

# Marital Fertility and Wealth in Transition Era France, 1750-1850

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## **Abstract**

Previous economic explanations for the European fertility transition have treated the early decline of French fertility as 'noise', the extreme tail end of a normal distribution. However, these theories have failed to be supported by the empirical record. Taking France as central, I re-examine the economic correlates of fertility decline at the individual level for four rural villages in France from 1750-1850. The results indicate that the richest groups (as measured by wealth at death) reduced their family size first. The economic rationale for this was the preservation of the family's relative socioeconomic status. Measures of economic inequality, proxying for the social mobility environment are strongly associated with fertility outcomes.

## **Introduction**

Economic explanations for the European fertility transition, such as demographic transition theory (Notestein 1945), micro economic theory (Becker 1960, 1991) and more recently unified growth theory (Galor 2004) have treated the early French fertility decline as 'noise', the extreme tail end of a normal distribution. This is the intellectual equivalent of treating Britain as the exception in explaining the Industrial Revolution<sup>1</sup>. At the time fertility fell (apx. 1800), France was by far the largest country in Europe, excluding Russia, with a population of almost 30 million people representing 27.7% of the total population of Western Europe (calculated from Maddison 2004). Considering this fact, and also the collective failure of researchers from varied disciplines in explaining Europe's demographic transition, I re-examine the economic correlates of fertility decline at the individual level for four rural villages in France from 1750-1850, covering the period when fertility fell in aggregate.

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<sup>1</sup> Comparison borrowed from Van de Walle 1974 p.5.

Over the past two centuries, fertility in most of the World has undergone a sustained and seemingly irreversible transition. Today, a low fertility regime is the norm in the developed world, with some regions (particularly in Europe) experiencing sub-replacement fertility. This demographic transition enabled the productivity advances of the Industrial Revolution to be transformed into higher living standards and sustained economic growth. Understanding the revolution in fertility behaviour between the Malthusian and the modern eras has therefore been a central research question. Despite this interest, researchers of the transition have not approached a consensus for the causal mechanisms behind the decline of fertility.

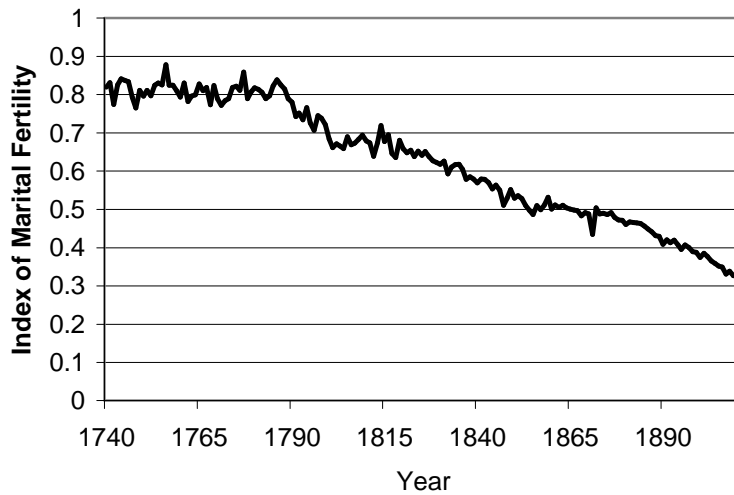
*“Theoretical writing has tended toward polarisation between those who attribute fertility decline largely to economic factors and those whom attribute it largely to cultural factors” (Burch 1995 p.1).*

The European fertility project (EFP) led by Ainsley Coale at Princeton University during the 1970s and ‘80s set out to provide an empirical base for demographic transition

theory. However, the EFP concluded that the decline of marital fertility during the late 19<sup>th</sup> century was almost completely unrelated to socioeconomic changes (Coale and Watkins 1986). Time (the decade of the 1890s), as opposed to any socio-economic measure, was the best indicator for the onset of sustained fertility decline. Therefore, the transition was an 'ideational change' and not an economic adaptation. Recent criticisms have somewhat diluted the authority of the Princeton view. Guinnane and Brown (2007) argue that the EFP's conclusions were biased by the level of aggregation. The sub-national districts used (departments, counties, cantons etc.) were too large and internally heterogeneous to be useful as distinct fertility regimes. Further, the socioeconomic data collected was not the most relevant to parent's fertility decisions.

The implications for further research are clear: To go beyond the EFP two issues must be addressed. Firstly, the level of aggregation, and secondly, the relevance of the socioeconomic data. The study presented here directly addresses these two concerns via an individual level analysis of fertility behavior with real wealth information.

**Figure 1: The index of Marital Fertility, 1740-1911, France**



Source: Weir 1994 Table B3. Annual estimates of Princeton indices for France, 1740-1911 p.330-1

A central feature of the European demographic transition is the exceptional early fertility decline of France. The reasons for this spectacular break from the historical pattern and divergence from European trends have never been fully explained. Figure 1 tracks the trend of the index of marital fertility – fertility relative to an observed maximum (that of an early twentieth century religious group, the Hutterites, who married early and prohibited contraception). From the late 18<sup>th</sup> century on, fertility appears to begin a steady and consistent decline from very

high levels (80-90% of the Hutterites) to very low levels (almost 30% of the Hutterites). Econometric testing for structural breaks in this series places the transition at 1776. This is nearly a century before anywhere else in Europe (Belgium (1874)), and 101 years before England and Wales (1877) (see Cummins forthcoming for details).

There have been relatively few previous studies of the relationship between economic status and family size at the individual level for France at this period. Weir, using the Henry demographic data, examined the Income-fertility relationship in Rosny-Sous-Bois, using tax records for 1747. In a cross-sectional analysis, he found no difference in marital fertility behavior between the income groupings. Fertility was high and varied little between his three income stratifications, although the evidence does suggest a reproductive advantage for his highest group relative to his lowest (7.3 to 6.2 births per family respectively) (Weir 1995 p.15). Weir's sample size was very small however – he only had a total sample of 47 families to analyse. Hadeishi, with a larger sample size and also using tax records, studied the town of Nuits in Burgundy from 1744-1792, and found a positive relationship between marital fertility and income

(2003 p.489). My analysis adds to this literature by linking pre-existing historical demographic data to new wealth data collected from various *Archives Departmentales* in France. The geographic and socioeconomic scope, along with the sample size, is far greater than previous studies. This will allow the identification of differential fertility patterns between socioeconomic strata with greater power. Further, there has been no previous study (to the author's knowledge) which has examined the wealth-fertility relationship during the period of the demographic transition in France (post 1790s).

