Supplementary Material to "Wealth, fertility, and adaptive behaviour in industrial populations"

Methods of literature search

We conducted several searches using Web of Science to identify articles examining the relationship between wealth and fertility. We searched for the terms wealth/income/wage/social status/assets AND reproductive success/number of children/fertility AND longitudinal (15 searches in total; last searches were conducted on July 2nd, 2015). This did not constitute an exhaustive search because other search engines could also have been used, and no attempt was made to chase up the references includes in the articles that our searches uncovered. Our choice of search engine was, however, an ideal way to identify studies that compare closely to those of evolutionary scientists, and with which they might be familiar. Our review should therefor be seen as an explorative snapshot of the existing literature of the association between wealth and fertility using longitudinal data. Our searches generated 295 articles, that were reduced to 242 articles without overlap. We both read the abstracts of all papers and agreed which articles required a close reading. We then subsequently read all articles deemed likely to have longitudinal data on fertility decisions related to wealth. We were as inclusive as possible in our selection process, with the presence of a longitudinal analysis being the only stringently applied criterion. Even so, this produced a sample of only 13 (5%) articles with relevant longitudinal measures of wealth and subsequent fertility decisions ([59–71]; see the below table for a description of these 13 studies and further description of our methods). It is important to note that many other articles also included relevant data, but we excluded them from our analysis because they investigated how fertility influenced subsequent income (which is a slightly different question), or they used fertility intentions as outcome (e.g. [48]; note that we do discuss this paper and the outcomes). This meant that we also excluded two articles that used longitudinal data, and asked whether income predicted fertility, but where income was measured following the births of children. In essence, these studies are cross-sectional in nature [114-115]. This is problematic because, as discussed before, fertility behaviour may also affect income. Indeed, income will almost always decrease in the year following the birth of a child, even when maternity pay is received. Note that we also only include the results from the longitudinal analyses reported in a given study, and not those of any cross-sectional analyses that were also presented.

There was some variation in outcome measures across the 13 articles we reviewed in detail, ranging from the probability of parenthood, second and third births, all births, and child mortality (which we included because reduced mortality might be a mechanism through which wealth can be associated with higher number of children). In all cases, the measure of wealth reported in the study was income (whether of respondents, spouses, or households). Only rarely was information provided on household assets. Measures of economic insecurity (e.g., periods of unemployment) were also recorded. The studies covered four Western European countries (Finland; [68], Sweden [61,66,69,71], Italy [67], UK [70], Russia ([62,65]; using the same sample), Australia [64] and the US [59-60,63]). It is important to mention that the sampling design of some studies (e.g., only sampling individuals who already had children; [59,64,66,71]), can lead to substantial problems of self-selection [72], which reduces our confidence in the results obtained from such studies (for further discussion, see [11,73]). All studies examined individuals in the second half of the 20th century; 10 of them tracked individuals over the change of the

millennium, whereas 2 studies covered slightly earlier periods (between 1961 and 1977; [59-60]). This meant that we could make no assessment regarding the magnitude of any change in association across time. Note that a recent study showed the association between both male and female earnings and parenthood became more positive between 1995 and 2010 [74]; this study was not included in the table because it was not among those identified in our searches). Education is often considered an important confounding variable; 9 studies controlled for some measure of education, whereas the remaining 4 did not. Most studies included household income (or included income from both individuals within the couple), although in 4 studies income was used from only one individual.

Our analysis revealed that the relationship between wealth and fertility was much more likely to be positive than negative: there were 8 positive (we include the protective effect of household income on child mortality in this number), 1 negative and 3 null findings observed. One study showed that couple income positively predicted the second birth, but negatively the third and fourth birth (see [11] for similar finding). The positive results can be considered more robust, as these studies often use much larger samples and more sophisticated analyses. Also, note that the sample from the US in which a negative association was observed [59], a null association was observed in follow-up study using a more extensive sample and time period [60]. A larger, more comprehensive study in the US at a later time period observed a positive effect [63]. Additionally, two studies used the same Russian sample, but covered slightly different periods, incorporated different confounding variables, and used a different sub-sample. As a result, perhaps, these studies came to differing conclusions: one observed no association [65], whereas the other observed a positive association [62]. Education did not seem to be the driving factor, as in the two studies in which education was not controlled for, the effect of income was clearly positive [61,70]. Observed effect sizes (that were difficult to compare because of the variation in outcomes, methodologies, and selection of subsamples) tended to be rather small in magnitude.

