different contexts compared to first, thus making them less comparable to first births (Khan & Raeside, 1998; Zhang et al., 2019). In addition, when analyzing births of all orders combined, there is the potential influence of educational upgrading (i.e., obtaining more education after having had the first child) and change in partners after first birth. These influences can be minimized by focusing the analysis on first births.

Table 6 Panel A shows the homogamy versus heterogamy models (same as Table 3) for first births only, while Panel B shows the homogamy vs. hypogamy vs. hypergamy models (same as Table 4) limited to first births. Results are entirely in line with Tables 3 and 5. The coefficients have the same sign and magnitudes and are further strengthened. Educational homogamy is positively associated with health outcomes (OR<1). Specifically, the odds of being LBW and PB for an infant born to a homogamous couple are 3.0 % and 4.3 % lower than those of an infant born to a heterogamous couple.

Within the group of couples with different levels of education (Panel B), we observe similar differences as those documented above: hypogamy is negatively associated with LBW and PB (OR>1). Specifically, the odds of being LBW and PB for an infant born to a hypogamous couple are, respectively, 5.6 % and 6.8 % higher than those of an infant born to a homogamous couple. For full-model estimates reporting all controls, see Appendix Table A8.

5.2. *Selection into couples*

How couples partner is not random. Maternal preferences for particular characteristics in a partner could influence educational similarity and infant health simultaneously. If this is the case – and since these preferences are ultimately unobserved factors – our results can be biased. To partly address the potentially endogenous relationship between parental educational similarity and infant health, we use a subsample of step-siblings to rule out the possibility that some unobserved maternal characteristics might explain both partner selection and infant health.

The step-sibling sample corresponds to a matched sample of children born to the same mother but different father. Using this subsample, we compare the prevalence of low weight and preterm births among homogamous vs. heterogamous, homogamous vs. hypogamous, and homogamous vs. hypergamous couples, only in cases where one child had a bad outcome (dummy=0) and the other a good outcome (dummy=1). Results are reported in Table 7, with full-model estimates including all controls in Appendix Table A9. If our previous results were solely driven by mothers' selection into homogamous and heterogamous couples, we would not observe significant associations between couples' educational similarity and birth outcomes in the step-sibling sample. Results from Table 7 suggest that selection does not seem to be the driving factor behind the associations reported in Tables 3, 4, 5, and 6. Homogamy is positively associated with infant health relative to heterogamy (Panel

Table 6
Models on the association between parental educational similarity and dissimilarity and birth-related outcomes, first births only (odds ratios reported).

	A. Homo/hetero		A. Homo/hypo/hyper	
	Low birth weight	Preterm birth	Low birth weight	Preterm birth
Homogamy (ref. heterogamy)	0.970 ***	0.957 ***		
	(0.010)	(0.009)		
Hypogamy (ref. homogamy)			1.056 ***	1.068 ***
			(0.012)	(0.012)
Hypergamy (ref. homogamy)			1.001	1.017
			(0.013)	(0.013)
Constant	0.091 ***	0.047 ***	0.088 ***	0.046 ***
	(0.007)	(0.004)	(0.006)	(0.003)
Obs.	846,861	846,861	846,861	846,861

Notes: Robust standard errors in parentheses. Odds ratios reported. Controls for average parental education, average parental education squared, and mother's age, married, father-mother age difference, infant's sex, urban residence, region of residence, and year of birth included but not shown. Full models reported in Appendix Table A6.
*** p < 0.01, ** p < 0.05, * p < 0.1

Table 7
Fixed effects models on the association between parental educational similarity and birth-related outcomes (odds ratios reported).

	A. Homo/hetero		A. Homo/hypo/hyper	
	Low birth weight	Preterm birth	Low birth weight	Preterm birth
Homogamy (ref. heterogamy)	0.884 *	0.894 *		
	(0.057)	(0.051)		
Hypogamy (ref. homogamy)			1.205 **	1.130
			(0.105)	(0.087)
Hypergamy (ref. homogamy)			1.067	1.107
			(0.089)	(0.083)
Obs.	4992	6476	4992	6476

Notes: Controls for average parental education, average parental education squared, married, parity, father–mother age difference, infant's sex, urban residence, region of residence, and year of birth included but not shown. Full models reported in Appendix Table A7.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

A). Disentangling the heterogamous group suggests that hypogamy is negatively associated with birth outcomes, while hypergamous and homogamous couples are not statistically different (Panel B). Estimated coefficients from the matched sample of step-siblings are far higher in magnitude, yet we do not comment on the latter in order to remain conservative. It is also worth noting that variation across different fathers' education requires either a separation or bereavement, complex phenomena which may limit the generalizability of these results. Corresponding OLS estimates including all children are reported in Appendix Table A10 and show comparable results.

