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Research Article

**Family size and intergenerational social mobility
during the fertility transition:
Evidence of resource dilution from the city of
Antwerp in nineteenth century Belgium**

Jan Van Bavel

Sarah Moreels

Bart Van de Putte

Koen Matthijs

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Table of Contents

| | | |
|-----|---|-----|
| 1 | Resource dilution and fertility decline | 314 |
| 2 | Context: the city of Antwerp | 316 |
| 3 | Data: the COR* sample | 317 |
| 4 | Measuring social status: the SOCPO classification | 319 |
| 5 | Descriptive results and confounding factors | 323 |
| 5.1 | Sibsize and social class | 323 |
| 5.2 | Birth order | 326 |
| 5.3 | Migration and incomplete sibsize | 327 |
| 5.4 | Age at recording of occupation | 328 |
| 6 | Regression analysis | 330 |
| 7 | Conclusions | 338 |
| | References | 340 |

**Family size and intergenerational social mobility
during the fertility transition:
Evidence of resource dilution from the city of Antwerp
in nineteenth century Belgium**

Jan Van Bavel¹

Sarah Moreels²

Bart Van de Putte³

Koen Matthijs⁴

Abstract

It has been argued in sociology, economics, and evolutionary anthropology that family size limitation enhances the intergenerational upward mobility chances in modernized societies. If parents have a large flock, family resources get diluted and intergenerational mobility is bound to head downwards. Yet, the empirical record supporting this resource dilution hypothesis is limited. This article investigates the empirical association between family size limitation and intergenerational mobility in an urban, late nineteenth century population in Western Europe. It uses life course data from the Belgian city of Antwerp between 1846 and 1920. Findings are consistent with the resource dilution hypothesis: after controlling for confounding factors, people with many children were more likely to end up in the lower classes. Yet, family size limitation was effective as a defensive rather than an offensive strategy: it prevented the next generation from going down rather than helping them to climb up the social ladder. Also, family size appears to have been particularly relevant for the middle classes. Implications for demographic transition theory are discussed.

¹ Interface Demography, Vrije Universiteit Brussel. E-mail: Jan.VanBavel@vub.ac.be.

² Centre for Sociological Research, KULeuven. E-mail: Sarah.Moreels@soc.kuleuven.be.

³ Department of Sociology, Ghent University. E-mail: Bart.Vandeputte@ugent.be.

⁴ Centre for Sociological Research, KULeuven. E-mail: Koen.Matthijs@soc.kuleuven.be.

1. Resource dilution and fertility decline

In his 1890 classic *Dépopulation et civilisation*, the French social scientist Arsène Dumont argued that adults with ambition tend to limit their family size because numerous offspring are an obstacle to success and achievement. For people who want to rise socially, he wrote, many children make inconvenient luggage (Dumont 1890(1990):77). The same holds for those who project their ambitions onto their children: numerous offspring dilute parental resources and therefore complicates or aggravates the social situation in the next generation (Dumont 1890(1990):73-91). Philippe Ariès (1980), referring to Dumont, argued in an article amply cited by demographers (Dalla Zuanna 2007) that the decline of fertility in the West is the consequence of the emergence of a child-oriented society. In such a society, parents' main investment consists of helping their children to get ahead. In the English-speaking world, Joseph A. Banks' *Prosperity and Parenthood* (1954) was instrumental in spreading the same ideas. Banks, who explicitly referred to Dumont's work, argued that social ambition was one of the motivating forces for family size limitation in the English middle classes.

In economics, the negative effect of family size on the future social status of children, due to resource dilution, is known under the heading of the quality-quantity trade-off (Black, Devereux, and Salvanes 2005; Maralani 2008). Becker (1991) calls proper consideration of the interaction between child quantity and quality “probably the major contribution of the economic analysis of fertility” (Becker 1991:135). Becker's economic theory implies that a reduction in the number of children raises investments in child quality, where quality is measured by the current as well as the future well-being of children, including their income when they become adults.

In a nutshell, the resource dilution hypothesis states that parental resources are finite and that additional children dilute the amount of time, money, and patience that each child receives from its parents. As a consequence of reduced parental investment per child, the opportunities to move up the social ladder, for example, through higher education are reduced (Downey 1995; Desai 1995; Maralani 2008). Historically, resource dilution is argued to have motivated fertility limitation as inheritance systems became more egalitarian and as education became more important in securing a good social position in terms of wealth and prestige (Van Bavel 2006; Dalla Zuanna 2007).

Despite its longstanding record in social and demographic theory, there is little direct empirical evidence backing the relevance of the resource dilution hypothesis for the historical fertility decline in Europe (Downey 1995; Haaga 2001; Black, Devereux, and Salvanes 2005; Dalla Zuanna 2007). One reason may be that it is very hard to tell selection effects from truly causal effects: do families with more children have observed or unobserved characteristics that would lower their social position, regardless of family

size? Or is there really a causal effect, such that a family with given characteristics would climb the social ladder if it would have had fewer children (Black, Devereux, and Salvanes 2005)?

Research in contemporary, modernized countries has consistently confirmed that the number of siblings is negatively associated with a range of desirable outcomes, including educational and occupational attainment. The association is persistent, also after controlling for potentially confounding variables (Kasarda and Billy 1985; Blake 1989; Downey 1995; see Steelman et al. 2002 for a comprehensive overview), although a recent study casts doubt on whether the association can be considered truly causal in the sense predicted by the resource dilution hypothesis (Black, Devereux, and Salvanes 2005). The evidence from studies about developing countries is much more mixed. The negative association between family size and child outcomes has been found to be much weaker, absent, or even positive there (Desai 1995; Steelman et al. 2002; Maralani 2008). Overall, the available body of evidence about countries around the world today suggests that the relationship between family size and children's social mobility changes as a society develops (Desai 1995; Maralani 2008). Yet, drawing conclusions about historical change from comparing rich and poor, rural and urban, or southern versus northern countries observed today represents a typical case in point of "reading history sideways" (Thornton 2005).

Given, on the one hand, the very prominent role of the resource dilution hypothesis in theories about the historical fertility decline in Europe and, on the other hand, the very scant empirical evidence supporting it, the aim of this article is to investigate whether the size of the family of orientation was indeed associated with the upward or downward mobility chances of adult children in a historical population undergoing the demographic transition during the nineteenth century. More specifically, we replicate the study by Van Bavel (2006), carried out in the small, middle class town of Leuven in Belgium, in a different context. The context for this study is the rapidly urbanizing, big city of Antwerp in the nineteenth century. Were children with fewer brothers and sisters more likely to climb higher on the social ladder than were children who had more siblings? Were sons and daughters originating from large families more likely to lose social status as compared to their parents?

We go beyond the analysis of Van Bavel (2006) by also addressing the role of gender and migration. Indeed, investigating differences by gender may reveal different strategies. For sons, a limited family size may result in better career prospects. For daughters, a limited family size may result in better chances to attract a suitable marriage partner. Also geographical origin may play a role. Migrants and non-migrants may be expected to hold different attitudes towards family limitation and their position in the local labour market is likely to be different as well.

2. Context: the city of Antwerp

During the 19th century, this important port city experienced major demographic and economic transformations. From about 55 thousand inhabitants at the start of the 19th century, Antwerp grew fast to more than 88 thousand inhabitants around 1850. In the course of the second half of the nineteenth century, it surpassed the Belgian capital city of Brussels and grew to be the biggest city of Belgium, with about 273 thousand inhabitants by the end of the 19th century. The annual average growth-rate rose from 0.7% in 1801-1810 to 3.2% in 1881-1890. Population growth was heavily influenced by migration, spurred by growing activity in the harbour. At the start of the nineteenth century, about 22% of the population was born outside Antwerp. This proportion increased to 43% by the end of the nineteenth century (Kruithof 1964:511-512; Vrielinck 2000: 1668-1669; Winter 2009).

