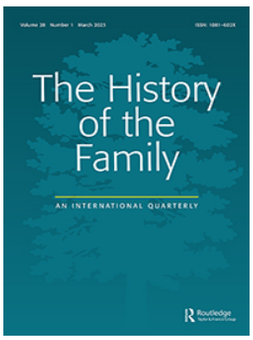

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Indirect pathways of multigenerational persistence: the role of uncles and assortative mating in the Netherlands, 1857-1922

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ABSTRACT

Recent research into intergenerational social mobility has examined the association between the socioeconomic position of grandparents (G1) and their grandchildren (G3), but it remains unclear why G1-G3 associations arise. Prevailing explanations focus on whether grandparents have a true direct influence on their grandchildren or an indirect one via omitted parental characteristics. We argue that there may be other important indirect pathways of multigenerational persistence: grandparents can transmit resources via uncles and aunts, and they can encourage assortative mating in the middle generation, which also increases the resources available to their grandchildren. We examine these indirect pathways by studying the status attainment of 176,678 Dutch men for the period 1857 to 1922 using marriage certificates. Results show that G3's status was substantially associated with uncles' status and that assortative mating based on social origin was strong. Accounting for these associations reduces much of the G1-G3 association. We therefore conclude that multigenerational persistence arose hardly because grandfathers had a direct influence but rather because grandfathers were important in more indirect ways.

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Social mobility; multigenerational; grandparents; uncles; assortative mating

1. Introduction

If societies have low rates of intergenerational social mobility, this is considered evidence that institutional barriers prevent individuals from achieving as much as their talents allow (Maas & van Leeuwen, 2016). Social mobility is often studied by examining how the socioeconomic position of individuals is determined by the socioeconomic position of their parents (Breen & Jonsson, 2005). Mare (2011) stressed that studying only parents is not sufficient and that a multigenerational perspective is needed to prevent underestimating persistence of inequality over generations. Resulting, researchers have been studying the association between the socioeconomic position of grandparents (G1) and their grandchildren (G3). A recent systematic review by Anderson, Sheppard and Monden (2018) of G1-G3 associations in educational outcomes shows that 65% of the studies find an association while controlling for the

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equivalent educational outcome of parents (G2).[1] This indicates that the intergenerational transmission of social inequality is cumulative over generations and that two-generational studies indeed overestimate social mobility.

It is not clear *why* these G1-G3 associations arise. A prevailing explanation is that grandparents have a true direct influence on their grandchildren. Another explanation is that omitted parental characteristics account for the association. For example, the number of studies that find a G1-G3 association for educational outcomes reduces from 65% to 45% after four or more parental SES variables are taken into account (additional to the parental equivalent of the G1 characteristic; Anderson et al., 2018). This could be interpreted as evidence that direct grandparent effects are important because they are still found in almost half of the studies. But it could also be seen as evidence for omitted variable bias because inclusion of more parental characteristics decreases the number of studies that find a G1-G3 association considerably. However, with this predominant focus on whether G1-G3 associations result from direct grandparent effects or unobserved parental characteristics (Fiel, 2018), we argue that it is largely overlooked that other important indirect pathways may explain G1-G3 associations.

First, grandparents could have an indirect effect via aunts and uncles. The role of aunts and uncles is often not considered (Milardo, 2009), with some notable exceptions (Erola et al., 2018; Jæger, 2012; Knigge, 2016; Lehti et al., 2019; Loury, 2006). Similar to (grand) parents, aunts, and uncles can act as role models or provide jobs, information, networks, or financial help. Compared to grandparents, they are more likely to still be alive, especially in societies with relatively low life expectancy, and more likely to be integrated into the labor market (Erola et al., 2018). Hence, aunts and uncles can be expected to influence G3's socioeconomic position. Omitting these extended family members may lead to misattributing indirect multigenerational effects via aunts and uncles to direct effects of grandparents.

Second, besides that grandparents may have an influence via the transmission of resources (directly to G3, via the parents, and/or via aunts and uncles), they could also secure social reproduction by encouraging assortative mating in G2, which leads to a pooling of resources that would benefit G3. Prior two-generational studies have shown that parents stimulate their children to marry partners with a similar socioeconomic background (Kalmijn, 1998; Zijdeman & Maas, 2010). Moreover, other two-generational studies demonstrate the important role that assortative mating in turn plays in transmitting socioeconomic status to the next generation (see, e.g., Dribe & Lundh, 2010; Ermisch et al., 2006). Ermisch et al. (2006), for example, show that on average 40 to 50% of the covariance between own permanent family income and that of parents can be explained by assortative mating. By combining these two strands of literature, one could thus expect G1 to have an impact on the resources available to G3 by influencing the marriage choices of G2. Nevertheless, most three-generational studies do not account for this potential indirect influence through assortative mating, because they study either the paternal or maternal lineage, but not both simultaneously (for notable exceptions, see Dribe & Helgertz, 2016; Erola & Moisio, 2007; Olivetti et al., 2018; Warren & Hauser, 1997). If only one lineage is studied, the G1-G3 association resulting from assortative mating is likely to be mistaken for a direct influence of G1 on G3. This may especially pose a problem for historical contexts since assortative mating based on socioeconomic background was stronger in pre-industrial societies than it is nowadays (Zijdeman & Maas, 2010).

Previous studies showed that these two indirect pathways could be of importance. Studies investigating the role of aunts and uncles in multigenerational reproduction of socioeconomic outcomes found a considerable positive impact of aunts/uncles and show that a part of the G1-G3 association is mediated by aunts/uncles (Erola et al., 2018; Jæger, 2012; Knigge, 2016; Lehti et al., 2019). However, they did not investigate both paternal and maternal lineages simultaneously and may therefore still overestimate the G1-G3 association. Research including information on both lineages shows that assortative mating is an important indirect pathway underlying the G1-G3 association, as including the grandfather of the other lineages attenuates the grandparent coefficient considerably (Anderson et al., 2018; Warren & Hauser, 1997). Yet, it remains unclear whether (the attenuation of) the G1-G3 association is related to grandfathers and not to other extended family members such as uncles.

We aim to investigate whether grandparents' indirect influences via uncles and aunts and assortative mating are important mechanisms underlying G1-G3 associations, and how crucial it is to consider them when testing for direct grandparent effects. To investigate this, it is important to study both mechanisms simultaneously, but this requires a combination of information that datasets usually do not have. This is probably the reason why previous studies investigating the influence of uncles and/or aunts did not include both paternal and maternal lineages, while the studies that included both lineages did not take into account the influence of uncles/aunts. Most survey data do not have extensive information on multiple extended family members of both lineages. Moreover, both longitudinal panel surveys and cross-sectional surveys come with other disadvantages. They often have smaller and/or biased samples and often have to rely on retrospective information on grandfathers that suffer more from measurement error (see, e.g., Pfeffer, 2014). Historical data, on the other hand, comes with the advantage that it provides high-quality data on extended family members of both lineages.

In this paper, we use the GENLIAS database which contains occupational information from the digitized marriage certificates of five of the eleven Dutch provinces from 1812 to 1922. Linking the marriage certificates to the certificates of the parents and the grandparents allows us to examine G1's direct and indirect influences via uncles/aunts and assortative mating on G3's occupational status attainment. In the Dutch society of that time, women often did not have an occupation once married and derived their status from their husband (Schulz et al., 2014). We therefore only analyze the occupational status of the men. To capture the influence of aunts, for example, this means we look at the occupational status of their husbands (i.e., uncles-in-law). In this way, we can study for 176,678 grandsons, over 70 years (1857 to 1922), how they were influenced by the status of their grandfathers, uncles, and uncles-in-law on both their father's and mother's side of the family.

The Dutch society during this period is an interesting context to study the direct and indirect pathways of multigenerational social reproduction. In the beginning of the nineteenth century, matching between Dutch spouses was largely based on the social standing of their parents (Zijdeman & Maas, 2010). Therefore, the indirect pathway of assortative mating likely played an important role in G1-G3 associations. During this period, both marital sorting based on social origin and the status attainment process have changed, largely due to (beginning) modernization processes (Knigge et al., 2014; Schwartz, 2013; Treiman, 1970). Therefore, we describe how the strength of each pathway

changed over time. This allows us to see whether the mechanisms underlying multigenerational persistence of inequality changed in importance when the Netherlands went from a pre-industrial to an industrializing society. In the discussion, we also reflect on what our results can and cannot tell us about multigenerational studies on contemporary societies that do not take uncles and aunts and/or assortative mating into account.

