

The relation between illegitimate fertility and subsequent childbearing within marriage.

An investigation of innovation-diffusion theory using cohort fertility data from a Belgian town

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A bstract - One of the major arguments made in the literature in support of the view that the European fertility transition was the result of the spread of an innovation called contraception, is that illegitimate fertility fell together with marital fertility. Indeed, the parallel decline of both illegitimacy and marital fertility strongly suggests that individuals in Europe were applying new forms of contraceptive behaviour that were previously not done or even unthinkable. The aim of this contribution is to investigate one implication of the argument: if the diffusion hypothesis is correct, one would expect that women who got children before marriage would be less likely to apply newly introduced forms of contraceptive behaviour within marriage than comparable women without births before marriage. The hypothesis is investigated using data from three birth cohorts living in a Belgian town between 1850 and 1910.

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The relation between illegitimate fertility and subsequent childbearing within marriage.

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1. Introduction

One of the major arguments made in the literature in support of the view that the European fertility transition was the result of the spread of an innovation called contraception, is that illegitimate fertility fell together with marital fertility. For example: “The single most telling piece of evidence to support the view that pregnancy prevention was indeed an innovation is the fact that illegitimate fertility fell in parallel with marital fertility” (Cleland, 2001: 48). This parallelism was discussed in 1971 by Shorter, Knodel, and van de Walle (1971): “It is a salient and little known fact that in most parts of Europe non-marital fertility duplicated the widely known decline in marital fertility” (p.375). More frequently cited – probably one of the most often cited references in the literature about the fertility transition in Europe – is the “Lessons from the past” paper by Knodel and van de Walle (1986). Noting the simultaneity of both marital and non-marital fertility decline, the authors argue that the more plausible interpretation is “that birth control practices were not widely diffused prior to the parallel declines in legitimate and illegitimate fertility and that the spread of the knowledge and skills to avoid unwanted births enabled both married and unmarried couples to reduce their fertility simultaneously” (p.403).

The parallel decline of both illegitimacy and marital fertility indeed does suggest that individuals in Europe were applying new forms of contraceptive behaviour that were previously very uncommon. Yet, as pointed out already by Schellekens (1995), this

interpretation of the decline of illegitimate fertility has not been put to serious test. To date, this still has hardly been done, as far as I know, while there is at least one reason why the diffusion interpretation should be questioned. If we agree, in line with Shorter et al. (1971) and with Knodel and van de Walle (1986), that a higher proportion of births out of wedlock was unwanted than among births within marriage, then we would expect that the decline of non-marital fertility would be sharper than the decline of marital fertility, as a consequence of the diffusion of birth control skills. This was not the case.

In support of the diffusion hypothesis, Oris (1988: 152-153) observed a relationship between illegitimacy and marital fertility in his study of 19th century poor people in the Belgian town of Huy. Oris noted that needy couples with pre-marital births, who had by this very fact proved to have had sex before marriage, were less affected by the spread of fertility control and exhibited higher marital fertility than couples without pre-marital births.

The only explicit test of the diffusion hypothesis, as far as I know, is Schellekens' (1995) analysis of the decline of illegitimate fertility in England between 1851 and 1911. The English data were not inconsistent with the hypothesis that the extent to which contraceptive methods were used explains some of the decline. However, the explanatory power of the use of contraception – as far as indirectly measured by the level of marital fertility – decreased substantially when a measure of nuptiality was included in the regression analysis. Schellekens concluded that “a change in the knowledge and acceptability of contraception does not seem to be a major explanation at the early stages of the decline” (p.374).

The main objective of this contribution is to investigate one implication of diffusion interpretation of the decline of illegitimate fertility: if that interpretation of the decline of illegitimacy is correct, one would expect that women who got children before marriage would be less likely to apply newly introduced forms of contraceptive behaviour within

marriage than comparable women without births before marriage. The hypothesis is investigated using data from three birth cohorts living in a Belgian town between 1850 and 1910.

2. Nonmarital fertility, nuptiality, and marital fertility

In his seminal article, Phillips Cutright (1971) used the framework of the proximate determinants of fertility to derive nine steps to unmarried motherhood. Shorter et al. (1971) ruled out four of these as candidates to explain the decline of illegitimate fertility at the end of the 19th century: the prevalence of sterility, fecundity, intra-uterine mortality, and underreporting of vital statistics. The historical evolution of these four determinants of recorded fertility would imply a rise of fertility rather than a drop. A fifth step concerns the definition of marriage employed by the civil registrars: some people may regard themselves as legitimately married and nevertheless be refused this status by officials. A marriage certified by a religious denomination but not sanctioned by the civil authority, is a typical case in point. However, during the time period at issue here, i.e. the episode of the fertility transition, civil marriage was already well established and no change occurred in the definition of marriage in most North-Western European countries (Segalen, 1993: pp.115-131).

So four of nine determinants are left over as mechanisms that were potentially involved in the decline of illegitimate fertility (Schellekens, 1995): (1) the extent of non-marital sexual activity, (2) contraceptive behaviour, (3) abortion, and (4) the likelihood of a marriage before childbirth (but not necessarily before conception). The diffusion interpretation implies that contraception has played a major role, maybe sometimes in combination with abortion.

Yet, the proximate determinants approach makes clear that other explanations are not necessarily incompatible with the diffusion hypothesis. A major alternative view is the courtship model (Laslett, 1980a). The essence of this model is that marriage and illegitimacy are two different outcomes of courtship behaviour (Alter, 1988: pp.116-125).

In a nutshell: from a courting woman's point of view,

“the risk of becoming an unwed mother had to be weighed against the risk of remaining a spinster. If she were to agree to her partner's demand for sexual intimacy, she could perhaps strengthen their relationship and increase the likelihood that they would marry. On the other hand, she risked conceiving a child and becoming an unwed mother” (Alter, 1988: p.120).

This model sees ups and downs in unwed motherhood as a function of the extent of non-marital sexual activity and the likelihood of marriage in case of pregnancy.

The courtship view on illegitimacy was highly inspired by the “striking and unexpected” findings by Peter Laslett et al. (1980, p. ix) that age at marriage and illegitimacy were inversely related. Contrary to the expectations, illegitimacy went up as age at marriage went down, and vice versa (Laslett, 1980a: 20-24). Yet, this surprising relationship did not hold everywhere (see, for example, Knodel, 1988: pp.227-229; Kok, 1990; 1991), and even in England the observation holds only until the middle of the 19th century. After that, both illegitimate fertility and age at marriage were on the decline in most European countries until the 1960's (Coale & Treadway, 1986; Watkins, 1986). As noted by Cutright (1971) and Shorter et al. (1971), this decline coincided with the decline of marital fertility.