Economically, things changed dramatically already during the first half of the 19th century. Due to a shortage of investments, the textile production, which had been one of Antwerp's main industries, imploded. By 1850, employment in this sector completely collapsed. On the other hand, harbour activities grew strongly as Antwerp evolved from an inland to an international port. Both external and internal factors were responsible for an impressive expansion of international activities. The liberalization of the trading climate and the competition of neighbouring ports, together with the continuing industrialisation of Belgium, the rapid transformation in the Ruhr and the Rhineland (Germany) and the invasion of the European market by cheap foreign grain stimulated the development of port activities externally. Moreover, local initiatives were also undertaken to stimulate the industrial and commercial activities in Antwerp. The expansion of port activities, coupled with strong population growth, created a favourable climate for the establishment of industry (Jeuninckx 1964; Veraghtert 1986:359-393).

While these economic developments brought more employment opportunities, they had some downsides for the urban population, too: the employment structure was much less regular and dock work was physically very demanding. Thousands of immigrants came to Antwerp because of the new employment possibilities but they were often confronted with bad housing and sanitary conditions, and many faced integration problems (Asaert 2007; Lampo 2002; Lis 1969; Van Houtven 2008). Moreover, the more than one million European migrants who emigrated via Antwerp with the 'Red Star Line' to the United States also strengthened these problems during the last decennia of the 19th century (Vervoort 2005:81-90).

3. Data: the COR* sample

We use a new demographic database called COR*, covering the population of the city of Antwerp between 1846 and 1920. The two main sources used to construct the COR*-database are the population registers and the vital registration records (birth, marriage, and death certificates) (Matthijs and Moreels 2010). The Belgian population registers are a high quality source that enables us to follow individuals, and their offspring, over time. From 1846 onwards, all Belgian municipalities were obliged to keep up a population register. This register is a repository of demographic and social information about all official inhabitants of the municipality, stored per dwelling. For each dwelling, all changes were recorded, such as births, deaths, marriages, and divorces as well as moves within the municipality and external migration (Gutmann and van de Walle 1978; Leboutte and Obotela 1988; Van Baelen 2007).

The COR* database has been composed by letter sampling: following the TRA*-sample in France (Dupâquier and Kessler 1992), all persons whose family name starts with a particular letter combination are selected in the sample. The letter combination that is the basis of this sample, namely COR*, satisfies a number of conditions: a good geographical distribution over the Flemish territory, socio-demographic representativeness, and language sensitiveness (especially with regard to foreign people) (Van Baelen 2007:5-15; Matthijs and Moreels 2010).

For the present analyses, we selected men and women (called index or reference persons) from the COR* database who were born between 1830 and 1900 and who were ever recorded to live in the city of Antwerp between 1846 and 1920. We look at intergenerational mobility by comparing male occupations in two generations, so the occupation of the father of the index persons has to be known in order to be included in the analysis.

For men, we use their own occupational titles as recorded in their marriage act or in the population register. If different occupations were recorded at different occasions (for example at census, marriage, or immigration date), we selected the occupation recorded on the occasion of the first marriage, if applicable and available, or the occupation recorded closest to age 25 otherwise. By applying these criteria, we obtained 749 pairs of observations of occupations for both father and son. Yet, in 82 of these cases, the son's occupation was recorded when he was at most 13 years old and no occupation was recorded at a later date. We consider these child occupations to contain insufficient information about their own social status of destination and, therefore, removed them from the analysis. This leaves 667 father-son pairs of occupations available for analysis.

For female index persons, we use the occupation of their first marriage partners, if applicable and available. As a consequence, only women who married during the study

period are included in the analysis. This amounts to 211 father – son-in-law pairs available for analysis. In sum, there are 878 pairs of occupations to be analyzed: 667 father-son plus 211 father-son-in-law pairs. There are 523 different fathers involved. The regression analysis will apply random effects multilevel modelling in order to deal with the nested structure of the data.

Our selection of cases implies that we need to take into account at least three potential sources of selection bias. The first follows from the fact that we need to know the occupation of the fathers of the index persons. As a result, sons who migrated to Antwerp without their fathers had to be excluded from the analysis. It is not unlikely that young men who migrated without their families of origin were also more mobile on the social ladder. Yet, we cannot tell a priori that they would be more likely to climb rather than descend, given the very high heterogeneity of migration to Antwerp (Winter 2009). But we can expect that we underestimate to an unknown extent the degree of social mobility, upwards or downwards, or both. To the extent that this is correlated with the number of siblings in the family of origin, this will bias our estimates of its effect.

The second source of potential selection bias is our exclusion of 82 cases of father-son pairs for which no occupation of the son was recorded past age 13. One obvious reason for not registering an occupation is unemployment, for illness or other reasons. This would imply that we underestimate downward mobility. Apart from unemployment, it can be argued that the higher the socio-economic status attached to an occupation, the more likely that it will be recorded in the population registers. If that is true, sons with a low social status will be more likely to be excluded from the sample, again implying an underestimation of downward mobility. Again, to the extent that this is correlated with the number of brothers and sisters, it will bias our results.

The third issue relates to female index persons: they are included in the analysis only if they got married. Assuming that women who are more attractive on the marriage market will be moving up the social ladder more often than relatively unattractive women (for whatever reason), we may expect that women who never got married will be more often going down the social ladder. Our results for female index persons should therefore be interpreted conditionally, i.e., they hold only for the selective group of ever marrying women.

4. Measuring social status: the SOCPO classification

In order to classify individuals in a social hierarchy based on occupational information, we use the SOCPO classification scheme. SOCPO represents a hierarchy of social power (hence the acronym) and was designed to complement the Historical International Standard Classification of Occupations (HISCO, van Leeuwen, Maas and Miles 2002). We use the concepts of social class and social status interchangeably: social classes, as defined within the logic of the SOCPO classification, are assumed to imply a particular status within the social stratification system.

The SOCPO classification scheme assumes that social status is a derivative of social power. Social power is defined as the potential to influence one's destiny or life chances through control of scarce resources. SOCPO distinguishes between economic and cultural sources of social power. Economic power is based on material resources of power, such as property. Cultural power is based on nonmaterial power sources, such as reputation, style, and standing. Both sources of power are partly related but they do not overlap completely (Van de Putte and Miles 2005).

SOCPO distinguishes between five dimensions underlying economic and cultural power:

1. property;
2. hierarchical position, i.e., the command position one has in an organizational structure (e.g.. 'manager', 'foreman');
3. skill;
4. whether a person's work comprises predominantly manual or non-manual tasks;
5. pure status, i.e., a title that refers to basically ascribed qualities (such as 'knight') and does not directly refer to skill, property or hierarchical position; in historical sources these titles are often used as an alternative for an occupation.

An important principle of the scheme is that these five dimensions are each in their own way contributing to the amount of social power (Van de Putte and Miles 2005). The result is a scheme with five Social Power Levels. These levels are labelled 'elite' (SOCPO 5), 'middle class' (SOCPO 4), 'skilled workers' (SOCPO 3), 'semiskilled workers' (SOCPO 2) and 'unskilled workers' (SOCPO 1). Table 1 presents the basic dimensions of the SOCPO-scheme.

