The increasing influence of siblings in social mobility. A long-term historical view (Barcelona area, 16th-19th centuries).

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1. Introduction¹

Parental influence over children's status attainment has historically been argued to be key, with paramount importance placed on the verticality of family relations (Calvi & Blutrach-Jelín, 2010; Clark, 2014; Song et al., 2020). However, the preeminent role of parents does not preclude influence from other family members. For instance, many studies have widened this vertical view to multigenerational ties and to the importance of the extended family (Adlermon, Lindahl, & Waldenström, 2018; Bengtson, 2001; Ruggles, 2010; Song & Mare, 2019). Another influence on social mobility comes from horizontal ties, such as from siblings, which has been scarcely studied for certain historical periods (Boudjaaba, Dousset-Seiden, & Mouysset, 2016; Calvi & Blutrach-Jelín, 2010).

In pre-industrial and pre-demographic transition periods, high mortality meant that many parents died before some of their children reached marriageable age. To this effect, low life expectancy may have meant that 50% of parents did not see all their children married (Pradas, 1997; A. T. Rosés, 1996; van Dijk, Janssens, & Smith, 2019; Willführ, 2009). The number of surviving siblings tended to increase because of the demographic transition (Corsini & Viazzo, 1997). In fact, the relationship between siblings would have been the most long-lasting across individuals' lives, because siblings were of a similar age and so shared more years of life with each other than with their parents (Pradas, 1997; A. T. Rosés, 1996). Besides, siblings would have been more likely to live in the same context and to share experiences and social networks (Davidoff, 2012; Goetting, 1986; White, 2001).

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Sibling relationships have been a focus of recent studies in historical demography. They highlight the decisive cross-sibling influence on social and demographic outcomes and life trajectories, mostly from the 18th century onwards (Baranowska-Rataj, Barclay, & Kolk, 2017; Bras, Kok, & Mandemakers, 2010; Davidoff, 2012; Johnson & Sabeau, 2011; Knigge, Maas, Van Leeuwen, & Mandemakers, 2014; Riswick, 2018; Sabeau, Teuscher, & Mathieu, 2007). Studies covering historical periods on the topic of sibling relationships give continuity to an already existing contemporary look to the topic carried out over the past decades (some examples are (Gilligan, Karraker, & Jasper, 2018; Karhula, Erola, Raab, & Fasang, 2019; Lyngstad & Prskawetz, 2010; Maralani, 2008; McHale, Updegraff, & Whiteman, 2012; Raab, Fasang, Karhula, & Erola, 2014). However, from a historical point of view, the relationship between the number of siblings (sibship size) and social outcomes is not straightforward, but rather points in different directions (Bras et al., 2010; Van Bavel, Moreels, Van de Putte, & Matthijs, 2011; Wall, 1996). There is also a lack of research on how siblings influence other siblings' status attainment for the whole social spectrum with a long-term perspective.

This paper aims to analyze how intra-generational family relationships determine the social destiny of siblings. We take a long-term perspective to establish the changes and continuities that took place between the 16th and the 19th centuries in the Barcelona area, using the unique data compiled in the Barcelona Historical Marriage Database (BHMD). It will contribute to advancing knowledge of social reproduction, broadening the understanding of how family ties were built and kinship operated from a horizontal perspective, a topic that has traditionally been neglected in the literature, and of social stratification and mobility (Alber, Coe, & Thelen, 2013; Engelstein, 2017; Volkom, 2006).

The Barcelona area, or the city of Barcelona and its surrounding area, represents a good study case for the evolving patterns of social mobility and family implications. Throughout the 16th and 17th centuries, wealthy landowning classes were formed as a result of the creation of medium-sized farms due to land transmission by an impartible inheritance system, where the eldest sons were usually the sole heirs, and marriage strategies (García Espuche, 1998). Important economic growth was also observed with the expansion of the vineyard, the export of its products, and a new type of sharecropping contract as a novel way of accessing land (Valls Junyent, 2002). This structural context prompted occupational mobility and the formation of a protoindustrialization, or the relatively early industrialization of Catalonia, starting from the end of the 18th century and creating one of the first industrialized areas of Southern Europe (Marfany, 2016; J. R. Rosés, 1998). Moreover, the area faced an early fertility decline, one of

the first among southern European regions and dating from the first half of the 19th century (Cabré, 1999).

This paper is structured as follows. In section 2, we discuss the theoretical background to siblings' influence on social mobility. In section 3, we present the data used, the main methods applied, and some limitations, in addition to discussing the assumptions adopted. We present the descriptive results with social mobility tables in section 4 and all the multivariate analyses made on social mobility in section 5. Last, in section 6 we conclude the paper with the main findings and discussion.

2. Theoretical background

The few existing historical studies on the social influence of siblings on other siblings show how from the 18th century onwards there was an intensification of horizontal relationships – brothers/sisters and cousins- especially in middle class families (Johnson & Sabeau, 2011), clearly reducing the prevalence of intergenerational relationships (parents and children). Furthermore, in light of emerging industrialization and the configuration of the liberal state, aspects such as the rise of the bourgeoisie, the transformation of the occupational structure, and increasing migrations could also have helped strengthen the emergence of a sibling-based kinship order (Sabeau et al., 2007). However, these works have mostly focused on more industrial periods and on countries like Germany, France, the Netherlands, and England rather than on southern European societies (Johnson & Sabeau, 2011). To this effect, this paper contributes to a more historical view of the topic based on a study area predominantly made up of stem families and an impartible inheritance system, a common characteristic of many Mediterranean societies usually coming under the so-called strong ties societies and based on complex social networks which would include also siblings (Bras & Van Tilburg, 2007; Reher, 1998).

