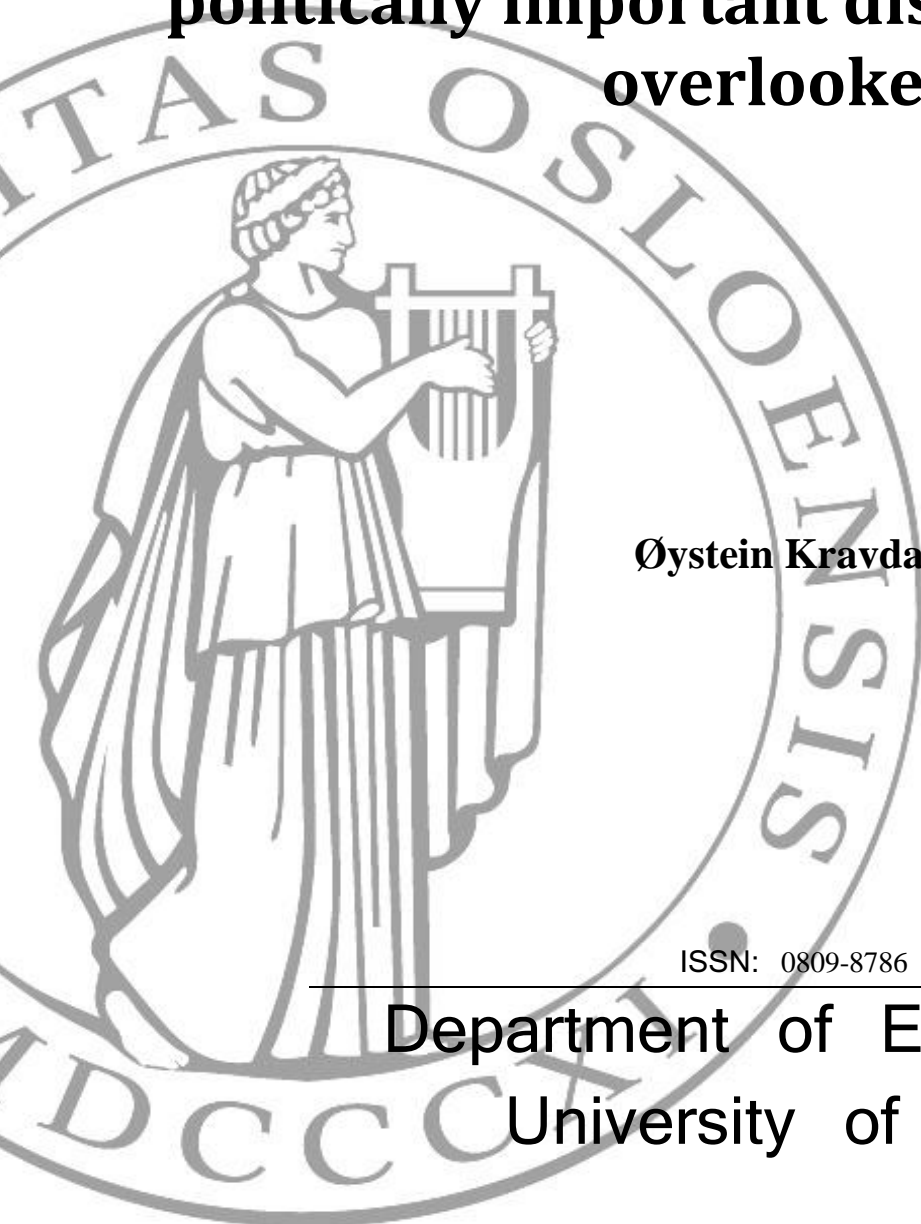# MEMORANDUM

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Expected and unexpected consequences of childbearing – a methodologically and politically important distinction that is overlooked

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Expected and unexpected consequences of childbearing – a methodologically and politically important distinction that is overlooked