The analysis is comprised of 3 sections. Section 1 details the data and it's summary characteristics. Section 2 is a detailed examination of the wealth-fertility associations. Section 3 analyses the mechanics behind the fertility patterns, while section 4 evaluates explanations for the French fertility transition. Section 5 Concludes.

## **The Method**

The demographic data<sup>2</sup> to be analysed is taken from Louis Henry's national random sample of 41 villages, roughly covering a span of over two centuries, from the late 17<sup>th</sup> to early 19<sup>th</sup> centuries (Weir 1995 p.2). This data<sup>3</sup> is the result of the application of the techniques of family reconstitution to parish registers. Considered a "truly revolutionary" study, it enabled historians and demographers to work together, with variables much more refined than crude series (Saito 1996 p.537). The result is a goldmine of individual level information on the demographic characteristics of historical France. Tens of thousands of observations record births, deaths and marriages. However, only 20% of the sample recorded the husbands occupation. As van de Walle has stated "unfortunately, the population of the parishes usually is not clearly stratified and most attempts in finding lags in the dates of fertility decline by socioeconomic groups have failed" (1978 p.264). To understand the relationship between

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<sup>2</sup> I thank George Alter for providing his version of the Henry dataset.

<sup>3</sup> The summary papers for the INED French family reconstitution are:  
Houdaille, J. 'Fécondité des mariages dans le quart nord-est de la France de 1670 a 1829' . *Annales de Demographie Historique*, (1976)  
Henry, L. Houdaille, J. 'Fécondité ...le quart nord-ouest' *Population (French Edition)*,(1973),  
Henry, L. 'Fécondité ...le quart sud-ouest de la France'. *Annales de Demographie Historique* (1972) and  
Henry, L. 'Fecondite ...le quart sud-est de la France', *Population (French Edition)*, (1978).

wealth and fertility in France at this period, the Henry dataset must be augmented with more detailed data.

The source for wealth data are the *Tables des Successions et Absences*<sup>4</sup> (TSA), which are stored in the various *Archives Departementales* in France. The TSAs were originally constructed for tax purposes and recorded all deaths in a locality, along with detailed information on date of death, residence, profession, age at death and marital status. Uniquely, the value of an individual's estate at death was noted, with a distinction between cash and property holdings (Bourdieu et al. 2004 p.4). Crucially, the TSAs recorded everybody, including those with zero assets at death (typically coded as "rien"). Almost ¼ of the individuals in the sample I use fall into this category.

Due to the fact that the property valuation recorded in the TSAs only covered property held in the locality, it is possible that the values calculated here are underestimates of the true property wealth of individuals. However, this bias only affects a small minority of the sample. According to Bordieu et al, 85% of individuals in the "TRA" sample

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<sup>4</sup> In English "Tables of Bequests and Absent Persons" (Bourdieu et al. 2004 p.4).

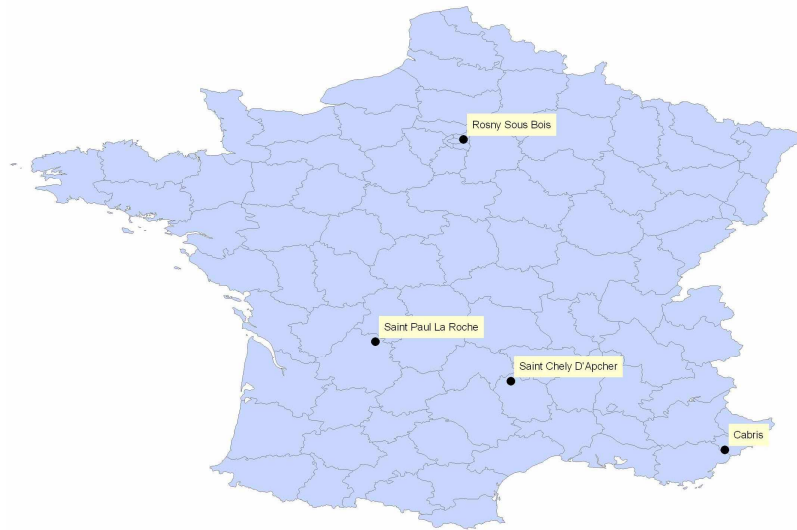
(also based on the TSAs) had 1 property record, leaving 15% with 2 or more (2004 p.7). Attempts to assess the accuracy of the wealth information in the TSAs are limited by the fact that “very few alternative sources exist” (Bourdieu et al. 2004 p.6). However, Bourdieu et al. test the validity of the Tables against other published data and find the TSA to yield consistent results (2004 p.7).

The Henry demographic data set<sup>5</sup> was linked to records from the *Tables des Successions et Absences*. The links were based upon name, profession, sex, age at death and date of death. These criteria serve to place close to 100% certainty in the accuracy of the links. Ultimately, four villages were selected on the basis that they were the best represented after linking. These villages had the properties of holding a significant number of individuals dying after 1810 (when the TSAs start to record estimates of wealth), and also having the TSAs preserved in the relevant *Archive Departmental*.

## **Figure 2: Villages in Sample**

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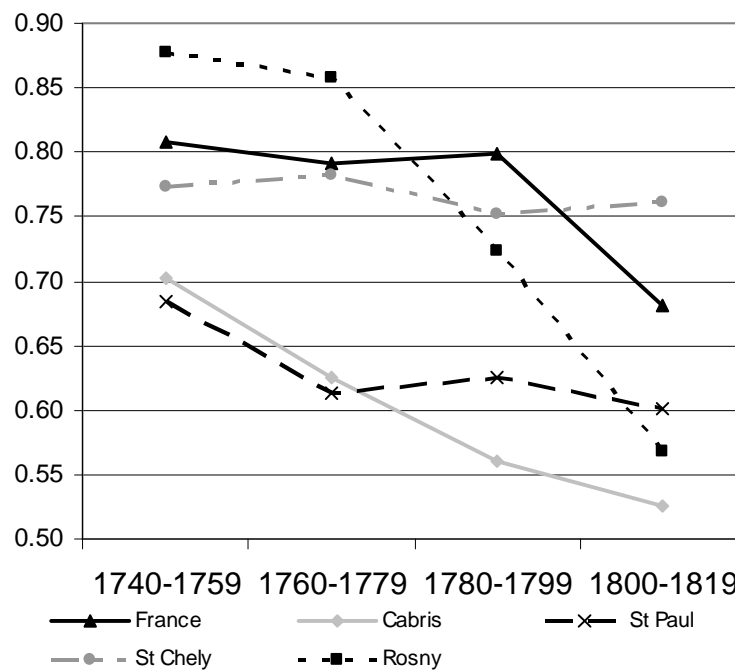
<sup>5</sup> A revised version of which was kindly supplied to me by George Alter.