Table 1: The SOCPO-scheme, basic dimensions, categorisation and merging

| SOCPO-level | Property | Hierarchical position | Skill and manual/non-manual | Pure status |
|-------------------------|-----------------------------|-----------------------|---|-------------|
| SOCPO 5 Elite | Macroscaled self employed | High commanders | Nonmanual super skilled | Nobility |
| SOCPO 4 Middle class | Medium-scaled self employed | Medium commanders | Nonmanual skilled, manual super-skilled | |
| SOCPO 3 Skilled | | Low commanders | Manual skilled | |
| SOCPO 2 Semi-skilled | Microscaled self employed | | Semiskilled | |
| SOCPO 1 Unskilled | | | Unskilled | |

First, the occupations mentioned in the Antwerp data have been coded into the HISCO classification, using the guidelines involved in that coding scheme (van Leeuwen, Maas and Miles 2002). Next, standardized recoding algorithms were used to reclassify HISCO-codes into the SOCPO-levels. In Antwerp, the unskilled occupational group consists mainly of day labourers and dockworkers (SOCPO 1, see Table 1). Semiskilled working class occupations (SOCPO 2) include soldiers as well as apprentices of traditional arts and crafts like forging, tailoring, and painting. Skilled occupations within the working classes (SOCPO 3) include mainly the traditional arts like the ones just mentioned. In addition, and typical of Antwerp, it also includes many apprentice diamond polishers; they are counted as skilled (and not semiskilled) because of the exceptional skill level involved. Middle class occupations (SOCPO 4) include white collar clerks and other office employees, next to experienced diamond polishers, and captains of ships and barges. Among the elite (SOCPO 5), we find professionals, engineers, merchants, and industrialists.

The upper panels of Tables 2 and 3 are the contingency tables for the pairs of father-son SOCPO-codes and for the pairs of father-son-in-law codes, respectively. For both tables, the hypothesis of statistical independence can safely be rejected (with $\chi^2= 140.5$ and $\chi^2= 49.4$, respectively, $df=16$ and $p<0.001$ in both cases). Note, however, that this is not really a fair statistical test since many fathers feature several times in it, i.e., once for every son and for every married daughter. The nested structure of the data will be dealt with in the multilevel regression analysis.

The lower panels of tables 2 and 3 report standardized residuals in order to get a first idea of the pattern of association. Standardized residuals behave like z -scores and are calculated as the difference between the observed frequency and the frequency

expected under independence, divided by the standard error of that difference (Agresti and Finlay 2009:229-231). Positive values indicate higher frequencies than expected under independence, negative values indicate lower than expected frequencies. Hence, values lower than -2 indicate a statistically significant negative association between the categories involved, values higher than +2 indicate a significantly positive association. Statistically significant residuals are put in bold.

Table 2: Contingency table for occupations of fathers and sons, city of Antwerp, 1846-1920

| Observed frequencies | | | | | | |
|--------------------------------------|-----------------------------------|----------------|------------|-----------------|----------|-------|
| Occupational status of father | Occupational status of son | | | | | |
| | 1. Unskilled | 2. Semiskilled | 3. Skilled | 4. Middle class | 5. Elite | Total |
| 1. Unskilled | 108 | 39 | 26 | 30 | 2 | 205 |
| 2. Semiskilled | 36 | 47 | 26 | 32 | 2 | 143 |
| 3. Skilled | 14 | 38 | 29 | 36 | 4 | 121 |
| 4. Middle class | 32 | 31 | 34 | 81 | 5 | 183 |
| 5. Elite | 5 | 0 | 1 | 6 | 3 | 15 |
| Total | 195 | 155 | 116 | 185 | 16 | 667 |
| Standardized residuals | | | | | | |
| Occupational status of father | Occupational status of son | | | | | |
| | 1. Unskilled | 2. Semiskilled | 3. Skilled | 4. Middle class | 5. Elite | |
| 1. Unskilled | 8.87 | -1.72 | -2.14 | -5.03 | -1.60 | |
| 2. Semiskilled | -1.20 | 3.08 | 0.28 | -1.61 | -0.88 | |
| 3. Skilled | -4.72 | 2.35 | 2.11 | 0.55 | 0.72 | |
| 4. Middle class | -4.10 | -2.37 | 0.50 | 5.86 | 0.35 | |
| 5. Elite | 0.35 | -2.16 | -1.11 | 1.07 | 4.51 | |

Inspection of the residuals for the father-son-table reveals that the unskilled are the most immobile group: sons of unskilled working class fathers are very likely to end up staying in the same social class as they were born into. Second in terms of intergenerational immobility are the elite and the middle class (with standardized residuals estimated at 4.51 and 5.86, respectively). There is significant positive association between the semiskilled and the skilled working classes, and significant negative association between the middle classes and the semiskilled and unskilled working classes. Associations with the elite, either in the paternal generation or in the

sons', are mostly not significant due to low frequencies. Therefore, nothing much can be said about this group in particular, except that there clearly is a tendency for intergenerational immobility.

Table 3: Contingency table for occupations of fathers and sons-in-law, city of Antwerp, 1846-1920

| Observed frequencies | | | | | | |
|--|--|----------------|------------|-----------------|----------|--------------|
| Occupational status of father | Occupational status of son-in-law | | | | | Total |
| | 1. Unskilled | 2. Semiskilled | 3. Skilled | 4. Middle class | 5. Elite | |
| 1. Unskilled | 28 | 20 | 14 | 4 | 0 | 66 |
| 2. Semiskilled | 15 | 8 | 11 | 21 | 1 | 56 |
| 3. Skilled | 11 | 4 | 4 | 12 | 0 | 31 |
| 4. Middle class | 7 | 7 | 8 | 33 | 2 | 57 |
| 5. Elite | 0 | 0 | 0 | 1 | 0 | 1 |
| Total | 61 | 39 | 37 | 71 | 3 | 211 |
| Standardized residuals | | | | | | |
| Occupational status of father | Occupational status of son-in-law | | | | | |
| | 1. Unskilled | 2. Semiskilled | 3. Skilled | 4. Middle class | 5. Elite | |
| 1. Unskilled | 2.92 | 2.98 | 0.95 | -5.72 | -1.18 | |
| 2. Semiskilled | -0.41 | -0.94 | 0.48 | 0.71 | 0.27 | |
| 3. Skilled | 0.87 | -0.87 | -0.73 | 0.65 | -0.72 | |
| 4. Middle class | -3.24 | -1.41 | -0.81 | 4.53 | 1.56 | |
| 5. Elite | -0.64 | -0.48 | -0.46 | 1.41 | -0.12 | |

In the contingency table for the status of fathers and their sons-in-law (Table 3), due to low frequencies, most associations between occupational groups are not statistically significant. Yet, an interesting exception is the significantly positive association between unskilled fathers and semiskilled sons-in-law. There is no equivalent positive association in the father-son table, which suggests that it was easier for daughters from the lowest social class to marry somewhat up into the (semi)skilled labouring classes than it was for sons from the same social class to reach the same occupational position themselves.

Given the small number of observations in many of the cells, especially in the highest social status group (SOCPO=5), and generally for the pairs of fathers and sons-

in-law, we decided to merge some of the occupational groups. First, the elite were merged with the middle class to represent the “high” social status group. The working classes, blue collar or not (SOCPO 1 to 3), were grouped based on the criterion of whether the occupation mentioned implies any trained skill (SOCPO 2 and 3) or not (SOCPO 1). On these grounds, the merging was done as follows:

- elite + middle class (SOCPO 4 and 5): called “middle class;”
- skilled + semiskilled (SOCPO 2 and 3): called “skilled working class;”
- unskilled group (SOCPO 1): called “unskilled working class.”

We now jointly analyze the social status destinies of sons and daughters, measuring the social status of sons by their own occupations, and the social status of daughters by the occupations held by their first marriage partners.