It is clear that economic factors are salient and influence people's fertility decisions in line with simple evolutionary predictions regarding the allocation of resources to reproduction. Despite the continued debate surrounding the association between wealth and fertility, this finding is not particularly earth-shattering: it is not surprising to discover that people assess their material wealth as part of their decision to have (more) children. For instance, recent research shows that around 50% of Italian couples report that they do not wish to have another child because of inadequate income [48]. This parallels closely the results of an earlier US study [59], which showed that 55% of the sample reported that they would have wanted more children if money not been a constraint (and this was particularly true for those with lower incomes).

***Supplementary table 1**: 13 studies from our literature review on the association between wealth and fertility*

Study [citation]	**Sample**	**N**	**Analysis**	**Measure of wealth**	**Outcome (descriptive)**	**Confounding variables**	**Finding (effect size when reported)**
Freedman & Coombs 1966 [59]	White mothers in Detroit who had given birth to a first, second or fourth child in July 1961.	~1113	?	Household income (5 categories) Income change (Upwards, Mixed, Downwards)	Births within two years	Religious preference Frequency of church attendance for Catholics	Household income negatively associated with additional births. Positive income change positively associated with additional births. Effect of income on births *Relative risk;* poorest (<3000$) vs poor (3000-4999$); vs medium (5000-6999$); vs rich (7000-8999$); vs richest (>9000$) Women with one child (N=372): 0.87; 0.90; 0.84; 0.79 Women with two children (N=372): 0.59; 0.54; 0.51; 0.43 Women with four children (N=369): 1.18; 0.95; 1.05; 0.79 Effect of income change on births Women with four children (N=369): *Relative risk;* negative vs positive income change 1.40
Freedman & Thornton 1982 [60]	White women in Detroit who were just married, or had a first, second or fourth birth in July 1961, and were married until 1977	897	Linear regression	Husband income Income change (note: we only used income from 1961, which preceded the births, not income from 1976)	Fertility after 15 years *Mean (SD)* No children in '61: 2.98 (1.20) One child in '61: 3.14 (1.24) Two children in '61:	Male education Female education Female age Religion	Husband income and income change was not associated with fertility. *Regression coefficient*; full samples; restricted sample of those who did not have unwanted births. **p*<0.05 Income Women with no children (N=118): -0.04; -0.02 Women with one child (N=261): 0.03; 0.01 Women with two children (N=264): 0.01; 0.01 Women with four children (N=254): -0.02; 0.05 Income change Women with no children (N=93): -0.00; -0.00

					3.38 (1.34) Four children in '61: 5.06 (1.18)		Women with one child (N=180): 0.00; 0.00 Women with two children (N=156): 0.00; 0.01* Women with four children (N=65): -0.01; -0.01
Andersson & Scott 2005 [61]	(Immigrant) women in Sweden (aged 16-45) followed between 1982-1997	155885	"form of indirect standardization" that is similar to proportional-hazards model	Income and public transfers in the same year (earnings in 4 categories; time-varying per year)	Parenthood 43.4% became mother (67,630 births)	Age Calendar period Time since immigration	Income typically positively associated with becoming parent. *Relative risk*; comparisons: low vs medium income; rich vs medium; top vs medium. *p<0.05 Sweden: 0.69*; 1; 1.20* Finland: 0.71*; 1.03; 1.36* Germany: 0.68*; 1.11; 0.95 Poland: 0.78*; 1.1; 1.41* Greece: 0.61*; 1.22; 1.17 Iran: 0.71*; 0.75*; 1.17 Turkey: 0.76*; 0.79; 1.64 Somalia: 1; 1.44; NA Thailand: 0.72*; 1.02; 3.14* Vietnam: 0.95; 1.29; 1.32 Chile: 0.87*; 0.9; 1.35
Grogan 2006 [62]	Russian married women (aged 23-33) who were followed yearly between 1994 and 2001 (RLMS)	197	Random effects logit models with Gauss – Hermite quadrature approximation	Household income in the previous year (time-varying per wave)	Births 4.73% chance of birth the year after the wave in 1994; 1.69% for the wave in 2000	Currently working Education Age / Age^2 # Children Child benefits State nursery / pre-school in region Local bread price Rural area Education specific employment / unemployment rate # Unemployment / Wage arrear spells	Household income positively associated with birth of a child. 13 different models were fitted. Logit estimates for household income varied between 0.0196 and 0.229 (Standard Error always 0.011); estimate always significant, either at the $p<0.05$ or $p<0.01$ level Logit estimates for household income^2 was always -0.0001 (SE always 0.000) and never significant "Changes in household income can account for about a 28% decline in the probability of married couples having a child in [a one year] period"