2. Theory and hypotheses

2.1. Transmission of extended family resources

Parents promote their children's status by transferring different types of resources – including financial, cultural, human, and social capital – to their children (Blau & Duncan, 1967; Bourdieu & Passeron, 1977). Similarly, extended family members (e.g., grandfathers, uncles) could use their resources to contribute to the socioeconomic outcomes of G3 (see Figure 1). Two mechanisms can be distinguished.

First, extended family members could transmit human and cultural capital to G3 through socialization, which takes primarily place during childhood and *requires contact* (Bengtson, 2001; Bourdieu & Passeron, 1977). In other words, similar to parents, extended family members can act as teachers or role models and shape the knowledge, skills, attitudes, behaviors, and preferences of G3 in ways that influence their socioeconomic outcomes in the longer run (Kohn, 1977). This may be especially the case for extended family members from the previous (parental) generation, such as uncles and aunts. Uncles tend to be active in the labor market and are therefore likely to have up-to-date knowledge of the labor market and to have useful labor market contacts (Erola et al., 2018). Because there is a stronger influence of, for example, the transmission of norms when multiple adults

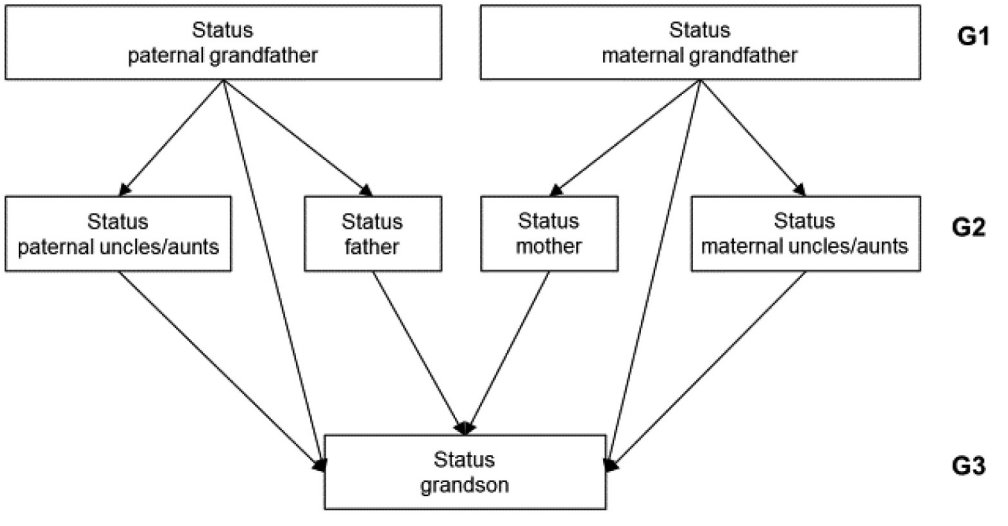

Figure 1. The multigenerational transmission of occupational status. G1 = first generation, G2 = second generation, G3 = third generation.

socialize children in the same direction, it can be argued that socialization by grandparents and aunts or uncles will be of additional benefit even if parents are socializing their children as well (Bol & Kalmijn, 2016; Lamont & Lareau, 1988; Møllegaard & Jaeger, 2015).

Second, extended family members could also have an *influence without contact*. Whereas resources such as human and cultural capital can usually be transferred only during the holder's lifetime, other resources, such as financial and physical capital, are much more durable (Mare, 2011). For example, capital in the form of land or a family business does not perish after the original holder dies. Since inheritance practices typically involve the transmission of land or wealth from one generation to the next (De Haan, 1994), such influences likely operate indirectly (i.e., via G2) instead of accounting for a direct G1-G3 association. Nevertheless, it may still be that G3 benefits from (accumulated) wealth in the forms of physical or financial capital even if they were never in contact with extended family members and if their parents (G2) did not (fully) benefit. Another way for extended family members to influence G3's occupational status is via reputation mechanisms (Knigge, 2016; Mare, 2011). This may operate in more formal, institutionalized ways (e.g., the nobility system) or more informal ways (e.g., employers who rely on the reputation of grandfathers and uncles; Knigge, 2016). Also, the reputation of successful grandfathers and uncles may inspire G3 to become successful themselves.

Although most children were born in nuclear families and extended family households were uncommon in the Dutch society of the nineteenth century (Kok & Mandemakers, 2012), extended family members were of importance. People had a material interest in maintaining relations with their extended family, amongst others because there were no welfare provisions (De Haan, 1994). There are several arguments to expect that grandparents and uncles and aunts played a role in occupational status transmission in the Netherlands in the nineteenth century, which we will explain.

2.1.1. Direct influence of grandparents

The aforementioned mechanisms provide theoretical reasons for a direct grandparent effect. In the Netherlands in the nineteenth century, both influence via contact and without contact can be expected. Co-residency of grandparents was uncommon, but grandparents often lived in close geographical proximity to their grandchildren, and the lives of many grandchildren overlapped with the lives of at least one grandparent (Knigge, 2016; Van Poppel, 2012). Durable resources are expected to have played a significant role because a large proportion of the Dutch population was employed in agriculture (40.3% in 1849; Smits et al., 2000) and educational opportunities were still limited (Mandemakers, 1996).

Indeed, Knigge (2016) found support for both mechanisms by investigating the *paternal* grandfather: his influence was stronger if contact was more likely, but the paternal grandfather also had an influence if contact was virtually impossible. Other research has shown that both paternal and maternal lineages are important for the intergenerational status transmission of status (Olivetti et al., 2018). Therefore, if G1-G3 associations are observed because grandfathers have a true direct influence on their grandchildren, one would expect to find it not only for paternal grandfathers but for *maternal* grandfathers as well.

H1: The occupational status of paternal and maternal grandfathers positively influenced the occupational status of their grandsons in the Netherlands during the nineteenth century.

However, the two mechanisms may not apply exactly to the same extent to paternal and maternal grandfathers. We expect it was more difficult for maternal than paternal grandfathers to have influence without contact because durable resources such as a farm were more likely to be transferred/inherited via the paternal lineage (De Haan, 1994). We assume that influence via contact did not differ, and therefore we expect that overall the influence was weaker for maternal than for paternal grandfathers.[2]

H2: The occupational status of paternal grandfathers has a larger influence than the occupational status of maternal grandfathers on the occupational status of their grandsons in the Netherlands during the nineteenth century.

2.1.2. Indirect influence via uncles and aunts

Although there are theoretical arguments for a direct influence of grandfathers, it could also be that the G1-G3 association is observed because of indirect influences. In the Netherlands, the average sibship size was between 4 and 5 siblings between 1840 and 1905 (Bras et al., 2010). Hence, there were multiple uncles and aunts who could influence G3's occupational status. The majority of these uncles and aunts likely lived within proximity of their nephews, while co-residency of aunts and/or uncles occurred in some cases in the Netherlands during the nineteenth century (Kok & Bras, 2008; Kok & Mandemakers, 2010, 2012). Moreover, there is evidence that the brothers and sisters of parents were part of the close network of the nuclear family. For example, siblings and siblings-in-law were often chosen as marriage witnesses (of G2) in this period while uncles also regularly featured as witnesses (of G3; Bras, 2011). Uncles and aunts thus are likely to have played a role in the lives and status attainment of their nephews.

Prior studies indeed suggest that the grandparental effect is largely operating through the influence on uncles and aunts (Erola et al., 2018; Jæger, 2012), which also seems to be the case for Dutch society in the nineteenth century (Knigge, 2016). Still, these prior studies may underestimate the importance of uncles and aunts because, in contrast to the present study, they include only one lineage. As pointed out, women in this period often did not have an occupational status of their own once married but derived their status from their husbands (Schulz et al., 2014). The occupational statuses of uncles-in-law are therefore probably a good representation of the resources that aunts were able to transmit to their nephews. We therefore hypothesize:

H3: The G1-G3 association in occupational status in the Netherlands during the nineteenth century is at least partially mediated by the occupational status of (a) paternal uncles and (b) maternal uncles.

H4: The G1-G3 association in occupational status in the Netherlands during the nineteenth century is at least partially mediated by the occupational status of (a) paternal uncles-in-law and (b) maternal uncles-in-law.

