Increased education and postponed fertility
- The rising reproductive cost of attaining status

Vegard Skirbekk and Samir KC

Short abstract

We argue that the achievement of social status through education leads to postponed and lowered fertility in countries all over the world. Rising educational attainment relates to an increasingly later onset of fertility - as most individuals postpone childbearing until after graduation.

New, unique education data allow estimation of the number of years required to reach a certain percentile in the schooling distribution by country/gender and age group. We consider 60 countries with data available for at least one point in time (N=254). We find that the mean age at first birth is younger than the median school graduation age for every point in time for all countries. On average, it takes women 5.5 years from school graduation age until their first child is born. Regression results show that graduating one year later relates to a maternity postponement of 3.6 months.

Extended abstract

Before the onset of fertility decline, high status couples were likely to have initiated family formation relatively early: For instance, in a study of Bavarian villages between 1700 and 1899, Knodel (1988) shows that wives of village leaders got married when they were 2.1 years younger than wives of non village-leaders. Higher status families were also found to have higher fertility levels (Betzig 1986; Razi 1980; Sogner et al. 1984; Skirbekk 2008).

As fertility levels declined, individuals of higher social rank – particularly those who were relatively highly educated – were found to have a relatively late onset of childbearing (Kennedy 2004; Jejeebhoy 1995; Mahy and Gupta 2001; Gaisie 1984; Konogolo 1985) and relatively low fertility levels (e.g., Coale and Watkins 1986; Cochrane 1979; Haines 1989; Jejeebhoy 1995, van Bavel 2006, Skirbekk 2008).

Schooling has become key indicator of social status achievement. Smith (1759) argued that individuals pursue fortune to attain a social position in society. More recently, Clark (1999) find that one's life satisfaction is determined by ones relative education and income levels, rather than one's absolute achievements. Skill-biased technical change and the higher earnings of the more educated is one cause of rising schooling levels, but educational attainment is likely to increase also for non-pecuniary reasons. For example, in the case of Norway, Hægeland et al. (1999) find that university enrolment increased even in periods of decreasing wage returns to higher education.

Education is not only of mounting importance when it comes to one's own status, but also when it comes to attracting a high status partner. In most countries, the population at the typical ages of marriage is characterised by both rising, but also more varied educational attainment (Lutz et al. 2007). Rising marital educational homogamy (Smits et al. 2000) suggests that more and more weight is given to a potential partner's schooling achievements in the marriage market.

Under conditions of rising status levels, "running to keep in the same place" implies that individuals continuously need to raise their own status through more education to keep their position in the status hierarchy (Lutz et al. 2006, Tournemaine 2008, Hopkins and Kornienko 2004).

Education has an independent postponement effect, net of preferences, abilities and opportunities, which has been shown through analysis of census datasets with extensive set of control variables, the use of MZ-twin data or the use of "natural experiments" (Kravdal and Rindfuss 2007; Rodgers et al. forthcoming, Skirbekk et al. 2004). In Sweden, for example, the (randomly allocated) difference of 11 months in the age at leaving school between women who were born in two consecutive months, December and January, implies a delay in the age at first birth of 4.9 months (Skirbekk et al. 2004).

Demographic events tend to be sequenced in a given order, and for many completing education and finding financial security through stable employment, establishing a stable relationship, or achieving certain material standards (including buying a house and a car) are necessary preconditions for having children (Blossfeld and Huinink 1991; Billari et al. 2006). Such events can therefore act as a wedge between the school leaving age and the age at first childbirth. In addition, fertility timing is also affected by changes in preferences acquired during the study period: Increased fertility timing through rationality in childbearing decision-making, increased female autonomy, an increase in contraceptive practice, and the higher costs of childbearing (Cochrane 1979; Jejeebhoy 1995; Kravdal 2002, St. Bernhard 2003).