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Abstract

Some consequences of childbearing are partly expected by the parents, while others clearly are difficult or impossible to foresee. In this paper, the different types of consequences, for parents or siblings, are briefly reviewed. It is then argued that if an effect of childbearing to a large extent is expected, varies between families, and is taken into account in the fertility decisions, it is very difficult to estimate the average effect. On the other hand, the existence of unexpected consequences is important from another perspective: Families' wellbeing could be higher if, hypothetically, people who make fertility decisions knew the consequences of childbearing that are currently unexpected to them. Thus, a reasonable state response to low fertility might be to support research on whether families on the whole would be better off with more children, and help disseminate research findings. It is not obvious that other types of family-level welfare disadvantages supposedly linked to low fertility can justify political interventions.

1. Introduction

There is much scientific interest in how a woman's or man's reproduction may affect her or his life in the short or longer term. In rich countries, there have, for example, been several studies of how childbearing and –rearing influence work activity (e.g. Boushey 2008) or health (e.g. Grundy and Kravdal 2010). In recent years, several authors have also made attempts to estimate effects of childbearing on the person's overall subjective well-being or "happiness" (e.g. Myrskylä and Margolis, 2014). Another and closely related research issue is how *children*'s lives are influenced by their parents' reproductive behaviour, i.e. by the number of siblings they grow up with and their age (e.g. Black et al. 2005). In addition to analysing such individual- or family-level effects of fertility, researchers have given much attention to the macro-level consequences, such as how the aging exacerbated by low fertility may affect public finances, quality of health care, and economic growth (Bloom et al., 2010; Lee and Mason 2014; Dormont et al. 2006) and the implications of population growth and changing age structure for the environment (McNeill 2006).

   In low-fertility settings, it is especially the potential macro-level consequences that have given rise to political discussion and in some cases reforms. For example, concerns about the sustainability of the pension systems in an aging population have been voiced in several countries, and this has in many of them led to changes in retirement eligibility criteria or support levels (e.g., Blake and Mayhew 2006). In some countries, concerns about societal consequences of low fertility have also motivated attempts to increase fertility (United Nations 2013). Arguments for trying to increase fertility in the parents' own interest have also been presented, but less often, and as explained below they are also less well-founded.

   The aim of this paper is to explain why it is important when doing research on the consequences of low fertility, and when discussing the motivation for such research and the need for political interventions, to make a distinction between individual- or family-level consequences that the parents do not expect and those that are expected. In short, there are two reasons. First, one will run into problems if the intention is to estimate an effect of fertility on a certain outcome and i) this effect to a large extent is expected and taken into account when individuals make fertility decisions, and ii) these expectations vary between individuals. This was pointed out recently by XXX (to preserve anonymity during review) and Deaton and Stone (2014), but has otherwise been ignored in the demographic literature. Similar problems have not attracted much attention in other social science areas either, although there is some consciousness about them and attempts have been made to suggest solutions or assess their magnitude (Blundell et al. 2005; Xie et al. 2012). Obviously, those doing research on effects of fertility should be aware of this methodological challenge.

   The second reason why the distinction between expected and unexpected consequences of childbearing is important is that families' wellbeing could be higher if, hypothetically, people making fertility decisions knew about the consequences that are currently unexpected to them. Thus, welfare gains could, in principle, be made by disseminating expert knowledge on how childbearing affects people's lives and doing further research about this. One should have this idea in mind when discussing possible policy responses to low fertility.

   Below, I first review briefly some consequences of fertility and discuss the extent to which these are expected by parents and whether there is likely to be much individual variation in these expectations, and in the unexpected consequences. In the next step, I explain the methodological problem that arises when estimating consequences of fertility that to a large extent are expected, varying, and taken into account in the fertility decision-making. This builds on an earlier discussion of this problem (XXXX to preserve anonymity), but key ideas are further developed. Finally, I discuss the relevance of the unexpected consequences

of childbearing from a welfare perspective and how their existence has implications for our thinking about population policies.