5. Descriptive results and confounding factors

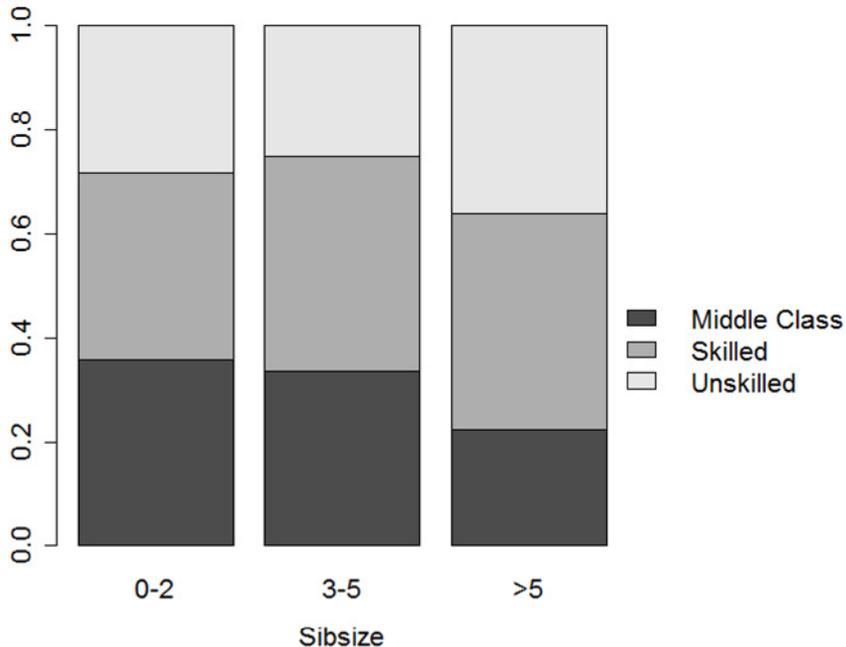
5.1 Sibsize and social class

Following Blake (1989), a person’s sibsize is defined as his or her number of siblings. Sibsize evolves over time: it increases when new brothers or sisters are born and decreases when some of them die. In all subsequent analyses, we have measured sibsize at age 20. Only full brothers and sisters have been counted, i.e., only people sharing the same biological mother and father were considered as siblings. Another limitation is that we could only count brothers and sisters who had at some point in time been registered in the Antwerp civil registration system. As a result, we may underestimate the sibsize of people whose parents did not stay in Antwerp during their complete reproductive lives. In order to account for this, we constructed a dummy variable indicating whether or not the mother of the index person remained continually registered in Antwerp between ages 15 and 49. If this was not the case, the reported sibsize may be lower than it actually was. Therefore, we enter the dummy variable in the regression analyses to see how it affects our results.

Bivariate descriptive statistics do suggest that the social status destinies of sons and daughters from Antwerp fathers were related to their sibsizes (see Figure 1). For example, the more siblings a man or woman had, the less likely he or she would end up in the middle class (as measured by own occupation for sons or by the husband’s occupation for daughters): 36% of those with at most two brothers and sisters had a middle class destination, as compared to 34% of those with three to five siblings and only 22% of those with more than five siblings. The relation between sibsize and the other social status destinations is more erratic. Still, whereas between 25-28% of people

with at most five siblings ended up in the unskilled working classes, this amounted to more than 36% of those with more than five siblings.

Figure 1: Distribution of children's social status destination by number of siblings, City of Antwerp, generations born between 1830 and 1920

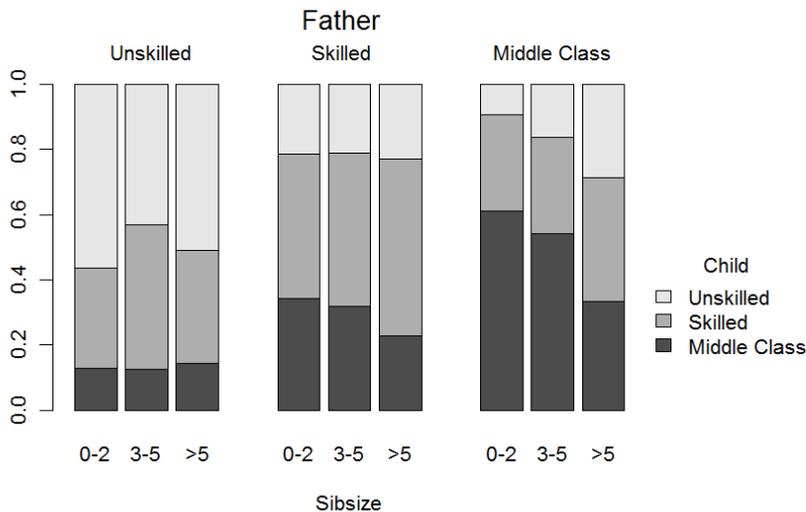


Yet, the suggested negative relationship between sibsize and social status destination may be spurious if birth control would first have been practiced, or practiced more intensely, in the middle and higher classes and only later in the working classes. This is what in fact happened in many parts of Europe (Skirbekk 2008), including Belgium (Van Bavel 2010). As a result, while socio-economic status tended to be positively related with family size before the nineteenth century (Clark and Hamilton 2006; Skirbekk 2008), this relationship turned around in the nineteenth century, with lower status groups exhibiting higher fertility than higher status groups. Therefore, the relationship suggested in Figure 1 may reflect what is in fact inheritance of social class: middle class fathers may have been more likely to limit their offspring, resulting in their

sons and daughters having smaller sibsizes, while at the same time being more likely to attain a middle class status, not because of the sibsize but due to status inheritance through other mechanisms.

In order to check whether the relationship between sibsize and the social status destination of children still holds after controlling for their social status of origin, Figure 2 gives the relevant distributions by social status of the father. It appears that sibsize is still negatively associated with children's own social status after controlling for their social status background. The figure does suggest, however, that the association may hold only for the skilled working and middle classes, not for the unskilled working classes. Children from the skilled working and middle classes were more likely to achieve a middle class position if they had fewer brothers and sisters. Conversely, children from large middle class families were more likely to go down to the unskilled working class. There is no such clear pattern for children from unskilled fathers.

Figure 2: Distribution of children's social status destination by social status of the father and by number of siblings, City of Antwerp, generations born between 1830 and 1920

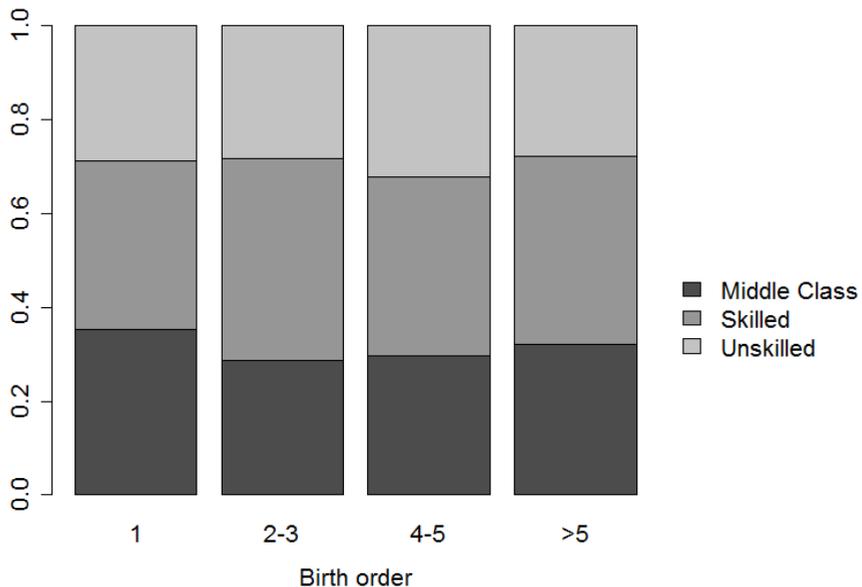


5.2 Birth order

Even if the relationship between sibsize and a child's own social status still holds after controlling for the father's social class, it may still be spurious for another reason. The number of siblings is correlated with birth order: people with one or two siblings cannot have birth order six or seven, and first-born children are more likely to be found among families with one or two children than among bigger families. As a consequence, if birth order has an effect on social status, it may be captured by sibsize.