Figure 1 attempts to map the relation between status attainment and age at first birth. Events in early adulthood are timed and sequenced according to a normative scheme, where status attainment through schooling precedes other events that frequently take place prior to childbearing, including finding a stable job, identifying a partner and finding adequate accommodation. Hence, for example, a change in the school graduation age can lead to a shift in all subsequent events, including the age of entrance into parenthood. Later and later levels graduation ages imply self-reinforcing effects in the norms for ages "appropriate" for initiating childbearing (Lutz et al. 2006), both for the population as a whole and within educational groups.

Hypothesis and Data

Hypothesis: Increased investments in time are needed to achieve a "high status" which leads to later fertility. Reaching a relatively high status takes a long time as one's reference group also attains more status. Using the first ever dataset that describes education not only by sex and period, but also by age (developed jointly at the International Institute for Applied Systems Analysis (IIASA) and the Vienna Institute of Demography (VID)), we tested the number of years necessary to attain a given level of status (measured as the top 20 percent or 50

percent of the school distribution) as later cohorts attain higher education, and investigated how this relates to fertility timing and outcomes. The IIASA education dataset (Lutz et al. 2007) shows educational attainment by sex, period and age for 120 countries for the period 1970-2000. A disaggregation of educational attainment by age was not available in earlier datasets.

The IIASA dataset can be used to show the required educational degree (primary, secondary or tertiary) necessary to be considered relatively well educated, e.g., to reach the 20th or 50th percentile by cohort, period and country.

We examined the education of individuals of the same sex and of similar ages (those who are 25-29 years old) in a given five-year period. The impact of the relative education is defined as reaching the 50th or 20th percentile in the education distribution according to preferences and abilities. As education levels increase over time, it takes longer to reach a given percentile in the education distribution.

The educational length is based on data from the UNESCO (2003) database, which provides the number of years necessary for various educational levels (age of school entry, primary, secondary, tertiary education) for a large number of countries over time. Data on the timing of childbearing are taken from the Council of Europe (2004) and UN's *World Fertility Report* (2007).

Findings & Conclusion

Figure 2 shows the number of years required to attain median education among women 25-29 for 14 countries (in total there are 120 countries). The general trend is one of increasing education and hence increasing schooling required to "stand still" in the school distribution. To our knowledge, no other study has ever shown the global relation between educational attainment and age at entrance into motherhood. Based on data from all countries for which the mean age of entry into motherhood is available, we calculated the impact of schooling on the timing of fertility. Our most important finding is that no country has ever had a median age of school exit higher than the mean age at first birth. The entry into maternity always takes place later than the median school leaving age. On average, it takes 5.5 years from median school graduation age (18.9 years) to the age at first birth (24.4 years).

From the age of reaching the 20th percentile in the school distribution (at age 21.8) to the age at first birth, it takes 2.6 years on average. The timing of entry into maternity generally succeeds the age of reaching the 20th percentile in the school distribution, where 87.7 percent of the country-year observations have a school leaving age that is younger than the mean age at first birth.

We found a positive relation between the mean age at first birth and the mean age of attaining the top 50 percent or the top 20 percent of the educational distribution, as shown in Figure 3. Bivariate regression analysis shows that reaching the median school length at an older age leads to postponed fertility: Exiting school one year later implies a later entrance into childbearing by 3.6 months (30%). This is slightly less than the 44% fertility postponement due to education identified in the "natural experiment" study on the effect of the school leaving age on the timing of fertility by Skirbekk et al. (2004).

We also investigate changes over time within countries, see Figure 4, where we restrict ourselves to European and a few Asian countries due to data availability. Again, we find a significant and positive relation between variation in the school leaving age and entry into parenthood for women where variation in the median education is positively associated with variation in the mean age at first birth.

The number of years required to reach the top 50 percent of the education distribution is generally increasing around the world. Only in recent decades does it overlap to a large extent with childbearing ages for women.

[…We will develop a more extensive model for testing the relation between schooling and fertility.

We will also extend the focus on self-reinforcing effects of status achievement through education as well as the parental influence on education choice.]