The family relationship between siblings can be understood as a competitive relationship, as proposed by the sociological theory of resource dilution (Blake, 1989), or as a mutually beneficial relationship, which could be understood from the so-called cooperative breeding framework (Kramer, 2010; Sear & Coall, 2011). The resource dilution theory assumes that parents' resources are finite, so the more children they have, the less economic resources, time, and attention can be allocated to each child, resulting in sibling rivalry. However, this theory focuses more on nuclear families and not on integrating the availability and utilization of state and community resources by families (Gibbs, Workman, & Downey, 2016). Moreover, sibling

competition, apart from being a product of the number of siblings (Merry, Bobbitt-Zeher, & Downey, 2020), would also be affected by the birth order and gender of the individuals, all factors that determined their position in the family (Davidoff, 1995; Davidoff & Hall, 2013; Dribe & Lundh, 2009; Van De Putte, Oris, & Matthijs, 2009; Van Poppel & Nelissen, 1999). These aspects would be even more important within certain family, economic, and legal contexts such as inheritance systems (Berkner & Mendels, 1978; Comas d'Argemir, 1988; Ferrer i Alòs, 2004, 2009). Among inheritance systems, those based on a model of impartible inheritance and a single heir, as in the case of Catalonia, could have fostered rivalry, but certainly also constituted a family compensatory framework that nuanced the differences promoted by the system (Barrera-González, 1992; Pujadas-Mora, Brea-Martínez, Jordà Sánchez, & Cabré, 2018).

The opposite view, which understands siblings as resources and not as rivals, comes from evolutionary biology. This literature explains how families maximize the opportunities of all the children using their own resources, whether tangible or intangible, taking an altruistic approach or involving other family members (G. Fertig, 2003; Johnson & Sabeen, 2011; Kurzban, Burton-Chellew, & West, 2015), as would be the case of siblings. In fact, there is empirical evidence of the participation and collaboration of older siblings in the upbringing of their younger siblings, the care of other elderly relatives, and the protection of their widowed parents (Sear & Coall, 2011)².

3. Data and Methods

The Barcelona Historical Marriage Database

The data used for this paper come from the Barcelona Historical Marriage Database, which includes the more than 600,000 marriages that took place in the Diocese of Barcelona between 1451 and 1905, and were registered in the Marriage License Books, which are currently deposited in the Archive of Barcelona Cathedral. This source originated from a categorical and proportional tax levied according to the socioeconomic status of brides and grooms marrying within the Barcelona Diocese. The right to tax marriages was granted to Barcelona Cathedral by Pope Benedict XIII (1394-1423) in 1409 (Carreras i Candi, 1914). The territorial coverage

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² Other complementary theories have shown siblings as a resource for other siblings or, conversely, as competitors. To this effect, we can refer to the Parental Investment Theory (Fisher, 1958; Trivers, 1974), the quantity-quality trade-off (Becker & Lewis, 1973; Becker & Tomes, 1976), and the Conditional Resource Dilution Model (Gibbs et al., 2016). For an extensive literature review on all these theories, which largely present the sibling relationship in this binary situation, see (Öberg, 2017).

of the BHMD corresponds to the Diocese of Barcelona, made up of four deanships: Barcelona, the main deanship called *Oficialitat*, and those of Piera, Vallès, and Penedés. These geographic units covered the main population centers at the time, including Barcelona, Mataró, Sabadell, Terrassa, and a conglomerate of rural towns located in the current counties of Baix Llobregat, Barcelonès, Maresme, and Vallès Occidental, totaling 250 parishes in 1900.

Across the five centuries covered by the source, husbands' first names and surnames were registered (one surname until 1876 and two surnames thereafter), as were those of the (future) wives from 1481. The occupations of the husbands, the marital status of both partners, the tax paid, and the first names and surnames of parents, except for the period 1645-1715, were also always registered. It should be noted that since the books contained all the marriages within the Diocese, it also provided daily recorded annual information on socioeconomic and demographic variables. One of the few pitfalls of this source is that parental occupations were not systematically recorded, apart from the period 1545-1643, and female occupations were rarely recorded.

The source was written in Catalan until 1860, after which the Spanish language was used. The non-existence of standard Catalan until the beginning of the 20th century favored the appearance over time of multiple written variations of the same name, surname, or occupation. All these aspects required a linguistic standardization and subsequent codification of the Barcelona Historical Marriage Database (BHMD) before statistical treatment. To do so, a complete harmonization of the names and surnames was first carried out using onomastic dictionaries (Pujadas-Mora et al., 2018).

Occupational titles were subsequently codified using the Historical International Classification of Occupations (HISCO). This classification enables a specific codification based on a historical adapted version of ILO's ISCO68 (Van Leeuwen, Maas, & Miles, 2002). HISCO occupations have also been classified using two international schemes of social stratification widely used with historical demographic data, namely HISCAM and HISCLASS (Lambert, Zijdemann, Van Leeuwen, Maas, & Prandy, 2013; Van Leeuwen & Maas, 2011). The former works as a ranking ranging from 0 to 99, where the most advantaged occupations have the highest scores and an individualized score is assigned to each occupation, which works as a continuous variable. The latter, on the other hand, establishes social categories based on degree of skill and more classical divisions such as manual and non-manual occupations.

The main objective of this study is the analysis of the influence of siblings on the status attainment of other sibling, so we had to discern how far father or father-in-law influence went, given that the individuals analyzed were measured at the time of marriage. To this effect, family reconstruction with nominative record linkage on marriages was carried out for the 16th-19th centuries. The linkages were first done vertically, parents-children, and then horizontally, linking siblings. These records were linked by integrating two string distances, the Bag distance and the Levenshtein distance, together with a linguistic functionality adapted to Catalan to alleviate the problem of similarity in the spelling of surnames or typographical errors (Villavicencio, Jordà, & Pujadas-Mora, 2015). Family reconstructions were carried out for two specific periods for which the data on parents were available. The first and second periods correspond to the years 1547-1643 and 1715-1880, respectively. Between 1645 and 1715, the record linkage could not be carried out because the names and surnames of the parents were not recorded on the source, as mentioned previously.

From 1547 to 1643 more than 80,000 marriage licenses, be they first or second marriages, were granted in the Barcelona area, while between 1715 and 1880 there were over 290,000. During the 16th and 17th centuries, 13,160 children were linked to their parents, and for the 18th and 19th centuries, 115,000 links were produced. Thus, the total figures for brothers and sisters analyzed for the 16th-17th centuries and the 18th-19th centuries are 2,889 and 32,761, respectively (Table 1). Furthermore, as the purpose of this paper is to analyze siblings' influence on social mobility, only reconstructed families made up of two or more brothers and sisters were taken into account.

Table 1: Number of families with two or more siblings by number of married siblings in the Barcelona area, 16th-19th centuries - Author's elaboration (BHMD).