Yet, Figure 3 suggests that the correlation between birth order and social status is weak at most. There were somewhat more first-born children ending up in the middle class than children with higher birth orders, but otherwise, the pattern is rather erratic. A chi-squared test for the underlying contingency table indicates that there is no significant dependence ($\chi^2=4.79$, $df=6$, $p>0.57$).

Figure 3: Distribution of children's social status destination by birth order, City of Antwerp, generations born between 1830 and 1920



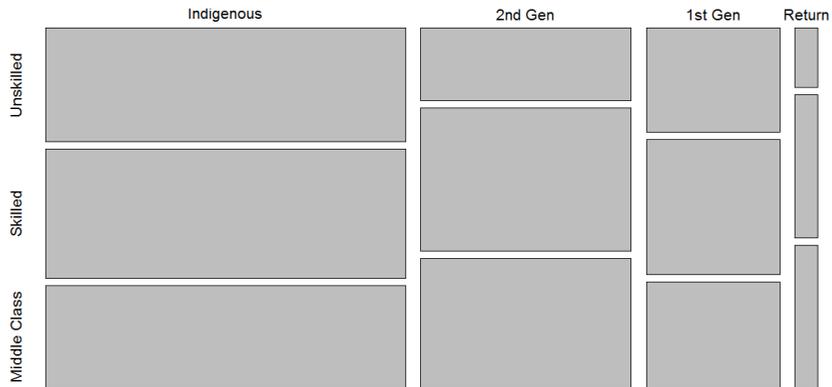
5.3 Migration and incomplete sibsize

Another potentially confounding factor is whether or not we have complete information about the reproductive lives of the parents of the index persons. Most parents did not live in the city of Antwerp during their complete reproductive lives. This implies that we may be missing full information about brothers or sisters of the index persons who never lived in Antwerp. As a result we may be underestimating the sibsizes of sons and daughters from migrant families. If migration is related to social class, then our estimates of the impact of sibsize on social status will be biased.

In order to account for this, we constructed a dummy variable indicating whether or not the mother of the reference person had been registered in the population registers of the city of Antwerp without interruption between reaching age 15 and reaching age 49. In addition, we constructed a set of dummies indicating the migration history of the family we are looking at.

We consider persons as indigenous when both the father and the reference person were born in the city of Antwerp. These amount to nearly half of the reference persons. We call 'first generation migrants' all the ones who were born outside Antwerp themselves, as well as their fathers. They make up about 18% of the study generation. 'Second generation migrants' are persons who were born in Antwerp themselves, but whose fathers were born outside the city. They represent 30% of the study population. Finally, persons who were born outside Antwerp, but whose fathers were born inside the city, are called return migrants. They account for only 3% of the index persons (see Table 4). Figure 4 depicts the bivariate relationship between migration history and social class destination in a mosaic plot (also called mosaic display, see Friendly 1994). The larger the rectangle, the higher the corresponding cell frequency. Judging from the bivariate relationship, it seems that skilled working class as well as middle class occupations were more frequent among second generation migrant families as well as among return migrants. This is indicated by the fact that the rectangles for these groups are higher than the ones for the indigenous persons. The indigenous people as well as first generation migrants divided between the three social classes in about equal shares.

Figure 4: Mosaic plot of social status destination by family migration history



5.4 Age at recording of occupation

The occupational status of a person may change over time as a result of career mobility. Therefore, occupational status is contingent on the age at which it is measured. From our data source, we can tell in most cases at what date an occupation was recorded, so we can calculate the age at measurement of the occupational status.

For married people, we used the occupation mentioned at the time of first marriage whenever this information was available. Yet, not all study persons married, and those who did marry, did not always do this in Antwerp. When the marriage act was unavailable and, hence, no occupational information was available for the time of marriage, we selected the occupation mentioned as close as possible to the date of the 25th birthday (of the male reference persons, or of the male spouses of female reference persons). We excluded all cases from the analysis if the only occupation available was recorded when the person was below age 14, since we consider most occupations pursued below that age are typical for childhood. These will not be representative for the occupation pursued during adulthood.

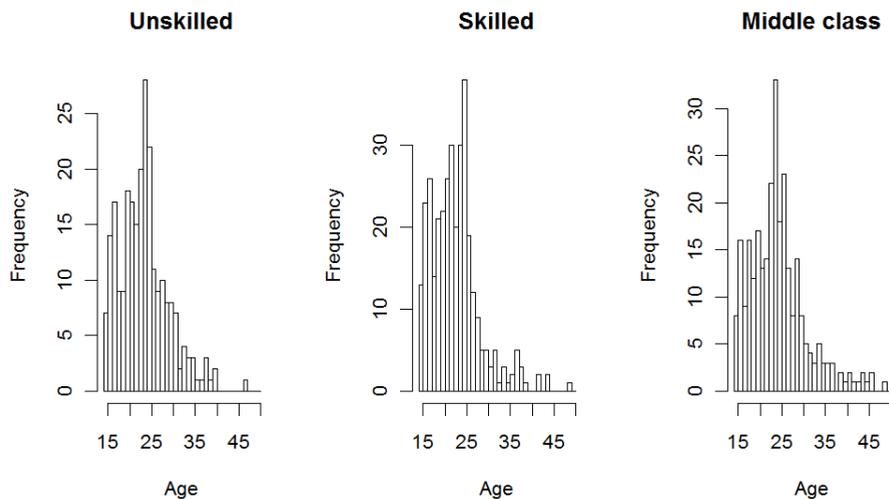
Figure 5 displays the frequency distributions of the age at recording of occupational status by social status destination. In all social classes, most occupations were recorded around age 25. The average ages at the recording of the occupational

status are 23.2, 22.4, and 24.2 for the unskilled, skilled, and middle classes respectively. The differences are not statistically significant (according to t-tests).

Table 4: Basic descriptive statistics of the variables used in the analysis

| | N | % | Min | Max | Mean | STD |
|--|----------|----------|------------|------------|-------------|------------|
| Social status of father | | | | | | |
| - Unskilled working class | 292 | 30.2 | | | | |
| - Skilled working class | 386 | 39.9 | | | | |
| - Middle and upper class | 290 | 30.0 | | | | |
| Total | 968 | 100.0 | | | | |
| Gender of reference person | | | | | | |
| - male | 784 | 77.2 | | | | |
| - female | 231 | 22.8 | | | | |
| Year of birth of reference person | 1015 | | 1830 | 1900 | 1872 | 17.2 |
| Age at recording of occupation | 994 | | 14 | 54 | 22.5 | 6.4 |
| Birth order | 1015 | | 1 | 15 | 2.9 | 2.2 |
| Sibsize | 1015 | | 0 | 15 | 3.9 | 2.6 |
| Complete reproductive life of mother info? | | | | | | |
| - yes | 574 | 56.6 | | | | |
| - no | 441 | 43.4 | | | | |
| Migration history of family | | | | | | |
| - Indigenous | 495 | 48.8 | | | | |
| - First generation | 184 | 18.1 | | | | |
| - Second generation | 304 | 30.0 | | | | |
| - Return migrant | 32 | 3.2 | | | | |
| Total | 1015 | 100.0 | | | | |
| Own social class | | | | | | |
| - Unskilled working class | 262 | 28.5 | | | | |
| - Skilled working class | 359 | 39.0 | | | | |
| - Middle and upper class | 299 | 32.5 | | | | |
| Total | 920 | 100.0 | | | | |