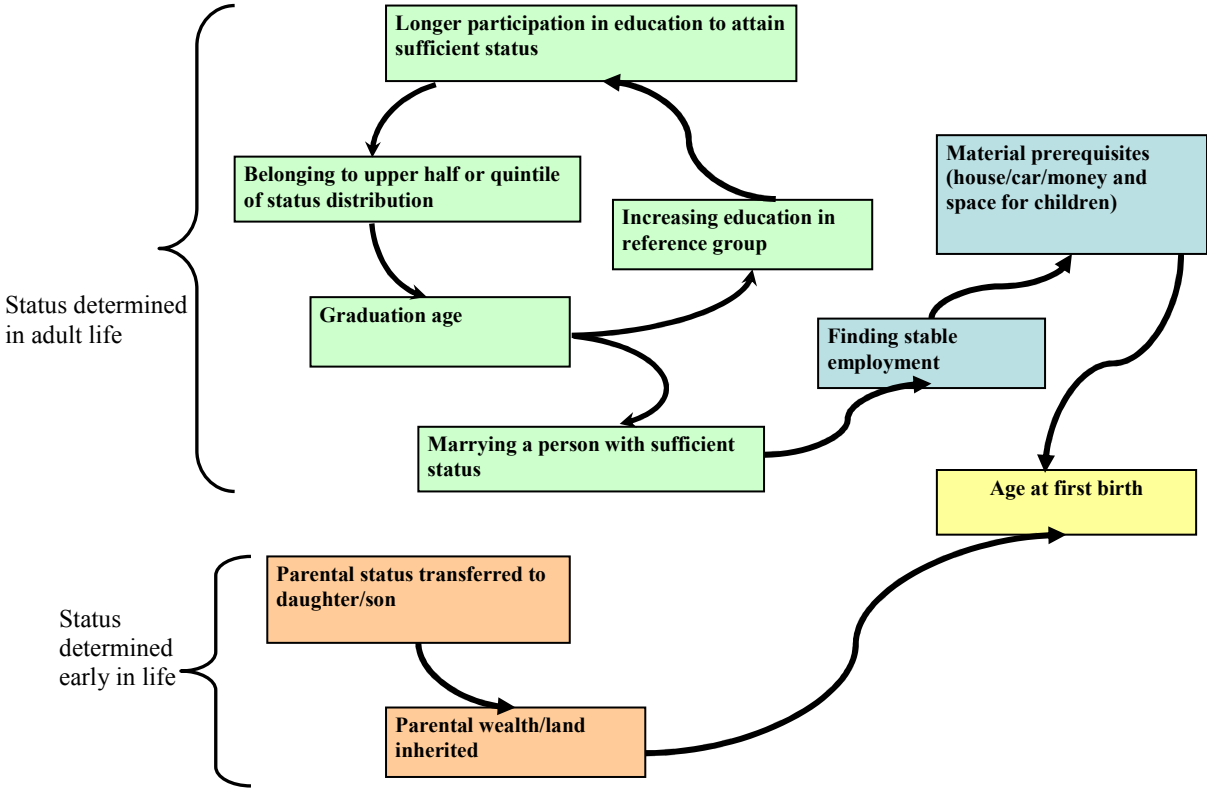Figure 1. Status attainment via education and first birth.