The sample covers the fertility experience of individuals who died roughly between 1810 and 1870, were born between the 1720s and the 1820s. The relevant 'fertile period' covered is therefore 1750-1850, roughly speaking. At this time approximately 80% of the French population lived in rural villages of a similar size to those in the sample (Coale and Watkins 1986 p.235). Fertility decline in France cannot be understood without understanding what was happening in these rural villages. However, the sample villages are only 4 out of perhaps 40,000 villages in France as a whole. The occupational distribution of these sample villages closely matched that of the complete Henry Sample

(41 villages). The deviations in representativeness are detailed in the appendix. In order to judge how representative the demographic regimes in these villages are, their fertility pattern relative to the National trend is plotted in figure 3.

**Figure 3: the Index of Marital Fertility ( $I_g$ ) by Sample Village, Contrasted with the National trend**



The National trend in  $I_g$  (Weir 1994 p.330) shows a sharp decline from high levels in the 1780-99 period.

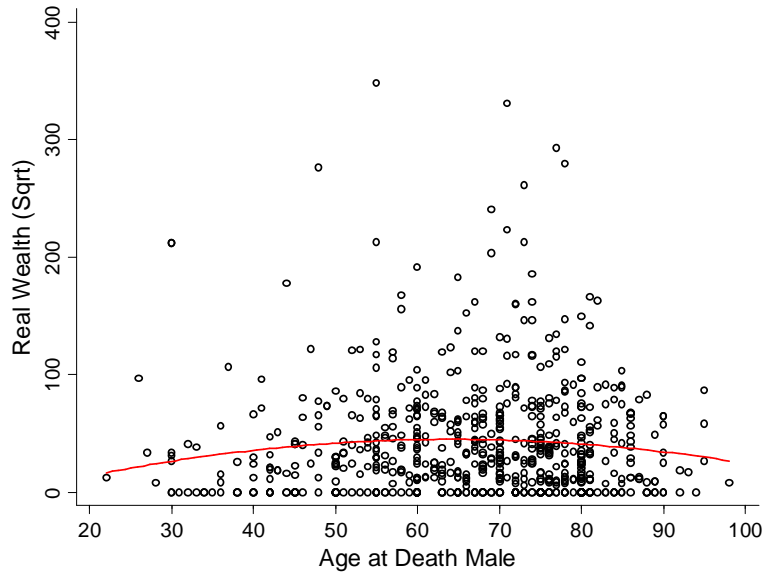
Interestingly, the sample villages display a high level of heterogeneity with respect to the trend in marital fertility. Rosny has exceptionally high marital fertility which then proceeds to decline dramatically from 1760-79 period to the post 1780s. Both Cabris and St Paul have relatively low levels of marital fertility (to the other villages and the National trend), with a trend towards decline evident in Cabris from the 1740-1759 period. The initial trend towards decline in St Paul stalls after 1760, and along with St Chely, whose fertility remains high throughout, no trend towards sustained decline is evident. The sample villages capture the high level of heterogeneity within France with respect to fertility patterns. Two of the villages – Rosny and Cabris – show clear evidence for decline, while the other two – St Paul and St Chely – do not share the same pattern. Examining the trend from the 1760-79 period to 1800-1819, we see that fertility in Rosny falls by nearly 40% and in Cabris by almost 20%. In St Chely and St Paul, fertility remains relatively constant. Therefore it is possible to identify 2 demographic regimes amongst the sample villages, a high fertility environment and a declining fertility environment. For the analysis, the data from each village

will be pooled and the varying wealth effects will be tested for by demographic regime.

### **Life Course Effects**

In aggregate, people tend to accumulate wealth over the life cycle, before dissaving and inter vivos bequests to offspring act to reduce the wealth held. This will have the effect of biasing the estimates from the TSA downward, with respect to true wealth, for those who died after this point. The data I use supports this notion, as the following graph illustrates (672 male observations).

### **Figure 4: Life Course Effects**



An OLS regression was run with the Square root of real wealth as the dependent variable, with age and age squared as the independent variables.

**Table 5: OLS regressions on the Square root of Real Wealth**

<b>Variable</b>	<b>Coeff.</b>	<b>SE</b>	<b>P</b>
Age at Death	2.04	0.96	0.03
Age at Death Squared	-0.016	0.007	0.03
Constant	-20.8	29.5	.48
Adjusted	0.004		

R-Squared	
Observations	672

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The reported coefficients on age at death, which are both significant at the 5% level, indicate a turning point age of 63.75<sup>6</sup>, beyond which the relationship between wealth and age at death turns negative. There is a possibility that the life course pattern of wealth accumulation and subsequent decline may blur the true level of wealth of an individual in the sample. However, I consider this probability quite small as the slope of the line is so flat. There are no significant negative associations revealed by the analysis of the aggregate data between the level of real wealth and age at death. In total over 60% of the sample died above 64, and taking their value of wealth at death carries a risk of undervaluation due to the life course effects. The OLS regression on the square root of real wealth allows us to calculate an average bias (assuming the true level of wealth is reached at age 64) based on the average life course relationship between wealth and age<sup>7</sup>.

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<sup>6</sup> Equivalent to the point on the quadratic fit of the wealth and age observations where the slope is equal to zero. Calculated via differentiating the regression equation of the quadratic fit, setting equal to zero, and solving for age at death.

<sup>7</sup> These numbers are calculated using the deviation of the regression line from a flat line from age 64 onwards.