Clearly, Laslett's courtship model has no universal applicability and needs qualification. As said, Laslett's view was highly inspired by the observation that age at marriage and illegitimacy were inversely related. The explanation given for this inverse relationship was that courtship activity is likely to increase as the circumstances are appropriate in principle for marriage. The more early courtships, the more early marriages but also the more women risking to become unwed mothers, and hence the higher the number of

births out of wedlock (Laslett, 1980a: 53-65). Yet, an increase in early courtship behaviour may also result in a decrease of illegitimacy if a higher proportion of early courtships end with marriage before childbirth rather than with the birth of an illegitimate child. This increase in the proportion of courtships resulting in marriage rather than illegitimacy may be the result of improved marriage opportunities, possibly created by better economic conditions (Tilly, Scott & Cohen, 1976; Schellekens, 1995).

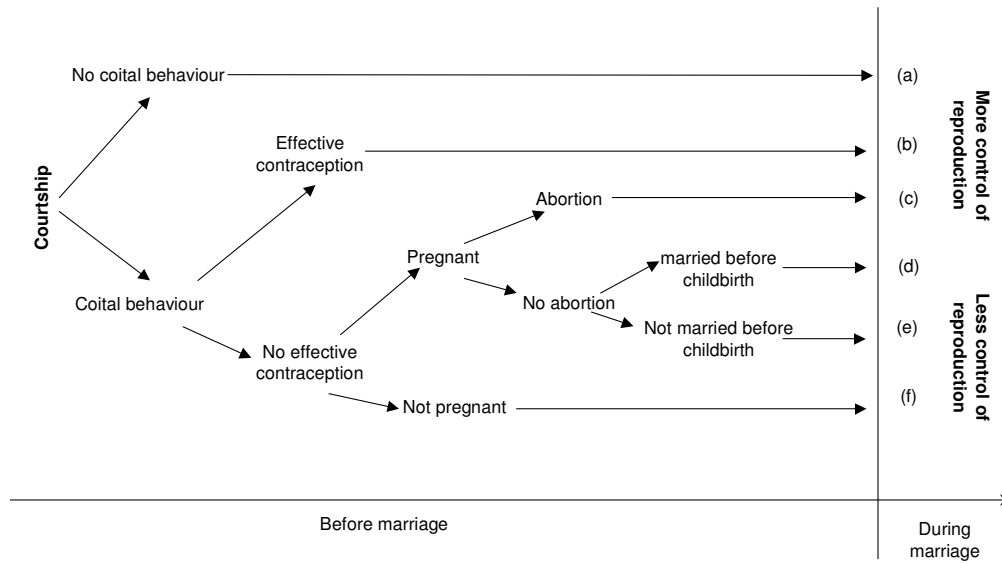
Summing up: in the courtship model, early courtship behaviour may result in more as well as in less illegitimacy, depending on the likelihood of marriage before a child is born to an unmarried couple. By itself, courtship behaviour touches upon the proximate determinant identified above as (1), i.e. the extent of non-marital sexual activity. The outcome of this behaviour depends on the other determinants: (2), (3), as well as (4), i.e. contraception, abortion, and the likelihood of marriage, respectively.

The rest of the paper investigates the plausibility of the hypothesis that the diffusion of contraceptive or abortive behaviour has played a major role in the decline of illegitimacy. This is done by using information about the outcome of pre-marital courtship to formulate hypotheses about the extent of control of reproduction during marriage.

The logic of the argument used to test the diffusion hypothesis is the following (see Figure 1). Some couples have coital experience before marriage, some haven't. To some extent, courtship without coital experience may be a sign of a high amount of self-control; couples who have no sex before marriage (group (a) in Figure 1) may exhibit a "culture of abstinence". This culture is instrumental in having control of reproduction (Szreter, 1996). Control may be exerted for family limitation, but given the appropriate motivation, control may just as well be employed to achieve a large family. A "culture of abstinence" combined with a motivation to have a large family has often been characteristic of conservative religious groups, typically exhibiting high marital fertility

(McQuillan, 1999). People belonging to this category (a) will have no illegitimate births nor pre-nuptial pregnancies.

Figure 1. Relations between sexual behaviour during courtship and fertility control after marriage



With our historical data, we cannot distinguish group (a) in Figure 1 from groups (b) and (c). Group (b) consists of couples who did have sex before marriage, but who were able to avoid any pre-marital conceptions by employing effective contraceptive techniques, while (c) are the couples with coital experience who did not employ any effective contraception but who avoided illegitimacy by means of abortion. Finally, with our data it is also not possible to tell (a), (b), or (c) from group (f). The latter includes women who ran the risk of conceiving a child before marriage by having sex without contraception, but who (by chance) did not get pregnant. What our data do allow, is to distinguish all groups discussed so far from groups (d) and (e). Characteristic of these two groups is that

they manifest a lack of effective contraceptive or abortive behaviour before marriage. If contraception or abortion did play a role in avoiding conceptions out of wedlock, then one should expect that women and/ or couples who are knowledgeable about effective contraceptive or abortive practices are relatively over-represented among those who did not give birth to a child conceived out of wedlock, and under-represented among those who got married before conceiving a child. Therefore, if the diffusion of contraception and abortion was important in bringing down illegitimacy in Europe after 1850, we would expect that groups (d) and (e) manifest less control during their marriage as well.

3. Context and data

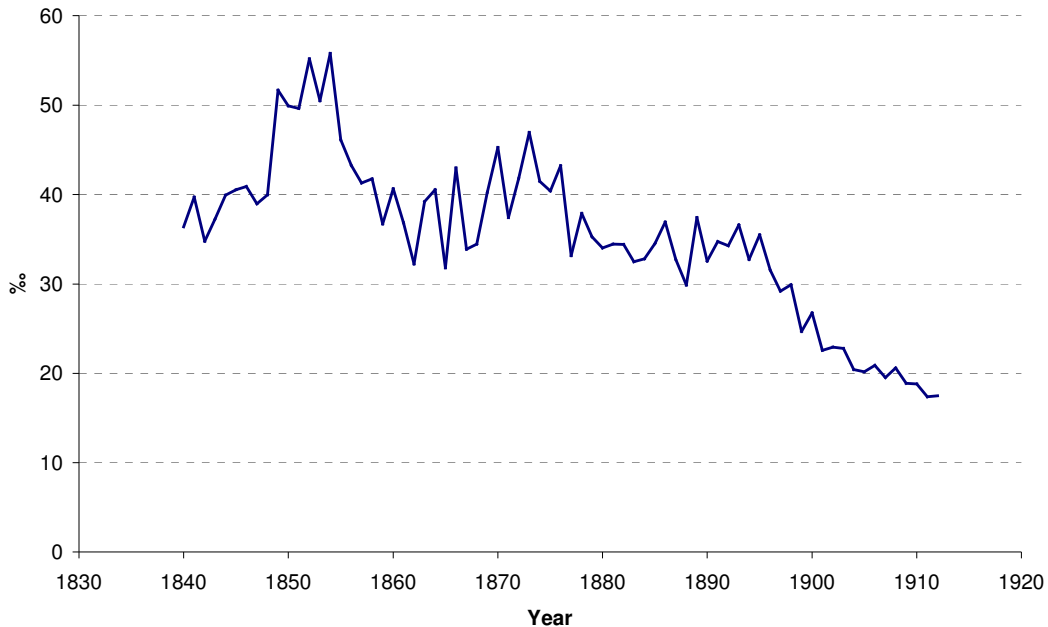
I will test whether couples with pre-marital conceptions and births were laggards in the adoption of new contraceptive behaviour within marriage. To this end, I use marital fertility data about three cohorts living in the town of Leuven. This town is situated in the Dutch-speaking part of Belgium, where economic modernization, secularisation and the fertility transition generally lagged behind the southern part of the country (Lesthaeghe, 1977). Economically, Leuven has a very long urban tradition as an administrative, trades and crafts centre. In the middle of the 19th century, about a third of the registered labour force worked in industry, while a fifth was employed in non-specific sectors. About 45% worked in services, trades or transport. Only 3% was employed in agriculture (Magits, 1975).

