ECONOMIC STATUS AND REPRODUCTIVE SUCCESS IN NEW FRANCE

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Introduction

It is often reported that at least in developing countries "fertility typically falls with education"[1] Recently, macroeconomists in particular have taken note of this stylized fact and posited a relationship between this fertility gap and inequality and growth. For example, Kremer and Chen (1999 and 2000) illustrate that this type of fertility differential may compound inequality, assuming that the uneducated are less likely to invest in their children's education. The uneducated population will grow more quickly than the educated and as a result the wage of the unskilled will fall. Because the opportunity cost of children falls for the uneducated, they have even more children. Hence the degree of inequality rises.[2] Consistent with their model, they note that empirical evidence indicates that the fertility gap between the educated and uneducated is larger in countries with higher degrees of inequality.[3] Dahan and Tsiddon (1998) have a similar approach but focus on the demographic transition. In their model, they also assume that the uneducated will have more children than the educated and the educated will be more likely to educate their children. As a result, the uneducated population experiences relatively rapid growth (hence a rising fertility rate overall and growing income inequality—the first phase of the demographic transition). This will eventually increase the return to skill, causing some unskilled to educate their children. This transition will lead to lower overall fertility rate (as more young are educated and

[1] Kremer and Chen (1999: 155).
[2] Theoretically, they illustrate that multiple equilibria are possible. The degree of fertility and wage differentials across unskilled and skilled workers depends on the initial proportion of skilled workers. In particular, the larger the initial proportion of skilled workers, the greater the chance that the economy may converge to a low inequality outcome. Kremer and Chen (1999).
[3] See Kremer and Chen, 1999: 156.

choose smaller families) and lower income inequality—the second phase of the transition.[4]

Of course to actually affect the economy's inequality (and hence growth) in the way that Dahan and Tsiddon (or Kremer and Chen) suggest, the unskilled would not just have to produce more children than the skilled, but more of their children must survive to adulthood. If the survival rates of the unskilled were much worse than the skilled, the population composition might not change in the predicted direction. It is useful to turn to the past to study this particular issue because longitudinal evidence on survival would be much more informative than cross-sectional evidence on births and deaths by socioeconomic group. A recent paper by Clark and Hamilton (2006) demonstrates that surviving family size was positively correlated with wealth in eighteenth century England. If wealth and skill were correlated, this would suggest that the skilled (adult) population grew more quickly than the unskilled (adult) population, possibly leading to less inequality.[5]

In that paper, we glean evidence on family size from wills (measuring the surviving number of children when the father was, typically, close to death).[6] A limitation of our data is that we cannot determine whether the relationship arose because fertility and wealth were positively correlated or because of a difference in the mitigating influence of infant and child mortalities across socioeconomic groups. In this paper, we take another step towards a better understanding of the relationship between surviving family size and socioeconomic status by turning our attention to a colony on the other side of the Atlantic—New France. The demographic data from

[4] For another look at the demographic transition and socioeconomic status, see Easterlin (2004): 179-83.
[5] As noted above, the impact on inequality in Kremer and Chen (1999) depends on the initial size of the skilled population relative to the unskilled population.
[6] The number of surviving children is defined as the number of living children, plus deceased children that lived long enough to produce offspring, a father listed in his will. Wills were typically written close to the individual's death.

New France is based on reconstituted family information, collected for the entire region of modern Quebec. It has the advantage of allowing the researcher to not only examine variation in surviving family size according to different socioeconomic measures but to also measure the relative importance of fertility and mortality in determining that relationship.

Apart from informing the literature on fertility and income distribution, this paper also advances our understanding of variation in surviving family size in this time period. This may be of particular interest to the study of the motivation for child bearing. Sundstrom and David (1988), for example, argue that parents optimally chose a family size based on the hypothesis that role of children was to care for the parents when they were old. Most studies that consider this rationale rely on fertility measures to study changes in child bearing and do not have data that allows them to determine whether the children were actually living when the parents were old.

In fact, very little is known about the relationship between socioeconomic status and reproductive success for colonial North America. It is possible to offer crude comparisons of, for example, the gentry in Philadelphia compared to either the entire city or other locations, using different sources.[7] According to Kantrow, marital fertility for Philadelphia's gentry was very high, close to the biological maximum, with a total fertility of 9.9.[8] Kantrow argues that fertility among Philadelphia's gentry was higher than that observed among more typical American populations (such as in Ipswich, Massachusetts, with a total fertility of 7.0) and very much higher than seen among the upper class in Switzerland or France.[9] Their death rates were also relatively low,

[7] Louise Kantrow (1980, 1989) studied the Philadelphia gentry and Billy G. Smith (1977) compiled birth and death rates for eighteenth century Philadelphia.
[8] See Wells (1992): 92. Based on Kantrow (1980).
[9] See Kantrow (1980): 25 and Wells (1992): 92-3.

indicating that the wealthy were particularly successful in reproducing themselves.[10] More is known if we move forward to the nineteenth century, but even then almost all of the focus has been on the relationship between socioeconomic status and mortality.[11] Up until recently, these studies found little relationship between mortality and socioeconomic status (e.g., Steckel (1988) and Haines and Preston (1997)). It seemed likely, then, that wealth and privilege did not lead to better health outcomes until the twentieth century, when people began to understand such things as the germ theory of contagious diseases (Mokyr, 2000) and the rich could better avoid health dangers. In a recent paper that makes use of a superior, large data set linking decedents in the mortality schedules with the survivors in the 1850 and 1860 federal population censuses, however, Joseph Ferrie (2004) finds a negative relationship between personal wealth and mortality for mid-nineteenth century America. Ferrie's findings cast doubt on the notion that the rich could not 'buy' better health outcomes prior to the twentieth century.

Within Canada, most of the evidence, as with this research project, focuses on Quebec (or New France), due to the superiority of data available. Historians have studied differences in rural-urban mortality for New France (Gadoury et al., 1985) and socioeconomic mortality differences for twentieth century Montreal (Thornton et al, 1988). Direct studies of differential fertility have not been common, although Gadoury (1992) does find evidence that some of the nobility were actively limiting family size in the eighteenth century, relative to the seventeenth century, but she does not directly compare the fertility behavior of the nobility (her topic of study) to the rest of the

[10] The crude death rate for Philadelphia as a whole is estimated to be 42.6 for the years 1722 to 1775; for the city's gentry, Kantrow's calculations yield estimates of 22.3 for males and 20.2 for females over the entire 1700s. Calculated from Smith (1977):871 (table 3). For the gentry calculation, see Gemery (2000): 163-4.

[11] For an exception see Haines (1980) who observes differences in fertility across occupation groupings for late nineteenth century America.

population. Given that no large individual-level studies of the seventeenth or eighteenth centuries have been undertaken it is worthwhile to push back in time and advance our understanding of these relationships.

Background

Settlement of New France began in the early 1600s. Quebec City was established in 1608 and Montreal in 1642. The population was naturally very small in the seventeenth century, reaching roughly 10,000 in 1681 and doubling that value in less than 30 years.[12] The French that crossed the Atlantic and settled in New France in the mid to late seventeenth century were disproportionately urban and of a middling sort. Rural peasants appear to have been under-represented.[13] Yet most of the immigrants ended up settling the rural areas of New France, acquiring farms at first near Quebec City, but soon spreading out in thin farms along the St. Lawrence River.

Pierre Boucher, writing in 1664, described a colony in which industrious people could prosper. He countered rumors about the young colony being filled with "great debauchery, [and large] numbers of worthless fellows and bad girls[:]

> … if any of them [bad girls] come here, they are not known for such; for before any can be taken on board ship to come here some of their relations or friends must certify that they have always been well-behaved. …As for the scapegraces, if any come over it is only because they are not known for what they are."