Figure 5: Histograms of age at recording of occupational status, by social status destination



6. Regression analysis

Our basic modelling strategy follows Van Bavel (2006) in that we model the probability for reference persons ending up in a particular social class by means of logistic regression. In the descriptive analyses presented so far, all reference persons from the study generation were treated as independent observations. We did not take into account that different reference persons may be sons and daughters from one and the same father. Fathers, and their families, may differ in their ability and eagerness to enhance or maintain the social status of their children. This may affect the social status destination of several of their children in the same way. Also, family size is endogenously determined by parental characteristics and hence may be related to characteristics that also affect their children's social status destination irrespective of any causal effect of family size as such. Some of these characteristics may be observed, like the socioeconomic status of the parents, but some will not be observed. In sum, heterogeneity on the family level endogenously affecting both family size and the socioeconomic status of children may remain unobserved, and this unobserved heterogeneity makes the disturbance term correlate among children from the same family (Black, Devereux, and Salvanes 2005; Van Bavel 2006).

Therefore, the following regression analyses take the nested structure of the data explicitly into account and control for unobserved heterogeneity by applying two-level random effects modelling: variation in the dependent variable is explicitly modelled to stem from two different levels. In our case, we distinguish between variation on the father or family level (i.e., sources of variation shared by children from the same father), and variation on the level of individual sons and daughters:

$$\text{logit}(P_{ijk}) = \mathbf{x}_{ij}'\boldsymbol{\beta}_k + \mathbf{z}_j'\boldsymbol{\gamma}_k + u_{jk} + e_{ijk} \quad (1)$$

The probability that a reference person i , son or daughter from father j , ends up in social class k is modelled to be a function of a vector of individual-specific characteristics \mathbf{x}_{ij} (including birth order and gender) with associated, class-specific slopes $\boldsymbol{\beta}_k$, and of a vector of family-specific characteristics \mathbf{z}_j (like social status as measured from the father's occupation), again with associated, class-specific slopes $\boldsymbol{\gamma}_k$. In addition, we add a random effect u_{jk} , specific for family j and social status destination k , reflecting the effect of unobserved heterogeneity on the family level. In order to estimate the model, we assume u_{jk} to have a normal distribution with mean zero and variance to be estimated. By adding this term, we get estimates of the standard errors for the fixed effects (i.e., for the slopes $\boldsymbol{\beta}_k$ and $\boldsymbol{\gamma}_k$) that are robust with respect to the clustering of children originating from the same family; without this term, estimated standard errors would be biased (Snijders and Bosker 1999; Agresti 2002). The residual on the individual level (e_{ijk}) is fixed to have unit variance, as usual in logistic regression. All models were fit using the Laplace approximation, implemented in R's package lme4 (Bates and Sarkar 2007).

In a first step, the social status destinations of children are modelled as a function of the father's social class, the gender of the reference person, his or her (centered) birth year, the age at the recording of the occupation in the child generation, the completeness of the information about the mother's reproductive live, and, last but not least, birth order and sibsize. The estimates of the fixed and random effects are in table 5 (Model I).

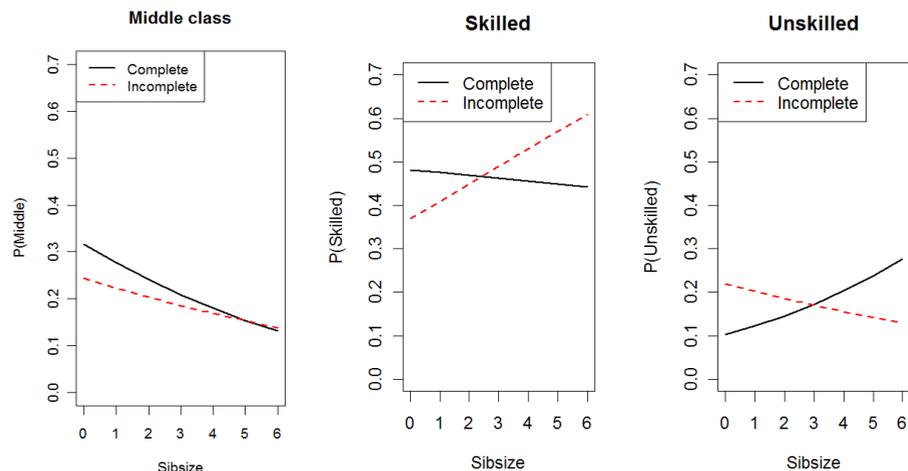
First, the results confirm strong social status inheritance effects: children are likely to end up in the same social class they were born into. A higher age at registration of the occupation is associated with somewhat higher chances of attaining a middle class status and lower chances of attaining skilled working class status. There are no significant effects of birth year, gender, or birth order.

Sibsize, in contrast, appears to have a significantly negative effect on the chances of reaching a middle class status and a significantly positive effect on the chances of ending up in the unskilled working class. However, not only the strength but in some cases also the sign of the effect depends on whether or not we can consider the sibsize

observed in Antwerp as complete or not. Indeed, there are some significant interactions of the effect of sibsize with whether or not we have full information about the reproductive history of the mother. These interactions as well as the strength of the effect of sibsize are illustrated in Figure 6.

Chances of attaining a middle class status were hindered by a large sibsize, but the effect is weaker if the sibsize is likely to be underestimated, as could be expected (see the dashed versus the solid line in the left panel of Figure 6). The expected probability of reaching a skilled working class status is not affected by sibsize in case of full information about the reproductive history of the mother. However, there is a strong positive effect if the real sibsize might be bigger due to incomplete information about the mother's reproductive history. The reverse holds for the probability of ending up in the unskilled working class: there is a significantly positive association between large sibsize and being in the lowest social class when the information about sibsize is complete; the association is negative, however, in case of potentially incomplete information. Later in this paper, we fit a model to see whether this can be explained by the migration history of the families involved.

Figure 6: Effect of the observed sibsize on the chances of ending up in the social class indicated above the graphs, by completeness of the information about the reproductive career of the mother*



* predicted probabilities are for first-born sons with a skilled working class father born in 1865 who recorded their occupation at age 25

The set of models just discussed assume that sibsize has the same effect on the social status destination, irrespective of the father's social class background. To relax this assumption, the second set of models allows the effect of sibsize to vary by father's social status (Model II in Table 5). The sizes of the estimated effects are graphically presented in Figure 7.

Sibsize appears to be unrelated to the chances of children with an unskilled working class background to reach a middle class status (see the solid line in the left panel of Figure 7). For children with a skilled working class father, there are indications of a small positive effect of having just a few brothers and sisters on the likelihood of climbing into the middle class, but the effect is statistically not significant. For sons and daughters of a middle class father, however, sibsize clearly matters a lot: large sibsize is associated with a steep decline in the likelihood of maintaining the social status of the father. This clearly lends support to the resource dilution hypothesis.

The estimates suggest that a large sibsize decreases the probability of reaching or maintaining a skilled working class status for children with an unskilled or skilled working class father, respectively. Yet, the effects are small at most and not statistically significant. Further down the social ladder, sibsize again matters a lot for children born in the middle class: having many brothers and sisters is strongly associated with steeply rising chances to end up in the unskilled working classes (see the graph to the right of Figure 7). This mirrors the strong negative effect of sibsize on the likelihood to maintain a middle class status (left hand panel in Figure 7). For children who were born in the skilled or unskilled working class, there is also evidence of a positive association between large sibsize and a high probability to go down to, or stay in, the lowest status group. Again, the latter effects are smaller and not statistically significant.