Families	16th-17th centuries		18th-19th centuries	
N (married siblings)	N (Families)	%	N (Families)	%
2	1,059	36.66	13,501	41.21
3	814	28.18	10,156	31
4	534	18.48	5,568	17
5	348	12.05	2,276	6.95
6	95	3.29	845	2.58
7	24	0.83	306	0.93
8	7	0.24	84	0.26
9	8	0.28	16	0.05
10	.	.	9	0.03
Total	2,889	100	32,761	100

Social mobility measures and analysis

In order to quantify the degree of social-family influence in the 16th-17th and 18th-19th centuries, we applied sets of both descriptive statistics and multivariate analyses. First, we calculated the so-called mobility tables, i.e. double-entry frequency tables of social groups (HISCLASS) of parents and children, and siblings who married first and the rest of siblings. The descriptive results are shown as standardized residuals, which inform about the strength of social endogamy or exogamy. Its interpretation enabled us to determine whether parents and children or siblings belonged to different social groups as a consequence of premeditated transmission or, on the contrary by chance, or in other words as if there were no barriers between social groups. In the first case, values would be equal to or greater than 2 and in the second case values would be equal to or less than -2. These analyses compared the fathers and fathers-in-law with the children and the first-married siblings with the other siblings as a way of charting the socioeconomic intensity of vertical and horizontal ties over time.

In the multivariate analysis, our models estimated the trends of fraternal influence over time through three different specifications. First, we measured the similarity between siblings' socioeconomic levels (HISCAM) using a multilevel model, also called a sibling model. These models allowed us to analyze the similarities between siblings by controlling for the common characteristics they shared because of living in the same family and the geographical and chronological context (Hox, Moerbeek, & Van de Schoot, 2017). The socioeconomic sibling correlation was computed as follows in an only-intercept model, where y_{ij} is the socioeconomic status (SES onwards) (measured with HISCAM classification) of an individual j in family i as

in equation 1. The overall variance can be decomposed into two parts (equation 2), where σ_a^2 is the variance at the family level and σ_b^2 is the variance at the individual level. Last, the sibling correlation or intra-class correlation coefficient in socioeconomic status SES (ρ) was calculated in equation 3.

$$y_{ij} = \beta_{00} + \varepsilon_{0ij} \quad (1)$$

$$\sigma_e^2 = \sigma_a^2 + \sigma_b^2 \quad (2)$$

$$\rho = \sigma_a^2 / (\sigma_a^2 + \sigma_b^2) \quad (3)$$

Second, to strengthen the importance of the influence of siblings on the socio-economic status of the other sibling, we estimated the SES elasticity for the two periods studied (16th-17th and 18th-20th centuries). To do so, we regressed the log SES of second-married or more children (HISCAM) on the log SES (HISCAM) of their parents, parents-in-law (where the information was available), and first-married siblings. This methodology is widely used in intergenerational economic mobility studies, and it has also been used with socioeconomic status (HISCAM) in historical contexts (Björklund & Jäntti, 2000; Corak, 2013; Dribe & Helgertz, 2016; Lindahl, Palme, Massih, & Sjögren, 2015). As can be seen in the next equation, the SES of second-married or more children, $Y_{2nd+ married}$, is a function of the logarithm of $Y_{fathers}$, $Y_{father-in-law}$ and $Y_{1st married}$, where the elasticity (coefficient) for each term reports the fraction of the SES of the ego due to their fathers, fathers-in-law, and first-married siblings.

$$\ln(Y_{2nd+married})_i = \alpha + \beta_1 \ln(Y_{father})_i + \beta_2 \ln(Y_{father-in-law})_i + \beta_3 \ln(Y_{1st married})_i + \varepsilon_i \quad (4)$$

Last, to also capture the influence of siblings in terms of social mobility, we ran several logistic regressions on the likelihood of second-married siblings or more having a different social class (HISCLASS) to their parents' (Y_i). In all the models, we used as predictors the social class of the fathers-in-law and first-married siblings, and whether they had a different class to their fathers. Thus, we were able to control for whether the social mobility or loss of intergenerational transmission (fathers) was due more to another kind of intergenerational transmission related to the fathers-in-law or first-married siblings. We also controlled for a set of sociodemographic variables, such as sibship sizes, marriage order, whether the parents were deceased upon ego's marriage or not, sex, and length of time between parents' and children's marriages (see Table

2). These variables have been shown to be determinants for social mobility, (Derosas & Oris, 2002; Rosenbaum-Feldbrügge, 2019).

$$Y_i = \ln(P/1-P) = \beta(\text{father-in-law variables})_i + \beta(\text{1st married variables})_i + \beta(\text{socio-demographic variables})_i \quad (5)$$

Table 2: Descriptive statistics of the main used variables

Descriptives	16 th -17 th centuries					18 th -19 th centuries				
Main Variables	N	mean	sd	min	max	N	mean	sd	min	max
Marriage years 1st Generation	2889	1572.28	15.25	1518	1594	32761	1795.76	36.56	1715	1850
Marriage years 2nd Generation	2889	1609.55	14.99	1547	1641	32761	1831.08	36.74	1750	1880
Sex Ego (0 Men, 1 Women)	2889	0.32	0.47	0	1	32761	0.45	0.50	0	1
Deceased Father (1)	2778	0.45	0.50	0	1	.	.	.	.	.
Children marriage order	2889	2.61	0.92	2	9	32761	2.51	0.84	2	10
Marriage years difference (Parents-children)	2889	37.27	8.06	16	62	32761	35.32	5.78	11	50
Marriage years difference (1st married sib-others sib)	2889	9.82	7.18	0	39	32761	7.90	5.58	0	36
HISCAM father	2869	52.56	6.39	44.9	99	31952	51.22	6.77	40.54	99
HISCAM parent-in-law	2393	53.22	7.82	44.9	99	4313	52.73	7.18	41	99
HISCAM 1st married sibling	2851	52.97	7.31	44.9	99	31705	51.40	8.27	40.54	99
HISCAM ego	2856	53.30	7.87	44.9	99	31451	51.26	8.52	40.54	99
HISCLASS father	2889	4.02	0.79	0	6	31962	110.96	3128.28	0	6
HISCLASS parent-in-law	2428	3.95	1.00	0	6	4313	68.56	2425.70	0	6
HISCLASS 1st married sibling	2889	4.00	0.97	0	6	31740	166.75	3860.83	0	6
HISCLASS ego	2889	3.97	1.01	0	6	31529	149.13	3636.59	0	6

Data limitation and assumptions

Despite the uniqueness of the BHMD as a long-term source for studying the demographic determinants of social mobility, we should acknowledge some important limitations of its use. The first relates to the territorial coverage and its likely effect on the genealogical reconstitutions, since we would obviously not be able to include children who migrated out of the Barcelona area, and also only married children would be retraceable. In this regard, while such limitations are not resolvable, we can point out that the Barcelona area acted much more as a pole of attraction for migration in the studied period rather than the opposite (Cura, 1992).