He goes on to say that if they did not shape up, they would suffer ("we know how to hang people in this country").[14] At the other end of the spectrum, he cautioned the very rich to remain in France: "this country is not yet fit for people of rank who are

[12] Charbonneau et al (1973: 43). This counts the non-natives only. The population was about 3,000 in 1666; 9,700 in 1681; 10,300 in 1688 and just over 20,000 in 1716. Sources: Census of Canada, 1871, Vol.4; Dechêne (1992: 315); Harris (1987); Dickinson and Young (1993: 67-70).
[13] Choquette (1997: chapter 4).
[14] "True and Genuine Description of New France Commonly Called Canada, 1664, Paris. Pierre Boucher. Reproduced in "A Few Acres of Snow" p.69

extremely rich, because such people would not find in it all the luxuries they enjoy in France." (Boucher in Thorner (1997: 70)).

While no one has studied the issue in detail, a number of scholars have argued that the gap between rich and poor was smaller in New France as compared to France. As Dechêne describes: "the brakes on the colonial economy and easy access to land tended to reduce material differences." (Dechêne, 1992: 229) Moogk (2000: 157) concurs: "In general, the extremes of wealth and poverty known in Europe were absent from New France."[15]

Nonetheless, France attempted to ensure class distinctions and segmentation of her colony's society in a number of ways. First, it instituted a feudalistic land tenure system, not unlike the system in pre-revolutionary France. The King of France appointed individuals, called seigneurs, to preside over large tracts of land (*seigneuries*). The seigneur had to provide settlers with a mill to grind their wheat, arbitrate disputes and coordinate public works such as road improvements. They granted plots to settlers (*habitants*) and in return, the *habitant* paid the seigneur a rent and some dues, but effectively owned the land in that he could sell it or pass it on to his heirs. If it was sold, the seigneur received a fee. Second, there was a noble class. Noble titles were awarded by the King of France to a very select number of men and then inherited through the male line. While there were relatively few 'new' nobles, those that did not inherit title typically had served as military officers and received lucrative officers' commissions. New France's nobility also qualified for pensions and some received profitable fur-trade licences. In other cases they received seigneuries (but not all seigneurs were noble).[16]

[15] Pavard et al (2005: 213) concur: "socioeconomic differences were not very pronounced during the first 100 years of colonization: the vast majority of the population shared the same living conditions, which were rural in nature." Pavard et al (2005) cite Nault et al (1990) with reference to this statement.
[16] See Gadoury (1991), Dechêne (1992), Greer (1997: 51) and Moogk (2000) for more on New France's nobility.

Hence even if wealth differences were more muted in the colony and some of the class distinctions in France were not maintained in New France, many examples illustrate that people appear to have been aware of and interested in maintaining class distinctions.[17] For example, there are reports of arguments about the location of families in churches (position, relative to the altar, reflected social status) and examples of preferential treatment of the well-to-do by the courts.[18] The local governor of the colony (the *intendant*) described the bulk of colonists as people that "love honours [sic] and praise."[19] And several scholars and contemporary observers characterize the upper class as very concerned with 'keeping up appearances'—with elaborate dress and furnishing, but relatively paltry incomes and high debt loads.[20]

Data

Demographers at the University of Montreal have reconstituted the vast majority of the population of New France from the inception of the French colony in the early 1600s until 1800 by linking the birth, marriage and death records from the Catholic parish registers.[21] Charbonneau et al. (1993) estimate that the parish registers before 1700 encapsulate roughly 95 percent of births and 85 percent of marriages and deaths (Charbonneau et al. (1993: 62)).

It is a particularly successful reconstitution because almost everyone in the colony's early history was Catholic – non-Catholics were not welcome and were, in some cases, deported. Omissions occur because of missing registers (most of the native Indian

[17] In France, for example, the nobility was not allowed to "engage in commerce"; in New France there was no such restriction. (Moogk, 2000: 149).
[18] Moogk (2000: 149-51).
[19] Gilles Hocquart "Memoir to the Minister Containing A Characterization of the French-Canadian Population, November 8, 1737" reprinted in Thorner, ed. (1997: 86). He goes on to describe the rural population as "self-seeking, vindictive, subject to drunkenness…and are not the most truthful people…..[that] are amenable enough when we flatter them."
[20] Dechêne (1992: 218),
[21] For more detail regarding the data sample, see Hamilton and Siow (2007).

registers did not survive);[22] illegibility within registers, which was especially common in the oldest registers; and unregistered vital events. Unregistered births, which would have been more likely in cases of illegitimacy or still births, are thought to have been relatively rare occurrences, compared to, for example, France.[23]

Thus these data capture the native born population and especially 'stayers' – those who were born and died in the colony – very well. In terms of taking a snap shot of the entire population at a point in time, immigrants are systematically underrepresented. They are captured if they married or died in the province, but in essence the sample used will reflect the native born population. Except for the initial settlement period in the early 1600s, New France's growth was primarily driven by natural increase, so the omission of immigrants is not anticipated to seriously affect the sample. In addition, emigration from New France is believed to have been fairly minimal.[24]

In order to study the relationship between socioeconomic status and surviving family size we focus on the progeny of married men. The sample employed here consists of 3,018 men who experienced their first marriage in New France between 1660 and 1710, for whom life span is known. These men produced 23,668 children. Restricting the sample to those individuals with known life span is clearly necessary given that we focus on surviving children. The marriage year restriction is imposed because of potential sample biases that arise for marriage after 1710. For instance, we restrict the sample of individuals born in the province to those born before 1700 because the reconstitution does not extend beyond 1800 (hence life span information may not be available for those born in the eighteenth century). As a result,

[22] Fire or other natural disasters are believed to have been relatively rare.
[23] For illegitimacy, see Paquette and Bates (1986). The illegitimacy rate was less than 1 percent in the 17th century and less than 2 percent in the early 18th century.
[24] Nault, Desjardins, and Légaré (1990: 274) report that (principally male) immigration "became more and more marginal relative to the native white population [after 1673]. Out migration, although significant at some moments, was negligible in total."

information on children's life span is less likely to be available the later into the eighteenth century the birth occurred. In addition, for marriages that occur late enough in the 1700s, family size may be censured. Hence marriages after 1710 are dropped. The records are also somewhat spottier before roughly 1660, so death information is less likely to be available for births that occurred prior to this date.

In terms of the key variables, socioeconomic status is measured by the husband's occupation. The father's occupation was recorded in the various parish registers roughly half the time. While occupation is a crude indicator of wealth, given the potential variation in income within occupation groups, those in skilled occupations likely enjoyed better financial circumstances than those in unskilled trades. Clark and Hamilton (2006), for example, demonstrate that occupation groupings were a reasonable predictor of socioeconomic status in England.[25] Because an individual's occupation often changed through his life, we use the male's occupation listed on the document closest to the time of his death. In addition, two sets of individuals that were likely wealthy have been identified through information in the parish and notary public's records. The first is members and offspring of the nobility (Gadoury, 1991). The second is members and offspring of the `bourgeois' class (Noguera, 1994). `Bourgeois' was often a self-appointed title taken by men with relatively high status occupations, such as large-scale merchants or crown appointed officials.