Leuven played a supportive role in the Belgian industrialization story, primarily through its functions as a centre of education, trades, and transport. The small-scale local industry expanded and modernized only gradually, and included mainly food industry (especially breweries), craft textile manufacturing, tanneries, wood, and construction (Matthijs, Van Bavel & Van de Velde, 1997).

Not surprisingly, this white collar, bourgeois town recruited many domestic servants, mainly young women coming from the rural villages; 30% of the registered female labour force consisted of servants in 1846, making up the single most important occupational category for women. Clearly, it was an important factor in attracting female immigrants to Leuven. The town hosted students and many soldiers as well, and male day labourers finding unstable employment and housing in Leuven (Matthijs et al., 1997)

Typically, illegitimacy figures were generally high in garrison- and university towns compared to their provinces (Mitterauer, 1983: 72). This traditionally held for Leuven as well. Like in many other European places (Shorter, 1971), illegitimacy reached its highest peaks in the middle of nineteenth century. Between 1846 and 1856, one in five to more than one in four births were illegitimate. Between 1845 and 1860, every year about 40 to more than 50 children were born per 1000 unmarried women of childbearing age (see Figure 2). During this period of economic crisis, the number of foundlings and abandoned children peaked as well. Between 1846 and 1856, the number of foundlings and abandoned children varied between 40 and 160 per year. In 1854, for instance, 1000 children were born, of which one in four out of wedlock, while nearly 160 children were abandoned or became foundlings. The figures for 1849 are similar (Matthijs, Van Bavel & Van de Velde, 1997: 37-41).

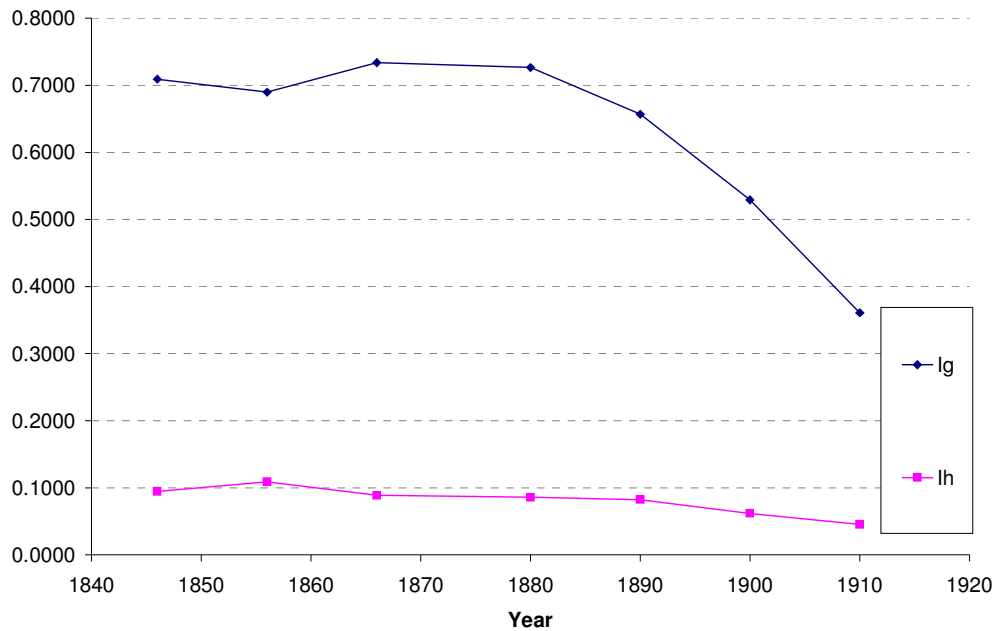
Figure 2. Non-marital general fertility rate: number of births out of wedlock per 1000 unmarried women aged 15 to 45 years, Leuven 1840-1910*



*Number of unmarried women aged 15-45 years has been interpolated between censuses with a cubic spline function

The secular decline of illegitimate fertility started after 1880, which is about the same time when marital fertility started to decline (see Figure 3). As said, it is this similarity in the timing of the decline of both legitimate and illegitimate fertility which inspired the thesis that the common cause is the diffusion of innovative contraceptive behaviour.

Figure 3. Coale-indices of marital (I_g) and non-marital fertility (I_h), Leuven 1846-1910



An assumption of that diffusion interpretation of the decline of illegitimate fertility is that women who give birth before marriage are less aware of effective contraceptive or abortive practices, or are applying them in a less effective way. The implication is that these women would also be less likely to apply contraceptive or abortive behaviour within marriage than comparable women without births or pregnancies before marriage. This hypothesis is investigated below by looking at the marital fertility of three birth cohorts living in the Belgian town of Leuven between 1850 and 1910.

Individual-level marital fertility data, for men as well as women, natives as well as immigrants, were collected from the population registers and from civil registration (birth, death, and marriage certificates) (for a discussion of the sources, see Gutmann and van de Walle, 1978; Lebouté and Obotela, 1988; or Alter, 1988). The first cohort consists of all married couples with at least one of the spouses born in 1830. This generation was included because it completed its fertile life course before any signs of marital fertility

decline were visible on the aggregate level (G1830). The second cohort includes all married couples with at least one spouse born in 1850. This cohort entered its fertile life phase at a time when marital fertility was starting to decline in Leuven (G1850). The third generation, with at least one spouse born in 1864, was living its adult years in full marital fertility transition (G1864) (Van Bavel, 2002). The statistical analysis is limited to women's first marriages because pre-marital pregnancies among women who never married before on the one hand, and pre-marital pregnancies among remarrying women on the other, are presumably very different issues.