2. Individual- and family-level consequences of fertility: expectations and variations

2.1 Variations in expectations

Most parents probably expect that childbearing will have some effects that add positively to their wellbeing. Children are, for example, likely to show affection; they may help the parents feel that life has a purpose; they may be seen as giving the parents adult status (relevant only for the youngest parents); parents may enjoy engaging in various activities with children; and it may be rewarding to see children develop (Eiback and Mock 2011; Nelson et al. 2012; White and Dolan 2009). Furthermore, many parents may have an idea that children may provide practical and emotional assistance in old age (Brandt et al. 2009; Wenger et al. 2007), and in the poorest segments of the population, financial support from adult children may be yet another important benefit of parenthood (Rendall and Bahchieva 1998). On the more negative side, most parents probably expect that they will experience periods with less sleep while a child is young (Dørheim et al. 2009). More importantly, they may over many years have poorer work opportunities (Boushey 2008, Dommermuth and Kitterød 2009), a more strained economic situation than they otherwise would have (Aassve et al. 2007), worry about the children's wellbeing, and have less time for adult leisure activities (Bittman and Wajkman 2000).

Obviously, there are different views about exactly how *much* the various positive aspects of childbearing and -rearing add to life quality, and how strong the negative consequences will be. For example, some parents may have particularly strong expectations about deriving pleasure from interactions with children; some may expect to be able to work quite much and continue to have much time for own leisure activities while the children are young because they can rely on help from grandparents; and some may not care so much about the loss of leisure time. On the other hand, some may have so low income at the moment that the immediate costs of childbearing and resulting loss of possibilities for other types of consumption would be a very large concern; and some may have a general tendency to be easily worried and fear that worries about the children may be a heavy burden. In the most extreme case, what some parents see as positive consequences may be seen as negative by others. One possible example is that the intense supervision required when the children are very young may itself, aside from the consequences for the family economy and the parents' leisure activity, be considered as very rewarding by some parents, while others may see it as a burden (Poortman and van der Lippe 2009). Another example is that some parents may expect that the co-operation with a partner about childrearing will strengthen their relationship, while others may fear that the relationship may deteriorate (Twenge et al. 2003). An obvious implication of these differences in expectations is that some parents will conclude that they, on the whole, will be better off by having a child than by not having a child, while others will reach the opposite conclusion.

2.2 Reality versus expectations

It is possible that people foresee quite well, for example, the rewards from interacting with a child and from seeing him or her grow up, as this touches on deeply held values about what is important in life and may be quite persistent (although, the enthusiasm about these aspects of parenting may vary between individuals). In such cases where expectations are met to a large extent, one may say that the consequences have been "expected", "foreseen" or even – if the expectations were particularly strong – "known". Most commonly, however, the actual

3

consequences (themselves hard to identify both for the individual and any outside observer) will differ from the expected consequences, perhaps quite markedly. A rather trivial example is that parents cannot possibly know precisely how sleep deprived they will be when they have a young child and how they will feel about it. Another example is that some parents may experience larger reductions in leisure time or work opportunities because of childrearing than they expected, for example because grandparents were less able to provide help than they thought or because the children did not so easily accept to be looked after by others. On the other hand, a child may turn out to be a more important source of old age support than the parents expected.

In addition to these types of consequences that most people probably are conscious about, although expectations are not necessarily met, there may be consequences that are considered by fewer. One possible example of this is that parents, according to some evidence, tend to take generally fewer risks (Wang et al. 2009) than the childless. Besides, they are typically subjected to stronger social control (Joutseneemi et al., 2007; Kendig et al., 2007), and they may be better socially integrated into the community (Knoster and Eggebeen 2006; Bühler 2008; Nomaguchi and Milkie 2004). It is not obvious whether these consequences themselves would be deemed positive or negative. Anyway, they likely contribute positively to parents' health by affecting their lifestyle and for other reasons (Grundy and Kravdal 2010). Some people may be aware of these quite complex processes that tend to take place, while others may not think much about them.