The various occupation groups are shown in Table 1 and some basic summary statistics are presented in Table 2. Overall, just 9 percent were members of the elite (either noble, bourgeois or gentry). They had the highest incidence of signing (as opposed to marking or leaving blank) at least one parish record – 65 percent. In the second socioeconomic tier are 'professionals' – typically notaries, merchants or owners

[25] The correlation between occupations and surviving family size was similar (but more muted) to that between wealth and surviving family size.

of a *seigneury* (a large block of land) or self-identified *bourgeois* that were not considered a part of a bourgeois family by Noguera.[26] Professionals constitute seven percent of the sample. Another four percent were military officers (termed 'officers'). The signature rates of professionals and officers were 43 percent and 38 percent respectively. The third tier consists of craftsmen (eight percent) and those in various trades (such as millers, bakers, and innkeepers). Their signature rates are 35 percent and 26 percent respectively. Labourers, which includes servants and voyageurs (who transported furs in large canoes between the interior and Montreal), comprise seven percent of the sample. Eighteen percent of labourers could sign a parish document. Soldiers (five percent of the sample) have been treated to a separate category because of potential restrictions that may have been imposed on them (such as living in the barracks or remaining with their troops), which may have affected their marital fertility. Twenty percent of soldiers signed their name. Farmers comprised 14 percent of the sample. This clearly understates the relative importance of farming in New France. It seems likely that most of the individuals who did not declare an occupation in one of their parish records (44 percent of the sample) worked the land in some capacity. In some respects they do appear similar to farmers – both farmers and 'unknown' had especially low signature rates – 15 and 14 percent respectively.[27] In

[26] The fact that there are 46 bourgeois in this sample that are not identified by Noguera (1994) as bourgeois requires further investigation. Because Noguera examined a large variety of notary documents when identifying bourgeois families, we are currently leaving these remaining bourgeois in a second tier occupational grouping.

[27] One possible problem with using signature rates as an indication of human capital is that the incidence of signing may be higher because the individual had more parish events (more births, more marriages). Signing is actually determined strictly from the marriage register. In any event, as will become clear those that did not declare an occupation did not have markedly fewer vital events. Their average lifespan was relatively short (60.76 years verses an average of 62 years) but the average total number of children they fathered was close to the sample average of 9.

addition, they overwhelmingly married in a rural setting (only 15 percent urban, compared to an average of 32 percent for all men).[28]

The number of surviving children is measured as the number of children known to outlive their father.[29] To measure this all of the father's marriages and births are considered, hence we examine the known survival of birth children (excluding step-children). Death information is not available for all children, however. Of the 23,668 children born to these men, life span is known for 19,291, or 82 percent, of the sample. This attrition is problematic if it is correlated with socioeconomic status. Three of the most likely reasons for unknown life span (or attrition from the sample) in the child population are: (1) the birth occurred late in the sample history and the child had not died prior to 1800 (so the information on death has not been linked to the sample), (2) the child left New France, or (3) the death was not recorded (this was perhaps most likely if the death occurred with childbirth, although many still births were recorded). It seems unlikely that reasons (1) or (3) varied significantly by socioeconomic status, but emigration rates may well have varied by status. Given that emigration likely occurred once the child had grown up (since that the father's death almost always occurred in New France), omitting these children from the sample would likely understate the number of surviving children among the upper echelon.

To investigate this we regress the incidence missing life span on occupation group dummy variables and literacy of the father and mother and a dummy variable equal to one if the father was born in New France, with additional controls for decade of birth,

[28] Another way to categorize the occupations is by literacy levels (work in progress).
[29] We are experimenting with different measures of 'surviving' family size or reproductive success. Interpretation of this measure is somewhat confounded by the fact that the number of survivors may decline with the longevity of the father. In fact, regressing the age of the first born child when the father dies on occupation dummy variables indicates that there is little variation in the age at which the father dies across occupation groups, with the exception of officers (whose children were, on average, almost 12 years older than children of the unknown) and the elite, whose children were 3 years younger. The average age of the first (fifth; eighth) born when their father died was 33.5 (28.7; 25) years.

gender of child, urban birth and birth rank.[30] Death information for children born in the 1720s or 1730s was more likely to be 'missing' than children born in the 1660s, consistent with censoring in the data set. All else equal, male children were much more likely to be 'missing', as were children with literate fathers and children whose fathers were either elite or soldiers. The children of immigrants were also more likely to be missing. These features are consistent with the notion that at least some of the attrition was occurring because of emigration (males for example, were and are more likely to migrate). Given that attrition (likely due to emigration) exhibits some correlation with socioeconomic status, the relationship between surviving children with known life span and socioeconomic status will be biased downward. To address this, we offer two measures of surviving family size and child mortality, one that counts only those known to have outlived their father as survivors (lower bound) and one of which assumes that all of the missing children outlived their father (upper bound).

If we consider the occupation groups that are fairly easily ranked (the four tiers shown in Table 1), the average number of surviving children from all marriages (number of known survivors divided by all children born – a lower bound for survivors) exhibits an unusual inverted–U shape (see Table 3 and Figure 1). Professionals and officers (second tier) left 4.61 and 5.26 children respectively, third tier husbands (crafts and trades) were survived by 4.45 and 4.23 children respectively, and laborers (in the fourth tier) left just 4.02 children. Surprisingly, though, husbands in the first tier – the elite – were surrounded by just 3.31 children at their death. The same pattern is evident when we examine the surviving number of children from the first marriage alone, but the differences are muted. For example, the difference between

[30] The equation is estimated with a logit model. Robust standard errors are computed, clustered by the father. Results are not reported to conserve space (available on request).

officers and laborers in the number of surviving children from all marriages is 1.24, while it is only 0.88 when considering first marriages alone.

In terms of the three socioeconomic groupings that are more difficult to categorize, farmers were the most prolific. In fact, with the exception of officers, they were the most prolific of any category, leaving 5.01 surviving children from all marriages. Those that never declared an occupation were survived by 4.40 children and soldiers were among the least prolific, leaving just 3.38 children (Table 3).

Using the upper bound measure of survivors does not alter the basic pattern exhibited with the lower bound measure – the average number of surviving children considering all marriages is higher for professionals and officers (6.32 and 7.19) than laborers (5.57) and still lowest for the elite (5.02) – see Table 3.

Before turning to a more systematic analysis of the data, it is worth considering the other marker of status available in this dataset – literacy, or the ability to sign one's marriage record. As evident in Table 2, this was a fairly uncommon attribute given that just 24 percent of the men in the sample signed their name.[31] Overall, the average number of surviving children (from either first or all marriages) is *higher* for illiterates, not lower as the pattern in Table 3 would suggest (with the exception of the elite). The average number of children surviving from the first marriage is 4.78 among literate husbands and 5.38 for illiterate husbands (upper bound values).[32] With all marriages considered the difference is almost eradicated (roughly 6 children, regardless of literacy), because the remarriage rate was so much higher among the literate.

[31] The rate at which people signed their names is a noisy measure of literacy in this dataset. There are individuals that were undoubtedly literate, such as notaries, that did not sign or mark their marriage record (the most common source of information on signatures). Nonetheless, the average signature rate is much higher for the upper echelon than for those with lower-status occupations (see Table 2).
[32] The comparable values using the lower bound definition of surviving children is 3.40 (illiterates) and 4.03 (illiterates).

Given that the number of surviving children is equal to the number of children born net of the number of deaths (prior to the father's death), we look at each of the components of this identity in turn. We begin with a detailed examination of the variation in fertility and then turn to the losses before returning to the surviving number of children.