**Table 6: Estimated Biases from Life Course Effects**

<b>Estimated Possible Downward Bias</b>	<b>Affected Age Groups</b>	<b>Obs</b>	<b>% of Sample affected</b>
5%+	64-98	421	61.61%
10%+	86-98	42	4.32%
20%+	95-98	4	0.15%

While the majority of the sample is at risk from underestimation of true wealth due to life course effects, any serious bias (>10%) is likely to only affect less than 5% of the sample. Ultimately the analysis presented here will split the wealth distribution in 3. The possibility of bias from underestimation must be considered minimal as a result of such a wide division of the sample.

There is a statistically insignificant effect of year of death on Real Wealth, with a linear fit completely flat for the sample period (figure 5). For analysis, the sample will be split into 3 Wealth groups. As there was no time trend in the evolution of real wealth during this period, the division of wealth is calculated over the entire sample, disregarding

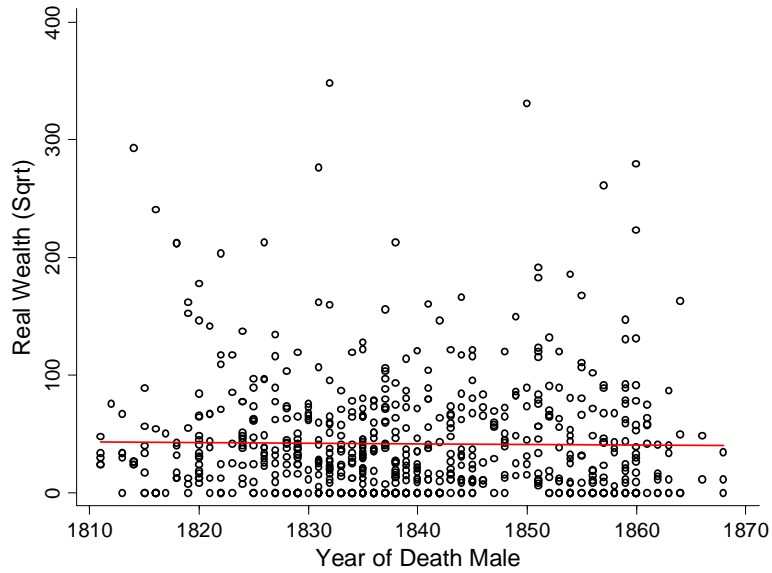
sub-period. The choice of 3 wealth cuts follows Weir (1995) and Gutmann and Watkins (1990), and makes sense when we consider that these villages were primarily agricultural and the socio-economic stratification, as perceived by the population themselves, was probably relatively simple. The division split the sample into even thirds, with those dying with the sum of 0-141 Francs been designated to group 1, those with wealth at death between 141 and 2100 Francs designated into group 2, and those with a wealth at death over 2100 been designated to group 3<sup>8</sup>. The nominal levels of wealth reported in the *Tables* were converted to real levels using a cost of living index from Lévy-Leboyer & Bourguignon (1985)<sup>9</sup>.

**Figure 5: Real Wealth by Year of Death (Males)**

<sup>8</sup> The observations (families) are distributed as follows:

Wealth Group	1	2	3	Total
<i>Non Decline Villages</i>				
Cabris	52	74	77	203
St Paul	101	26	35	162
Total	153	100	112	365
<i>Decline Villages</i>				
St Chely	47	65	52	164
Rosny	30	30	51	111
Total	77	95	103	275

<sup>9</sup> Which was kindly supplied to me by Pierre-Cyrille Hautcoeur



### Raw Wealth Correlations

Table X reports the average number of children born and the number of children surviving to 10 (termed ‘net’ family size’ in this analysis).

**Table X, Average Children born and surviving per Wealth Group**

	Children Ever Born	Net Family Size
<i>Non-Decline Villages</i>		
Wealth Group 1	4.87	3.42

Wealth Group 2	5.90	3.87
Wealth Group 3	5.93	4.10
<i>Decline Villages</i>		
Wealth Group 1	5.50	4.44
Wealth Group 2	4.88	3.87
Wealth Group 3	3.88	3.21

These values represent the actual gross and net reproductive success between the wealth groups. The different demographic regimes have very different wealth-fertility relationships. Where fertility is high and unchanging, the wealth-fertility relationship is positive. The richest group here has a family size over 21% larger than the poorest (over 19% if we measure this in ‘net’ terms). Where fertility is declining, the wealth fertility relationship is the reverse. The differential between the richest and the poorest group’s family size is now *minus* 30%! (27% in ‘net’ terms). The varying family sizes of the sample follow a clear and direct wealth-pattern, once we control for the type of fertility regime revealed by the aggregate trends.

The raw averages discussed above say nothing on the mechanics of the fertility differentials between the groups.

How was the lower cross sectional fertility of the rich achieved in those villages where fertility was declining? Further why was fertility so low amongst the poorest groups in the villages where fertility was not declining? Malthusian logic would immediately propose the female age at marriage, the classic European 'preventative' check as the driver behind these patterns. Also, differential female mortality between the age groups could be generating a lot of the variation. Does the perceived wealth effect act through these channels? The following section details regressions designed to detect the wealth effects controlling for these demographic variables and also event dummies such as the French Revolution.

### **Deconstructing the Wealth Effects**

The equations below detail the components of net family size. Any wealth effects on net family size have to operate through differentials in these values.

$$NetF = CEB - CED$$

$$NetF = MFR * MD - CED$$

$$MD = EU - FAgeM$$

$$EU = \min(MAgeD, FAgeD, FAgeM, 45)$$

Where *NetF* is net family size, *CEB* and *CED* are children ever born and died respectively, *MFR* is the marital fertility rate, *MD* is the duration of the marriage, *EU* is the end of the union (marriage), *MAgeD* is the husbands age at death, *FAgeM* and *FAgeD* are female age at marriage and death respectively.

Further, it can be expected that other forces, operating at the village level, and also at the national level (for instance the influence of the Revolution, and the effects of the Napoleonic wars). To examine the specific wealth effects in the sample, a regression framework was established containing demographic and also variables representing the Revolution and the Wars. One problem to overcome was the potential endogeneity of including an individual's infant mortality amongst the independent variables with their fertility experience as the dependent variable. This was

replaced by a measure for aggregate infant mortality, calculated by village, period of marriage (before and after 1800) and wealth group.