6. Discussion and Conclusions

Social scientists have had a long-standing interest in how interactions among family members and their characteristics have implications for the health and wellbeing of the family and its members (Brown, Manning, & Stykes, 2015; Case & Paxson, 2002; Rauscher, 2020). Understanding parents' interacting characteristics is vital for illuminating a whole range of dynamics in the demographic makeup of households, including children's outcomes. In this study, we have placed an exclusive focus on the relationship between parental educational similarity and children's health at birth. From a theoretical standpoint, parental educational similarity could be beneficial for children's outcomes to the extent that it implies complementarity in parental inputs towards childbearing and childrearing, reduced maternal stress, enhanced relationship quality, and reduced conflict. Higher resources ought to be associated with better child outcomes, as well as births to better-educated individuals should be more likely to exhibit positive outcomes. The reality is more complex among couples with diverging socioeconomic characteristics than among couples with similar ones. Couple composition matters for birth outcomes because within-couple and parent-to-child interactions occur in non-neutral contexts. By non-neutral contexts we refer to situations in which men and women's returns to education favor men, and where specific couple configurations fit better with established social norms than other – e.g., rising educational hypogamy that challenges the idea of male economic dominance. Consequently, in non-neutral contexts we may observe unexpected relationships between joint parental characteristics and birth outcomes.

We have used rich data on births occurring in Chile between 1990 and 2015 – combined with municipality-level information obtained from an ancillary survey – to assess whether, empirically, the associations observed are in line with some of the above expectations. Although we could not test for detailed mechanisms due to the nature of the data (administrative records), our results suggest that educational homogamy is positively associated with desirable birth outcomes. Compared to parents with different levels of education, parents with the same level of education face a lower probability of having low-weight and preterm births (*H1*). This result aligns with recent evidence from the US (Rauscher, 2020), and the specific result for Chile adds to the existing literature by showing that the *homogamy-benefit* hypothesis also holds in a country that has only recently joined the rank of high-income societies. Furthermore, our analysis suggests that the *homogamy-benefit hypothesis* more strongly holds at the high end of the educational distribution for PB (*H2*), a finding which is consistent with the observation that higher-SES couples in Chile are increasingly homogamous (Bucca & Urbina, 2019; Esteve et al., 2013).

The coefficients that support these claims are small compared to other determinants of birth outcomes (e.g., parity, mother's age); however, they are comparable in size to other meaningful social markers in the Chilean society, namely, being married or in a union. Also, evidence suggests that the prevalence and relative importance of marriage for children's health outcomes is declining over time (Torche & Abufhele, 2021), while the prevalence of hypogamous couples and female labor force participation are increasing. Hence, the assessment of these relatively small associations remains an important endeavor in light of a rapidly-changing society.

Two important observations follow from the homogamy-benefit result. First, benefits related to parental educational homogamy may have far-reaching implications due to the well-established associations between birth outcomes and developmental and socioeconomic conditions throughout the life course (Case & Paxson, 2010; Gluckman, Hanson, Cooper, & Thornburg, 2008; Pakpahan, Hoffmann, & Kröger, 2017). Second, to the extent that educational homogamy is more prevalent among highly-educated groups, homogamy-related benefits may contribute to perpetuating socioeconomic inequalities both within and across generations.

Relatedly, we also showed in an incremental manner that testing the *homogamy-benefit* hypothesis does not tell the whole story and that the benefit of homogamy is only apparent when the reference group is made up of hypogamous couples, which feature the worst infant-health outcomes. In unequal societies where gender roles and expectations still draw heavily on the male-breadwinner family model, the educational composition of heterogamous couples may imply different levels of maternal stress or conflict between partners. Our second set of results is in line with these predictions, and our test for selection using the matched sample of step-siblings suggests that our findings are not only driven by selection issues. Moreover, stronger results among first births (a set of births with higher risk of negative outcomes) further support these claims. The relationship between heterogamy and birth outcomes depends on who in the couple is the more educated partner (*H3*). When the woman is the more-educated one (hypogamy), educational heterogamy is negatively associated with birth outcomes; when the man is the more-educated one (hypergamy), results between homogamy and hypergamy are not statistically different.