Fertility

Looking at the number of children ever born reveals an even more pronounced inverted-U pattern within the four tiers: the elite fathered just 6.99 children in their first marriage while officers produced an astounding average of 9.46 children and professionals produced almost 8 children (see Table 3 and Figure 2). At the other end of the socioeconomic spectrum, laborers fathered 7.23 children, below the overall average of 7.84 offspring. When subsequent marriages are taken into account the differences between the most prolific at the upper end of the spectrum (the second tier) and laborers (the fourth tier) are further magnified. For example, the average total number of children born was 11.18 for officers and 8.10 for laborers – a difference of three children (compared to a difference of one to one and a half children when examining surviving children).[33]

The differences in average family size across occupation group may have reflected differences in some of the underlying characteristics of the husband and wife. Age at marriage (especially the wife's age) and life span, for example, are potentially important determinants of family size. The summary statistics are presented in Table 4. The overall average age at first marriage was 27.7 years (for men). It was relatively high

[33] Notably, for the sample we consider, men in New France were producing more surviving children than their relatively higher status counterparts who were leaving wills in England in the seventeenth century. See Clark and Hamilton (2006).

among the elite, 29.5 years of age, and traders (third tier) and laborers (fourth tier), at 29.7 and 29.3 years of age respectively. In fact, while total fertility exhibited a strong inverted-U shape when considering the four tiered occupation groups, average marriage age mirrors that pattern with a U-shape. The youngest new husbands were officers – with an average of just 25.6 years. This is in stark contrast to the soldiers under them, who married for the first time well past their thirtieth birthday (a mean age of 31.8 years). Part of this gap may reflect the fact that soldiers were almost all immigrants shipped to New France to serve (native born incidence is recorded in Table 2) while 97 percent of the officers were born in New France.

The average age of women at the time of marriage descends with each tier. At the top, wives of the elite, were 21.3 years of age, while laborers' wives were, on average, just 19.1 years of age.[34] Outside of the four tiers was even greater variation in age. Farmers married the youngest women, just 18 years of age, while the average age of soldiers' wives was 23 years.

In terms of life span, husbands lived, on average, to age 62 and wives had an average life span of 60 years. The elite (both husbands and wives) appear to have had comparatively short lives, the men living to about 60, in contrast with age 62 for laborers, who married at roughly the same average age. Farmers appear relatively fortunate, living to 64 and, most oddly, officers lived to an average age of 72.7 years! Officers could also boast relatively healthy wives (compared to others within the four tiers) and were also among the most likely to remarry.

To examine the variation in total fertility by socioeconomic status, we consider the determinants of fertility from the first marriage, remarriage, and fertility from the second marriage separately. This approach is not comprehensive, but allows us to take

[34] Wives are not restricted to first marriages.

a closer look at the main components of the factors that comprise total fertility. For example, we can think of expected total fertility for married individual *i* as the sum of fertility from the first marriage (F_{1i}) and the expected fertility from a second marriage, which would equal the probability that they survive their first wife (s_{1i}) times the probability that they remarry (r_{1i}) times fertility in the second marriage, et cetera:

$$E(TF)_i = F_{1i} + s_{1i}r_{1i}F_{2i} + s_{2i}r_{2i}F_{3i} + \ldots$$

Third or higher order marriages were fairly uncommon. Considering the men in this sample (who initially married between 1660 and 1709 with known life span), 80 men married at least three times (49 of these marriages produced children – an average of 3.5 children over all third marriages), 10 men married at least four times (five of these marriages were unfruitful), and three men managed to marry five times (but each of these marriages was childless). In contrast, 627 men married at least twice (and produced an average of 5.1 children in the second marriage).

(a) First Marriage Fertility

We estimate a reduced form equation of the number of children born in the first marriage, which is modeled as a function of socioeconomic status (captured by a series of occupation-group dummy variables), with additional controls for various attributes of the individuals and marriage. Different versions are reported in Table 5. Given the discrete and non-negative nature of the dependent variable, we employ a Poisson regression model.[35] Column (1) includes the trade dummy variables alone. It indicates the basic inverted-U pattern—relative to men with an unknown occupation (the

[35] The standard Poisson regression model assumes that the mean of the dependent variable is equivalent to its variance. In cases of under or over dispersion, modifications should be employed. The results here do not fail the over-dispersion test. Some papers that examine completed fertility argue for specifications that take account of under-dispersion, although they appear to find little difference in the results between the standard and modified Poisson model. We are still working on the most appropriate specification.

omitted category, which had an average family size close to the overall mean), the elite and laborers produced significantly fewer children, and officers and craftsmen producing significantly more children. Controlling for the location of marriage (a dummy variable equal to one if it was an urban marriage) and the marriage decade (not reported), has little effect on this basic pattern (column 2). Including controls for the marriage age and life span of the: wife (column 3), wife and husband (column 4), or marriage ages coupled with marriage length (column 5) does affect the basic pattern in the raw data. The results in column 4, for example, are suggestive of a positive relationship between socioeconomic status and first marriage fertility, with positive and significant coefficients for the elite and professionals and a negative and significant coefficient on the laborers dummy variable. Officers, with their remarkably large families, no longer have significantly different family size once age-at-marriage and longevity controls are included. In addition, the results show that delays to marriage (for both men and women) were highly correlated with smaller family size, all else equal, while longevity (for both men and women) had a positive impact on the number of progeny. Using the length of marriage instead of individual life span controls (column 5) explains considerably more of the overall variation in the number of children born in the first marriage and also mutes, but does not entirely eliminate, the variation in family size across socioeconomic group. These results suggest that the fact that laborers and elites married late and had relatively poor longevity, while officers married young and experienced long lives and marriages goes a long way to explain the socioeconomic variation in first marriage family size. Having said that, professionals and craftsmen still exhibit relatively large families, all else equal.[36]

[36] Report results that include literacy variable: negative and significant.

(b) Remarriage

The incidence of the husband remarrying is modeled as a function of attributes of the individuals, such as occupation group, age at widowhood, decade of widowhood, as well as attributes of the first marriage. The equation is estimated with a maximum likelihood probit model. Different specifications are reported in Table 6. Column 1 includes only the trade dummy variables, which illustrates a statistically higher incidence of remarriage among professionals and officers, relative to those with unknown occupation. Including controls for age at widowhood (negatively correlated with remarriage) and urban first marriage strengthens this positive association between socioeconomic status and remarriage. Now the elite, professionals, officers and those in a craft were all more likely to remarry than the unknown (all else equal – see column 3).[37] This reflects the fact that those in the upper echelon tended to marry (and hence experience widowhood) relatively late. Adding controls for literacy (in the first marriage) and the incidence and number of children from the first marriage does not tend to weaken this strong positive association (see columns 4 and 5). These regressions do reveal that men who married literate wives the first time round were less likely to remarry (while own literacy was not an important determinant of remarriage). Were men with literate first wives (a relatively rare attribute – just 19

[37] If we had considered higher order marriages, the representation of the upper echelon would have been even higher:

Population share by marriage rank and socioeconomic status (percent)

	First	Second	Third	Fourth
Elite	8.9	9.7	7.5	20
Professionals	6.8	7.8	8.8	20
Officers	3.9	6.7	10	20
Laborers	6.7	6.1	2.5	0
Unknown	44	43	40	20
N				10

percent signed their first marriage record) pickier or less desirable in the marriage market? Finally, not having any children in the first marriage increased the likelihood of remarriage.[38]

(c) Second marriage fertility

Fertility in the second marriage is modeled as it was with the first marriage. The results are reported in Table 7. Column 1 (which just includes the occupation group dummy variables) indicates that among men that married a second time, the elite and officers produced fewer children than those without a known trade. Most of this negative correlation between socioeconomic status and remarriage fertility disappears (or is markedly weaker) once controls are introduced for the second wife's age at marriage and life span, suggesting that the tendency of the upper echelon to marry older women (in particular) and women with relatively short lives was once again an important factor in determining their relative fertility.

Hence several points emerge from these results. First, the inverted-U shaped relationship in the raw data between fertility and socioeconomic status is stronger when considering total fertility as compared to first marriage fertility because the remarriage rate is positively correlated with socioeconomic status (given that remarriage fertility did not vary much with socioeconomic status).[39] Second, variation in marriage ages of the spouses and the longevity of the marriage by socioeconomic group explain a considerable portion of the variation in total fertility. Once these factors are taken into account, the relationship between fertility in the first marriage and socioeconomic status is actually positive. The higher remarriage rates among the upper strata would only

[38] For women, not having children in the first marriage had a negative impact on their remarriage chances. See Hamilton and Siow (1999).
[39] Note that examining second marriage fertility instead of subsequent fertility from all marriages understates the fertility of the upper echelon given that the remarriage probability was strongly correlated with socioeconomic status.

magnify this result. Given the relatively low raw mean fertility of the elite, this suggests that variation in longevity and marriage age should be examined in more detail.