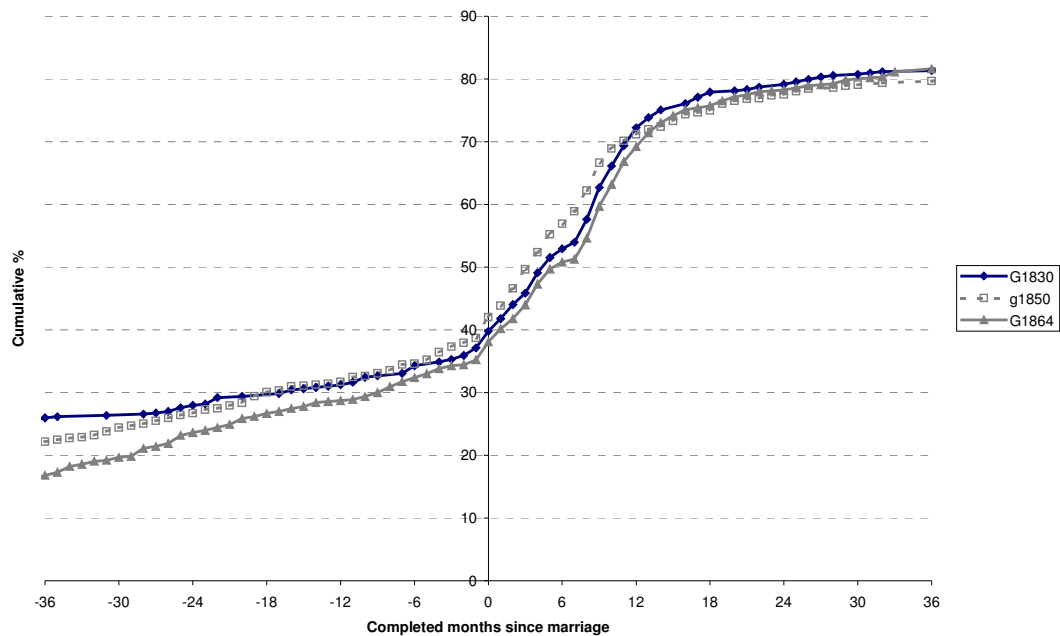
Figure 4 gives the central part of the cumulative probability distribution function of the interval between marriage and the first birth attributed to it, irrespective of whether it was born before or after the wedding-day. That illegitimacy was quite high in Leuven is confirmed by the high proportions of women who brought children born before marriage to their first marriages. In the first generation this was 37%. In the second, it was even higher: 39%. The decline of pre-marital fertility was evidenced only in the third generation, with a percentage of 35% of first marrying women with pre-marital births. In these figures, only pre-marital births are counted that were subsequently legitimised by marriage.¹

In each generation, about 70% of women who married for the first time had given birth to at least one legitimate or legitimised child within a year after the wedding day (Figure 4). Within the first 12 months of marriage, the frequency distribution of first births has a markedly bimodal shape (Figure 5). This pattern is usually taken as an indicator of relatively permissive attitudes toward pre-marital sexual activity (Alter, 1988: p.131-132). More specifically, the closer the first peak in post-nuptial births is to the wedding-day,

¹ These percentages are about 10% higher than the ones displayed for Leuven in Matthijs (2001: p.145). This can be explained by the fact that Matthijs includes not only first but also higher order marriages. Still, the timing of the onset of the decline of the proportion of marriages legitimising at least one child, as evident from Matthijs (2001: p.145), is consistent with the figures cited for the three generations used in the current study.

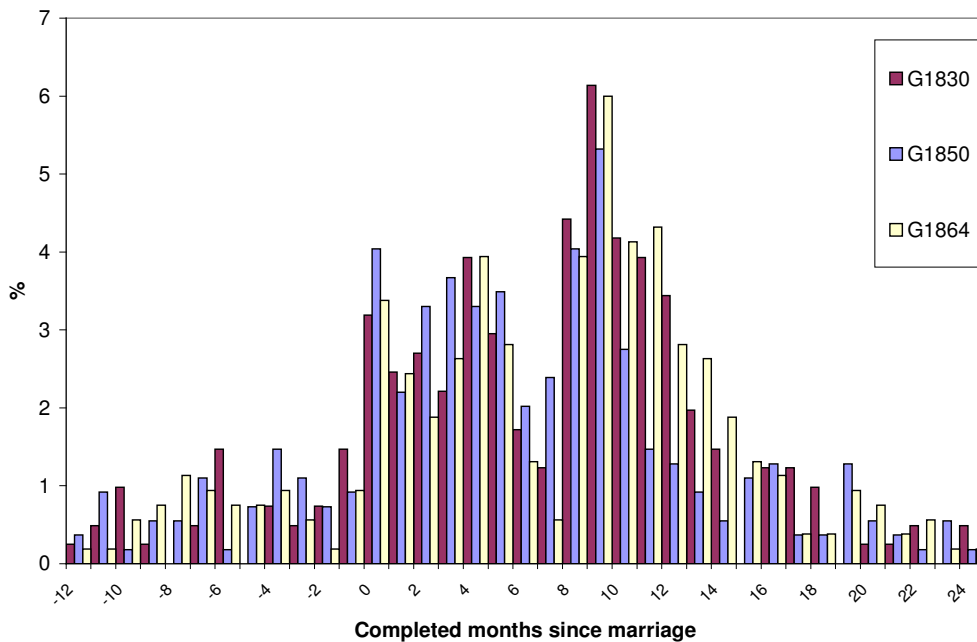
the more likely that the prevailing culture was tolerant toward unmarried but pregnant women. If couples would want to hide prenuptial conceptions, they should want to marry as soon as the pregnancy would be noticed. In that case, birth would take place six or seven months after marriage instead of after three or four months. The data in Figure 5 suggest mixed attitudes in Leuven: within the boom during the first 8 months of marriage, the distribution is also bimodal. Apparently, some married as soon as possible after noticing the pregnancy, while others finished the gestation period almost completely during their engagement.

Figure 4. Cumulative probability distribution (per cent) of interval between marriage and first birth, by generation. Leuven 1846-1910



(source: interval hu - gb1b.sas → interval hu - gb1b.xls)

Figure 5. Percent of first births by interval between marriage and first birth, by generation, Leuven 1846-1910



(source: interval hu - gb1.sas → interval hu - gb1.xls)

The next section tries to find a method to see whether couples who were able to avoid pre-marital pregnancies or births, were also controlling their fertility more after marriage.

4. Method

As often in historical demography, the problem is to tell natural fertility differences from deliberate fertility control. In his study of fourteen German villages in the 18th and 19th century, Knodel (1988: pp.226-239) noted that women who were pregnant at marriage generally experienced modestly higher marital fertility rates than those who were not. A number of factors could account for this difference, including deliberate fertility control as well as differential fecundity. Knodel tends to favour the latter explanation. Indeed, if “sexual activity were routine following betrothal or a commitment to marry, a pregnancy

prior to marriage would be more likely to ensue for couples who were more fecund than for those who were less “ (p.236).

Yet, I would argue that Knodel’s data also indicate that the difference in marital fertility between women who had been pregnant brides and those who were not, (a) was more consistent and stronger in the 19th than in the 18th century, and (b) that this strengthening of marital fertility differences between the two groups was particularly marked for age-specific marital fertility rates above age 35. These findings can be deduced from Table 9.11 in Knodel (1988: p.237). Assuming that stopping became more prevalent in the course of the 19th century (Coale, 1986), this suggests that deliberate stopping behaviour also played a role.