A second important point is the way we assume women's occupational status, which is basically using the occupations of their future husbands. This is due to an inherent limitation of

our source for this study (Marriage Licences Book), which did not record the female occupations, unfortunately an extremely common occurrence in most historical studies. A third aspect concerns measuring sibship size only in terms of married children, which is likely to give a biased view of the real family dynamics since not all the siblings married. However, for the period and the area covered, this is almost impossible to obtain due to the non-existence and non-conservation of parish registers and the large territorial extension.

The last and perhaps most important limitation of this demographic study is not having any ages or birth dates, hence the need for caution when assimilating marriage order and birth order, since they may not necessarily have been the same. To this effect, although we do not claim this to be the solution in all cases, there is historical evidence that helps us to at least define that the first-married sibling was generally the eldest one. As mentioned in the introduction, the single-heir system prevailed in the area studied throughout the entire period, the main characteristic of which was that the eldest siblings tended to be the heir. It has been pointed out that the heirs (the eldest) were usually the first to marry (Congost, Ferrer Alós, & Marfany, 2013; Marfany, 2006). However, perhaps the clearest aspect of the eldest single-heir sibling is highlighted by the vast literature arguing that in most societies with impartible inheritance systems they were by far the most likely sibling to inherit the same parental occupation (Arrizabalaga, 2005; Béaur, 2004; Congost, Ros, & Sagner, 2016; Ferrer i Alós, 2009; C. Fertig, Lünemann, & Fertig, 2005). In this regard, we first carried out a descriptive analysis of occupational mobility or inheritance. As can be seen in Figure 1 below, we computed the intergenerational occupational mobility by marriage order over time in the Barcelona area. An increase in occupational mobility can be observed, meaning that over time individuals inherited the same parental occupation less, especially from the 18th century onwards.

In all the periods, the first-married siblings were those with the least intergenerational occupational mobility, meaning that they had the same occupation as their parents to a higher degree than the other children (Figure 1). Interestingly, this divergence between first-married and other siblings is most marked in the period 1750-1799, a time when industrialization and major changes in the occupational structure of the Catalonia area had already started to take place (Brea-Martínez & Pujadas-Mora, 2018). However, the gap in occupational mobility between the first-married and the other siblings is almost 20%, indicating that when 40% of individuals have the same occupation as their fathers, the rate among first-married siblings will be 60%. For this specific reason, we find evidence relevant to this study to assume that eldest siblings were the first to marry.

Figure 1: Intergenerational occupational mobility by marriage order in the Barcelona area (16th-19th centuries). Authors' elaboration (BHMD)

4. Intergenerational and intragenerational transmission in the Barcelona area (16th and 19th centuries)

First, we calculated the intergenerational mobility tables using standardized residuals. The columns show the social groups (HISCLASS) to which the parents belonged, while the corresponding social groups of the siblings are shown in the rows. As can be seen in Tables 3 and 4, for the 16th-17th and 18th-19th centuries, respectively, the diagonals, i.e. the coincidence between social groups, denote the existence of high intergenerational transmission since they always present the highest values, indicating that social endogamy was important. However, this intergenerational endogamy was higher in the 16th-17th centuries than in the 18th-19th centuries given that the total intergenerational transmission fell from 77% to 58%³. From the end of the 18th century, the Barcelona area had been undergoing a process of industrialization involving a significant change in the occupational structure and an important process of proletarianization (Brea-Martínez & Pujadas-Mora, 2019; Martínez-Galarraga & Prat, 2016). This decrease in intergenerational transmission was the consequence of an expected loss of family influence on the social status of their descendants, as proposed by the already classical

³ It should be noted that the comparison between the social groups of fathers and children is made at the time of their own marriages, meaning that we are comparing more similar age ranges than if we took the parents' and children's ages at the time of the children's marriage, and therefore also making these groups more comparable from a demographic point of view. A comparison of parents and children in the same period would give us a more accurate picture of the current context, but would also mean comparing individuals at different points in the life cycle, introducing a bias in the measure of socioeconomic status attainment (Haider & Solon, 2006).

theory of modernization (Knigge, 2016), although evidently this influence did not completely disappear and could have taken other forms, as we will explain later in this study.

It is worth mentioning that among the better-off groups in the social hierarchy (HISCLASS 0,1,2,3) there was also a certain intergenerational social mobility, evidencing a common class behavior explained by the size of their social groups, which tended to be small and in turn would easily have featured common socio-professional networks (Kocka, 1984). At the base of the social pyramid, important levels of intergenerational transmission can also be observed for unskilled workers, lower-skilled workers, and above all farmers, but each in their own group.

After observing a decrease in parental influence in the mobility tables, we carried out the same analysis by comparing siblings who were married first (in the columns) with those who were married in the rest of the positions (rows). We specifically crossed the siblings' social information, with a particular focus on the sibling who married first and had a different occupation to the father and the rest of the siblings, in order to isolate the parental influence. In general, intra-generational association was lower among siblings than between parents and children. However, an inverse trend to that of intergenerational influence is found for fraternal influence. In fact, in almost all the groups, the coincidence in socioeconomic terms between siblings who married first and other siblings increased between 3 and 6 times over time, suggesting that the loss of intergenerational influence around the 18th and 19th centuries did not directly mean a loss of family influence, but rather a change or diversification of the protagonists of this influence.

The specialized literature argues that the industrialization process and transformation of the occupational structure would have led to a decrease in the intergenerational transmission of the same occupation or social status (social adscription) and the preponderance of individual achievements (status achievement) (Featherman, Jones, & Hauser, 1975; Knigge, 2016; Long & Ferrie, 2013), but does not take other types of family influence into account. In contrast, the growing literature on horizontal ties indicates that these became stronger over time (Johnson & Sabea, 2011; Sabea et al., 2007).