Child mortality

We define the sample in two different ways to address the issue of sample attrition. First we restrict our analysis to children with known life span. This essentially assumes that all of the missing children died randomly, in a way that was uncorrelated with their father's socioeconomic status. Second, we assume that all of the children with missing life span information outlived their father.[40]

Given that the largest share of childhood deaths occur relatively early in the child's life, we examine the variation in deaths that occur prior to the child's first birthday (termed child mortality rate). One-quarter of children with known life span died before the age of 5 (Figure 4) and 75 percent of these deaths occurred in the first year – these deaths are the focus of our study. Nineteen percent of the children with known life span died before their first birthday. If we assume that all children with unknown life span lived beyond age five, then almost 21 percent of children died prior to age 5 and 15.6 percent died before turning one.

Separating children that died in their first year from those that survived their birthday reveals some of the well-known correlates of infant or child mortality. Those that died young were more likely to be male and experience birth in an urban setting

[40] Other possible ways to treat these observations include treating the missing children as censored observations and attribute a life span to them based on the life span of those children with known life span (conditional on their attributes). Finally, we can examine female children separately, given that they were less affected by immigration. This is work in progress.

during the winter. The chance of celebrating one's first birthday was also associated with a longer previous birth interval (2.05 years versus 1.84 years).[41]

Short birth intervals have been associated with higher rates of subsequent infant mortality in other settings.[42] The causal link is not necessarily straightforward – it may have arisen because the previous child died in infancy (the cessation of frequent breast feeding restores the mother's potential fertility), which may indicate a genetic (or behavioral) weakness specific to the family or it may indicate a relatively short course of breastfeeding and the quick succession of births may have depleted the mother's, and so the new infant's, health. Differences in these sorts of unobserved factors may have varied by socioeconomic status.

Table 8 illustrates that the child mortality rate (death prior to age one) varied by socioeconomic group. Whether we consider only the sample of children with known life span or count all children with unknown life span as living past age one, the elite experienced the highest mortality rate (26 percent relative to an overall average of 19 percent (known life span) or 20 percent versus 16 percent for laborers and 15 percent for farmers for the second definition). Craftsmen also experienced high rates – 24 (or 19) percent of their children died before reaching age one. The elite and craftsmen were also most likely to have children that were born in a city – 64 and 61 percent respectively – relative to just 10 percent for officers or 24 percent for laborers. Undoubtedly the cities were cesspools and detrimental to both children and adults' health. Table 8 also reveals relatively small variation in the average birth interval by socioeconomic group (1.96 years for professionals and officers compared to 2.10 years for laborers and 2.08 years for farmers), with the exception of the elite. Their average

[41] These mean differences are for the sample with known life span. If we include those with unknown life span (as living longer than one year), the previous birth interval of the longer lived is 2.06 years.
[42] For example, see Bahlotra and van Soest (2005), Chen et al (1974), Curtis et al (1993). In contrast, see Murphy and Wang (2001).

birth interval was just 1.84 years. The elite in New France, perhaps especially the nobility, may have wet-nursed their children, which would have placed the women at a greater risk of pregnancy soon after the birth of a child.[43]

To examine the incidence of mortality in more detail we regress mortality on the trade dummy variables and other determinants of child mortality first excluding children with unknown life span (columns 1 and 2) and then include them as children that lived past age one (columns 3 and 4, Table 9). Two versions with each sample are presented. The first includes only the trade dummy variables, with unreported decade and season of birth dummy variables. The second introduces such factors as the previous birth interval, birth rank, mother's age at birth and birth characteristics such as gender and location (urban). Because some of these variables are potentially endogenous regressors these results should be interpreted cautiously. A logit model is employed and the standard errors are adjusted for clustering at the paternal level. The results indicate that regardless of the specification the elite, crafts and traders experienced disproportionately high child mortality, relative to other occupations. Assuming that all of the unknown children lived past age one does reduce the magnitude of the effect for the elite, it is still quite large.

Conclusions

Elite males in New France were a breed apart – they married late (if at all), did not live that long by the standards of the day and although they produced relatively few children overall, they were fairly productive given the late age of their first wife and her relatively short live. They were much more likely to remarry if their first wife died before them but among those that remarried they were somewhat less productive

[43] Source: Gadoury (1992): 146. Their higher rates of child mortality also would have put downward pressure on the birth interval.

in their second marriage. Overall they still produced fewer children than others. They also tended to bury more of their children, making their net family size and the number that outlived them, relatively small.

If we consider those in the second tier, professionals for example, relative to laborers, they produced more children in their first marriage (once we take account of the age of their wife) and had a higher chance of remarrying. They did not experience the greater degree of loss (through child mortality) experienced by the elite. Craftsmen, however, who also produced more children and had a better chance of remarrying than men without a declared occupation, also had relatively high child mortality rates.

In sum, there is evidence of systematic variation in the numbers of surviving children across the socioeconomic gradient – perhaps more than would be anticipated at a time when contraception was not systematically practiced and the rich could not readily 'purchase' better health care.

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Table 1: occupation groupings

Category		Occupations (N in brackets)
Top tier:		
	Elite	Noble (parent or individual inherited or awarded title from King of France) (96) or bourgeois (parent had one of a number of high ranking government posts) (124) or gentry (titled individuals e.g. baron, marquis, knight or "Sir" (*ecuyer*) (38).
Second tier:		
	Professionals	Bourgeois (46), *seigneur* (32), notary (27), surgeon (23), ship's captain (23), merchants or *negociant* (23), church warden (17), architect or surveyor (7), King's agents and officials (*conseiller do Roi, procureur du Roi*) (5), guard of the royal warehouse (1), administrator (1).
	Officers	Military officers (117).
Third tier:		
	Craftsman	Most numerous include carpenters (48), masons (37), furniture makers (*menusier)* (36), shoemakers (22).
	Trades	Miller (21), baker (15), beadle, verger or choir member (*chantre*) (11), carter (9), innkeeper (8),butcher (6), clerk (4), brewer (3), chandler (1).
Fourth tier:		
	Laborer	*Voyageur* (71), laborers (*journalier, travaillant, labourer*) (59), apprentice (2), servant (46), fisherman (5)
Other:		
	Soldier	Soldier (122), sergeant (29), militia (1).
	Farmer	*Habitant* (384), *fermier* (30)
	Unknown	No occupation

Table 2: Summary statistics

Category	N	Fraction of sample	Fraction signed	Born in NF	Married in city
Top tier:					
Elite	269	0.09	0.65	0.55	0.70
Second tier:					
Professionals	205	0.07	0.43	0.54	0.42
Officers	117	0.04	0.38	0.88	0.20
Third tier:					
Craftsmen	251	0.08	0.35	0.44	0.53
Trades	78	0.03	0.26	0.23	0.50
Fourth tier:					
Laborers	203	0.07	0.18	0.53	0.37
Other:					
Soldiers	152	0.05	0.20	0.03	0.51
Farmers	414	0.14	0.15	0.46	0.36
Unknown	1329	0.44	0.14	0.82	0.15

Table 3: Average Number of Children by Social Group

	N	None	Children Born		Surviving children (lower bound)		Surviving children (upper bound)	
		(%)						
Marriages:			First	All	First	All	First	All
Elite	269	9.67	6.99	8.00	2.91	3.31	4.35	5.02
Professionals	205	4.39	7.94	9.45	3.93	4.61	5.31	6.32
Officers	117	2.56	9.46	11.18	4.56	5.26	6.03	7.19
Crafts	251	2.39	8.43	9.98	3.85	4.45	5.27	6.23
Traders	78	6.41	7.73	9.35	3.61	4.23	4.86	5.86
Laborers	203	4.93	7.23	8.10	3.68	4.02	4.92	5.57
Farmers	414	2.65	8.75	9.70	4.56	5.01	5.93	6.58
Unknown	1329	6.17	7.69	8.83	3.93	4.40	5.27	6.08
Soldiers	152	8.55	6.75	7.51	3.03	3.38	4.44	4.94
All	3018	5.47	7.84	9.00	3.87	4.36	5.23	6.03

Table 4: Summary statistics: marriage characteristics.