2.2. Pooling of resources via assortative mating

How occupational status is transmitted over generations does not only involve the transmission of resources as a family strategy, but also the pooling of resources via assortative mating. Assortative mating, where people choose partners with similar characteristics, is argued to arise for several reasons. First, people have an *individual preference* for marriage partners from their own social class because they share the same culture, which makes it more likely they have similar preferences about how to raise the children, spend leisure time, and so on (Bourdieu, 1984; Kalmijn, 1998; Van Leeuwen & Maas, 2010). Concerning economic resources, people prefer marriage partners with a higher position, which will also lead to assortative mating since marriage candidates with the most economic resources select among themselves and those with the fewest economic resources have to rely on one another (Kalmijn, 1998). Besides spouses' own preferences, also *third parties*, including parents, peers, and institutions, influence marriage choices (Kalmijn, 1998).[3] Spouses do not only share personal resources but also resources from their social networks. Third parties, therefore, have an interest in safeguarding that marriage does not affect their resources (Zijdeman & Maas, 2010).

Assortative mating can be expected to be especially salient in the Netherlands in the nineteenth century. In pre-industrial societies, marriage was less a romantic act and to a larger extent an instrumental affair where wealth and social status were important characteristics in partner choice (Coontz, 2004; Shorter, 1975). An important reason for this is that individual preferences were relatively weak and third-party preferences were relatively strong in this period. Especially parents had an interest in marriage choices being instrumental rather than romantic in nature. Assortative mating made it more likely that the partner (and his or her family) had similar views and aspirations as the parents, making the intergenerational transmission of property and values easier (Maas & van Leeuwen, 2019). Also, many parents depended on their children to take care of them in old age (De Haan, 1994). Parents will therefore have tried to impose control on marriage choices or at least to socialize children such that they identify themselves as a member of their own group and comply with the social norm of assortative mating (Kalmijn, 1998). Pooling of resources in G2 will not only have benefitted G1 though but also G3.

In general, when searching for an attractive marriage partner, both the candidate him or herself and the parents are thus interested in the future socioeconomic resources of potential spouses. Because future resources of the spouse are uncertain, candidates and their parents can use two signals as predictors of future success: the potential spouse's current status or the spouse's family background (i.e., status of the parents-in-law; Zijdeman & Maas, 2010). Therefore, the statuses of the paternal and maternal lineages as drawn in Figure 1 are not independent, but tend to be associated (see Figure 2a). For example, because the potential spouses use each other's status as a criterion when deciding to marry, these statuses will be positively associated, as indicated by the double-headed arrow between father's and mother's status in Figure 2a. Similarly, because parents use the status of parents-in-law as a criterion, there is an association between the paternal and maternal grandfather's status. Because spouses use the status of the parents-in-law as well, and parents use the status of the potential spouse, there is also an association between the father and the maternal grandfather and the mother and the paternal grandfather.

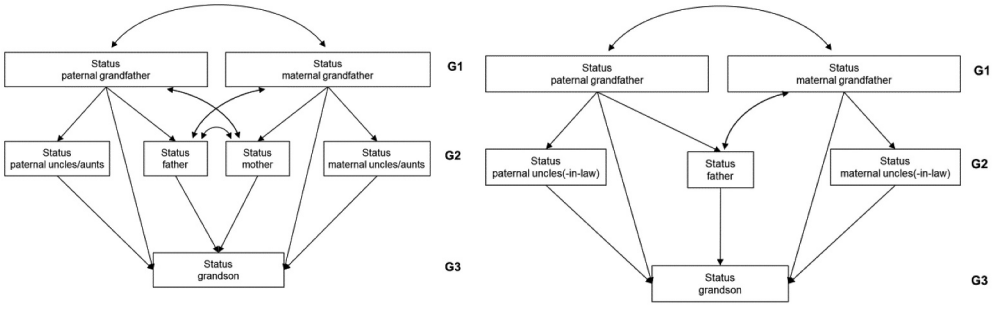

Figure 2. A) General model integrating three-generational mobility and assortative mating; **b)** General model applied to the Dutch context in the 19th century. Single-headed arrows indicate direct influence; double-headed arrows indicate associations due to partner selection processes. G1 = first generation, G2 = second generation, G3 = third generation.

Figure 2a illustrates the general case in which the partner selection process is symmetrical. However, the selection process was rather asymmetrical in the preindustrial and industrializing periods (Zijdeman & Maas, 2010). This is because women often had no occupational status or ended their occupational career once they were married and because they had a low likelihood of attaining an occupation of high status (Schulz et al., 2014; Zijdeman & Maas, 2010).[4] Consequently, the status of the mother was not a reliable signal, only the status of her father was (Zijdeman & Maas, 2010). Therefore, it makes sense to omit mother's status from the theoretical model, which results in Figure 2b. In this specific case, we expect assortative mating to be reflected especially by a positive association between the paternal and maternal grandfather's status because third party influences were strong and future resources depended much on social origin. Still, we also expect a positive association between father's status and the maternal grandfather's status because individual preferences and own status as a signal will have played a role as well. Both these associations have been found for the Dutch provinces in the nineteenth century (Maas & van Leeuwen, 2019; Zijdeman & Maas, 2010). One can see, in Figure 2 that, because of the association between the paternal and maternal grandfather that arises from assortative mating in G2, leaving out one lineage would result in overestimating the G1-G3 association in the other lineage.

H5a: The occupational status of paternal grandfathers (G1) was positively associated with the occupational status of maternal grandfathers (G1) in the Netherlands during the nineteenth century.

H5b: The occupational status of fathers (G2) was positively associated with the occupational status of maternal grandfathers (G1) in the Netherlands during the nineteenth century.

2.3. Changes over time

Multigenerational associations can be expected to have changed over time. The Dutch context changed during the period that we studied (1857–1922), most notably related to modernization. Many modernization processes in the Netherlands are thought to have

started around 1865 (De Jonge, 1968). Industrialization increased continuously from 1860 (Knigge et al., 2014). Inter-provincial migration was uncommon before the 1870s but increased after that time (Wintle, 2000). Mass transportation became available because of a dense train and tram network, which developed rapidly from 1860 and 1880, respectively (Knippenberg & De Pater, 2002). Concerning urbanization, the Netherlands was already very urbanized compared to other surrounding countries. Between 1800 and 1850, urban growth stagnated somewhat and growth was only incidental. From the second half of the nineteenth century onwards, urbanization took place more rapidly (Wintle, 2000). Educational expansion remained modest in the nineteenth century. The expansion of the secondary school system especially took off from 1910 onwards (Mandemakers, 1996).

Such modernization processes may have decreased the G1-G3 association over time. First of all, the transmission of (extended) family resources is thought to have weakened during this period. It is argued that, during modernization, ascribed characteristics became less decisive and achieved characteristics more decisive in the status attainment process (Blau & Duncan, 1967; Kerr et al., 1960; Treiman, 1970). This shift from ascription towards achievement implies that not only fathers but also extended family members, such as uncles and grandfathers, would have been less of a help for status attainment since their (durable) resources were of lesser importance (Knigge, 2016).[5]

Second, the indirect pathway of pooling of resources via assortative mating likely decreased over time. Modernization processes may have changed partner selection processes in several ways. With the change from ascription to achievement, a groom's own status gained importance compared to his father's status as a signal of future socioeconomic success (Blau & Duncan, 1967; Treiman, 1970). Additionally, the pressure on children to marry homogenously decreased. One reason is that parents' control weakened with increased mobility and urbanization because people who move to new areas or live in large cities are more independent and less affected by third parties (Zijdeman & Maas, 2010). Another reason is that preferences for marriage partners shifted from being rational to being romantic in Western societies (Shorter, 1975). With decreased parental control and increased financial independence, there was a solid foundation for more personal preferences and less instrumental partner choices in the second half of the nineteenth century (Van de Putte, 2005). Previous studies indeed show that the association between paternal and maternal grandfather's status declined, whereas the association between father's status and his father-in-law remained stable or even increased (Maas & van Leeuwen, 2019; Zijdeman & Maas, 2010).

Altogether, we could thus expect that the G1-G3 association decreases over time because the direct influence of grandfathers declined, the indirect pathway via uncles became less effective, and pooling of resources via assortative mating became a less important pathway of multigenerational status transmission. The latter would also imply that the G1-G3 association resulting from assortative mating is in later periods less likely to be mistaken for a direct influence of G1 on G3 if only one lineage is studied.