The models take the following functional form:

*CEB*

$f.(C, YOM, D, FageM_i, FageD_i, MageD_i, REV, NWARs, IM, Wealth)$

*NetF*

$f.(C, YOM, D, FageM_i, FageD_i, MageD_i, REV, NWARs, IM, Wealth)$

Where *C* represents a constant, *D* is a fertility regime fixed effect, *IM* is the infant mortality rate by sub-period, village and wealth group, and *REV* and *NWARs* are categorical variables representing the revolution and Napoleonic wars respectively. The last mentioned 'event' variables were coded relative to year of marriage, with those with a year of marriage in 1789 or later receiving a revolution effect, and those married between 1802 and 1814 receiving a war effect. The *Wealth* variable is included in the regression as a categorical variable In order to account for expected non-linearities in the wealth fertility relationship.

As the dependant variable is a count variable (either gross or net fertility), and because the data is 'overdispersed' relative to the Poisson distribution, the appropriate method is to use negative binomial regression. The distribution of both gross and net fertility matched the negative binomial distribution closely, and a comparison with the Poisson distribution is detailed in the appendix.

**Table 11 Negative Binomial Regressions**

<i>Model</i>	Children Ever Born	Net Family Size
<i>Demographic variables</i>		
Age at Marriage, Female	-0.064*** (0.006)	-0.063*** (0.006)
Age at Death, Female	0.037*** (0.005)	0.043*** (0.005)
Infant Mortality	0.001* (0.001)	0.000 (0.001)
<i>Event variables</i>		
Revolution	-0.156** (0.059)	-0.124* (0.063)
Napoleonic Wars	0.025 (0.063)	0.002 (0.068)
<i>Wealth Effects</i>		
Wealth Group1 (ref.)	0	0
Wealth Group2	0.146 (0.088)	0.125 (0.099)
Wealth Group3	0.012 (0.093)	0.082 (0.104)
<i>Wealth-Fertility Regime Interactions</i>		
Main Decline Effect	0.114 (0.094)	0.198 (0.100)
Wealth Group1 (ref.)	0	0
Wealth Group2	-0.261* (0.122)	-0.270* (0.133)
Wealth Group3	-0.264* (0.129)	-0.349* (0.140)
Constant	1.286*** (0.252)	0.800** (0.288)
N	449	449
Pseudo R2	0.095	0.092

\*\*\* Significant at .001% level

\*\* Significant at .01% level

\*Significant at.05% level

**Table 12, Net Wealth Effects on Children ever born and Net family size**

	Children Ever Born	Net Family Size
<i>Non-Divide Villages</i>		
Wealth Group 1	4.58	3.89
Wealth Group 2	5.30	4.41
Wealth Group 3	4.64	4.23
<i>Divide Villages</i>		
Wealth Group 1	5.13	4.75
Wealth Group 2	4.58	4.11
Wealth Group 3	3.99	3.63

The 'pure' wealth effects on fertility in table 12 are calculated from the interaction coefficients in the negative binomial regressions. A constant age at marriage for females (25) and complete life course fertility (surviving to at least 50) is applied for each wealth group. Once the net effect is calculated for each wealth group, the coefficient is

exponentiated to give the expected numbers for each wealth group. These numbers can be understood as representing the net wealth effects controlling for the factors listed in the regression, and ignoring the effects of the Revolution and Napoleonic Wars. In relation to the richest and poorest groups, the strong positive wealth fertility relationship almost completely disappears within the *non-decline* villages. A small differential exists when net family size is considered, but it is half the magnitude of the raw average differentials. Those in the middle in the non-decline villages – Wealth group 2, appear to have the highest marital fertility. Where fertility decline has already begun, the net wealth fertility relationship is still sharply negative, with the richest groups having over 20% fewer births.

Another feature the regression results highlight is the high relative fertility of Wealth Group 2 in the *non-decline* villages. One postulation on this feature could be that a proportion of the richest groups in the *non-decline* villages are beginning to control their fertility, but this proportion is too small to move the size of the wealth effect below that of the poorest group. The quality of the Henry dataset allows us to examine in fine detail the mechanics of the wealth

fertility differentials, and this is described in the next section.

### **The Mechanics behind the Fertility Patterns**

The results from the regressions demonstrate systematically that economic status mattered during the period of fertility decline in France. What were the mechanics behind these patterns? The regressions indicate that both the gross and net family size correlations with wealth were independent of marriage age and age at death. The significant negative association, particularly for Rosny and Cabris (the 'decline regime' villages) for marriages after 1800, must therefore represent an implementation of fertility limitation strategies. There are 2 ways for couples to control their desired family size. Firstly, they can stop bearing children once they reach a certain target family size – this is known as 'stopping' behaviour. Secondly, they can increase their birth intervals – 'spacing' behaviour. The European demographic transition has overwhelmingly been attributed to 'stopping behaviour'. However, the aggregation of those pursuing different reproductive strategies may blur the true picture. As van Bavel has stated; "research explicitly

analyzing stopping and spacing has hardly ever differentiated between social status groups" (2002 p.7). The French fertility patterns discussed here are delineated by economic categories, and this section evaluates to what extent stopping and spacing can be attributed.

### **'Stopping' Behaviour**

The Henry demographic dataset allows the calculation of fertility measures such as Age Specific Fertility Rates, Coale's index of marital fertility, the Total marital Fertility Rate and the Coale and Trussell fertility control measures "M" and "m" (referred to as big and little m respectively). The Coale-Trussell parameters are calculated from the age specific fertility rates and represent deviations from the age pattern of 'natural fertility'. An M value of 1, and a 'm' value of 0 indicate no fertility control. Typically, researchers look for an 'm' value greater than .200 for an unambiguous sign of a controlling population. M, is harder to interpret, but may catch 'spacing' effects. The appendix details the statistical derivation of the Coale-Trussell parameters. However, these measures have been criticised in the literature and are far from fool proof. Table XIII summarises

the calculated Age specific marital fertility rates, Total Marital Fertility Rates and the Coale and Trussell fertility control parameters.