	Marriage Age	Marriage Age Wife	Life Span	Life Span Wife	Fraction Remarry
Elite	29.53	21.27	60.59	58.95	0.57
Professionals	27.59	20.39	61.41	57.21	0.59
Officers	25.63	20.26	72.73	60.68	0.61
Craft	28.05	19.32	62.17	57.24	0.57
Trader	29.67	19.75	64.07	59.73	0.55
Laborer	29.30	19.14	62.31	58.76	0.46
Farmer	28.21	18.00	64.14	61.16	0.42
Unknown	26.42	20.38	60.76	60.42	0.48
Soldiers	31.81	23.06	65.49	62.50	0.40
All	27.68	20.07	62.26	59.88	0.50

Table 5: Number of Children Born in First Marriage

	(1)		(2)		(3)		(4)		(5)	
Elite	-0.095	***	-0.073	***	0.033		0.059	**	0.038	
	(0.025)		(0.027)		(0.029)		(0.029)		(0.029)	
Professionals	0.033		0.037		0.108	***	0.112	***	0.073	**
	(0.027)		(0.027)		(0.029)		(0.029)		(0.029)	
Officers	0.208	***	0.208	***	0.199	***	0.043		0.056	
	(0.032)		(0.032)		(0.034)		(0.034)		(0.034)	
Craft	0.093	***	0.107	***	0.115	***	0.116	***	0.067	***
	(0.024)		(0.025)		(0.026)		(0.026)		(0.026)	
Trades	0.006		0.014		0.056		0.048		0.065	
	(0.042)		(0.043)		(0.044)		(0.044)		(0.044)	
Labor	-0.062	**	-0.057	**	-0.69	**	-0.059	**	-0.037	
	(0.028)		(0.028)		(0.03)		(0.030)		(0.03)	
Soldiers	-0.13	***	-0.114	***	-0.035		-0.022		-0.037	
	(0.033)		(0.033)		(0.034)		(0.035)		(0.035)	
Farmers	0.13	***	0.116	***	0.097	***	0.069	***	0.062	***
	(0.019)		(0.022)		(0.023)		(0.023)		(0.023)	
Urban			-0.059	***	-0.054	***	-0.037	**	0.066	
			(0.015)		(0.016)		(0.016)		(0.045)	
Marriage age (wife)					-0.046	***	-0.044	***	0.068	***
					(0.002)		(0.002)		(0.011)	
Life span (wife)					0.011	***	0.01	***		
					(0.000)		(0.000)			
Marriage age (husband)							-0.015	***	-0.006	***
							(0.001)		(0.001)	
Life span (husband)							0.013	***		
							(0.001)			
R squared	0.008		0.009		0.09		0.145		0.236	
N	3018		3018		2692		2692		2692	
Other Controls										
Marriage Decade			X		x		x		x	
Marriage Length, marriage length squared, marriage age wife squared									x	

Notes: Poisson specification. Dependent variable is the number of children born in the first marriage. Standard errors are in parentheses. Significance noted at the: *** = 1 percent, ** = 5 percent, * = 10 percent levels. Constant term not reported.

Table 6: The Incidence of Remarriage: Probit Estimation

	(1)		(2)		(3)		(4)		(5)	
Elite	0.085		0.196	**	0.226	**	0.240	**	0.235	**
	(0.055)		(0.083)		(0.086)		(0.087)		(0.088)	
Professional	0.105	*	0.064		0.086	*	0.100		0.107	
	(0.059)		(0.112)		(0.113)		(0.115)		(0.115)	
Officer	0.124	*	0.35	***	0.355	***	0.352	***	0.357	***
	(0.066)		(0.073)		(0.072)		(0.074)		(0.073)	
Craft	0.084		0.153		0.177	*	0.174	*	0.177	*
	(0.053)		(0.091)		(0.093)		(0.094)		(0.094)	
Trade	0.066		0.263		0.274		0.27		0.283	
	(0.092)		(0.176)		(0.174)		(0.174)		(0.169)	
Labor	-0.025		0.057		0.071		0.091		0.097	
	(0.064)		(0.121)		(0.121)		(0.12)		(0.118)	
Soldier	-0.086		0.063		0.068		0.107		0.143	
	(0.069)		(0.305)		(0.301)		(0.299)		(0.293)	
Farmer	-0.062		0.091		0.105		0.093		0.098	
	(0.050)		(0.089)		(0.090)		(0.092)		(0.093)	
Age at widowhood			-0.035	***	-0.035	***	-0.036	***	-0.037	***
			(0.003)		(0.003)		(0.003)		(0.004)	
Sign (husband)							0.040		0.038	
							(0.065)		(0.065)	
Sign (wife)							-0.160	**	-0.163	**
							(0.070)		(0.07)	
No children (first marriage)									0.319	**
									(0.116)	
Number of children (first marriage)									0.006	
Other controls:									(0.008)	
Urban first marriage					x		x		x	
R squared	0.01		0.445		0.446		0.451		0.457	
N	1102		671		671		671		671	

Notes: Coefficients reported are the change in probability of a one-unit change in the independent variable, evaluated at the means of the independent variables. All but the first regression include controls for the decade of widowhood. Standard errors are in parentheses. Significance noted at the: *** = 1 percent, ** = 5 percent, * = 10 percent. The sample includes men that outlived their first wife.

Table 7: Remarriage Fertility

	(1)		(2)		(3)		(4)	
Elite	-0.22	***	-0.195	***	-0.132	*	-0.064	
	(0.068)		(0.074)		(0.077)		(0.077)	
Professionals	0.103		0.127	*	-0.067		0.029	
	(0.065)		(0.068)		(0.075)		(0.076)	
Officers	-0.241	***	-0.235	***	-0.11		-0.244	***
	(0.081)		(0.081)		(0.088)		(0.089)	
Craft	-0.001		0.067		0.009		0.037	
	(0.061)		(0.065)		(0.068)		(0.068)	
Trades	0.225	**	0.253	***	0.025		0.072	
	(0.094)		(0.095)		(0.096)		(0.096)	
Labor	-0.129		-0.112		-0.093		-0.019	
	(0.08)		(0.081)		(0.088)		(0.089)	
Soldiers	-0.188	*	-0.215	**	-0.325	***	-0.229	**
	(0.10)		(0.102)		(0.108)		(0.108)	
Farmers	0.116	*	0.13	**	0.026		0.072	
	(0.06)		(0.065)		(0.071)		(0.072)	
Urban			-0.091		-0.136	***	-0.097	**
			(0.044)		(0.047)		(0.047)	
Marriage age (wife)					-0.086	***	-0.077	***
					(0.003)		(0.004)	
Life span (wife)					0.008	***	0.007	***
					(0.001)		(0.001)	
Marriage age (husband)							-0.015	***
							(0.003)	
Life span (husband)							0.017	***
							(0.001)	
Constant	1.651	***	1.788	***	3.307	***	2.588	***
	(0.027)		(0.118)		(0.153)		(0.191)	
R 2	0.01		0.016		0.326		0.362	
N	627		627		554		554	
Other Controls								
Marriage Decade			x		x		x	

Notes: Poisson specification. Dependent variable is the number of children born in the first marriage. Unknown is the omitted occupation group. Standard errors are in parentheses. Significance noted at the: *** = 1 percent, ** = 5 percent, * = 10 percent levels.