Additionally, some authors have shown how the decline of familial influence, although progressive, was slow over time, with levels of occupational transmission maintained until the second half of the 20th century in countries like Sweden, the Netherlands, and France (Karlsson & Stanfors, 2011; Knigge et al., 2014; Zijdemann, 2009). Therefore, less intergenerational influence (parents) would not necessarily mean a decrease in family influence on the social fate

of its members, but the emergence of other types of influence such as fraternal. To this effect, common environments and similar ages of brothers and sisters obviously mean a probable influence on the formation of social networks that provided occupational and other opportunities (Knigge et al., 2014).

Table 3: Mobility tables with standardized residuals for intergenerational social mobility (Fathers – Children) in the Barcelona area, 16th-17th and 18th-19th centuries. Authors' elaboration (BHMD).

		HISCLASS CHILDREN						
HISCLASS FATHER 16th-17th c.	N=5515	0	1	2	3	4	5	6
	0	59.4	-0.4	-0.6	0.5	-3.5	-1.7	-0.5
	1	3.5	29.4	2.0	-1.2	-4.8	-2.6	-1.1
	2	1.9	6.7	29.4	-1.2	-9.4	-3.2	-0.5
	3	-1.1	3.3	2.5	35.5	-24.2	-2.8	-0.3
	4	-4.7	-9.5	-8.9	-20.2	49.0	-30.2	-10.3
	5	-1.4	0.6	-1.6	-3.4	-32.5	42.8	-0.8
	6	-0.5	-1.3	-0.8	1.2	-11.4	-1.2	36.2
HISCLASS FATHER 18th-19th c.	N=47306	0	1	2	3	4	5	6
	0	26.9	11.3	6.5	-2.8	-2.8	-1.7	-2.1
	1	3.8	56.1	14.3	-1.1	-10.3	-8.9	-6.8
	2	6.8	18.6	47.8	-0.7	-20.2	-6.0	-6.7
	3	-1.7	4.0	8.1	63.7	-46.0	-5.7	-16.6
	4	-2.8	-16.4	-24.3	-39.6	109.5	-47.5	-7.6
	5	1.4	-1.4	4.4	-2.5	-63.1	67.4	-6.9
	6	-2.5	-7.7	-9.4	-12.9	-4.9	-8.7	43.4

Labels: Nobility (0); Higher managers and professionals (1); Lower managers, professional, clerical (2); Skilled workers (3); Farmers (4); Lower skilled workers (5); Unskilled workers (6)

Table 4: Mobility tables with standardized residuals for intragenerational social mobility (1st married siblings – Rest of siblings) in the Barcelona area, 16th-17th and 18th-19th centuries. Authors' elaboration (BHMD).

		HISCLASS Sibling (=> 2nd married) (Total)						
HISCLAS S 1st married sibling 16th-17th c.	N=974	0	1	2	3	4	5	6
	0	27.0	3.4	-0.4	-0.9	-1.6	-1.4	-0.4
	1	-0.3	12.2	1.2	-1.1	-2.4	-0.1	-1.0
	2	-0.5	-0.5	5.9	0.5	-0.4	-2.8	0.8
	3	-1.0	-0.8	-2.3	3.4	2.0	-2.2	-3.0
	4	-0.9	0.2	0.6	-2.5	2.0	0.0	-0.5
	5	-1.3	-2.8	-1.4	-1.9	-1.9	5.0	0.2
	6	-0.4	-1.1	-1.7	2.4	-0.7	-2.5	5.6
HISCLAS S 1st married sibling	N=1506 4	0	1	2	3	4	5	6
	0	12.5	5.2	3.6	-2.0	-1.6	-1.0	-1.1
	1	10.1	26.2	13.6	-0.8	-6.1	-7.9	-5.3
	2	1.3	10.5	33.7	-3.4	-12.0	-6.0	-6.0
	3	-1.0	-1.6	-0.7	23.6	-10.0	-6.0	-8.6
	4	-0.5	-4.3	-9.2	-10.5	35.7	-13.2	-0.8
	5	-2.7	-6.1	-7.8	-1.8	-14.2	29.8	-12.2
	6	-1.4	-5.8	-10.6	-12.4	7.3	-10.4	32.6
Labels: Nobility (0); Higher managers and professionals (1); Lower managers, professional, clerical (2); Skilled workers (3); Farmers (4); Lower skilled workers (5); Unskilled workers (6)								

5. The decline of intergenerational influence and the strength of horizontal ties

The descriptive results showed the emergence of the influence of first-married siblings over other brothers and sisters. This fact could be related to a net survival effect, as when parents died the eldest siblings were usually responsible for social reproduction, given that the single heir system was in operation in places like Catalonia (Ferrer i Alòs, 2004). From the figures below, we measured the so-called sibling correlation using a linear multilevel model. Its main contribution is that the random variance allows us to explain how similar individuals from the same family are and to consequently verify that their observations are not statistically independent.

To put it differently, the fact that a sibling had a certain occupation/social status was not an individual occurrence but a consequence of the family context. Therefore, as might be expected of an Ancien Regime society like that of the 16th and 17th centuries, siblings were much more similar in socioeconomic terms than they were later due to the important intergenerational transmission of occupation/social status. However, it is important to highlight how the coefficient increases when industrialization was in full flow as a consequence of a structural change in economic activity and the demand for new profiles, which went hand in hand with an important process of proletarianization (Brea-Martínez & Pujadas-Mora, 2018; Martínez-Galarraga & Prat, 2016). In fact, among less well-off individuals, the propensity for their siblings to have an unskilled occupation such as a day laborer or a factory worker was greater.

Despite this generalized decrease in sibling correlation over time, it is significantly less intense if we take whether the first-married sibling had the same occupation (HISCO) as the father into account. Siblings who married first and had the same occupation as their father have a more pronounced slope in the decrease of the sibling correlation. If we only consider the families whose first-married siblings did not have the same occupation as the father, the slope over time is flatter. These results seem to indicate that, as expected, intergenerational mobility increased over time. However, when this mobility was already observed among first-married children, the other siblings tended to have a more similar social status to them, therefore implying that a good part of the loss of intergenerational influence was absorbed by fraternal influence. (Figure 2).