The reproductive advantage of the richest group in the *non-decline* villages is emphasised by the high value for  $M = 0.927$ . This means that the richest group here has a fertility level very close to that of the natural fertility schedule. For the *non-decline* villages,  $M$  has decreased and the scale of the decrease is, again, closely related to economic status. The richest have the lowest level of fertility and the poorest wealth group have the highest. Focusing on 'm' – the parameter indicating significant deviation from a natural age pattern of marital fertility, the results indicate no unambiguous signs for stopping behaviour in any of the regimes. However, this value is the largest for the richest group in the *decline* villages (0.146). Despite failing to be significant and above the 0.200 threshold, the value is indicative of a small proportion of 'stoppers'.

Another way to detect 'stopping' behaviour is to look at the average age women have their last birth. These values are reported for the regime and wealth group combinations

in table XC. The values are calculated only for those women and their husbands who died after 50. The mean age at last birth in populations practising 'natural fertility' is approximately 40-41 years (Bongaarts (1983) as cited by Kohler et al. 2002 p.28). Amongst the villages where fertility was not declining, there is no significant variation to report. Age at last birth is high, around 37-38 years for all wealth groups. For the villages where fertility was declining, the top 2 wealth groups do show evidence for 'stopping' behaviour; the mean age at marriage is significantly below that of the other groups in the sample.

**Table X, Demographic Measures by Fertility Regime**

<b>Non-Decline Villages</b>			
	<b>Wealth Group 1</b>	<b>Wealth Group 2</b>	<b>Wealth Group 3</b>
<i>Age Specific Marital Fertility Rates</i>			
20-25	0.364	0.313	0.373
25-30	0.357	0.360	0.432
30-35	0.302	0.389	0.349
35-40	0.268	0.321	0.303
40-45	0.155	0.176	0.158
45-50	0.008	0.027	0.000
Total Marital Fertility	7.75	8.43	8.70
<i>Coale Trussell Measures</i>			
M	0.802*	0.795**	0.927
S.E.	0.105	0.087	0.092
"m"	0.029	-0.141	0.064
S.E.	0.119	0.095	0.113
<b>Decline Villages</b>			
<i>Age Specific Marital Fertility Rates</i>			
20-25	0.302	0.250	0.216
25-30	0.343	0.313	0.261
30-35	0.313	0.273	0.228
35-40	0.242	0.209	0.164
40-45	0.133	0.100	0.084
45-50	0.009	0.007	0.009
Total Marital Fertility	7.58	6.82	5.86
<i>Coale Trussell Measures</i>			
M	0.768**	0.682***	0.587***
S.E.	0.096	0.085	0.087
"m"	0.058	0.104	0.146
S.E.	0.107	0.099	0.100

**Table XC, Age at last birth by fertility regime**

	Wealth Group 1	Wealth Group 2	Wealth Group 3
<i>Non-Divide Villages</i>	37.81	38.62	36.92
<i>Divide Villages</i>	37.80	35.90	35.37

### **'Spacing' behaviour**

Having established some partial evidence for the presence of parity-specific fertility control amongst the wealthiest groups in the sample villages, the question of 'spacing' arises. It is far easier to detect 'stopping' behaviour in population sub-groups than it is to detect 'spacing' behaviour. One way to detect spacing is to model the birth intervals directly using a Cox proportional hazards model. The results will describe the effects of the covariate independent variables in terms of a 'hazard rate', which is defined as the instantaneous probability of the event in question (in this case a birth), and is therefore directly related to the length of the birth interval. As the model is

intended to reveal differences in spacing behavior, only closed birth intervals are used. The formulation of the birth interval model follows previous analyses by Alter (1988), Bengtsson and Dribe (2006) and Van Bavel (2004a, 2004b) and Van Bavel and Kok (2004). After consideration of the varying inclusion of demographic factors in these studies, it was decided to concentrate on those factors most commonly found to affect the birth interval. This was done with the aim of producing a parsimonious model which could capture the wealth effects (if any) on the duration of the birth interval. The demographic factors included were the age of the mother (in 5 year age bands), the duration of the marriage and the life status of the previous born child. Where a mother had a child under 2 years at the time of conception of her next child this was coded for. In common with the analysis by Bengtsson and Dribe, I include shared frailty at the individual level to control for unobserved family-specific heterogeneity in the sample (2006 p.736).

As mentioned, the results reported in table X are presented as *hazard ratios*. Where the reported coefficient equals 1, there is no effect of that variable on the hazard of a birth.

**Table X, Cox regression on closed birth intervals**

	$e^{coeff.}$	$se^{coeff.}$	$p$
<i>Women's Age</i>			
15-19	0.664	0.169	0.107
20-24	0.946	0.075	0.480
25-29 (ref.)	1	-	-
30-34	0.941	0.066	0.388
35-39	0.772	0.078	0.010
40-44	0.313	0.047	0.000
45-49	0.044	0.021	0.000
Marital Duration	0.935	0.008	0.000
Infant Alive	0.167	0.015	0.000
Decline Effect	0.886	0.126	0.886
<i>Main Wealth Effects</i>			
Wealth Group 1 (ref.)	1	-	-
Wealth Group 2	1.262	0.175	0.092
Wealth Group 3	1.376	0.204	0.032
<i>Wealth-Fertility Decline</i>			
<i>Interactions</i>			
Wealth Group 1 (ref.)	1	-	-
Wealth Group 2	0.703	0.133	0.062
Wealth Group 3	0.479	0.093	0.000
Frailty variance	0.419	.049	
N – Number of birth Intervals		2186	
Likelihood Ratio $\chi^2$	215.41		0.000

**Table XII, Net Hazard Ratios by regime and Wealth**

**Group**

	Wealth	Wealth	Wealth
	Group 1	Group 2	Group 3
<i>Non-Divide Villages</i>			
	1.000	1.262	1.376
<i>Divide Villages</i>			
	0.886	0.787	0.584

The Cox regressions on the hazard of a birth place attach high significance to marital duration and the presence of an infant. Further, the natural fall off in fecundity is reflected by the falling hazard ratios for age groups past the 25-29 reference category. The wealth effects are reported as interactions in the regression table. In order to calculate the net wealth effects, these values are multiplied, producing the values reported in table XII. The wealth effects are large. For the *non-divide* villages, the hazard ratio for a birth increases with the wealth category, indicating that the top 2 wealth groups have significantly shorter birth intervals than the poorest group. For the *divide* villages, the opposite is true. The richest here have much longer birth intervals than

the poorest group. The results strongly indicate that spacing played a substantial role in the declining fertility of the richer groups in the sample. In comparison with the Coale-Trussell measures and the age at last birth calculations, it appears that it was spacing, not stopping which was the primary driver behind the French fertility decline.