Table 8: Children of Men Summary Statistics

	N	Child mortality rate (a)	Child mortality rate (b)	Previous birth interval	Winter birth	Urban birth
Elite	1477	0.26	0.20	1.84	0.22	0.64
Professionals	1329	0.19	0.13	1.96	0.25	0.45
Officers	924	0.17	0.14	1.96	0.25	0.10
Craftsmen	1747	0.24	0.19	1.97	0.27	0.61
Trades	498	0.22	0.18	1.95	0.27	0.48
Laborers	1198	0.20	0.16	2.10	0.24	0.24
Soldiers	796	0.19	0.15	2.06	0.25	0.33
Farmers	3001	0.18	0.15	2.08	0.27	0.27
Unknown	8321	0.18	0.14	2.02	0.25	0.08

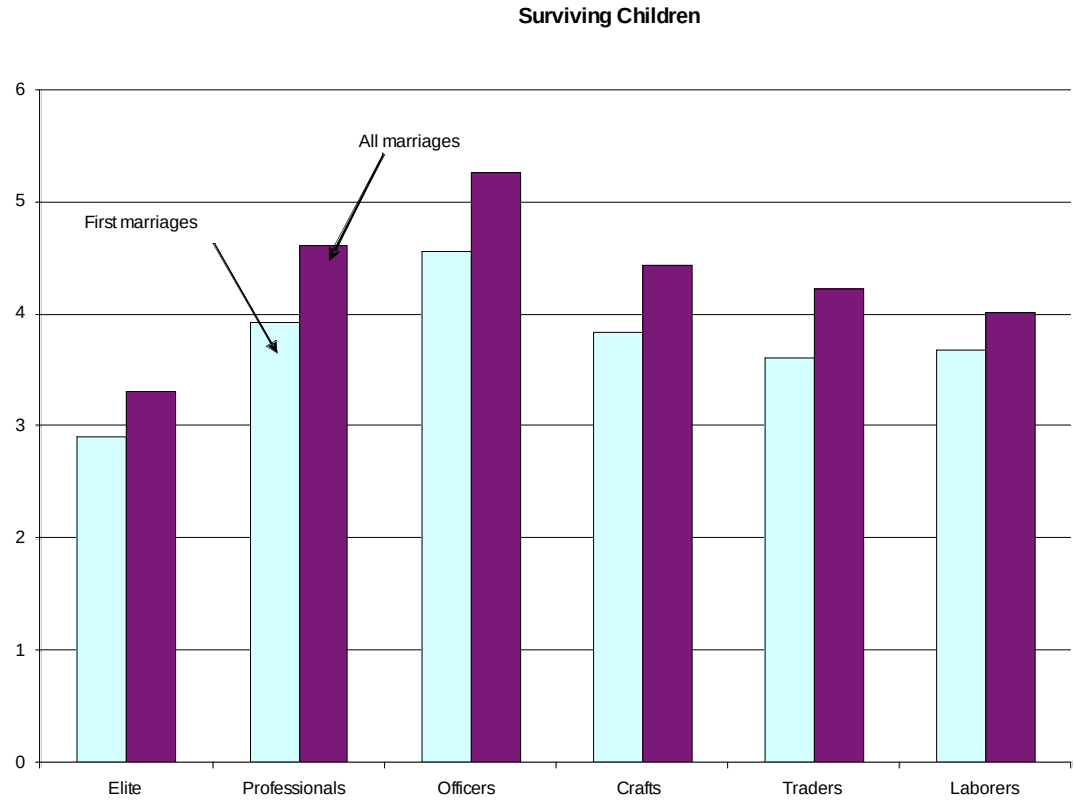
Notes: Sample consists of the children of men married between 1660 and 1709 with known life span. Children's life span must also be known, except in "child mortality rate (b)", in which all children with unknown life span are assumed to live to at least age one.

Table 9: The Incidence of Child Mortality: Logit estimation.

Children:	Known life span				All			
	(1)		(2)		(3)		(4)	
Elite	0.483	***	0.444	***	0.413	***	0.346	***
	(0.084)		(0.103)		(0.080)		(0.098)	
Professional	0.107		0.083		0.106		0.074	
	(0.108)		(0.124)		(0.106)		(0.121)	
Officers	-0.067		-0.126		-0.037		-0.109	
	(0.126)		(0.130)		(0.125)		(0.131)	
Craft	0.371	***	0.322	***	0.370	***	0.310	***
	(0.081)		(0.099)		(0.080)		(0.097)	
Trades	0.278		0.374	**	0.283	*	0.345	**
	(0.167)		(0.169)		(0.162)		(0.162)	
Laborer	0.155		0.148		0.152		0.152	
	(0.101)		(0.127)		(0.099)		(0.126)	
Soldier	0.114		0.089		0.052		0.040	
	(0.123)		(0.145)		(0.122)		(0.142)	
Farmer	0.008		0.102		0.027		0.112	
	(0.073)		(0.090)		(0.073)		(0.089)	
Interval(t-1)			-0.332	***			-0.324	***
			(0.044)				(0.043)	
Mom's age			0.016	**			0.011	*
			(0.007)				(0.007)	
Male			0.214	***			0.061	
			(0.046)				(0.045)	
Urban birth			0.265	***			0.248	***
			(0.065)				(0.063)	
Birth rank			-0.128	***			-0.110	***
			(0.030)				(0.029)	
B rank ^2			0.010	***			0.009	***
			(0.002)				(0.002)	
Constant	-1.550	***	-2.699	**	-1.794	***	-2.888	***
	(0.037)		(1.067)		(0.037)		(1.060)	
R squared	0.004		0.0363		0.0035		0.0275	
	19291		12807		23668		15761	