The last set of models (Model III in Table 5) includes indicators for the migration status as well as an interaction between the social status of origin and the sex of the reference person. The latter interaction was included to check whether status inheritance would be stronger or weaker for married women than for men.

Looking at the model for a middle class status destination first, it appears that women born to fathers with a skilled working class or a middle class background are significantly more likely to marry men with at least a middle class status than sons with the same social class background who have to attain a middle class occupation themselves. This suggests that daughters were more instrumental for a family than sons if the issue was to maintain or climb to a middle class status in the next generation, as long as they were successful in getting married.

Table 5: Multilevel logistic regression models of the probability to attain a particular social status destination, city of Antwerp, generations born between 1830 and 1900

| MODEL I | SOCIAL STATUS DESTINATION | | | | | | | | |
|--|---------------------------|-------|-----------|-----------------|-------|----------|-------------------|--------|-----------|
| | MIDDLE CLASS | | | SKILLED WORKING | | | UNSKILLED WORKING | | |
| | b | se | p<= | b | se | p<= | b | se | p<= |
| Intercept | -3.168 | 0.559 | 0.000 *** | 0.054 | 0.406 | 0.894 | -0.547 | 0.475 | 0.250 |
| Social class of father (unskilled=ref) | | | | | | | | | |
| - Skilled working class | 1.441 | 0.341 | 0.000 *** | 0.635 | 0.213 | 0.003 ** | -1.747 | 0.249 | 0.000 *** |
| - Middle class | 2.934 | 0.350 | 0.000 *** | -0.249 | 0.235 | 0.288 | -2.202 | 0.291 | 0.000 *** |
| Reference person is daughter (ref=son) | 0.295 | 0.239 | 0.218 | -0.237 | 0.189 | 0.211 | 0.036 | 0.221 | 0.872 |
| Year of birth (centered around 1865) | 0.010 | 0.007 | 0.170 | -0.002 | 0.005 | 0.673 | -0.007 | 0.007 | 0.314 |
| Age at recording of occupation | 0.034 | 0.017 | 0.046 * | -0.031 | 0.014 | 0.025 * | 0.008 | 0.016 | 0.602 |
| Birth order | 0.093 | 0.059 | 0.114 | 0.006 | 0.046 | 0.888 | -0.090 | 0.054 | 0.094 |
| Sibsize | -0.186 | 0.072 | 0.010 * | -0.026 | 0.052 | 0.613 | 0.202 | 0.061 | 0.001 *** |
| Reprod. history | | | | | | | | | |
| mother incomplete | -0.357 | 0.415 | 0.390 | -0.461 | 0.316 | 0.145 | 0.905 | 0.387 | 0.019 * |
| ...X Sibsize | 0.069 | 0.096 | 0.470 | 0.190 | 0.070 | 0.007 ** | -0.309 | 0.087 | 0.000 *** |
| Family STD | 1.556 | | | 0.92965 | | | 1.1593 | | |
| BIC | 996.3 | | | 1179 | | | 989.2 | | |
| -2LL | 922 | | | 1104 | | | 914.8 | | |
| MODEL II | | | | | | | | | |
| Intercept | -3.915 | 0.696 | 0.000 *** | 0.102 | 0.451 | 0.822 | -0.033 | 0.5055 | 0.947 |
| Social class of father (unskilled=ref) | | | | | | | | | |
| - Skilled working class | 2.046 | 0.632 | 0.001 ** | 0.637 | 0.382 | 0.096 | -2.138 | 0.431 | 0.000 *** |
| - Middle class | 4.434 | 0.662 | 0.000 *** | -0.402 | 0.429 | 0.349 | -3.736 | 0.5804 | 0.000 *** |
| Reference person is daughter (ref=son) | 0.332 | 0.240 | 0.167 | -0.241 | 0.190 | 0.204 | -0.009 | 0.2216 | 0.966 |
| Year of birth (centered around 1865) | 0.009 | 0.007 | 0.206 | -0.002 | 0.005 | 0.681 | -0.006 | 0.0066 | 0.359 |
| Age at recording of occupation | 0.034 | 0.017 | 0.052 | -0.031 | 0.014 | 0.025 * | 0.0095 | 0.0161 | 0.557 |
| Birth order | 0.087 | 0.059 | 0.142 | 0.007 | 0.046 | 0.881 | -0.085 | 0.0529 | 0.107 |
| Sibsize | 0.018 | 0.122 | 0.881 | -0.036 | 0.075 | 0.628 | 0.0625 | 0.0808 | 0.439 |

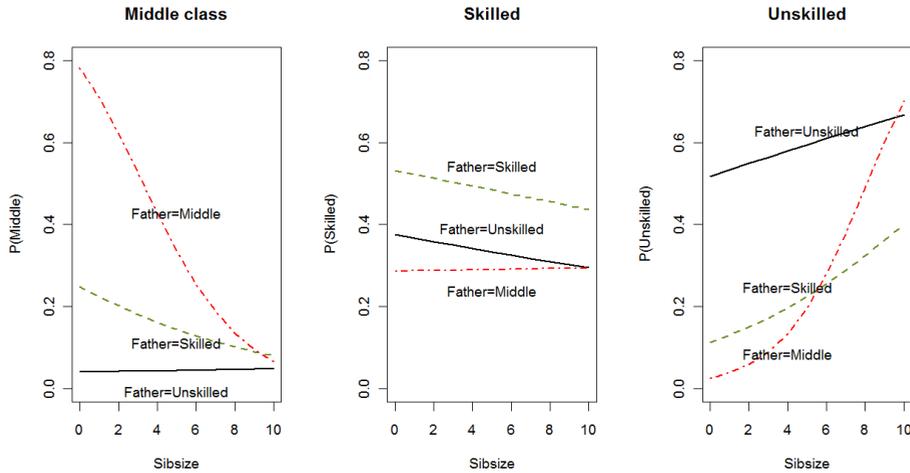
Table 5: (Continued)

| MODEL II | SOCIAL STATUS DESTINATION | | | | | | | | |
|--|---------------------------|-------|-----------|-----------------|-------|-----------|-------------------|--------|-----------|
| | MIDDLE CLASS | | | SKILLED WORKING | | | UNSKILLED WORKING | | |
| | b | se | p<= | b | se | p<= | b | se | p<= |
| Reprod. history | | | | | | | | | |
| mother incomplete | -0.344 | 0.425 | 0.418 | -0.467 | 0.317 | 0.140 | 0.8788 | 0.394 | 0.026 * |
| ...X Sibsize | 0.073 | 0.096 | 0.443 | 0.189 | 0.070 | 0.007 ** | -0.301 | 0.086 | 0.000 *** |
| Sibsize X ... | | | | | | | | | |
| ...Skilled working | | | | | | | | | |
| class father | -0.152 | 0.132 | 0.250 | -0.002 | 0.084 | 0.984 | 0.1041 | 0.0953 | 0.275 |
| ...Middle class father | -0.410 | 0.139 | 0.003 ** | 0.040 | 0.093 | 0.666 | 0.3897 | 0.1154 | 0.001 *** |
| Family STD | 1.5211 | | | 0.92875 | | | 1.1175 | | |
| BIC | 999.8 | | | 1192 | | | 990.7 | | |
| -2LL | 912 | | | 1104 | | | 902.8 | | |
| MODEL III | | | | | | | | | |
| Intercept | -3.567 | 0.719 | 0.000 *** | -0.445 | 0.484 | 0.358 | 0.379 | 0.534 | 0.477 |
| Social class of father (unskilled=ref) | | | | | | | | | |
| - Skilled working class | 1.598 | 0.651 | 0.014 * | 1.173 | 0.413 | 0.005 ** | -2.505 | 0.465 | 0.000 *** |
| - Middle class | 3.975 | 0.675 | 0.000 *** | -0.031 | 0.454 | 0.945 | -3.820 | 0.593 | 0.000 *** |
| Reference person is | | | | | | | | | |
| daughter (ref=son) | -1.624 | 0.879 | 0.065 . | 0.806 | 0.339 | 0.017 * | -0.322 | 0.351 | 0.358 |
| ...X Skilled working | | | | | | | | | |
| class father | 2.190 | 0.945 | 0.020 * | -1.683 | 0.451 | 0.000 *** | 0.903 | 0.485 | 0.063 . |
| ...X Middle class | | | | | | | | | |
| father | 2.574 | 0.971 | 0.008 ** | -1.217 | 0.515 | 0.018 * | -0.504 | 0.679 | 0.458 |
| Year of birth (centered | | | | | | | | | |
| around 1865) | 0.008 | 0.007 | 0.287 | -0.003 | 0.006 | 0.633 | -0.003 | 0.007 | 0.642 |
| Age at recording of | | | | | | | | | |
| occupation | 0.031 | 0.018 | 0.083 . | -0.026 | 0.014 | 0.061 . | 0.007 | 0.016 | 0.668 |
| Birth order | 0.072 | 0.060 | 0.231 | 0.001 | 0.047 | 0.985 | -0.056 | 0.054 | 0.301 |
| Sibsize | 0.009 | 0.123 | 0.943 | -0.001 | 0.077 | 0.985 | 0.022 | 0.081 | 0.789 |
| Reprod. history | | | | | | | | | |
| mother incomplete | -0.297 | 0.427 | 0.487 | -0.493 | 0.321 | 0.124 | 0.852 | 0.395 | 0.031 * |