The next section fits multivariate regression models that include a number of controls for the natural and structural covariates of marital fertility, as well as a variable that should allow us to detect parity-aimed fertility control. If the diffusion interpretation of the decline of illegitimacy is correct, we should observe more evidence of such control among women without pre-marital births than among women who did give birth before marriage.

4.1 Modelling stopping behaviour

The approach taken is built on the tradition in historical demography to look at the age at last birth as an indicator of stopping behaviour. In case of natural fertility, the age at last birth is determined by the length of birth intervals and by the onset of sterility: people with long birth intervals tend to have a lower age at last birth (Okun, 1995), but the most important natural determinant is the onset of sterility (Wilson, Oeppen & Pardoe, 1988). The fertility transition is characterised by the diffusion of a third determinant of the age at last childbirth, called parity-dependent stopping behaviour (Coale, 1986). This mode of

fertility control is aimed at a desired family size: parity-dependent stopping means that couples who have reached a maximum desired family size, try to prevent further reproduction (Okun, 1995).

Instead of modelling the age at last birth directly, taking married women as the unit of analysis, we follow a sequential approach. A sequential approach is advisable because, if the age at last birth is partly determined by stopping, this behaviour is by definition a function of the number of children alive, and this number is changing over time during the reproductive life course. So instead of modelling age at last birth in one step for individual women, we use birth intervals as unit of analysis. The dependent variable is the probability that the current birth interval remains open – is not closed by an additional birth –, i.e. the probability that no more birth occurs after the birth that started the current interval. In other words, we model the probability that the age at last birth is the age at the start of the current interval. This probability can be modelled by means of a logistic regression. More precisely, the dependent variable is the logit-transformation of the probability that no more child is born within five years after a previous birth. The reasons for applying a five-year limit are explained in Van Bavel (2002; 2004).

4.2 Natural and parity-aimed stopping

If couples do not deliberately try to stop having children, the most important determinant of the onset of infertility is the woman's age (Trussell and Wilson, 1985; Larsen and Menken, 1989; Wood et al., 1994). In order to capture the non-linear effect of age on sterility, we include age at the start of the birth interval in the form of five-year age categories. Secondly, in the absence as well as in the presence of parity-dependent fertility control, marriage duration is highly associated with fecundability and, hence, with

birth spacing and therefore with the probability that another birth occurs within five years (Wood et al., 1994; Van Bavel, 2003).

After controlling for woman's age and marriage duration, the fecundity of marriages still varies significantly. Differences between couples reflect differential fecundability and breastfeeding habits (Knodel, 1988; Wood, 1994). Couples characterized by high fecundity will have, on average, shorter birth intervals and, hence, a higher cumulative number of births at any age and marriage duration. For these couples, the probability that the current interval is closed by yet another birth will also be relatively high. Therefore, the crude legitimate parity covariate, i.e. the number of children already born within the current marriage at the start of the current birth interval, is included in order to control for natural fecundity differences (Van Bavel, 2004).

The survival status of the previous child has been shown to be a very important determinant of the next interval when the previously born infant is breastfed (Wood, 1994). Infant mortality will therefore enhance the likelihood of an additional birth. This covariate is included in the regression equations as a dummy variable that is set to one if the previously born child dies within the current birth interval and before reaching age one.

Finally, if the reproductive behaviour would be deliberately aimed at a final family size that the married couple (or one of the partners) does not wish to exceed, we would expect a positive effect of the number of children alive on the odds of stopping. So we include both net and crude parity: the former is the number of children still alive at the beginning of the current interval, while the latter includes all children already born, alive as well as deceased. If net parity has a statistically significant effect on the likelihood of stopping, even after controlling for crude parity (or, equivalently, the number of deceased children), this would strongly suggest that parity progression was being controlled with a desired offspring in mind. Van Bavel (2003; 2004) explains the theoretical and

methodological rationale behind including both crude and net parity. There is no problem of multicollinearity as long as the number of children born is not always equal to the number of children alive, and if there is enough variability within the sample (cf. Wooldridge, 2003: especially p.98).

5. Findings

We distinguish between three groups of married women: (1) those who did not record any pre-nuptial pregnancy; (2) women who did get pregnant before marriage, but who got married before the birth of the child; and (3) women who gave birth to at least one child before getting married. In each of these groups separately, the presence of parity-dependent stopping behaviour is assessed by looking at the effect of the number of children alive (i.e. net parity). The results of the regression analyses are pasted below.

In the first two generations, a high number of children alive did not advance stopping in any group. In G1830, if anything, the effect of net parity was negative rather than positive among people without any pre-marital pregnancy ($p < 0.084$). If this effect is real, several explanations are plausible. One possible reason would be the heterogeneity of this group with respect to reproductive goals: maybe some were striving for large family sizes rather than trying to limit their offspring. Another explanation may be that a negative effect captures some of the non-linearity of the effect of crude parity. More difficult to explain is the positive slope for net parity among women from G1830 who had been unmarried mothers, although it is not statistically significant ($p > 0.11$).

In the second generation, all statistically significant effects are in line with expectations in the absence of parity-dependent stopping. There is one interesting exception: among the women of G1850, the higher the number of children born before marriage, the higher the probability of stopping, *ceteris paribus* ($p < 0.002$). This seems to contradict the

hypothesis that illegitimacy is a sign of poor contraceptive knowledge. Yet, there is no effect of family size (including children born before as well as after marriage) on stopping. Maybe there are explanations for the effect of pre-marital fertility other than parity-aimed stopping.

Only in the third generation, we do find a clear effect of achieved family size on stopping. However, we only find a statistically significant effect among G1864 women who did get pregnant before marriage but married before childbirth: per additional child alive, the odds of stopping increased with about 56%, after controlling for age, marriage duration, number of confinements, and survival status of the previous child.

Output of ESSHC04 Model 2.sas

G1830 No pre-marital births nor pregnancy

Ordered Value	Response Profile		Total Frequency
	STOP		
1	1		81
2	0		303

Probability modeled is STOP=1.