Figure 2. Graduation age required to attain median education among women 25-29 for 14 countries. Source: Own calculations
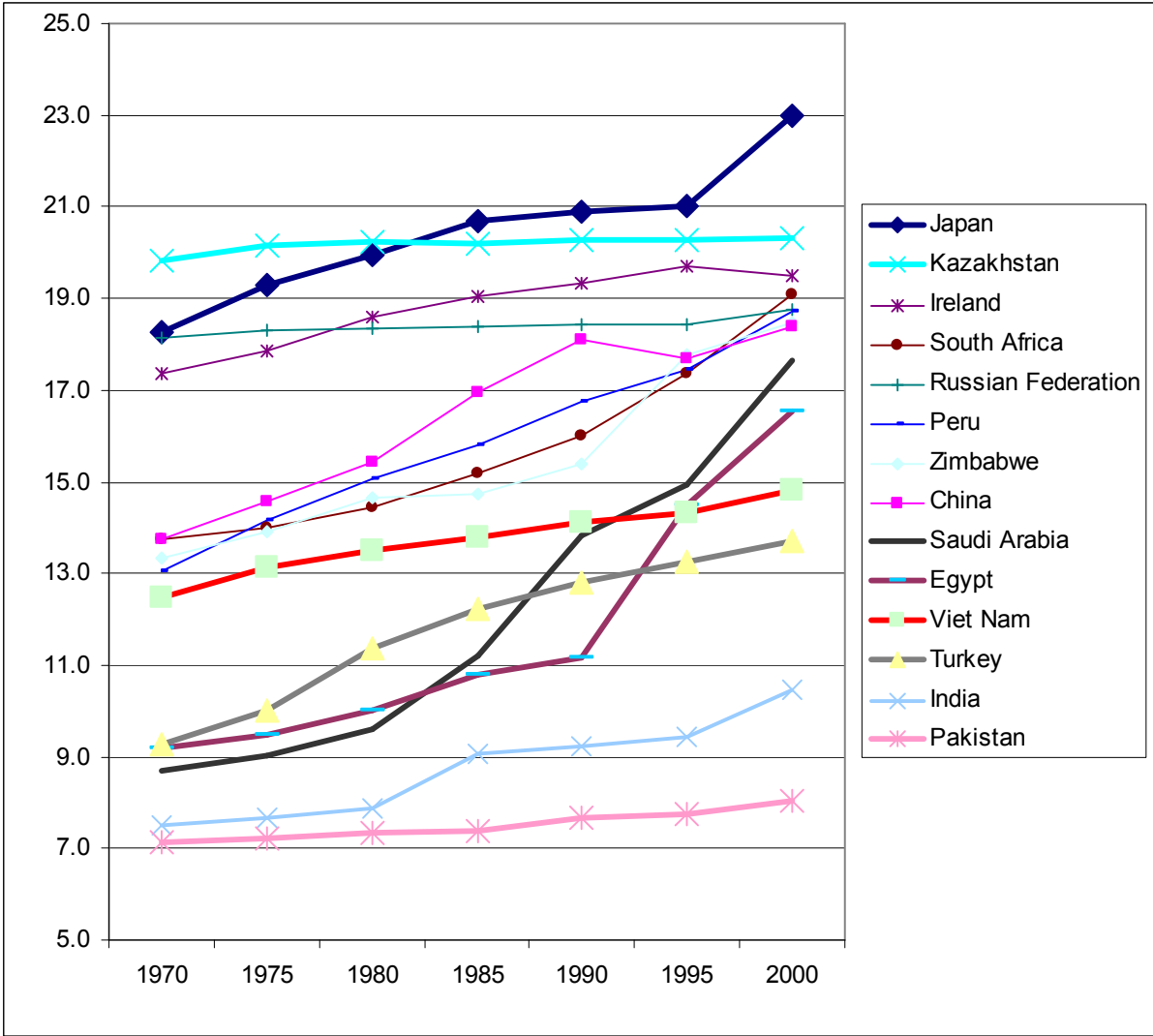