3. Data and methods

3.1. Data

We use the GENLIAS database (version 2007_03), which contains digitized Dutch marriage certificates from 1812 to 1922 (Oosten & Mandemakers, 2007). This database includes information such as the date and place of marriage; names, ages, and occupations of the bride and groom; and names and occupations of their parents. Marriage certificates have been linked to parents' marriage certificates for the provinces Groningen, Limburg, Overijssel, Gelderland, and Zeeland. These provinces are not representative of the Netherlands, as the provinces with the largest cities are not included. However, the provinces that are included contained plenty of large cities as well (Knippenberg & De Pater, 2002) and there was considerable regional variation in the degree of modernization (Knigge et al., 2014). Therefore, we do not think that relying on these five provinces would lead to substantially different estimates as compared to the situation where we would have data on the Netherlands as a whole.

The linkage of marriage certificates was done using a computer algorithm based on the combination of first and last names of both parents as stated on the child's and parents' marriage certificates, and other information such as age and year of marriage (Oosten, 2008). As shown in Figure 3, we created a three-generation version out of this by matching the marriage certificates in which a couple is groom and bride in one and father and mother of the groom in another (or of the bride in case of maternal grandparents). After several selections and deletion of missing cases (see next section), we can study 176,678 grandsons who married between 1857 and 1922.

3.2. Selections and missing data

As argued previously, we study only men. We only include first marriages, because the influence of family background on partner selection and the transmission of resources might be different for grooms who married for the second time. This leads to a database

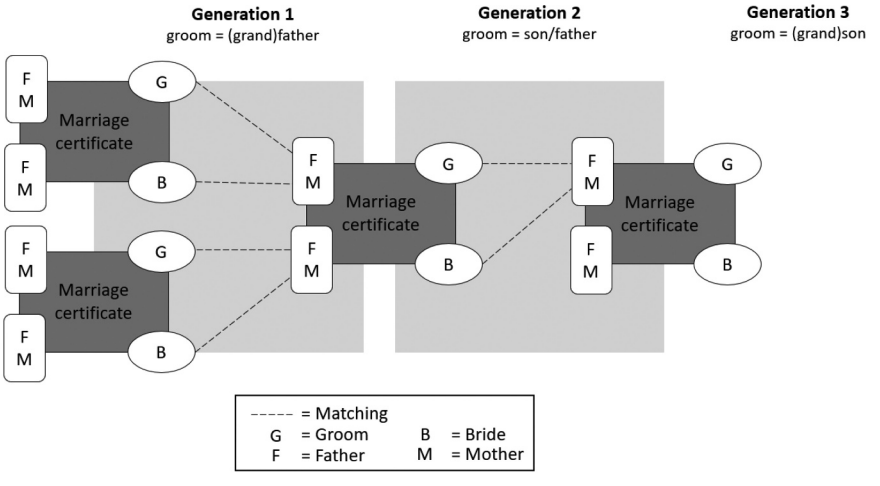

Figure 3. Matching of the marriage certificates.

of 952,587 grooms married between 1812 and 1922. To have a three-generational database, we have to reshape the data (see Figure 3). First, the marriage certificate of a G3 groom has to be linked to that of his parents. Next, the marriage certificate of the parents (G2 groom and bride) has to be linked to those of both their parents (G1 grooms and brides). For the G3 grooms marrying shortly after 1812, their parents' and grandparents' marriage certificates will not be part of the database because they will have married before 1812. The first marriage year for which G3 grooms could be linked to their parents is 1831, while the first marriage year for which G3 grooms could be linked to their grandparents as well is 1854 for the paternal lineage and 1852 for the maternal lineage. The first marriage year for which G3 grooms could be linked to both the paternal and maternal grandparents simultaneously was 1857, which determines the starting year of our analyses. Of the 526,119 grooms that could be linked to their parents, 248,779 could be linked to their paternal grandparents, 235,529 to their maternal grandparents, and 176,685 to both their paternal and maternal grandparents.

There is missing occupational data for grandsons (in 1.4% of the 176,685 cases), fathers (18.7%), paternal uncles (44.6%), paternal uncles-in-law (48.2%), maternal uncles (45.7%), maternal uncles-in-law (47.5%), paternal grandfathers (23.3%), and maternal grandfathers (21.6%). Missing values were dealt with using Full Information Maximum Likelihood (FIML) estimation in the analyses (Arbuckle, 1996). The FIML procedure works by estimating a casewise likelihood function based on all the variables that are observed for a case. In this way, all available data are utilized during parameter estimation (Enders & Bandalos, 2001). FIML has been shown to provide unbiased parameter estimates and standard errors if missings values are missing at random (MAR) or missing completely at random (MCAR; Enders & Bandalos, 2001). Both MAR and MCAR require that the variable with missing data is not associated with whether someone has a missing value for that variable. This can be assumed in our case (see section 3.3 Potential Selectivity).

In seven cases, using FIML estimation was not possible because all occupational status data were missing. Hence, the analytical sample is N= 176,678.

3.3. Potential selectivity

Although the use of marriage certificates offers extraordinary opportunities to study multigenerational social mobility, we also have to consider its (potential) disadvantages. First, there are no data for people who remained unmarried. However, the data still cover a large part of the population because 86 to 89% of males born between 1800 and 1900 married at some point (Ekamper et al., 2003). Moreover, selectivity is limited because, in this era, the likelihood of remaining unmarried was not greatly dependent on social background (Engelen & Kok, 2003), nor did married and unmarried men differ significantly in status (Schulz et al., 2015).

Second, since data are available for five of the Dutch provinces, certificates will not be linked if grooms, their fathers, paternal grandfathers, or maternal grandfathers were migrated from these provinces. Migrants are not a random selection because they often have a higher status. As stated by Knigge (2016), it is not expected that this will influence the results substantively since the number of missings due to migration is not very large. Based on census data, 8% of the people lived in another province than the one in which they were born in 1849, 13% in 1899, and 15% in 1930 (Knippenberg & De Pater, 2002).

Besides, the data do include information on migrants who migrated between the five provinces. Using the same dataset, Knigge et al. (2014) showed that there were only small differences in the effect of family influence on status attainment between data with and without information on migrants in the nineteenth century.

Finally, marriage records suffer from missing data. Especially information on the occupation of the father of the groom or bride is frequently missing, usually if the father is deceased (Knigge, 2016; Van Leeuwen & Maas, 2010). Because of the linked data structure, the missing cases on father's occupation and grandfather's occupation can be slightly reduced by using the marriage certificates of siblings. Still, there is a considerable number of missing cases. Yet, it is not believed that these missing data will influence the results substantially. This is because previous studies have shown that mortality was not related to status, and that there were little differences in occupational status and the father-son status correlation between those with and without missing data on, respectively, father's and grandfather's occupation (Knigge, 2016; Maas et al., 2011; Zijdeman & Maas, 2010).

3.4. Measurements

Grandson's occupational status, the dependent variable, is based on the occupation stated on his marriage certificate. These occupations were coded using the Historical International Standard Classification of Occupations (HISCO; Van Leeuwen et al., 2002). Subsequently, these were recoded into the HISCAM status scale (Lambert et al., 2014). This scale runs theoretically from 1 to 99, but we observe the range 10.6 to 99 (see Table 1 for the descriptive statistics of all variables).

Father's occupational status is the HISCAM status score derived from the occupation stated on his child's marriage certificate. In case of multiple married children, we take the average score over the occupations stated on the marriage certificates of all of his children. Similarly, *paternal grandfather's occupational status, maternal grandfather's occupational status, paternal uncles' occupational status*, and *maternal uncles' occupational status* are derived from the occupations stated on their children's marriage certificates. Since grandsons could have multiple paternal or maternal uncles, we use the average status of the uncles on either side. Grandsons could also have no uncles at all or only uncles without occupational information. Because we use FIML, as mentioned, these cases can still be analyzed.

We included several control variables. For grandson's occupational status, we controlled for *G3 marriage year* and *G3 age at marriage* which both can be found on G3's marriage certificate. Furthermore, we control for *G3 birth order*, which is the birth rank among his married siblings, and *G3 sibship size*, which is measured by the number of married brothers and sisters. We also controlled for *G2 sibship size* of the father and the mother, as these variables reflect the number of married aunts and uncles. Similarly, for father's status, we controlled for *G2 marriage year, age at marriage, birth order*, and *sibship size*.