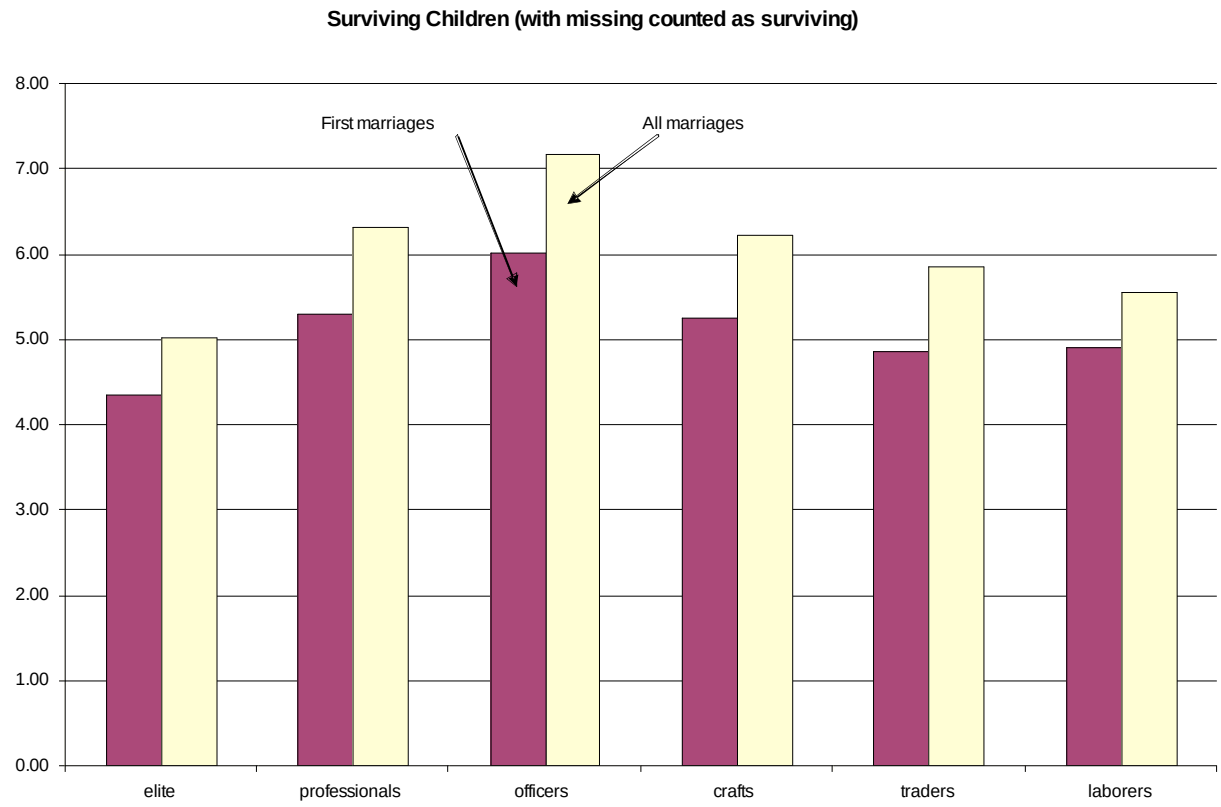
Notes: Child mortality is defined as death prior to the child's first birthday. Robust standard errors clustered on marriage. Dependent variable for columns 1 & 2 = child mortality defined over sample of children with known life span; col. 3 & 4 assumes children with unknown life span live > 1 year (and sample includes children with unknown life span). Interval (t-1) is previous birth interval. Unreported regressors: decade of birth and season of birth dummy variables. The omitted category is for a child born in spring in the 1660s whose father had an unknown occupation.

Figure 1: The average number of surviving children, by socioeconomic group (lower bound measure).



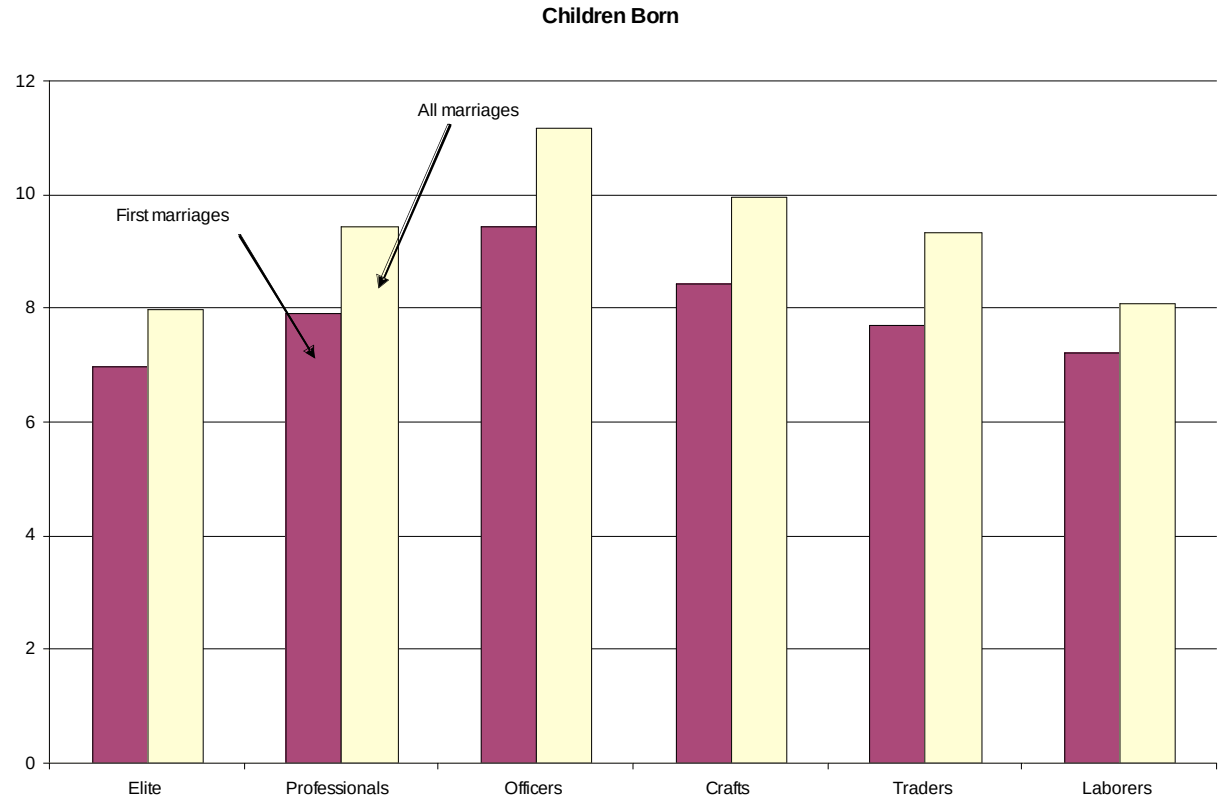
Notes: Children with missing death date (life span) information are assumed to die before their father.
Source: Table 3.

Figure 2: The average number of surviving children, by socioeconomic group (upper bound measure).



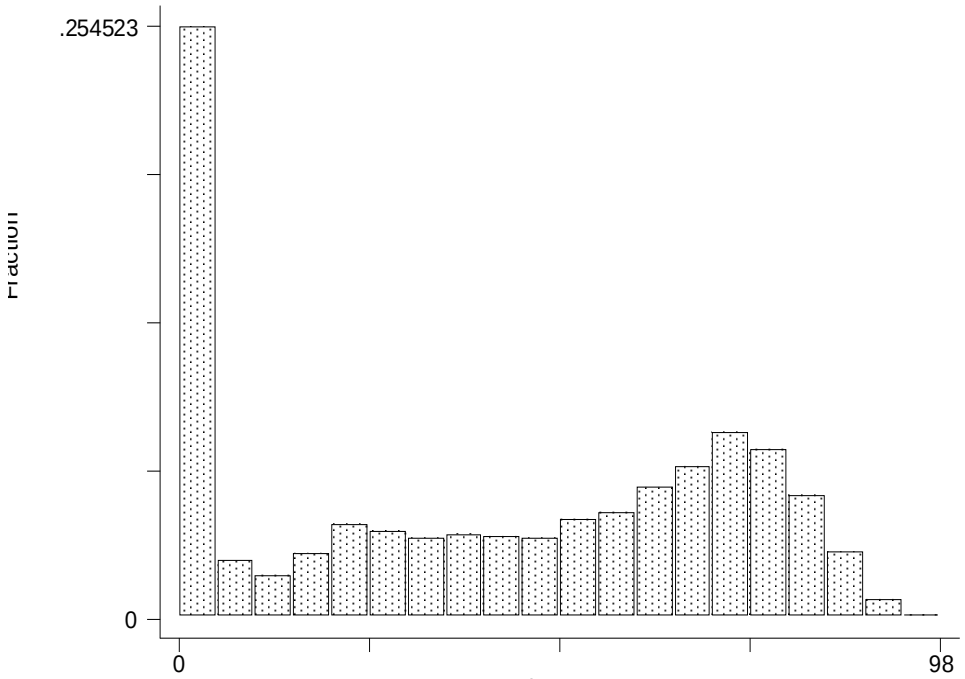
Notes: Children with missing death date information are counted as outliving (surviving) their father.
Source: Table 3.

Figure 2: The average number of children ever born, by socioeconomic group.



Source: Table 3.

Figure 4: Life span of Children



Note: sample is children of married men with known life span, married 1660-1709, in which the life span of the child is known. N = 19,291.