Figure 3. Mean age at first birth and median graduation age (N=254). OLS regression results: 0.30 (t=7.68, R-sq (adj)=0.19).
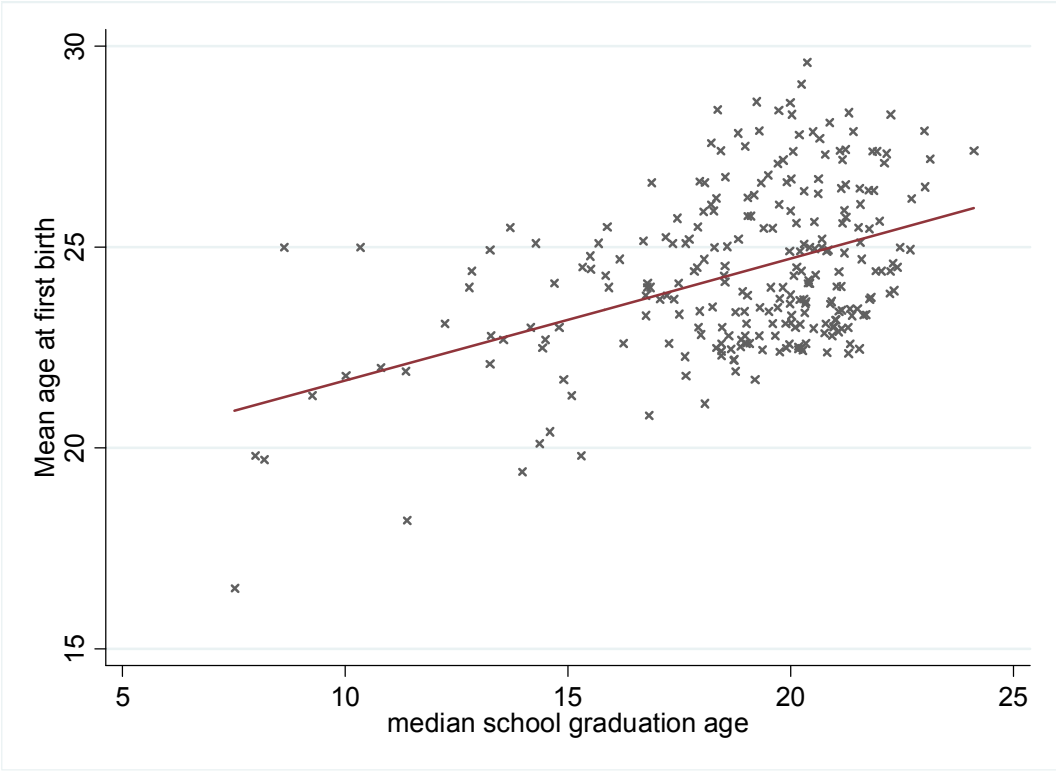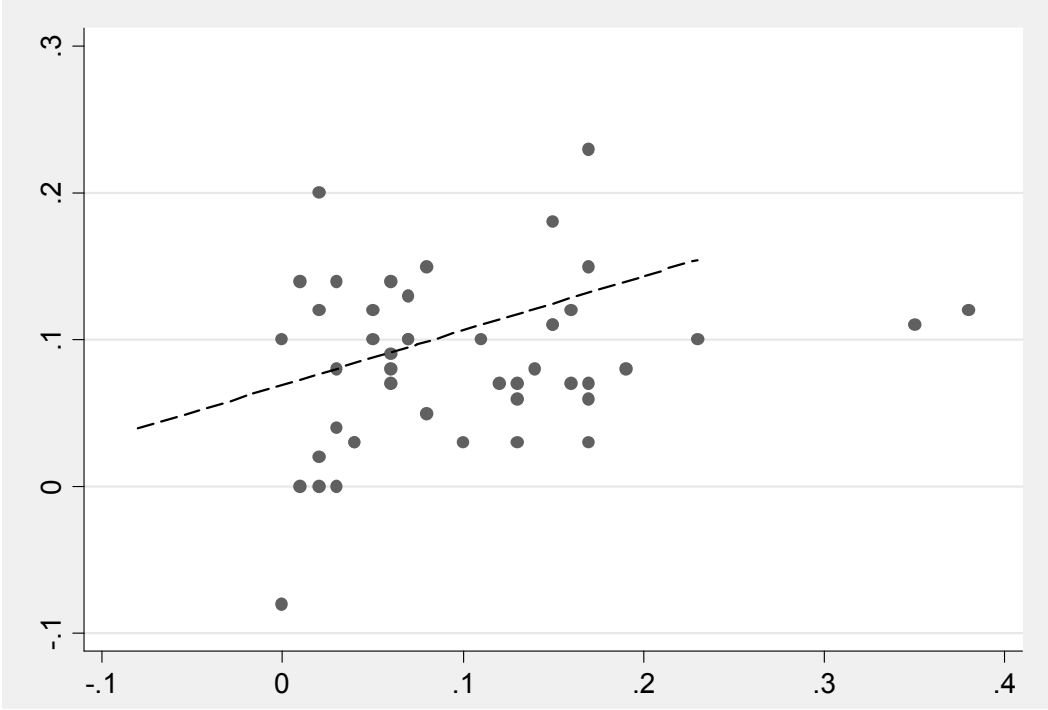