Figure 2: Sibling correlations in SES (HISCAM) according to if 1st married siblings had the same or different occupation than fathers (Model 1). Authors' elaboration (BHMD)

Considering only the families with at least two children, the linear models 2,3,4, and 5 show the association in terms of socioeconomic status (HISCAM) between the non-first-married children and their first-married siblings, their parents, and their in-laws. Accordingly, we can quantify how similar individuals were socioeconomically, with the aim of observing whether the influence of first-born siblings (taking into account the Catalan impartible inheritance system) on their other siblings was greater or less than that of the parents and/or the in-laws, i.e. to assess whether or not the horizontal influence (siblings) could have been greater than the vertical influence (parents). Moreover, we also differentiated between all non-first-married children and only those who had a different occupation to their father⁴.

⁴ It should be considered that not having the same occupation as their fathers does not necessarily mean having a different social class. To this effect, in the 16th and 17th centuries, an individual whose father was a dyer could be a weaver; that is to say, different occupations among the same economic sector and social group.

The results show that during the 16th and 17th centuries, the greatest influence over non-first-married siblings was the vertical one (father-children), explaining between 60% and 70% of the cases analyzed if fathers-in-law were not taken into account. However, among the individuals with a different occupation (HISCO), there was a greater propensity to resemble their older siblings in a socio-economic sense. The results for the 16th and 17th centuries confirmed an expected trend, that when an individual did not inherit the parental occupation, first-married siblings were the ones most influencing the rest of the children. This indicates that in the 16th and 17th centuries, when parents could not ensure the social reproduction of their descendants, older siblings could potentially fill this role. On repeating the models for the 18th and 19th centuries, we can see that having the same occupation as one's father or not was no longer important, since during this period fraternal influence was equal to or higher than parental influence. To this effect, we see an important change in the influence of family over the long term because in the 16th and 17th centuries the vertical line (parents) was the most important, while from the 18th century onwards it was the horizontal line (siblings) that best explains the socioeconomic associations.

Table 5: SES (HISCAM) associations (elasticities) between ego and fathers, fathers-in-law and first married siblings in the 16th-17th and the 18th-19th centuries. Author's elaboration (BHMD).

	Non-first Siblings	Non-first Siblings	Non-first Siblings, Ego's HISCO $\neq$ Father's	Non-first Siblings, Ego's HISCO $\neq$ Father's
16th-17th c.				
SES Father	0.577*** (0.0230)	0.671*** (0.0218)	0.374*** (0.0477)	0.469*** (0.0454)
SES Father-in-law	0.194*** (0.0150)		0.251*** (0.0322)	
SES 1 st Married Sibling	0.197*** (0.0196)	0.206*** (0.0191)	0.284*** (0.0436)	0.291*** (0.0421)
<i>N</i>	2352	2829	736	914
adj. <i>R</i> ²	0.514	0.477	0.335	0.280
18th-19th c.				
SES Father	0.246*** (0.0179)	0.281*** (0.00715)	0.0908*** (0.0229)	0.120*** (0.00911)
SES Father-in-law	0.225*** (0.0157)		0.282*** (0.0209)	
SES 1 st Married Sibling	0.224*** (0.0149)	0.301*** (0.00582)	0.229*** (0.0189)	0.342*** (0.00735)
<i>N</i>	3998	29863	2671	21004
adj. <i>R</i> ²	0.204	0.174	0.155	0.123

Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

In the previous models, we started capturing the influence of first-married children on the other siblings in terms of socioeconomic association (measured with HISCAM). However, it could be argued that as siblings share a similar context during their life, major shifts in the occupational structure would make them more likely to be similar socioeconomically to their parents or parents-in-law. For instance, this would have been the case throughout industrialization, leading to an increase in absolute mobility (Dribe, Helgertz, & Van de Putte, 2015; Kurz & Muller, 1987; Simkus, 1984). To this effect, we apply logistic models with the current intergenerational social group mobility as the dependent variable, which means measuring the likelihood of belonging to a different social group than one's father (categorized using HISCLASS).

Apart from social class background (social class of parents and parents-in-law) and the social class of the ego and their first-married sibling, our models also control for different sociodemographic variables such as sibship size, marriage order among siblings, and whether fathers were dead upon ego's marriage. All the models were equally replicated for the two samples, the 16th-17th centuries and the 18th-19th centuries, with the only exception that for the more recent period we did not have information about whether the parents were alive or dead at the time of their son's marriage.

We ran a set of logistic regressions on the likelihood of intergenerational social mobility (fathers and second-married children HISCLASS) in the 16th and 17th centuries. The first noticeable element in model 6 is that the same trends captured in terms of socioeconomic associations in previous models also applied to the likelihood of facing intergenerational class mobility in this period. To this effect, model 6 shows the high likelihood of being from a different social class than the parents if the first-married siblings and the parents-in-law were also from a different class than the ego's parents, while some demographic variables such as the marriage order (3rd and 4th or more compared to 2nd) did not have any substantial or significant effect.

For all three models, the fact of being a woman slightly decreased the likelihood of having intergenerational social mobility when compared to men. These results should not be interpreted as women generally tending to have less mobility (through marriage) than men did. They rather indicate that in a context of the legal inheritance system based on primogeniture, higher transmission was especially granted to the eldest/first-married individuals, while the men among second-married siblings would be more likely or forced to find different social pathways. Such pathways for non-first-married men could mean downward social mobility, while women could easily end up in an endogamous marriage (Ferrer i Alòs, 2009; Pujadas-

Mora et al., 2018). Moreover, evidence shows that dowries were usually higher than the legitime of their brothers, thus the socioeconomic opportunities for remaining in the same social class instead of facing downward mobility was easier for sisters (Goody, 1998; Mikes & de Montagut, 2018).

Last, we ran a set of interactions of the intergenerational social mobility status of first-married siblings with their sex and with the information as to whether fathers were dead at the time of the marriage of the second-married or more children. Accordingly, having a deceased father in the 16th and 17th centuries was not influential for intergenerational social mobility, either *per se* or interacted with the social mobility status of the first-married siblings. In fact, the likelihood of facing social mobility for second-married or more children was higher when fathers were alive when the marriage took place and the first-married siblings already had a different class than the parental one. Second, when the sex of first-married siblings and their social mobility status were interacted, we observe that as in the previous case, egos had higher likelihoods of having social mobility if their first-married siblings also did, and especially if those siblings were women.