Trends over time were described based on the marriage year of the grandson, which runs from 1857 to 1922. We coded these into five time periods, each covering roughly 12 years: 1857–1874, 1875–1886, 1887–1898, 1899–1910, 1911–1922. Coding it into shorter periods such as decades was not possible, as this gave converging problems for especially the oldest cohort, which has the least number of cases.

3.5. Analytic strategy

We use Structural Equation Modeling (SEM) to test our hypotheses. SEM has the advantage that the direct and indirect effects[6] of grandfathers and the hypothesized associations based on partner selection can all be tested simultaneously and that it can handle missing data using FIML.[7] The control variables were included in all models and their effects are presented in Table A1 (Appendix A). First, we test whether there is a G1-G3 association for the paternal lineage while taking into account the indirect effect via the occupational status of fathers (Model 1). Then we add the effect of paternal uncles(-in-law) (Model 2). We do the same for the maternal lineage (Model 3 and 4). These models are used for a first assessment of whether there is an indirect influence via uncles (*H3*) and uncles-in-law (*H4*). Next, we examine the influence of paternal and maternal lineages simultaneously by including the occupational status of both paternal and maternal grandfathers and uncles(-in-law), and the associations due to partner selection processes (Model 5). This model is used to test to what extent there is evidence for assortative mating, that is, positive associations between paternal and maternal grandfathers and fathers and maternal grandfathers. Furthermore, it is investigated to what extent studying both lineages together reduces the paternal and maternal G1-G3 association. If a substantial G1-G3 association remains after taking into account the indirect influences of uncles and assortative mating, it would be more likely that the G1-G3 association reflects a true direct influence of grandparents. Therefore, we use this final model to test *H1* and *H2*. For describing the trends in the (in)direct multigenerational associations, we estimated the final model for the five time periods.

Table 1. Descriptive statistics (*N*= 176,678).

Variables	N missing	Mean	SD	Min.	Max.
Occupational status					
G3 Grandson (DV)	2,456	47.510	12.512	10.6	99
G2 Father	33,013	46.888	10.053	10.6	99
G2 Paternal uncles	86,478	46.621	9.537	10.6	99
G2 Maternal uncles	87,334	46.648	9.335	10.6	99
G2 Paternal uncles-in-law	85,207	46.704	9.571	10.6	99
G2 Maternal uncles-in-law	83,869	46.790	9.491	10.6	99
G1 Paternal grandfathers	38,101	45.582	9.187	10.6	99
G1 Maternal grandfathers	41,238	45.625	9.273	10.6	99
Control variables					
G3 marriage year	0	1905.607	12.312	1857	1922
G3 age at marriage	0	26.619	4.816	16	72
G3 birth order	0	2.457	1.616	1	14
G3 sibship size	0	3.940	2.081	1	14
G2 marriage year	0	1872.453	12.934	1832	1905
G2 age at marriage	0	26.659	4.463	16	79
G2 father's birth order	0	2.396	1.557	1	13
G2 father's sibship size	0	4.044	2.055	1	15
G2 mother's sibship size	0	4.104	2.073	1	14

DV = dependent variable, G1 = first generation, G2 = second generation, G3 = third generation.

4. Results

4.1. Paternal lineage only

We first perform a three-generational model only for the paternal lineage, where the occupational status of the paternal grandfather predicts the status of the grandson partially through the influence of the father. Model 1 (Table 2) shows the standardized coefficients. In the Netherlands in the nineteenth century, the total association between paternal grandfathers and grandsons was .331. The association between father's and grandson's occupational status was considerable (β = .470, p < .001). As a consequence, the association between paternal grandfathers and the status of their grandson is largely indirect: their status is positively associated with the status of their own son (i.e., the father), which in turn is associated with grandson's status (indirect effect = .210, p < .001). The G1-G3 association that remains after accounting for fathers is significant (β = .121, p < .001). Although this can be interpreted as a small effect (see, e.g., Acock, 2014), relative to father's effect it is still moderately large. The effect size of paternal grandfathers is a quarter of that of parents, the same as found in the meta-analyses by Anderson et al. (2018).

To investigate whether paternal grandfather's status is still associated with their grandson's status after taking into account other resources of the intermediate generation, we include the average status of paternal uncles and uncles-in-law (Table 2, Model 2). Taking into account paternal uncles and uncles-in-law reduces the G1-G3 association by 45.5% from .121 (Model 1) to .066 (Model 2). Interestingly, the coefficients for paternal uncles (β = .099, p < .001) and paternal uncles-in-law (β = .091, p < .001) are significantly stronger influence than those of paternal grandfathers.[8]

For the paternal lineage, the remaining G1-G3 association is only 18.8% of the total association between paternal grandfather's occupational status and their grandson's status. The total association is largely present because of the indirect pathway via the intermediate generation of the paternal lineage, including fathers (58.7% of the total association; indirect effect = .206, p < .001), paternal uncles (11.7%; indirect effect = .041, p < .001), and paternal uncles-in-law (10.8%; indirect effect = .038, p < .001). We thus find support for our hypotheses that the G1-G3 association is partly mediated by the occupational status of paternal uncles (*H3a*) and paternal uncles-in-law (*H4a*).

4.2. Maternal lineage only

We perform the same multigenerational model for the maternal lineage, which produces results very similar to those for the paternal lineage. The total association between maternal grandfathers and grandsons is .307 (see Model 3, Table 2). This association was mainly present because of the relatively large indirect influence via fathers (indirect effect = .187, p < .001). The G1-G3 association while accounting for fathers is significant (β = .120, p < .001). This also holds when the maternal uncles' statuses (β = .086, p < .001) and uncles-in-law's statuses (β = .092, p < .001) are included in Model 4. There is still a significant G1-G3 association but it reduces by 40.0% from .120 in Model 3 to .072 (p < .001) in Model 4. This means that also for the maternal lineage the total association between grandfather's and grandson's status is largely the result of indirect pathways via

Table 2. Standardized coefficients of the structural equation models predicting grandson's occupational status (N = 176,678).

	Model 1			Model 2			Model 3			Model 4			Model 5		
DV: Grandson	β		(se)	β		(se)	β		(se)	β		(se)	β		(se)
Father	.470	***	(.003)	.438	***	(.003)	.458	***	(.003)	.428	***	(.003)	.415	***	(.004)
Paternal grandfather	.121	***	(.003)	.066	***	(.003)							.027	***	(.004)
Paternal uncle				.099	***	(.004)							.076	***	(.004)
Paternal uncle-in-law				.091	***	(.004)							.068	***	(.004)
Maternal grandfather							.120	***	(.003)	.072	***	(.004)	.031	***	(.004)
Maternal uncle										.086	***	(.004)	.067	***	(.004)
Maternal uncle-in-law										.092	***	(.004)	.076	***	(.004)
Total associationPGF → Grandson	.331	***	(.003)	.351	***	(.003)							.259	***	(.003)
Total indirect effect	.210	***	(.002)	.285	***	(.003)							.225	***	(.003)
Specific indirect effects															
- Via father	.210	***	(.002)	.206	***	(.002)							.145	***	(.002)
- Via paternal uncle				.041	***	(.002)							.042	***	(.002)
- Via paternal uncle-in-law				.038	***	(.002)							.037	***	(.002)
Total association MGF → Grandson							.307	***	(.003)	.335	***	(.003)	.326	***	(.004)
Total indirect effect							.187	***	(.002)	.263	***	(.003)	.286	***	(.003)
Specific indirect effects															
- Via father							.187	***	(.002)	.189	***	(.002)	.207	***	(.002)
- Via maternal uncle										.036	***	(.002)	.037	***	(.001)
- Via maternal uncle-in-law										.038	***	(.002)	.042	***	(.001)

*** p< .001. DV = dependent variable, se = standard error, PGF = paternal grandfather, MGF = maternal grandfather. In all models the following control variables were included: G3 marriage year, G3 age at marriage, G3 birth order, G3 sibship size, G2 father's sibship size, and G2 mother's sibship size (regressed on G3's occupational status); G2 marriage year, G2 age at marriage, G2 father's birth order, and G2 father's sibship size (regressed on G2's occupational status) (see Table A1 in Appendix)

fathers (56.4% of the total association; indirect effect = .189, $p < .001$), via maternal uncles (10.7%; indirect effect = .036, $p < .001$), and via maternal uncles-in-law (11.3%; indirect effect = .038, $p < .001$). The significant indirect effects of maternal uncles and uncles-in-law provide support for our hypotheses (*H3b* and *H4b*).