Figure 4. Mean age at first birth and the median school graduation age. Within-country variation. European and Asian countries with available data. (coeff=0.17, t=1.74, R-sq (adj)=0.05)

References

Betzig, L. 1986. *Despotism and Differential Reproduction: A Darwinian View of History*. Aldine: Hawthorne.

Billari, F., J. Fürnkranz, and A. Prskawetz. 2006. Timing, sequencing, and quantum of life course events: A machine learning approach. *European Journal of Population* 22(1): 37-65.

Birkelund, G. E. and J. Heldald. 2003. Who marries whom? Educational homogamy in Norway. *Demographic Research (Max Planck Institute)* 8,1.

Blossfeld, H.-P. and J. Huinink. 1991. Human capital investments or norms of role transition? How women's schooling and career affect the process of family formation. *American Journal of Sociology* 97: 143-68.

Blossfeld, H.-P. and A. Timm, Eds. 2003. *Who marries whom? Educational Systems as Marriage Markets in Modern Societies*. Vol. 12. The Netherlands: Kluwer Academic Publishers.

Bongaarts, J. and J. Menken. 1983. The supply of children, in R. Bulatao and R. D. Lee (eds.), *Determinants of Fertility in Developing Countries: A Summary of Knowledge*, Volume 1. New York: National Academy Press, pp. 27-60.

Caldwell, J. 2001. What do we know about Asian population history. Comparisons of Asian and European research. Pages 3-23 in C. Liu (ed.), *Asian Population History*. Oxford, UK: Oxford University Press.

Clark, A.E. 1999. Are wages habit-forming? Evidence from micro data. *Journal of Economic Behaviour and Organization* 39: 179-200.

Clark, A.E. and A.J. Oswald. 1996. Satisfaction and comparison income. *Journal of Public Economics* 61(3): 359-381.

Coale, A. J. and S. C. Watkins. 1986. *The Decline of Fertility in Europe*. Princeton, N.J.: Princeton University Press.

Cochrane, S. 1979. *Fertility and Education. What do We Really Know?* Baltimore: Johns Hopkins University Press.

Council of Europe 2004 "Recent demographic developments in Europe". Strasbourg: Council of Europe

Gaisie, S.K. 1984. The proximate determinants of fertility in Ghana. *World Fertility Survey Scientific Report*, No. 53.

Grund, C. and D. Sliwka. 2003. The impact of wage increases on job satisfaction: Empirical evidence and theoretical implications. *IZA Discussion Paper*, No. 387. IZA: Bonn

Grusky, D. 1994. *Social Stratification. Class, Race and Gender in Sociological Perspective*. Boulder, CO: Westview Press.

Haines, M. 1989."Social class differentials during fertility decline. England and Wales revisited", *Population Studies* 43: 305-323.

Hajnal, H. J. 1965. "European marriage patterns in perspective", in D. Glass and D E. C. Eversley (eds.) Population in History, Edward Arnold, London: 101-143.

Hopkins, E. T. Kornienko. 2004. Running to keep in the same place> consumer choice as a game of status. Am Econ Rev. 94 (4): 1085-1107

Hægeland, T., T.J. Klette, and K.G. Salvanes. 1999. Declining returns to education in Norway? Comparing estimates across cohorts, sectors and over time. *Scandinavian Journal of Economics* 101(4): 555-576.

Jejeebhoy, S. 1995. *Women's Education, Autonomy and Reproductive Behaviour: Experience from Developing Countries*. Oxford: Clarendon Press.