In Table 7, we repeat the same type of models for individuals who married during the 18th and 19th centuries. In model 9, unlike in model 6 (16th and 17th centuries), although first-married siblings with social mobility still influenced the intergenerational social mobility of the other siblings, they did so to a lesser degree than the parents-in-law did. However, it must be considered that socioeconomic information about parents-in-law was much less frequent in the 18th and 19th century, which dropped our sample to only 4,010 cases. Besides, when the sex of the first-married sibling was interacted with their own social mobility status, we saw that the influence over the likelihood of social mobility among second-married or more siblings was still high. However, while the influencers in the 16th and 17th centuries were mainly first-married women, in the 18th and 19th centuries they were mostly men.

Interestingly, the change from first-married women to first-married men in terms of the most influential on social mobility might be explained by the different contexts of the periods. During the 16th and 17th centuries, the main channel for social mobility and reproduction for less geographically mobile societies was marriage, as pointed out by (Ferrer i Alòs, 2018) for rural Catalonia throughout the 18th and 19th centuries. In fact, these results are also in line with other studies in Europe, which highlight the role of women in the social reproduction of their families, achieving social mobility as a way of practicing strategic marriages (Dribe & Lundh, 2010; Kalmijn, 1998; Kok, 2017). However, with the transformation of the occupational structure and

the increase in rural-urban migrations, it was mainly male siblings who become more influential, especially through the creation of kinship social networks (Meyer, 2000; Ostergren, 1982; Wegge, 2008).

Table 6: Logistic regressions on the likelihood of having a different social group than fathers for second married or more children (16th-17th centuries). Authors' elaboration (BHMD)

Dependent variable (Ego has a different class than father) XVI-XVII	M6	M7	M8
Father-in-law different class than father	4.226*** (0.457)	4.198*** (0.463)	4.226*** (0.466)
First-married Sibling different class than father	6.341*** (0.697)		
Female (first married sibling)	0.976 (0.108)	0.958 (0.108)	
Sibship size	1.085 (0.0638)	1.086 (0.0654)	1.081 (0.0653)
Third married	0.863 (0.129)	0.876 (0.131)	0.873 (0.131)
Fourth married or +	0.895 (0.200)	0.903 (0.204)	0.893 (0.203)
Female (ego)	0.489*** (0.0617)	0.478*** (0.0624)	0.498*** (0.0643)
Difference in years parents-ego (marriage)	1.014 (0.00881)	1.012 (0.00902)	1.013 (0.00898)
Difference in years 1 st sibling-ego (marriage)	0.998 (0.0100)	0.999 (0.0103)	0.998 (0.0103)
First married has same class father X Father is dead		1.437** (0.201)	
First has different class father X Father is alive		8.197*** (1.258)	
First has different class father X Father is dead		6.128*** (1.019)	
First married has same class father X Sibling Female			0.800 (0.114)
First has different class father X Sibling Male			4.681*** (0.748)
First has different class father X Sibling Female			6.159*** (1.024)
Father is dead			1.131 (0.124)
<i>N</i>	2428	2327	2327
pseudo <i>R</i> ²	0.224	0.221	0.220
Log likelihood	-1110.43	-1071	-1072.81

Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 7: Logistic regressions on the likelihood of having a different social group than fathers for second married or more children (18th-19th centuries). Author's elaboration (BHMD).

Dependent variable (Ego has a different class than father) XVIII-XIX	M9	M10
Father-in-law different class than father	4.054*** (0.287)	4.049*** (0.286)
First-married Sibling different class than father	2.759*** (0.195) (0.0646)	
Sibship size	1.084* (0.0415)	1.081* (0.0414)
Third married	0.934 (0.0907)	0.939 (0.0913)
Fourth married or +	0.983 (0.148)	0.987 (0.149)
Female (ego)	1.287*** (0.0981)	1.284** (0.0978)
Difference in years parents-ego (marriage)	0.979* (0.00821)	0.980* (0.00822)
Difference in years 1 st sibling-ego (marriage)	1.023** (0.00856)	1.023** (0.00856)
First married same class father X Sibling female		1.046 (0.104)
First married different class father X Sibling Male		3.286*** (0.346)
First married different class father X Sibling Female		2.492*** (0.236)
<i>N</i>	4010	4010
pseudo <i>R</i> ²	0.14	0.14
Log likelihood	-2387.92	-2385.36

Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 8: Logistic regressions on the likelihood of having a different social group than fathers for second married or more children according to the social group of fathers-in-law and first married siblings (16th-19th centuries). Author's elaboration (BHMD).

Dependent variable (Ego has a different class than father)	M11 16 th -17 th c.	M12 18 th -19 th c.
Father-in-law different class than father	3.092*** (0.672)	3.599*** (0.539)
Father-in-law Farmer	<i>ref</i>	<i>ref</i>
Father-in-law Non-Manual	0.654 (0.535)	0.582 (0.359)
Father-in-law Artisan	3.198*** (0.818)	1.359 (0.214)
Father-in-law Day Labourer	1.300 (0.789)	1.046 (0.167)
Father-in-law $\neq$ Father X Father-in-law Non-Manual	6.761* (5.835)	2.137 (1.405)
Father-in-law $\neq$ Father X Father-in-law Artisan	0.689 (0.244)	1.085 (0.226)
Father-in-law $\neq$ Father X Father-in-law Day Labourer	1.577 (1.094)	0.950 (0.222)
First-married Sibling different class than father	1.883* (0.542)	2.710*** (0.468)
First Married Sibling Farmer	<i>ref</i>	<i>ref</i>
First Married Sibling Non-Manual	0.326 (0.192)	1.110 (0.395)
First Married Sibling Artisan	0.427*** (0.0825)	1.249 (0.178)
First Married Sibling Labourer	0.710 (0.267)	0.732* (0.116)
First Sibling $\neq$ Father X First Sibling Non-Manual	8.224** (5.615)	1.301 (0.545)
First Sibling $\neq$ Father X First Sibling Artisan	7.912*** (2.938)	0.709 (0.150)
First Sibling $\neq$ Father X First Sibling Day Labourer	3.441* (1.839)	1.506 (0.390)
Female (First Married Sibling)	0.994 (0.114)	0.904 (0.0658)
Sibship size	1.074 (0.0647)	1.090* (0.0421)
Third married	0.887 (0.136)	0.935 (0.0915)
Fourth married or +	0.926 (0.212)	0.965 (0.147)
Female (ego)	0.454*** (0.0597)	1.299*** (0.0997)
Diference years parents-ego (marriage)	1.013 (0.00907)	0.981* (0.00834)
Diference years 1 st sibling-ego (marriage)	0.998 (0.0104)	1.022* (0.00867)
<i>N</i>	2428	4010
pseudo <i>R</i> ²	0.262	0.150
Log likelihood	-1055.65	-2361.57

Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

6. Conclusions and discussion

This paper investigated fraternal influence on the social mobility of children marrying in the Barcelona area, the most dynamic area of Catalonia from an economic point of view, between the 16th and the 19th centuries. One of the main contributions of this study is that it analyses the entire social spectrum, strengthening the importance of horizontal influences, which have not previously been extensively researched either at the Spanish level or with a long-term international perspective.