Model Fit Statistics

Criterion	Intercept	Intercept and Covariates
	Only	
AIC	397.671	331.479
SC	401.621	363.084
-2 Log L	395.671	315.479

Testing Global Null Hypothesis: BETA=0

Test	Chi-Square	DF	Pr > ChiSq
Likelihood Ratio	80.1917	7	<.0001
Score	85.9465	7	<.0001
Wald	62.4262	7	<.0001

Analysis of Maximum Likelihood Estimates

Parameter	DF	Estimate	Standard	Wald	Pr > ChiSq
			Error	Chi-Square	
Intercept	1	-2.1835	0.3842	32.3026	<.0001
AGE 30-34	1	-0.2939	0.4553	0.4168	0.5186
AGE 35-39	1	0.7861	0.4284	3.3669	0.0665
AGE 40 & +	1	1.8730	0.4970	14.2046	0.0002
M.DURATION	1	0.2609	0.0694	14.1424	0.0002
CRUDE PAR.	1	-0.1921	0.1432	1.8001	0.1797
NET PAR.	1	-0.2378	0.1375	2.9881	0.0839
INF.MORTAL.	1	-0.8960	0.4058	4.8742	0.0273

Odds Ratio Estimates

Effect	Point	95% Wald	
	Estimate	Confidence	Limits
AGE 30-34	0.745	0.305	1.819
AGE 35-39	2.195	0.948	5.082
AGE 40 & +	6.508	2.457	17.236
M.DURATION	1.298	1.133	1.487
CRUDE PAR.	0.825	0.623	1.093
NET PAR.	0.788	0.602	1.032
INF.MORTAL.	0.408	0.184	0.904

Association of Predicted Probabilities and Observed Responses

Percent Concordant	81.7	Somers' D	0.638
Percent Discordant	17.9	Gamma	0.640
Percent Tied	0.3	Tau-a	0.213
Pairs	24543	c	0.819

G1830 Pre-marital conception, marriage before childbirth

Response Profile

Ordered Value	STOP	Total Frequency
1	1	53
2	0	233

Probability modeled is STOP=1.

Model Fit Statistics

Criterion	Intercept and Covariates	
	Intercept Only	Intercept and Covariates
AIC	276.192	225.387
SC	279.848	254.635
-2 Log L	274.192	209.387

Testing Global Null Hypothesis: BETA=0

Test	Chi-Square	DF	Pr > ChiSq
Likelihood Ratio	64.8056	7	<.0001
Score	81.4631	7	<.0001
Wald	50.7985	7	<.0001

Analysis of Maximum Likelihood Estimates

Parameter	DF	Estimate	Standard Error	Chi-Square	Pr > ChiSq
Intercept	1	-2.0752	0.4942	17.6323	<.0001
AGE 30-34	1	0.3884	0.5308	0.5352	0.4644
AGE 35-39	1	1.1463	0.6075	3.5607	0.0592
AGE 40 & +	1	3.8439	0.7834	24.0779	<.0001
M.DURATION	1	0.0438	0.0926	0.2235	0.6364
CRUDE PAR.	1	0.000679	0.2282	0.0000	0.9976
NET PAR.	1	-0.2270	0.1870	1.4725	0.2249
INF.MORTAL.	1	-0.2892	0.5357	0.2914	0.5893

Odds Ratio Estimates

Effect	Point Estimate	95% Wald Confidence Limits	
AGE 30-34	1.475	0.521	4.174
AGE 35-39	3.146	0.957	10.349
AGE 40 & +	46.709	10.060	216.876
M.DURATION	1.045	0.871	1.253
CRUDE PAR.	1.001	0.640	1.565
NET PAR.	0.797	0.552	1.150
INF.MORTAL.	0.749	0.262	2.140

Association of Predicted Probabilities and Observed Responses

Percent Concordant	77.0	Somers' D	0.549
Percent Discordant	22.1	Gamma	0.554
Percent Tied	0.9	Tau-a	0.166
Pairs	12349	c	0.774

G1830 Couples with at least one pre-marital birth

Response Profile		
Ordered Value	STOP	Total Frequency
1	1	42
2	0	179

Probability modeled is STOP=1.

Criterion	Model Fit Statistics	
	Intercept Only	Intercept and Covariates
AIC	216.940	178.955
SC	220.338	212.937
-2 Log L	214.940	158.955

Testing Global Null Hypothesis: BETA=0			
Test	Chi-Square	DF	Pr > ChiSq
Likelihood Ratio	55.9844	9	<.0001
Score	56.0395	9	<.0001
Wald	36.8924	9	<.0001

Analysis of Maximum Likelihood Estimates					
Parameter	DF	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
Intercept	1	-2.8502	0.7858	13.1552	0.0003
AGE 30-34	1	-1.5685	0.9621	2.6575	0.1031
AGE 35-39	1	0.1791	0.7810	0.0526	0.8186
AGE 40 & +	1	1.6670	0.9279	3.2275	0.0724
M.DURATION	1	0.0780	0.1123	0.4834	0.4869
CRUDE PAR.	1	-0.1616	0.2363	0.4680	0.4939
NET PAR.	1	0.3265	0.2062	2.5075	0.1133
INF.MORTAL.	1	-1.0234	0.6484	2.4915	0.1145
pre-m.preg.	1	1.0767	0.6125	3.0902	0.0788
#pre-births	1	-0.0660	0.3283	0.0404	0.8406

Odds Ratio Estimates			
Effect	Point Estimate	95% Wald Confidence Limits	
AGE 30-34	0.208	0.032	1.373
AGE 35-39	1.196	0.259	5.528
AGE 40 & +	5.296	0.859	32.647
M.DURATION	1.081	0.868	1.347
CRUDE PAR.	0.851	0.535	1.352
NET PAR.	1.386	0.925	2.076
INF.MORTAL.	0.359	0.101	1.281
pre-m.preg.	2.935	0.884	9.749
#pre-births	0.936	0.492	1.781

Association of Predicted Probabilities and Observed Responses

Percent Concordant	84.1	Somers' D	0.685
Percent Discordant	15.6	Gamma	0.686
Percent Tied	0.2	Tau-a	0.212
Pairs	7518	c	0.843

G1850 No pre-marital births nor pregnancy

Response Profile

Ordered Value	STOP	Total Frequency
1	1	81
2	0	311

Probability modeled is STOP=1.

Model Fit Statistics

Criterion	Intercept Only	Intercept and Covariates
AIC	401.417	304.294
SC	405.389	336.064
-2 Log L	399.417	288.294

Testing Global Null Hypothesis: BETA=0

Test	Chi-Square	DF	Pr > ChiSq
Likelihood Ratio	111.1233	7	<.0001
Score	121.8449	7	<.0001
Wald	73.7093	7	<.0001

Analysis of Maximum Likelihood Estimates

Parameter	DF	Estimate	Standard Error	Chi-Square	Pr > ChiSq
Intercept	1	-2.4552	0.4119	35.5373	<.0001
AGE 30-34	1	0.6659	0.4471	2.2183	0.1364
AGE 35-39	1	1.2427	0.4791	6.7279	0.0095
AGE 40 & +	1	3.1662	0.6437	24.1947	<.0001
M.DURATION	1	0.3078	0.0610	25.4631	<.0001
CRUDE PAR.	1	-0.4587	0.1449	10.0141	0.0016
NET PAR.	1	-0.1197	0.1518	0.6215	0.4305
INF.MORTAL.	1	0.3783	0.4105	0.8496	0.3567

Odds Ratio Estimates

Effect	Point Estimate	95% Wald Confidence Limits	
AGE 30-34	1.946	0.810	4.675
AGE 35-39	3.465	1.355	8.861
AGE 40 & +	23.717	6.717	83.747
M.DURATION	1.360	1.207	1.533
CRUDE PAR.	0.632	0.476	0.840
NET PAR.	0.887	0.659	1.195
INF.MORTAL.	1.460	0.653	3.264

Association of Predicted Probabilities and Observed Responses

Percent Concordant	84.6	Somers' D	0.696
Percent Discordant	15.1	Gamma	0.698
Percent Tied	0.3	Tau-a	0.229
Pairs	25191	c	0.848

G1850 Pre-marital conception, marriage before childbirth

Response Profile		
Ordered Value	STOP	Total Frequency
1	1	92
2	0	335

Probability modeled is STOP=1.