### **Why did fertility decline in France?**

Any socioeconomic explanation for early French fertility decline must consider that England, with a higher level of GDP per capita, a smaller agrarian sector and a larger urbanization rate lagged behind French fertility trends by over 100 years. This fact undermines demographic transition theory, the Microeconomic theory of fertility and unified growth theory<sup>10</sup>. All of these theories rely on measures of income, modernization and structural changes in the economy in initiating a substitution of child quantity for quality. None of them can explain why France was first.

The French themselves have long been preoccupied with the unusual characteristics of their demographic

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<sup>10</sup> At least in explaining the fertility transition.

history. An intellectual climate obsessed with depopulation and the decline in French fertility arose around the turn of the 20 century. Van de Walle briefly discusses this mostly forgotten literature, criticizing its “outdated and weak statistical content”, and states that the work amounted to a no more than a series of hypotheses (1974 p.6). Some of these hypotheses have survived to today, and I focus upon those forwarded by Tony Wrigley and David Weir.

### **Neo-Malthusian Explanation**

Wrigley sees the early adoption of family limitation in France as “a variant form of the classic prudential system of maintaining an equilibrium between population and resources to which Malthus drew attention”. Essentially, the preventative check now operated through marital fertility directly, and not indirectly through age at marriage. The net reproduction rate in France from the late 18<sup>th</sup> to late nineteenth century was always close to 1, suggesting that the population was still finely constrained by available resources (Wrigley p.55 1985). As previously mentioned, almost 80% of the French population were rural, and nearly 70% lived off farming at the time of the decline (Chesnais

1992 p.335). Chesnais also points out that “farming remained primitive” and that there were numerous indicators of overpopulation (such as increase in wheat prices from the 1760s-1820s) (1991 p.336). These features certainly lend themselves to a Malthusian interpretation of the fertility pattern.

The testable implication of this hypothesis, as stated by Weir, is that there should be a strong positive relationship between real income and fertility (1984 p.31). However, this ‘neo-Malthusian’ reasoning for the early decline for French fertility fails to be supported by the individual level data collected in this analysis. If the restriction on births was a response to an economic constraint, we would expect those closest to subsistence to initiate fertility control. This is clearly not the case for the four villages in the sample. Where fertility is declining, the wealth-fertility relationship is negative. Fertility decline here is more pronounced for the richer groups; they are the first to employ this new variant of the preventative check, but this is not a ‘neo-Malthusian’ response.

## **The Revolution**

Many scholars (Weir 1984a, and more recently Murphy 2009?) have explicitly linked the Revolution to the fertility decline. At a superficial (and highly aggregated) level, the events are near simultaneous (see figure 1). However, econometric tests on the aggregate fertility rate place the decline in fertility before the Revolution (1776, see Cummins 2009). Further, it is widely accepted that many localities began their fertility transition long before 1789 (Chesnais 1991 p.338). In the data collected for this analysis, Rosny and Cabris have substantially declining fertility rates before the Revolution (see figure 3). However, the ideological and socioeconomic causes of the revolution were germinating long before 1789. Could these forces have also contributed to the fertility revolution as well as the political?

An economic rationale for the decline in French fertility, associated with the revolution has been forwarded by Weir. He states “evidence on fertility by social class is scarce, but tends to support the idea that fertility control was adopted by an ascendant “bourgeois” class of (often small) landowners” (1984 p.613). The revolution enabled an element of the rural population to increase their control over

the land, while others lost out and became more reliant on wage labour. For the new rural bourgeoisie, children became “superfluous as labourers and costly as consumers” (Weir 1984 p.613). The decline of fertility in France in the early to mid 19<sup>th</sup> century was primarily due to the decline of the demand for children by this new class. It was only after 1870 when France joined the rest of Europe in a fertility transition which transcended the social order (Weir 1984 p.614).

The results of this analysis support Weir’s hypothesis on the French fertility transition. The new class of landowners created by the revolution would certainly lie within the top wealth category as constructed here. The results clearly show, as Weir expected, that fertility decline was initiated by this wealthy group. Further, the effect of the revolution on family size is large, negative and significant (see table 11). This is captured in the negative binomial regressions by coding a categorical variable for those who married after 1789. A more precise testable implication of Weir’s hypothesis is that those who have greater property wealth should have the lowest fertility. Further, the cash component of total wealth at death should

be an insignificant predictor for family size. By splitting the wealth measures into the property and cash components we can test for this in the sample data. Once the value is separated, the distribution is split into even thirds with respect to cash and property separately<sup>11</sup>. Table X reports the results of a negative binomial regression, similar to the previous exercise, but this time dividing wealth into its constituent parts.

**Table X Negative Binomial Regressions**

<i>Model</i>	Children Ever Born	Net Family Size
<i>Demographic variables</i>		
Age at Marriage, Female	-0.062*** (0.006)	-0.061*** (0.006)
Age at Death, Female	0.036***	0.044***

<sup>11</sup> The division for property was all those with 0 value at death in group 1, all those with property over 0 and less than 2000 Francs in group 2, and all those with over 2000 Francs property wealth going to group 3. For cash, all those with 0 wealth at death were designated to group 1, those with over 0 and under 155 Francs in group2, and all those over 155 in group 3. The following matrix describes the relationship between the various groups in terms of observations:

Property Wealth Group	Cash Wealth Group			Total
	1	2	3	
1	154	45	12	211
2	59	85	60	204
3	39	33	135	207
Total	252	163	207	622

	(0.005)	(0.005)
Infant Mortality	0.002***	0.001
	(0.000)	(0.001)
<i>Event variables</i>		
Revolution	-0.154**	-0.132*
	(0.058)	(0.063)
Napoleonic Wars	0.016	0.000
	(0.061)	(0.068)
<i>Property Wealth Effects</i>		
Wealth Group1 (ref.)	0	0
Wealth Group2	-0.027	-0.070
	(0.061)	(0.068)
Wealth Group3	-0.182**	-0.175*
	(0.066)	(0.072)
<i>Cash Wealth Effects</i>		
Wealth Group1 (ref.)	0	0
Wealth Group2	0.080	0.105
	(0.064)	(0.071)
Wealth Group3	0.033	0.069
	(0.069)	(0.076)
Constant	1.162***	0.67*
	(0.294)	(0.294)
N	404	404
Pseudo R2	0.092	0.087