4.3. Paternal and maternal lineage simultaneously

Next, we study both lineages simultaneously while taking into account the associations related to partner selection processes (see Figure 4 and Table 2, Model 5). The G1-G3 association for the paternal lineage decreases even further with 59.1% from .066 (Model 2) to .027 (Model 5). For the maternal lineage, there is a decrease of 56.9% from .072 (Model 4) to .031 (Model 5). We hypothesized that this reduction in the G1-G3 association results from an indirect pathway where grandparents prompt the middle generation to pool resources via instrumental partner selection. We argued that this pathway would be reflected in assortative mating based on social origin (*H5a*). Indeed, we find a strong positive association between paternal grandfather's status and maternal grandfather's status ($Cov_{pgf,mgf} = .521$, $p < .001$; see Figure 4). Figure 4 further shows that, in line with *H5b*, father's and maternal grandfather's status were also positively

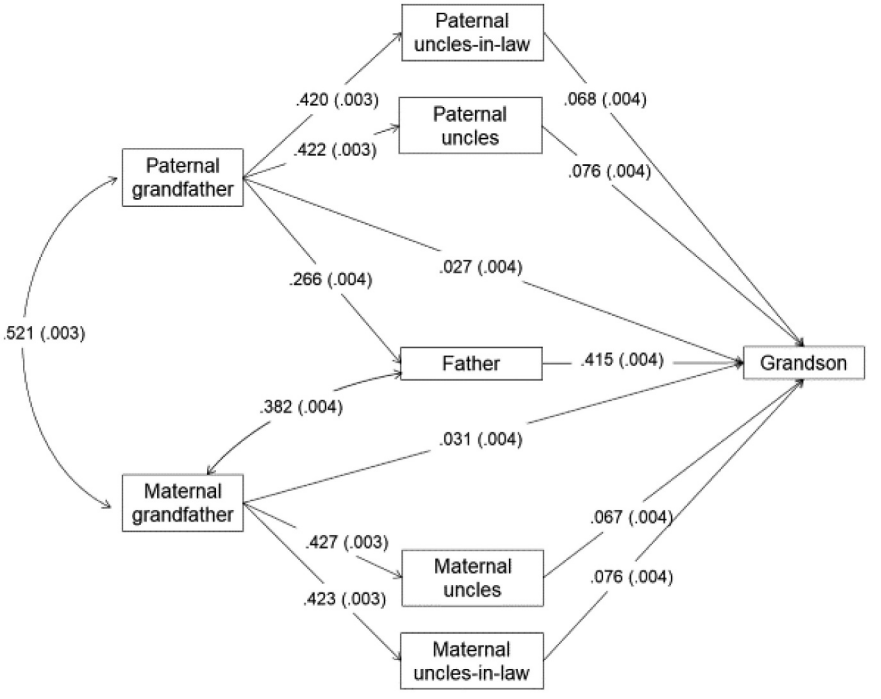

Figure 4. The final model including three-generational associations, indirect pathway via uncles(-in-law) and assortative mating ($N = 176{,}678$). Standardized coefficients with standard errors in parentheses. All coefficients are significant ($p < .001$). The following control variables were included: G3 marriage year, G3 age at marriage, G3 birth order, G3 sibship size, G2 father's sibship size, and G2 mother's sibship size (regressed on G3's occupational status); G2 marriage year, G2 age at marriage, G2 father's birth order, and G2 father's sibship size (regressed on G2's occupational status).

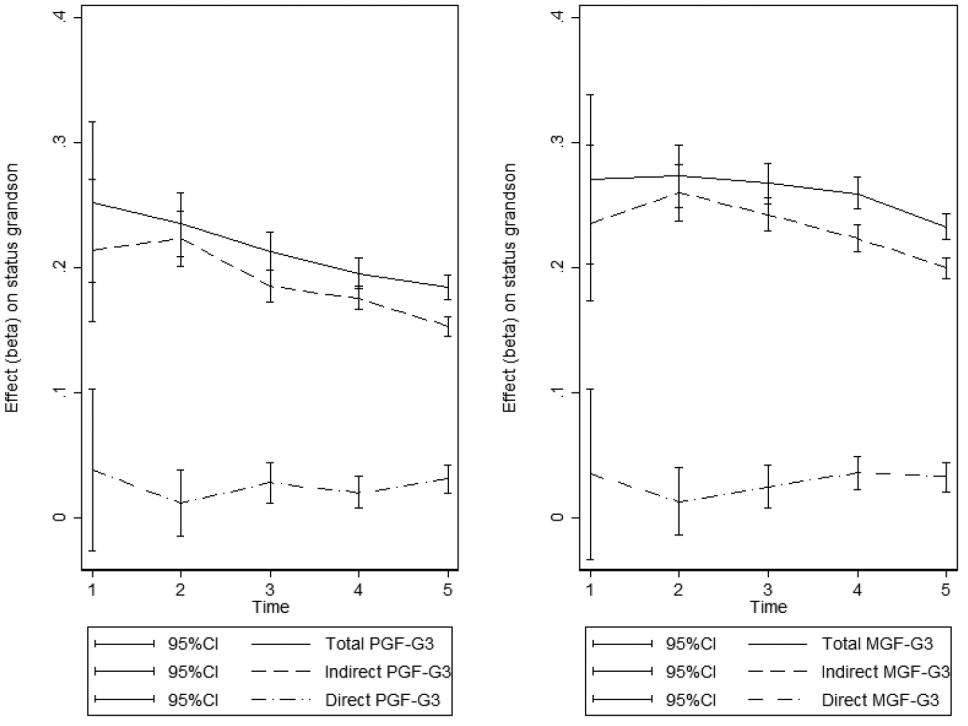

Figure 5. Total G1-G3 association, total indirect effects (via fathers and uncles), and direct effect for the paternal (left) and maternal (right) lineages over the period 1857 to 1922. Standardized coefficients with 95% confidence intervals (CI). Changes over time refer to the periods 1857–1874 (1), 1875–1886 (2), 1887–1898 (3), 1899–1910 (4), and 1911–1922 (5).

associated ($Cov_{f,mgf}$ = .382, $p < .001$). In other words, matching of Dutch partners in the nineteenth century was based to a large extent on the social origin of the groom and bride; the groom's own, attained, social position played a role too, but to a lesser extent.

When we do not only take the indirect pathway via uncles into account but also assortative mating by studying both lineages together, we still find significant G1-G3 associations for both paternal grandfathers (β = .027 $p < .001$) and for maternal grandfathers (β = .031, $p < .001$) (see Model 5). However, the effect sizes are not very substantial. Compared to the initial G1-G3 association that we found for paternal grandfathers (.121) and maternal grandfathers (.120), the associations are largely reduced when uncles (Model 2 and 4) are considered and approach zero when additionally assortative mating (Model 5) is accounted for. Hence, we do not find convincing support for our first hypothesis. We also expected that if grandfathers had a direct influence, it would be stronger for the paternal than the maternal lineage (*H2*), but we do not find a significant difference between the effect of the paternal and maternal grandfather's occupational status (p= .599). The coefficients for maternal and paternal uncles(-in-law) diminished somewhat compared to Model 2 and 4 respectively, but not much. This means that *H3a/b* and *H4a/b* are also supported when analyzing both lineages simultaneously instead of separately.

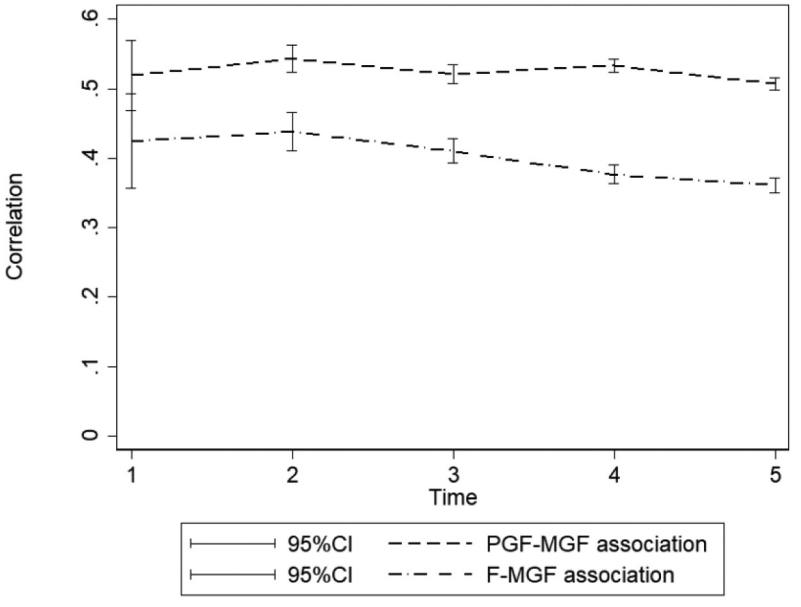

Figure 6. Associations related to assortative mating over the period 1857 to 1922. Changes over time refer to the periods 1857–1874 (1), 1875–1886 (2), 1887–1898 (3), 1899–1910 (4), and 1911–1922 (5).