Model Fit Statistics		
Criterion	Intercept Only	Intercept and Covariates
AIC	447.017	394.572
SC	451.074	427.026
-2 Log L	445.017	378.572

Testing Global Null Hypothesis: BETA=0			
Test	Chi-Square	DF	Pr > ChiSq
Likelihood Ratio	66.4455	7	<.0001
Score	75.2257	7	<.0001
Wald	58.4417	7	<.0001

Analysis of Maximum Likelihood Estimates					
Parameter	DF	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
Intercept	1	-1.8528	0.3386	29.9347	<.0001
AGE 30-34	1	0.2285	0.3842	0.3539	0.5519
AGE 35-39	1	1.0855	0.4190	6.7129	0.0096
AGE 40 & +	1	2.3228	0.5400	18.5026	<.0001
M.DURATION	1	0.1187	0.0586	4.1058	0.0427
CRUDE PAR.	1	-0.1838	0.1518	1.4668	0.2258
NET PAR.	1	-0.0711	0.1449	0.2409	0.6236
INF.MORTAL.	1	-0.4582	0.4049	1.2810	0.2577

Odds Ratio Estimates			
Effect	Point Estimate	95% Wald Confidence Limits	
AGE 30-34	1.257	0.592	2.668
AGE 35-39	2.961	1.303	6.730
AGE 40 & +	10.204	3.541	29.406
M.DURATION	1.126	1.004	1.263
CRUDE PAR.	0.832	0.618	1.120
NET PAR.	0.931	0.701	1.237
INF.MORTAL.	0.632	0.286	1.398

Association of Predicted Probabilities and Observed Responses

Percent Concordant	71.9	Somers' D	0.444
Percent Discordant	27.5	Gamma	0.447
Percent Tied	0.6	Tau-a	0.150
Pairs	30820	c	0.722

G1850 Couples with at least one pre-marital birth

Response Profile

Ordered Value	STOP	Total Frequency
1	1	88
2	0	440

Probability modeled is STOP=1.

Model Fit Statistics

Criterion	Intercept	Intercept and Covariates
	Only	
AIC	477.793	380.763
SC	482.062	423.454
-2 Log L	475.793	360.763

Testing Global Null Hypothesis: BETA=0

Test	Chi-Square	DF	Pr > ChiSq
Likelihood Ratio	115.0296	9	<.0001
Score	134.4302	9	<.0001
Wald	87.3505	9	<.0001

Analysis of Maximum Likelihood Estimates

Parameter	DF	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
Intercept	1	-2.8066	0.4781	34.4598	<.0001
AGE 30-34	1	0.3390	0.4623	0.5375	0.4635
AGE 35-39	1	1.1483	0.4940	5.4031	0.0201
AGE 40 & +	1	2.7921	0.5896	22.4251	<.0001
M.DURATION	1	0.2429	0.0586	17.1635	<.0001
CRUDE PAR.	1	-0.4116	0.1120	13.5030	0.0002
NET PAR.	1	-0.0578	0.0969	0.3554	0.5511
INF.MORTAL.	1	0.1522	0.3748	0.1649	0.6847
pre-m.preg.	1	0.0422	0.3372	0.0157	0.9004
#pre-births	1	0.5643	0.1812	9.6999	0.0018

Odds Ratio Estimates

Effect	Point Estimate	95% Wald Confidence Limits	
AGE 30-34	1.403	0.567	3.473
AGE 35-39	3.153	1.197	8.302
AGE 40 & +	16.315	5.137	51.814
M.DURATION	1.275	1.137	1.430
CRUDE PAR.	0.663	0.532	0.825
NET PAR.	0.944	0.781	1.141
INF.MORTAL.	1.164	0.559	2.428
pre-m.preg.	1.043	0.539	2.020
#pre-births	1.758	1.233	2.508

Association of Predicted Probabilities and Observed Responses

Percent Concordant	80.5	Somers' D	0.615
Percent Discordant	19.0	Gamma	0.618
Percent Tied	0.5	Tau-a	0.171
Pairs	38720	c	0.808

G1864 *No pre-marital births nor pregnancy*

Response Profile

Ordered Value	STOP	Total Frequency
1	1	101
2	0	201

Probability modeled is STOP=1.

Model Fit Statistics

Criterion	Intercept Only	Intercept and Covariates
AIC	386.915	374.830
SC	390.625	404.514
-2 Log L	384.915	358.830

Testing Global Null Hypothesis: BETA=0

Test	Chi-Square	DF	Pr > ChiSq
Likelihood Ratio	26.0848	7	0.0005
Score	26.3977	7	0.0004
Wald	23.3475	7	0.0015

The LOGISTIC Procedure

Analysis of Maximum Likelihood Estimates

Parameter	DF	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
Intercept	1	-0.9928	0.3138	10.0099	0.0016
AGE 30-34	1	0.5156	0.3235	2.5395	0.1110
AGE 35-39	1	0.8655	0.4361	3.9378	0.0472
AGE 40 & +	1	1.7536	0.5980	8.5997	0.0034
M.DURATION	1	0.1070	0.0530	4.0771	0.0435
CRUDE PAR.	1	-0.4386	0.1901	5.3219	0.0211
NET PAR.	1	0.2112	0.1965	1.1547	0.2826
INF.MORTAL.	1	-0.1242	0.4384	0.0802	0.7770

Odds Ratio Estimates

Effect	Point Estimate	95% Wald Confidence Limits	
AGE 30-34	1.675	0.888	3.157
AGE 35-39	2.376	1.011	5.586
AGE 40 & +	5.775	1.789	18.645
M.DURATION	1.113	1.003	1.235
CRUDE PAR.	0.645	0.444	0.936
NET PAR.	1.235	0.840	1.816
INF.MORTAL.	0.883	0.374	2.086

Association of Predicted Probabilities and Observed Responses

Percent Concordant	66.0	Somers' D	0.325
Percent Discordant	33.5	Gamma	0.327
Percent Tied	0.5	Tau-a	0.145
Pairs	20301	c	0.662

G1864 Pre-marital conception, marriage before childbirth

Response Profile

Ordered Value	STOP	Total Frequency
1	1	66
2	0	169

Probability modeled is STOP=1.