Musick et al 2009 [63]	White and Black women from the US (aged 16-46) followed between 1979 and 2004 (NLSY79)	3934	Discrete-time multinomial hazard models	Wages (log-transformed; lagged by two years) Averaged previous wages (time-varying per year)	Intended, mistimed, and unwanted births *Mean fertility* White women Intended: 1.36 Mistimed: 0.42 Unwanted: 0.08 Black women Intended: 0.94 Mistimed: 0.83 Unwanted: 0.40	Age / Age^2 Education Education x Age Education x Age^2 Currently in school Fertility desires Currently employed Spousal income Data imputed	Wages positively related to intended births in whites, negatively related to mistimed births in Blacks. Results similar when using averaged previous wage. Effect of wages on births *Multinomial logistic regression estimate*; **p*<0.05 White women (N~2029) Intended: 0.19* Mistimed: -0.10 Unwanted: -0.07 Black women (N~1197) Intended: 0.19 Mistimed: -0.25* Unwanted: -0.16 Predicted ratio of fertility for 75th percentile of wage/25th White women (N~2029) Intended: 1.11 Mistimed: 1.00 Unwanted: 0.91 Black women (N~1197) Intended: 1.02 Mistimed: 0.95 Unwanted: 1.01
Craig & Siminski 2010 [64]	Australian partnered couples with child (age<5) between 2001-2007 (HILDA)	569	Probit regression	Household income in previous wave (and squared term) (log-transformed; time-varying per wave)	2nd birth 30.1% chance of 2nd birth per wave (171 2nd births)	Female age / Age^2 Male age / Age^2 Age child Female / Male education Female / Male hours of work SES area of residence	Household income seemed positively associated with having a second birth. Across models, one unit increase in the logarithm of household income increased the probability of a birth within a year by 10%

						Year Female / Male relationship satisfaction Female / Male fertility preferences Female / Male perceptions of housework Female / Male gender ideology	*Marginal effect* (*SE*; *p*-value; *N*) Base model: 0.1034 (0.0584; 0.078; 569) Model with all controls except gender ideology: 0.1054 (0.0604; 0.079; 540) Model with all controls: 0.0900 (0.0643; 0.159; 461)
Kumo 2010 [65]	Russian women (aged 15-49) who were followed yearly between 1994 and 2004 (RLMS)	~2500 (varying per data collection wave)	Pooled logit analysis	Equivalized household income + squared term in the previous wave (time-varying per data collection wave)	Births 2.5-2.8% chance of birth across waves	Age Wants children # Children / Children^2 Presence of spouse Man / Woman in household eligible for pension benefits Owner-Occupier Living / Floor area dwelling Life satisfaction Future expectations for living In work Education Living in rural area Region Year	No effects of income on the probability of a child, using several specifications. *Pooled logit β* (*p*-value) Equivalized household income: 0.00 (0.72) Equivalized household income^2: 0.00 (0.48)
Dribe & Stanfors [66]	Swedish couples followed between 1991 and 2005	422315 births	Multinomial logit models	Household income at the turn of the year (ten categories; time-varying per year)	2nd, 3rd, and 4th births 344431 2nd births: 45.7% 68666 3rd births: 45.5%	Educational status couple Female share of income Male age / Age^2 Female age / Age^2 Female age at first	Household income was positively associated with the 2nd birth, but negatively with the 3rd and 4th birth *Relative risk* (*p*-value); compared to 5th income category; income effect on first; second; third birth I: 0.64 (0.000); 1.21 (0.007); 1.51 (0.002) II: 0.75 (0.000); 1.21 (0.000); 1.45 (0.000)