Why would hypogamous couples exhibit worse infant health than homogamous or hypergamous couples? We speculated on two potential explanations and provided indirect empirical support for the latter using additional data on FLFP at the municipality level. First, and in line with the above discussion, hypogamy is a less traditional couple configuration as men have historically outpaced women in educational attainment; it is only in relatively recent cohorts – 1972 is estimated to be the birth year of the first cohort to close the gender gap in education in Chile – that women started reaching similar or higher schooling attainment than men (Ganguli, Hausmann, & Viarengo, 2014). The socio-cultural change towards the acceptance of new roles for cohorts of recently-educated women might take longer (Cha & Thébaud, 2009). Educational hypergamy is instead a more socially-accepted couple configuration, and hypergamous couples might suffer less from social stigma. Also, hypergamous couples might have more financial resources

relative to hypogamous couples due to higher returns to education for men in the labor market. These conditions may translate into less within-household conflict, reduced maternal stress, and higher and better investments in children.

Second, a family where the mother has more education than the father likely sees the mother as the primary provider of the household. In a country like Chile, where an egalitarian division of childcare or housework is far from established (Yopo Diaz, 2016; Matear, 1997), a breadwinner mother-to-be might face a double burden, which might again translate into more stress, conflict, and relationship instability. By showing that outcomes of children born to hypogamous couples are more negative in municipalities where women participate more in the labor force, we provided indirect empirical support for the existence of such conflict (*H4*). Using Goldscheider, Bernhardt, and Lappegård's terminology (2015), the Chilean society might still be far from achieving the "second phase" of the gender revolution, and social norms surrounding the role of women might well underlie the associations we document.

Despite several robustness checks, our results should be interpreted with caution. First, we are not claiming that the association between parental educational similarity and infant health is causal. The step-sibling sample allows us to control for unobservable maternal characteristics, but we could not identify an exogenous variation to address all selection issues fully. Relatedly, the step-sibling analyses cannot fully address selection into relationships, as maternal preferences for particular characteristics also shape the choice of a second partner. Second, as mentioned several times, our results do not provide detailed evidence on individual-level mechanisms driving the observed associations. Future research drawing on alternative suitable data sources should investigate behaviors during the prenatal period that could shed light on potential mechanisms. Third, the municipality-level analyses provide a first approximation towards understanding the importance of women's social roles in the Chilean society in explaining the association between educational (dis)similarity and children's outcomes, yet we acknowledge that more and better meso- and macro-level indicators of gender norms – alongside a whole other range of institutional factors – should be explored in further research on the topic. Fourth, the dataset only provides the partnership status – married or unmarried – and it does not contain information on cohabitation. Relatedly, the sex of the partner is not recorded (birth-records questions are directly asked about the "father"), hence we do not have clear information on births from same-sex couples and we cannot generalize results beyond heterosexual couples. Lastly, the birth-records information is entirely provided by the mother, hence the educational level of the father could be measured with error, or be missing altogether. A separate investigation should be devoted to studying the outcomes of children born to single mothers (or "fathers missing") in the Chilean context.

There is an open methodological question in the literature on how to deal with the issue of disentangling the homogamy/heterogamy coefficients from the additive coefficients of mother's and father's education. Identifying the former is made difficult by the collinearity between mother's education, father's education, and the difference between the two (Eeckhaut, Van De Putte, Gerris, & Vermulst, 2013), in a spirit similar to the Age-Period-Cohort (APC) dilemma. Social mobility scholars have dealt with similar issues for decades, and there is an ongoing yet unresolved debate as to what method should be preferred, including alternatives such as Duncan's Square Additive Model (SAM) (O. D. Duncan, 1966), Sobel's Diagonal Reference Model (DRM) (Eeckhaut et al., 2013; Sobel, 1981, 1983), or more recent and elaborate options such as the Mobility Contrast Model (MCM) suitable to analyze heterogeneous effects of mobility (Luo, 2022). In line with related research by Rauscher (2020) and Pesando (2022), in this paper we have opted for simpler model specifications, acknowledging their possible limitations. We chose a specification that – on top of the assortative mating coefficient – includes the average of mother and father's education and its squared term as a way to measure pooled household resources. Nonetheless, we have carefully assessed the sensitivity of the results to alternative model specifications.

Despite the above limitations, the economic, social, and gender norms prevailing in Chile, combined with the sustained inequality and uneven educational expansion that has occurred over the last 30 years (Celhay & Gallegos, 2015; Daude & Robano, 2015; Torche, 2010), provided a stimulating scenario to test the homogamy-benefit hypothesis and its variations in relation to children's outcomes at birth. Moreover, exploring differences between parental-SES groups and heterogamous couples allowed us to understand better the patterns and associations of marital sorting and children's health outcomes. Ultimately, a proper understanding of assortative mating patterns allows to shed light on fundamental changes underlying the demography of the population, the characteristics of family formation, and the reproduction of intra- and inter-generational inequalities. This study was an attempt to move this scholarship forward in the context of Chile, an interesting yet rarely investigated country that has recently joined the rank of the world's wealthiest nations yet keeps maintaining high levels of inequality.

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.rssm.2022.100736.

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