Model Fit Statistics

Criterion	Intercept Only	Intercept and Covariates
	AIC	281.065
SC	284.525	265.981
-2 Log L	279.065	222.304

Testing Global Null Hypothesis: BETA=0

Test	Chi-Square	DF	Pr > ChiSq
Likelihood Ratio	56.7611	7	<.0001
Score	56.5032	7	<.0001
Wald	32.7626	7	<.0001

Analysis of Maximum Likelihood Estimates

Parameter	DF	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
Intercept	1	-1.4180	0.4161	11.6135	0.0007
AGE 30-34	1	0.0177	0.4424	0.0016	0.9681
AGE 35-39	1	0.3970	0.5327	0.5555	0.4561
AGE 40 & +	1	3.3880	0.8682	15.2279	<.0001
M.DURATION	1	0.2057	0.0726	8.0362	0.0046
CRUDE PAR.	1	-0.7252	0.1871	15.0276	0.0001
NET PAR.	1	0.4454	0.2003	4.9453	0.0262
INF.MORTAL.	1	0.3154	0.4685	0.4533	0.5008

Odds Ratio Estimates

Effect	Point Estimate	95% Wald Confidence Limits	
AGE 30-34	1.018	0.428	2.423
AGE 35-39	1.487	0.524	4.225
AGE 40 & +	29.605	5.400	162.323
M.DURATION	1.228	1.066	1.416
CRUDE PAR.	0.484	0.336	0.699
NET PAR.	1.561	1.054	2.312
INF.MORTAL.	1.371	0.547	3.434

Association of Predicted Probabilities and Observed Responses

Percent Concordant	76.4	Somers' D	0.532
Percent Discordant	23.2	Gamma	0.534
Percent Tied	0.4	Tau-a	0.216
Pairs	11154	c	0.766

G1864 Couples with at least one pre-marital birth

Response Profile		
Ordered Value	STOP	Total Frequency
1	1	96
2	0	320

Probability modeled is STOP=1.

Model Convergence Status
Convergence criterion (GCONV=1E-8) satisfied.

Criterion	Model Fit Statistics	
	Intercept Only	Intercept and Covariates
AIC	451.450	389.009
SC	455.481	429.316
-2 Log L	449.450	369.009

Testing Global Null Hypothesis: BETA=0			
Test	Chi-Square	DF	Pr > ChiSq
Likelihood Ratio	80.4408	9	<.0001
Score	85.1424	9	<.0001
Wald	60.6607	9	<.0001

Analysis of Maximum Likelihood Estimates

Parameter	DF	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
Intercept	1	-2.1797	0.4820	20.4500	<.0001
AGE 30-34	1	0.2067	0.3790	0.2975	0.5855
AGE 35-39	1	0.6977	0.4680	2.2225	0.1360
AGE 40 & +	1	1.7095	0.5661	9.1193	0.0025
M.DURATION	1	0.2595	0.0737	12.4111	0.0004
CRUDE PAR.	1	-0.3700	0.1461	6.4113	0.0113
NET PAR.	1	-0.0546	0.1523	0.1284	0.7201
INF.MORTAL.	1	-0.6848	0.4395	2.4284	0.1192
pre-m.preg.	1	0.0196	0.2975	0.0043	0.9475
#pre-births	1	0.4811	0.2662	3.2668	0.0707

Odds Ratio Estimates

Effect	Point Estimate	95% Wald Confidence Limits	
AGE 30-34	1.230	0.585	2.585
AGE 35-39	2.009	0.803	5.027
AGE 40 & +	5.526	1.822	16.760
M.DURATION	1.296	1.122	1.498
CRUDE PAR.	0.691	0.519	0.920
NET PAR.	0.947	0.702	1.276
INF.MORTAL.	0.504	0.213	1.193
pre-m.preg.	1.020	0.569	1.827
#pre-births	1.618	0.960	2.726

Association of Predicted Probabilities and Observed Responses

Percent Concordant	76.0	Somers' D	0.524
Percent Discordant	23.6	Gamma	0.525
Percent Tied	0.4	Tau-a	0.186
Pairs	30720	c	0.762

6. Discussion

The results presented in this paper support the diffusion interpretation of the decline of illegitimacy in Europe that started in the latter quarter of the nineteenth century. At the same time, they confirm the value of the courtship model of pre-marital conceptions. The diffusion hypothesis holds that “the spread of the knowledge and skills to avoid unwanted births enabled both married and unmarried couples to reduce their fertility simultaneously” (Knodel & van de Walle, 1986: p.403). The courtship model says that illegitimacy declined as a result of improved marriage opportunities for courting couples. There is no contradictions between both views and the findings presented above are in line with both explanations.

To start with the key issue of this paper, it was found that in Leuven, married couples with at least one pre-marital birth were *not* applying parity-dependent stopping in order to control their fertility. We did find evidence of parity-aimed stopping for couples without pre-marital births. In the youngest generation, that is, who was finishing its reproductive career just before the First World War. This supports the diffusion view. However, this evidence could only be found among couples who, indeed, did not have any children before marriage, but who did *conceive* their first child before marriage. The latter qualification supports the courtship view of sex before marriage.

Before discussing how these results support both the diffusion hypothesis and the courtship view, let’s first try to answer the question why there is no evidence that people without any pre-marital conceptions were able to limit their family size. One explanation for this unexpected finding is that this is the most heterogeneous group, including people who did not have sex before marriage as well as people who did but who were effectively applying contraception or abortion, as well as couples with lower fecundity (see groups (a), (b), (c), and (f) in Figure 1, respectively). Group (a), characterised by pre-marital

chastity, may include a disproportional number of strong adherents to the prescriptions of the clergy. The Catholic church did not approve of sex before marriage while at the same time favouring pro-natal attitudes (Stengers, 1971; Phayer, 1977). Couples adhering to the teachings of the Church stand in sharp contrast to group (b), who apply contraception, and even more in contrast to group (c), who turn to abortion in order to avoid unwanted births. Yet, all these groups are lumped together into the same category in the above analysis because our historical data do not allow us to distinguish between them.

Couples with a pre-marital conception but without a pre-marital birth, clearly did have coitus before marriage without applying effective contraception or abortion. The finding that this group in particular, once married, was the one that was evidently applying parity-aimed fertility control, indicates that pre-marital pregnancies were probably not unwanted. Apparently, pre-marital pregnancy was not the result of deviant behaviour but rather an expected result of normal courtship in the popular culture of Leuven. This confirms earlier findings (Van Bavel, 2001). Contraception and abortion was only applied in order to avoid *unwanted* births. First children, born within marriage but conceived before marriage, were clearly not counted among these.

The birth of children out of wedlock probably *was* an unwanted event for many. Pre-marital births may often have been the result of pre-marital sex without effective contraception or abortion in the absence of realistic marriage opportunities. Therefore, assuming that unwed motherhood was not a desirable status, illegitimacy was probably a sign of poor practical knowledge of contraception. The lack of parity-aimed control in this group, in contrast to the group without a pre-marital birth, corroborates the diffusion hypothesis.

This confirmation that the diffusion of contraception played an important role in the fertility transition is no falsification whatsoever of the thesis that fertility declined as an adaptation to changing societal conditions.

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