\*\*\* Significant at .001% level

\*\* Significant at .01% level

\*Significant at.05% level

The results agree exactly with Weir's predictions. The wealth category which has significantly fewer children is composed of the richest property owners. However, the

driving factor in his hypothesis is the changing cost of children, due to the substitutability of wage labour by poorer socioeconomic groups. This does not uniquely identify a particular French characteristic as this process must surely have been existed in other countries. At this time, the English population was far less reliant on the agricultural sector and children must have been as expensive, if not more so, as they were in France.

In France, however, serfdom had disappeared by the 18<sup>th</sup> century, and most peasants owned their own land, in contrast to most of Europe (Chesnais 1991 p.336). The fertility decline originated amongst the wealthiest of this property holding class<sup>12</sup>. According to Chesnais, almost 63% of the population was represented by landowners and their families in 1830 while the comparable figure for Britain is 14% (1991 p.337). The widespread ownership of land amongst the rural population is a unique feature of the French socio-economic landscape at this time. Because of this, economic inequality was lower in France than in England during the 19<sup>th</sup> century (Piketty et al. 2006 p.250). This implies that the environment for social mobility was

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<sup>12</sup> In aggregate terms. The nobility restricted their fertility far earlier than the rest of the population, see Livi Bacci 1986.

more fluid in 18<sup>th</sup> and 19<sup>th</sup> century France than anywhere else in Europe. Arsene Dumont, writing a century after the onset of the transition, placed social mobility as the 'raison de etre' of the French fertility decline and termed "social capillarity" as the phenomenon driving the limitation of family sizes (Dumont 1890). The Revolution served "to increase the thirst for equality and stimulate the social ambition of families, both for themselves and their progeny" (Chesnais 1992 p.334). The old social stratifications under the *Ancien Regime*, where hereditary rights had determined social status, were weakened by the Revolution. All of this served to facilitate individuals' social ambition, and the limitation of family size was a tool in achieving upward social mobility<sup>13</sup>. This phenomenon, while associated with the Revolution, originated before the political climax of 1789.

The testable proposition of this hypothesis is that fertility should be negatively related to the opportunities for

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<sup>13</sup> Recently, the issue of social mobility and relative status in understanding Europe's fertility decline has been coming to the fore. Skirbekk (2008) and Van Bavel (2006) discuss the issue explicitly. Van Bavel (2006) finds a negative relationship between family size and children's subsequent socioeconomic status (p.15) and suggests that these intergenerational motivations may be important in understanding the fertility transition (p.16).

social mobility. A crude proxy for the social mobility environment is the level of economic inequality. In a society with a large rural, landless majority and a small group of elites, the prospects for social mobility are limited. It makes no sense to control fertility if family size has no impact upon a family's relative social standing. The economic distance between the bottom and the top status groups is too great, and therefore upward social mobility is unattainable for the majority of the population. However, changes in the distribution of wealth/income between groups in the population reflect a changing environment for the possibility of social mobility. As economic inequality declines, fertility is induced to decline also, as parents now realize that social mobility is possible and the prospects for it are affected by family size. One way to evaluate the strength of this hypothesis is to examine the level of economic inequality in cross section in the individual wealth data collected for Transition era France.

**Table X, Gini coefficients by village**

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Gini Coefficient

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<i>Non Decline Villages</i>	
St Paul	.861
St Chely	.818
<i>Decline Villages</i>	
Cabris	.705
Rosny	.722

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Table X reports gini coefficients based on total real wealth, by village, for the sample. The levels of inequality are very high, and typical of the pre-industrial era. For the villages where fertility is declining, the gini coefficient is significantly lower than where it is not. This suggests that the level of inequality was associated with the onset of the fertility transition.

Another way to test the social mobility environment is to examine the relationship between father and son's wealth at death. Where the environment for social mobility is more open, father's wealth should have less importance in the determination of son's wealth, than would be the case where fertility is high. For a very small subsample (40), I was able to investigate this relationship. Table X reports the

results of an OLS regression on son's wealth, with father's wealth as an independent variable.

**Table X, Father's wealth as determinant of son's wealth**

Decline Regime Villages	56.56*	35.42
	(24.47)	(33.89)
Fathers Wealth (Sqrt)	0.864***	0.798***
	(0.177)	(0.210)
Fathers Wealth*Decline Regime	-0.669*	-0.724*
	(0.305)	(0.349)
Sons Family Size		-3.761
		(3.854)
Fathers Family size		-3.300
		(3.394)
Constant	2.13	62.38
	(20.99)	(52.38)
Observations	42	40
Adj. $R^2$	0.346	0.320

Where fertility is high and not declining, father's wealth is a highly significant predictor of son's wealth. This relationship appears to be far weaker where fertility is declining. The effective coefficient on father's wealth in the determination of son's wealth in these 'decline' regime is one quarter of that of the villages where fertility is stagnating (.864 vs. .195). When both father and son's family

size are controlled for, the coefficient on father's wealth in the 'non decline' villages is ten times its corresponding value in the 'decline' villages (.798 vs. .074). This result strongly implies that the strength of the intergenerational transmission of wealth, it's 'stickiness' within families, and the social mobility environment this implies, is associated with the presence of fertility decline.

As I have stated before, Demographic transition theory, the microeconomic theory of fertility and unified growth theory cannot explain why French fertility fell first in Europe because they all predict that fertility should have declined in England before anywhere else. Wrigley's neo-Malthusian response cannot be valid as it was the richest groups who reduced their fertility, and Weir's explanation, again, does not uniquely identify France. What was unique to France, was the pattern of landholding and relative affluence (to the rest of the world). There are many good reasons to suspect that social mobility may be a factor behind the decline. The level of inequality and the perseverance of wealth within families, both highly related to the social mobility environment were both found to be negatively associated with the presence of declining fertility.

## **Conclusion**

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