Kennedy, S. 2004. Education and the Timing of Marriage and Childbearing: A Comparative Study. Paper presented at the Population Association of America Annual Meeting, http://paa2004.princeton.edu/download.asp?submissionId=42143

Knodel, J. 1988. *Demographic Behavior in the Past. A Study of Fourteen German Village Populations in the Eighteenth and Nineteenth Centuries*. Cambridge, UK: Cambridge University Press.

Konogolo, L. 1985. Variation in entry into motherhood and length of effective reproductive life among women in Kenya. *Studies in African and Asian Demography*. CDC Annual Seminar. *Place: Publisher?*

Kravdal, Ø. 2002. Education and fertility in Sub-Saharan Africa: Individual and community effects. *Demography* 39(2): 233-250.

Kravdal, Ø. and R.R. Rindfuss. 2007. Changing Relationships between Education and Fertility – A Study of Women and Men born 1940-64. Mimeo. Department of Economics, University of Oslo, Norway.

Lutz, W., A. Goujon, S. K.C., and W. Sanderson. 2007. Reconstruction of population by age, sex and level of educational attainment of 120 countries for 1970-2000. *Vienna Yearbook of Population Research 2007*, pp. 193-235.

Lutz, W., V. Skirbekk, and M.R. Testa. 2006. The low fertility trap hypothesis. *Vienna Yearbook of Population Research 2006,* pp. 167-192.

Mahy, M. and N. Gupta. 2001. Trends and Differentials in Age at First Birth in Sub-Saharan Africa. Paper presented at the IUSSP General Assembly, Brazil, August 2001.

Razi, Z.V.I. 1980. *Life, Marriage and Death in a Medieval Parish: Economy, Society and Demography in Halesowen, 1270-1400*. Cambridge, UK: Cambridge University Press.

Rodgers, Joseph L., Hans-Peter Kohler, Matt McGue, Jere R. Behrman, Inge Petersen, Paul Bingley and Kaare Christensen (forthcoming). "Education and Cognitive Ability as Direct, Mediated, or Spurious Influences on Female Age at First Birth: Behavioral Genetic Models Fit to Danish Twin Data." *American Journal of Sociology*

Skirbekk, V. 2008. Trends in fertility by social status. *Demographic Research* 18(5).

Skirbekk, V., H.-P. Kohler, and A. Prskawetz. 2004. Birth month, school graduation and the timing of births and marriages. *Demography* 41(3): 547-568.

Smith 1759. *The Theory of Moral Sentiments.* London: A. Millar.

Smits, J., W. Ultee, and J. Lammers. 2000. More or less educational homogamy? A test of different versions of modernization theory using cross-temporal evidence for 60 countries. *American Sociological Review* 65: 781-788.

Sogner, S., H.B. Randsborg, and E. Fure. 1984. *Fra Stua Full til Tobarnskull* [From High Fertility to the Two Child Family]. Oslo: Universitetsforlaget.

Solnick, S. and D. Hemenway. 1998. Is more always better? A survey on positional concerns. *Journal of Economic Behaviour and Organisation* 37: 373-383.

St. Bernard, G. 2003. Major Trends Affecting Families in Central America and the Caribbean. Paper prepared for United Nations Division of Social Policy and Development, Department of Economic and Social Affairs, www.un.org/esa/socdev/family/Publications/mtstbtables.pdf

Tournemaine, F. 2008. "Social aspirations and choice of fertility: Why can status motive reduce per-capita growth?" Journal of Population Economics (21): 49-66

UNESCO. 2003. *Global Education Digest: Comparing Education Statistics Across the World*. New York: United Nations Educational, Scientific and Cultural Organization.

UN. WORLD FERTILITY REPORT 2007. United Nations.Department of Economic and Social Affairs. Population Division

Van Bavel, J. 2006. The effect of fertility limitation on intergenerational social mobility: The quality-quantity trade off during the demographic transition. *J Biosoc Sci* 38(4): 553-569.

Wilson, C. 1984. Natural fertility in pre-industrial England, *Population Studies* 38: 225-240.