4.4. Changes over time

Figure 5 shows the paternal and maternal G1-G3 associations over time (for more detailed results, see Table A2 in Appendix A. Both multigenerational associations, but especially the paternal G1-G3 association, decrease over time. This is mainly the result of indirect pathways via the intermediate generation becoming less important over time. This applies not only to the indirect influence via the father but also to extended family members of uncles and uncles-in-law (see Table A2). The direct effects of paternal and maternal grandfather – that only account for a small part of the total G1-G3 association – did not change much over time.

The associations related to assortative mating are shown in Figure 6. The association between paternal grandfather's and maternal grandfather's status did not change much over the period 1857 to 1922, whereas the association between father's and maternal grandfather's status slightly decreased.[9]

5. Conclusion and discussion

The growing realization in social mobility research that the dominant parent-offspring paradigm may underestimate the transmission of inequality across generations has prompted scholars mainly to look at whether there are G1-G3 associations in socio-economic outcomes. We used a three-generational database, covering a large part of the Netherlands over the period 1857 to 1922, to show that a parent-offspring approach is indeed too limited, but that including grandparents does not suffice either. We conclude

that G1-G3 associations may arise not so much because grandfathers have a direct influence, but that grandfathers can still be important in more indirect ways: via uncles and assortative mating.

Even though we observe significant associations between grandson's status and both the paternal and maternal grandfather's status, we are hesitant to stress the importance of direct grandparental influence. One reason is that the direct grandfather pathway reduces substantially if uncles are taken into account. The direct effect for paternal grandfathers shrinks with 46.2% after including paternal uncles and uncles-in-law, and the direct maternal grandfather effect with 44.5% after including maternal uncles and uncles-in-law. Another reason is that the direct grandfather pathways reduce even further if both lineages are studied together. We argued that the paternal grandfather would capture part of the influence of the maternal lineage when the latter is not considered because of assortative mating, and vice versa. We find that the direct paternal grandfather effect diminishes by 62.2% if we include the maternal lineage, and for maternal grandfathers by 60.6% if we include the paternal lineage. Because of these reductions, we must keep the possibility in mind that no sizeable effect would remain if we would be able to include more measures of the middle generation, especially since we do not directly observe the influence of the mother.[10]

Whether or not grandfathers had a direct influence, social reproduction was more complex than a two-generation parent-offspring transmission. One reason is that uncles turned out to matter – even more so than grandfathers. In other words, the direct influence of extended family members needs to be considered but should not be confined to that of grandparents. One caveat to keep in mind here is that the influences found for uncles(-in-law) need not be (completely) causal. It could also be that they serve as proxies for an underlying latent variable. Some have argued that such a latent variable captures genetic inheritance (Clark, 2014), but it could also include unmeasured parental resources. Extended family members could have a statistical effect because they provide additional information for this underlying latent variable, instead of a substantive effect because of their resources. Especially for maternal uncles(-in-law) it could be that they (also) capture part of the influence of the mother. Another important reason is the impact that grandparents had on the marital choices of the middle generation. We found that the association between paternal and maternal grandfathers' statuses was strong. We expected this large marital sorting on social origin because parents had a strong interest in who their children married. Strategic partner selection is argued to be one of the most effective strategies in maintaining or improving socioeconomic positions over generations (Dribe & Lundh, 2010). Therefore, by stimulating their children to marry assortatively, grandparents not only secured their own position in old age, but they also improved the socioeconomic conditions of their grandchildren.

How important it is to include these complexities when studying social reproduction, and in what way, is likely to depend on the larger context. We looked at the mechanisms underlying social reproduction in the Dutch context of the nineteenth century, a context that is characterized by a nuclear family system with grandparents living near their (grand) children and playing a prominent role in partner selection processes of their children. We expect that our findings generalize to contexts with similar characteristics, such as other Northwest European countries around that time. For contemporary societies, we expect that with a change from ascription to achievement during modernization, the mechanisms may have changed. We find that the indirect pathway via uncles and uncles-in-law decreased

over time, as well as indications of decreased assortative mating by occupational status. If this trend continued, an implication would be that indirect grandparental influence via partner selection plays a modest role nowadays. This would mean that it is not as imperative to study the paternal and maternal grandparents simultaneously in contemporary Western societies, but it is in societies that have more traditional marriage practices. However, for uncles and aunts, it is less obvious why their role would be much less important nowadays than in the Netherlands in the nineteenth century. Not taking uncles and aunts into account could therefore lead to misinterpreting the size and mode of social reproduction in contemporary societies. Whether these expectations are correct, remains an empirical question to be answered.

Although we may misunderstand the pathways through which social reproduction occurs if we leave out certain extended family members, it is not necessarily the case that we grossly underestimate the persistence of inequality. We showed that the influence of a family member that is left out is often (mis)represented in the influence of another family member. For example, if the maternal lineage is left out, their influence becomes part of paternal lineage effects because of the strong assortative mating. This implies that studies could use the status of grandfather's to better capture the influence of family background if no other data on extended family members are available. Researchers should be aware that in such case grandfather estimates do not capture a direct, causal influence, but largely other influences including those of uncles and (extended) family members of the other lineage. If future research has the opportunity to collect new data, a strong focus on data of grandfathers seems not as important as commonly thought. Including other extended families such as paternal and maternal uncles seems more worthwhile.

To really say something about the extent to which persistence of inequality is underestimated in a parent-offspring model, future research should not only include extended family members but also investigate how the influence of one family member depends on that of another. In a way, we have implicitly assumed that the influence of all family members is additive, while in reality the influence of one family member could compensate or multiply that of another (Anderson et al., 2018; Daw et al., 2020; Jæger, 2012). For instance, extended family members may step in, especially when parents have little resources or if they are not (strongly) involved in their child's life (cf., Bol & Kalmijn, 2016). Opposed to such compensatory mechanisms, it could also be that there are patterns of cumulative advantage (Erola & Kilpi-Jakonen, 2017). For example, perhaps parents with high socioeconomic status know better how to put their resources to use for their children if the parents came from high social standing themselves compared to when this position is 'new' to them.

Mare (2011) pointed out that the literature has largely ignored pathways of social reproduction beyond direct parent-child transmission. He suggested to attend to the role of remote kin and to 'the tandem nature of demographic and socioeconomic reproduction'. Whereas the literature on direct grandparent effects took off, it has been much more unresponsive to including other extended family members and demographic processes. In this paper, we showed that other extended family members – in our case uncles – may be even more important to consider than grandparents. Moreover, we showed that families may indeed reproduce socioeconomic (dis)advantage over multiple generations by influencing the demographic behavior – in our case marriage choices – of the next generations. Marriage choices are a type of demographic behavior that is of particular interest to the inequality literature because it is an important cause of social exclusion. Through strategic

marriage choices, people can keep attractive social positions within the family. It thus made sense to integrate intergenerational mobility and mobility at marriage as a first step. But of course, there are other demographic behaviors of next generations, such as fertility, that families can influence to further strengthen socioeconomic (dis)advantages across generations. A logical follow-up step would therefore be to incorporate also these other forms of demographic behavior into the multigenerational framework. Song and Mare (2017) showed how this can be done for fertility within the prospective approach. For the more common retrospective approach, it is not straightforward how to do this and thus poses a challenge for future research.