Among the main conclusions, we pinpoint the emergence of the figure of siblings as determinants in the status attainment of individuals and the consequent decline in parental influence from the 18th century onwards for all social groups (Davidoff, 2012; Sabea et al., 2007). To this effect, while vertical family influence was more important during the Ancien Regime and diminished during industrialization, horizontal influence increased mainly from the second half of the 18th century onwards, coinciding with the progressive process of Catalan protoindustrialization and industrialization. The emergence of horizontal influence in detriment to vertical influence over time is clear not only from the mobility tables but also when considering sibling models and SES associations focused on non-first-married children. The loss of intergenerational influence was absorbed by fraternal influence, which became more important than the role played by exogamous marriages (observed through parents-in-law with a different SES). Besides, the logistic regressions on intergenerational social mobility showed that vertical influence on status attainment increased transversally across all social groups and with almost no differences controlling for other demographic factors such as the sibship size, the marriage order of other siblings, or whether or not parents were still alive when they got married.

The results also showed that the influence of first-married siblings on the rest of the children worked differently over time depending on sex. During the 16th and 17th centuries, first-born sisters with exogamous marriages had a higher influence than first-married brothers on the social mobility of their non-first-married siblings. Conversely, from the 18th century onwards, first-married brothers had a higher influence than first-married sisters, as had happened in the past. Interestingly, these results show how the occupational structural change observed across time operationalized the influence by gender differently within families. While in the 16th century, intergenerational immobility was higher, especially among farmers (the most predominant social group), the main channel through which social mobility and reproduction could be achieved was marriage (Dribe & Lundh, 2010). To this effect, sisters would have

played the most important role in prompting the social mobility of the other siblings. Nevertheless, with the progressive establishment of industrialization from the end of the 18th century and throughout the 19th century, the progressive shift in the occupational structure, and the increase in migration towards urban areas levelled off the gender gap in terms of sibling influence, and with higher migration among men than women, brothers would have started to influence other siblings more.

In light of the results showing the intensification of horizontal ties, we propose a multifactorial interpretation that brings together demographic phenomena, the change in the occupational structure, and social mobility. In many European countries in the 18th century, including Catalonia, there was an increase in life expectancy (Abarca, Llopis, Sebastián, Bernardos, & Velasco, 2015; Ferrer i Alós 2016; Schneider, 2013) (Abarca et al., 2015; Ferrer-Alòs, 2016; Schneider, 2013), although it must be borne in mind that this was due to an improvement in adult mortality and not in child mortality. To this effect, it would be expected that vertical ties were strengthened rather than horizontal ones, since adults who gained in life expectancy would be more likely to be alive when their children got married. However, this was not the case in our study since we saw no increase in intergenerational influence over time, but rather the contrary. Moreover, children reaching marriageable ages would also have had older average ages, which would explain the intensification of intra-generational transmission as seen for the Barcelona area.

The change in the occupational structure as a consequence of industrialization from the second half of the 18th century onwards in Barcelona, especially among the young population (Brea-Martínez & Pujadas-Mora, 2018; Cura, 1992; Martínez-Galarra & Prat, 2016), is another factor to understand why older (first-married) siblings and not their parents or in-laws exercised more influence over younger siblings. In fact, from the 18th century onwards, it was more productive for younger siblings to follow in the wake of their older brothers and sisters who had gone in search of opportunities in the new expanding economic sectors than to continue with parents or in-laws traditional sectors, many of which had already entered a recession, as was the case with farming. In addition, the cost of entering new and expanding productive sectors for younger siblings was lower than the cost incurred by their older siblings who had previously done this. The support they received could be direct, making it easier for them to get a job, or at the very least at the level of being informed about similar jobs, as has been observed in sibling migration (Kesztenbaum, 2008). Therefore, economic transformation affecting the same generations would similarly explain the intensification of horizontal ties.

Furthermore, how this structural change and the increase in life expectancy could have served to consolidate a trend towards fraternal relations in altruistic terms, which had already been observed in the 16th and 17th centuries in the area of study (Pujadas-Mora et al., 2018), should be considered. Despite the single-heir system prevailing in that period, there was no evidence of downward mobility among non-heirs. Therefore, the verticality of the transmission was the regulating element of the system, since it foresaw the maximization of the distribution of family investments, which would have resulted in a tightening of the relationships between siblings as the competition between them dissipated. To this effect, in the multilevel models we observe an association in socioeconomic terms between the siblings who married first and the other siblings in the 18th and 19th centuries, because when individuals did not inherit the same occupation as their father, they generally had a similar socio-occupational status to the first-married. This indicates the importance of fraternal altruism to find alternatives when social reproduction in vertical terms did not occur.

Another important feature observed in this study concerns the main theoretical arguments relating siblings, sibships, and social mobility, namely the sibling competition model (as an effect of resource dilution), as opposed to more altruistic views such as those in the cooperative breeding framework. We interpret the strengthening of horizontal ties as a side effect of a well-established cooperative model among siblings, and also as reflecting the natural ties of affectivity between siblings and the increasing importance of kinship in Europe as pointed out by Sabea (2011), rather than from a more utilitarian view of individualistic competition. In fact, ties of affectivity and cooperation from the eldest siblings would be key to compensate an inheritance system like the impartible inheritance in Catalonia, which by default generated inequality, as stated previously.

Overall, these elements help to nuance one of the main arguments of the classic theory of modernization, which argues a significant loss of family influence as a consequence of the industrialization process, an element already rejected by other authors (Knies et al., 2014, Zijdemans, 2009). In short, we can conclude that we do not observe the loss of family influence, but rather a change of protagonists, moving from parental transmission to sibling transmission, meaning that kinship still played a very important role.

7. References

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