					9218 4th births: 8.8%	birth / Age^2 Time since last birth Place of residence Country of birth Birth cohort Civil status	III: 0.83 (0.000); 1.17 (0.000); 1.33 (0.000) IV: 0.88 (0.000); 1.1 (0.000); 1.14 (0.005) VI: 1.04 (0.000); 0.84 (0.000); 0.84 (0.000) VII: 1.12 (0.000); 0.79 (0.000); 0.79 (0.000) VIII: 1.21 (0.000); 0.82 (0.000); 0.67 (0.000) IX: 1.3 (0.000); 0.87 (0.000); 0.76 (0.000) X: 1.44 (0.000); 1 (0.929); 0.75 (0.000)
Santarelli 2011 [67]	Italian married couples followed between 1995 and 2001 (ECHP)	726	Cox regression	Male income in previous year (tertiles) Female labour market status (4 categories) (time-varying per year)	Time to conception of first child 48.8% had first birth	Woman's age Social financial transfers Private financial transfers Area or residence	Men's income had no effect on parenthood. Women with jobs had their first child later than those without. *Relative risk;* ***p*<0.01 Male income Low vs middle: 1.06 Low vs high: 1.06 Female labour market status Housewife vs unemployed: 1.21 Housewife vs low income job: 0.67** Housewife vs high income job: 0.70
Remes et al 2010 [68]	Finish children born between 1987-2003	201211	Cox regression	Equivalized household income at the turn of the year (quintiles; time-varying per year)	Child mortality at the ages 1-14 0.88% mortality (1,780 deaths)	Family type Degree of urbanization Parental age at birth Number of children Parental education Sex child Five year cohort	Lower income associated with higher mortality among children 1-4 years (*Hazard ratio*: 1.94 (95% CI: 1.40–2.68) for the lowest income quintile compared to highest). Income not associated with mortality among children 5-9 years (*Hazard ratio*: 1.21 (95% CI: 0.87–1.69) for the lowest income quintile compared to highest).
Scott & Stanfors 2011 [69]	(Immigrant) men and women in Sweden (aged 15-44) followed between 1990 and 2005	499249	Cox regression	Income and public transfers from various sources in previous year (earnings in 4 categories; time-varying)	Parenthood	First born Parental composition Birth cohort Metropolitan residence Education Labour market status Year	Income positively associated with parenthood in all groups in both sexes, but somewhat stronger in men. *Relative hazard*; men emigrating to Sweden before 11; men with immigrant parents born in Sweden; women emigrating to Sweden before 11; women with immigrant parents born in Sweden. Only comparisons between low vs top income are shown (see paper)

							Sweden: 2.27; 2.27; 2.05; 2.05 Chile: 1.91; 2.82; 2.53; 3.34 Czechoslovakia: 3; 1.83; 3.5; 2.53 Denmark: 1.96; 2.22; 1.87; 2.18 Finland: 2.26; 2.14; 2.43; 2.19 Germany: 2.72; 2.37; 2.73; 2.48 Greece: 2.77; 1.51; 2.27; 2.39 Hungary: 3.59; 2.52; 3.14; 2.47 Lebanon: 1.13; 1.78; 1.34; 1.17 Norway: 2.43; 2.17; 3.03; 2.44 Poland: 1.96; 2.39; 2.7; 2.43 Syria: 1.75; 1.24; 1.9; 1.22 Turkey: 1.29; 1.61; 1.81; 1.73 UK/Ireland: 1.91; 1.74; 2.52; 2.47 USA/Canada: 0.44; 1.97; 5.01; 2.07 Yugoslavia: 2.04; 2.18; 1.94; 2.11
Waynforth 2012 [70]	British men and women (aged 30) born in 1970 (BCS70) and followed between 2000 and 2004	8914	Logistic regression	Income Partner income Household income (log-transformed)	Birth within 4 years	Marital status Household size	Household income positively associated with birth of a child; depending on analyses either male or female partner income positively associated *Odds-ratio*; **p*<0.05; ***p*<0.01 Sexes pooled (dependent variable): Household income (all births): 1.02* Male income (all births): 1.06** Female income (all births): 1.02 Male income (parity>1): 1.02 Female income (parity>1): 1.15* Women only (dependent variable): Male income (all births): 1 Female income (all births): 1.03 Male income (parity>1): 1.06 Female income (parity>1): 1.23* Men only (dependent variable):

							Male income (all births): 1.07** Female income (all births): 1.06 Male income (parity>1): 1.08 Female income (parity>1): 1.2
Stanfors 2014 [71]	Swedish highly-educated parents with three high-status professions (lawyers, medical doctors, academics) followed between 1991 and 2009	13334	Discrete time event history models	Couple income in year + squared term (time-varying per year)	2^{nd} and 3^{rd} births 72.4% had 2^{nd} and 22.1% had 3^{rd} birth (9,652 2^{nd} and 2,952 3^{rd} births)	Profession Partner education Woman's share of income Age / Age^2 Partner Age / Age^2 Woman's age at first birth / Age^2 Duration since last birth Place of residence Country of birth Cohort Civil status	Income positively, but weakly associated with having 2^{nd} and 3^{rd} birth; returns to income diminishing *Logistic regression estimate B* (*p*-value) for couple income / $income^2$ 2^{nd} births: Men: 0.040 (0.000) /-0.0004 (0.003) Women: 0.019 (0.155) / -0.00006 (0.482) 3^{rd} births: Men: 0.016 (0.055) /-0.0001 (0.188) Women: 0.018 (0.009) / -0.0001 (0.068)

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