Notes

1. For similar findings on indicators of socioeconomic status other than educational outcomes, see, e.g., Beck (1983), Chan and Boliver (2013), Daw et al. (2020), Dribe and Helgertz (2016), Engzell et al. (2020), Hertel and Groh-Samberg (2014), Knigge (2016), and Warren and Hauser (1997).
2. Note, however, the evolutionary theoretical argument that maternal grandmothers' effects should be largest because only they can be sure to invest in their own offspring (Hawkes et al., 1998). Effects of the maternal grandmother may be picked up by the maternal grandfather's status.
3. Another common argument why people tend to mate similar people is that they have more *opportunities* to meet similar people. Members of larger and geographically concentrated groups are more likely to marry assortatively (Blau, Blum, & Schwartz, 1982). Meeting contexts such as neighborhoods, schools, and social networks are not independent of social class (Kalmijn, 1998; Kalmijn & Flap, 2001). In the Netherlands in the nineteenth century, participation in secondary school was limited and restricted to men, and thus did not provide opportunities to meet and potentially mate (Zijdeman & Maas, 2010). Local communities were probably more relevant contexts. With increasing urbanization from the second half of the nineteenth century onwards (Wintle, 2000), areas may have become more heterogeneous concerning social status, which increases the opportunity for exogamy (Uunk, 1996).
4. And even if mothers had an occupation, the influence of their occupational status on their son's occupational status was negligible compared to that of fathers (Kong et al., 2020).
5. Modernization is probably the most influential change in this period and would decrease the G1-G3 association. However, there are also other developments that may partly counteract this. Simultaneously, the life expectancy increased over time, implying that the overlap in lives of grandparents and grandchildren increased leading to more opportunities for grandfathers to influence their grandchildren via contact (Knigge, 2016).
6. We sometimes use the terms direct and indirect effects because this is how the pathways are commonly referred to in mediation models. However, it should be noted that these are associations rather than causal effects.
7. A slight disadvantage is that it does not take into account the multilevel structure of the data. The data have four levels (grandsons, fathers, grandfathers, and communities) and a non-hierarchical multiple membership structure because grandsons are nested within both the paternal and maternal grandfather. It is not straightforward how to perform a multiple membership multilevel model in a SEM framework and the results are not easy to communicate. We did perform multiple membership multilevel regressions, which yielded similar conclusions as the SEM models (results available upon request).
8. The difference is significant with $p < .001$ as indicated by the Wald test of parameter constraints (results not shown).
9. Note that these trends are somewhat different than those reported by Maas and van Leeuwen (2019), who found that from approximately 1870 onwards the (what we labelled) PGF-MGF association decreased whereas the F-MGF association increased. This could be related to the fact that they studied partner selection processes over a longer period

(marriages between 1813 and 1922), whereas in our three-generational setup we only study partner selection of the father's generation (marriages 1832 and 1905, but note that we take the grandson's perspective by referring to 1857–1922). Combined with the difference in operationalization of the time periods, both studies may capture different phases of the changes over time.

10. Daw et al. (2020) found that grandparental education is associated with grandchild education, but that this association significantly reduced when they included the other parent's education, while Wolbers and Ultee (2013) found that the effect of both grandfathers' education is completely indirect once both parents' education is taken into account.

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Appendix A – supplementary tables

Table A1. Standardized coefficients of the control variables in the structural equation models predicting grandson's occupational status (N = 176,678).

	Model 1			Model 2			Model 3			Model 4			Model 5		
	β		(se)	β		(se)	β		(se)	β		(se)	β		(se)
DV: Grandson															
G3 marriage year	.092	***	(.002)	.091	***	(.002)	.092	***	(.002)	.093	***	(.002)	.093	***	(.002)
G3 age at marriage	.074	***	(.002)	.070	***	(.002)	.076	***	(.002)	.070	***	(.002)	.065	***	(.002)
G3 birth order	.036	***	(.003)	.036	***	(.003)	.036	***	(.003)	.036	***	(.003)	.035	***	(.003)
G3 sibship size	−.090	***	(.003)	−.089	***	(.003)	−.091	***	(.003)	−.089	***	(.003)	−.086	***	(.003)
G2 father's sibship size	−.016	***	(.002)	−.015	***	(.002)	−.018	***	(.002)	−.017	***	(.002)	−.016	***	(.002)
G2 mother's sibship size	−.015	***	(.002)	−.014	***	(.002)	−.013	***	(.002)	−.012	***	(.002)	−.012	***	(.002)
DV: Father															
G2 marriage year	.040	***	(.002)	.040	***	(.002)	.051	***	(.002)	.048	***	(.002)	.045	***	(.002)
G2 age at marriage	.016	***	(.002)	.012	***	(.002)	.000		(.002)	−.003		(.002)	−.003		(.002)
G2 father's birth order	.001		(.003)	.001		(.003)	.000		(.003)	.002		(.003)	.001		(.003)
G2 father's sibship size	−.027	***	(.003)	−.026	***	(.003)	−.030	***	(.003)	−.031	***	(.003)	−.030	***	(.003)

Notes: *** $p < .001$. DV = dependent variable, se = standard error, PGF = paternal grandfather, MGF = maternal grandfather, G2 = second generation, G3 = third generation. Models correspond with the models presented in Table 2.

Table A2. Standardized coefficients of the structural equation models predicting grandson's occupational status over time.

	Model 1			Model 2			Model 3			Model 4			Model 5		
DV: Grandson	*β*		(se)	*β*		(se)	*β*		(se)	*β*		(se)	*β*		(se)
Father	.400	***	(.033)	.436	***	(.014)	.428	***	(.008)	.432	***	(.006)	.398	***	(.005)
Paternal grandfather	.038		(.033)	.012		(.014)	.028	**	(.008)	.020	**	(.006)	.031	***	(.005)
Paternal uncle	.153	***	(.037)	.151	***	(.015)	.076	***	(.009)	.073	***	(.007)	.068	***	(.006)
Paternal uncle-in-law	.063		(.041)	.081	***	(.014)	.070	***	(.008)	.065	***	(.007)	.066	***	(.006)
Maternal grandfather	.035		(.313)	.013		(.014)	.025	**	(.009)	.036	***	(.007)	.033	***	(.006)
Maternal uncle	.085		(.049)	.060	***	(.013)	.068	***	(.008)	.055	***	(.006)	.075	***	(.006)
Maternal uncle-in-law	.061		(.039)	.091	***	(.014)	.081	***	(.008)	.086	***	(.006)	.063	***	(.006)
Total associationPGF → Grandson	.252	***	(.033)	.235	***	(.013)	.213	***	(.008)	.195	***	(.006)	.184	***	(.005)
Total indirect effect	.214	***	(.029)	.223	***	(.011)	.185	***	(.007)	.175	***	(.005)	.153	***	(.004)
Specific indirect effects															
- Via father	.069	***	(.017)	.127	***	(.007)	.120	***	(.004)	.117	***	(.003)	.099	***	(.003)
- Via paternal uncle	.028	***	(.017)	.058	***	(.007)	.034	***	(.004)	.031	***	(.003)	.028	***	(.002)
- Via paternal uncle-in-law	.038		(.018)	.038	***	(.014)	.031	***	(.004)	.027	***	(.003)	.027	***	(.002)
Total association MGF → Grandson	.270	***	(.034)	.273	***	(.004)	.267	***	(.008)	.259	***	(.006)	.232	***	(.005)
Total indirect effect	.235	***	(.032)	.260	***	(.003)	.242	***	(.007)	.223	***	(.005)	.200	***	(.004)
Specific indirect effects															
- Via father	.170	***	(.020)	.191	***	(.009)	.176	***	(.005)	.163	***	(.004)	.144	***	(.003)
- Via maternal uncle	.039		(.023)	.028	***	(.006)	.030	***	(.004)	.024	***	(.003)	.030	***	(.002)
- Via maternal uncle-in-law	.026		(.017)	.041	***	(.006)	.036	***	(.004)	.037	***	(.003)	.026	***	(.002)
Years	1857–1874			1875–1886			1887–1898			1899–1910			1911–1922		
N	2,036			13,085			33,407			54,454			73,702		

Notes: ** $p < .010$, *** $p < .001$. DV = dependent variable, se = standard error, PGF = paternal grandfather, MGF = maternal grandfather. In all models the following control variables were included: G3 marriage year, G3 age at marriage, G3 birth order, G3 sibship size, G2 father's sibship size, and G2 mother's sibship size (regressed on G3's occupational status); G2 marriage year, G2 age at marriage, G2 father's birth order, and G2 father's sibship size (regressed on G2's occupational status).