Table 5: (Continued)

| MODEL III | SOCIAL STATUS DESTINATION | | | | | | | | |
|------------------------------------|---------------------------|-------|----------|-----------------|-------|---------|-------------------|-------|-----------|
| | MIDDLE CLASS | | | SKILLED WORKING | | | UNSKILLED WORKING | | |
| | b | se | p<= | b | se | p<= | b | se | p<= |
| Migration history (ref=Indigenous) | | | | | | | | | |
| - First generation | | | | | | | | | |
| migrant | -0.146 | 0.335 | 0.662 | 0.074 | 0.246 | 0.764 | 0.092 | 0.285 | 0.747 |
| - Second generation | | | | | | | | | |
| migrant | 0.334 | 0.281 | 0.233 | 0.293 | 0.209 | 0.162 | -0.802 | 0.264 | 0.002 ** |
| - Return migrant | 1.055 | 0.688 | 0.125 | 0.029 | 0.542 | 0.958 | -1.061 | 0.722 | 0.142 |
| Sibsize X ... | | | | | | | | | |
| ...Reprod. history | | | | | | | | | |
| incomplete | 0.080 | 0.096 | 0.407 | 0.174 | 0.071 | 0.014 * | -0.280 | 0.086 | 0.001 ** |
| ...Skilled working | | | | | | | | | |
| class father | -0.137 | 0.133 | 0.303 | -0.036 | 0.085 | 0.670 | 0.138 | 0.096 | 0.150 |
| ...Middle class father | -0.400 | 0.140 | 0.004 ** | 0.020 | 0.094 | 0.833 | 0.418 | 0.115 | 0.000 *** |
| Family STD | 1.5006 | | | 0.94078 | | | 1.0744 | | |
| BIC | 1019 | | | 1211 | | | 1006 | | |
| -2LL | 897.4 | | | 1089 | | | 884.2 | | |
| N children | 863 | | | 863 | | | 863 | | |
| N fathers | 454 | | | 454 | | | 454 | | |

Figure 7: Predicted probability of reaching the social class indicated above the graphs, by social class of the father and sibsize



Finally, there is no evidence that migration, either by the parent or by the child, mattered significantly for the chances to have a skilled working class or middle class destination. However, second generation children, i.e., children who were born in Antwerp but their fathers were not, had a lower likelihood of ending up in the unskilled working class than did natives. This is remarkable since there is no significant difference between natives and first generation migrant children – i.e., children who migrated into Antwerp themselves.

7. Conclusions

This paper has shown that the number of siblings is associated with the social class destination of people living in the city of Antwerp in the late nineteenth and early twentieth century. We distinguished between three social classes, based on the occupations mentioned in civil registration: the unskilled working class, the skilled working class, and the middle class. The latter social class also includes the elite, but their number is so low that it is not feasible to put them in a separate category.

Sibsize mattered in Antwerp particularly for sons and daughters born into the middle class: a high number of brothers and sisters was associated with steeply declining chances to maintain the relatively high occupational status of their fathers. Remarkably, in case of a very high sibsize (more than 5 siblings), middle class sons and daughters were more likely to end up in the unskilled than in the skilled working classes. The effects of sibsize on the intergenerational mobility of sons and daughters with a working class background were much smaller and often not statistically significant. Yet, the effects all run in the direction of a large number of siblings increasing the odds of going down the social ladder.

Overall, if family size limitation was used by parents in order to support the positions of children on the social ladder, the results in Antwerp suggest that it was only effective as a defensive strategy. Limiting the number of offspring would increase the chances that sons and daughters would maintain their social status, especially in the middle classes. Having numerous offspring resulted in a significant proportion of the children going down the social ladder. This echoes the finding of a study in late 20th century United States that a large sibsize adversely affected the prospects of children in well-to-do families but had virtually no effect in low-income families (Steelman et al. 2002:253). Maybe it doesn't matter how many sibling you have if your parents are poor and there are no resources to be diluted at all.

All these findings hold when we do have complete information about the reproductive life stage of the mother. In situations when the information is incomplete and when there is a serious risk of underestimating the actual sibsize, the effects went sometimes in unexpected, opposite directions. This could not be explained away by migration.

There is no evidence that migration mattered significantly for the chances to have a skilled working class or middle class destination. Yet, remarkably, second generation children, who were born in Antwerp while their fathers were not, had lower chances to end up in the lowest, unskilled working class than did natives. There was no such significant difference between natives and first generation newcomers to Antwerp.

In all social classes, sons and daughters tended to inherit the social class of their fathers, but the inheritance effects were strongest in the middle class and in the

unskilled working class. There are significant gender differences with respect to the inheritance of social class: married daughters from a middle class or skilled working class father were significantly more likely to have a husband with at least a middle class status occupation than sons born into the same classes were likely to have at least a middle class status occupation themselves. From the perspective of family strategies with respect to their social status, this suggests that having daughters would be more instrumental than having sons to climb the ladder, or to maintain a favourable position, at least as long as these daughters are successful in getting married (because only married daughters could be included in the analysis).

If we assume that parents have a preference for their children to maintain or enhance their social status, fertility can be expected to decline when society evolves in such a way that lower fertility enhances the probability that children climb the social ladder, or maintain a favourable position on that ladder. They would be motivated to limit their family sizes if numerous offspring would increase the chances of social devaluation in the next generation. The analysis in this paper showed, for one urban population in Belgium, that fertility limitation would indeed be effective in enhancing the likelihood that children would maintain their social status. Yet, it would not have been effective as a strategy to enhance their children's status as compared to their own. In sum, family size limitation worked as a defensive rather than as an offensive social strategy.

If the relation between family size and intergenerational mobility has a major explanatory value for the fertility transition, the kind of effects found here should not be found before the demographic transition. Maybe the number of children was less important for children's social mobility in pre-industrial Europe? Maybe this connection emerged only during the economic modernization? If that were true, the linkage between family size and intergenerational mobility may well be crucial in explaining the fertility transition.

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