While there has been research on how childbearing may affect the mentioned types of what we may call "social-behavioural" outcomes – both those that people may have some (often incorrect) expectations about and those they may have less expectations about – we do not know anything about the gap between the actual consequences and the expected. This gap is certainly highly varying. For example, some may expect that their feeling of loneliness in old age will be reduced by an amount Δy if they have another child. However, for a subgroup of these individuals, the effect on loneliness may turn out to be larger than Δy, for example because the child gets a job nearby and can very easily visit, while it may become smaller for others because the child turns out to be rather uninterested in having contact with the parents. (Note that there are many unpredictable factors that can make people more or less lonely – and which could be symbolized by adding a random term to a loneliness equation – but that is another issue. The point now is that there are variations in how the *consequences of children for the degree of loneliness* differ from the expected consequences.)

To continue with a stochastic version of this example, let us say that some people expect the chance of loneliness (a dichotomy for simplicity) to be reduced by 50% by having a child. However, for a subgroup the effect may actually be 40%, and for others 45%, 55% or 70%. It is, of course, possible that the unexpected contributions (-10%, -5%, 5% and 20%, respectively) tilt in a certain direction, i.e. their average is non-zero. If the average is positive, one could say that people tend to have underestimated the value of children as buffer against loneliness. (As further discussed below, it is possible that younger potential parents might benefit from knowing that.)

In contrast, some consequences are probably known to experts, but to few others, so in that sense they are "unexpected". To be more specific, there is a literature suggesting that the number of pregnancies, and the age at which the first occurs, probably affect the mother's chance of developing certain types of cancer (Salehi et al. 2008; Russo and Russo 2007) or other diseases (Naver et a. 2011; Skilton et al. 2009) through hormonal changes or other physiological mechanisms. It seems reasonable to consider these changes in the diseases risk as occurring in all women, and in the future just as much as in the past. In other words, they are "general" (or one might refer to them as constant or non-varying). If we assume, for example, that low fertility has an adverse health impact through such mechanisms, the

implication would be that having few children has more negative consequences than expected by the parents (although only a minority actually develop these diseases and other factors may play a much larger role in the disease etiology).

Finally, in addition to the mentioned types of unexpected consequences, there may be "general surprises". For example, perhaps a government suddenly decides – and without having ever indicated any plans about it - to increase the child allowances, thus reducing the adverse economic consequences of childbearing for everyone. It would, of course, be very hard even for experts to predict something that comes out of the blue like that, so it is truly unexpected for everyone.

2.3 Effects of number of siblings on children's wellbeing

Turning very briefly to the offspring perspective, the number of children in a family may also affect the *children's* wellbeing in many different ways. In particular, it is widely believed that children benefit from having at least one sibling—a notion perhaps underlying the two-child norm that has probably affected fertility in rich countries for a long time (Blake 1968). In support of such a notion, several (but not all) studies have shown that children with siblings tend to have particularly well developed social skills (e.g., Downey and Condron 2004). On the other hand, there are also potentially adverse effects of having (many) siblings. More specifically, there may be fewer economic resources available to children in large families, both during childhood and later (Keister 2003), and they may get less attention from their parents. In part because of such effects, one might expect a negative association between sibship size and children's education, but it has not materialized very clearly in recent investigations based on relatively advanced approaches to deal with the selection problem (Angrist et al. 2010; Åslund and Grönqvist 2010; Black et al. 2005; de Haan 2010). Adverse effects did not appear in a recent study of cognitive outcomes either; rather, the results pointed in the opposite direction (Sandberg and Rafail, 2014).

Unfortunately, there are no studies indicating the extent to which parents know the (often inconsistent) research-based evidence about such effects on siblings, what conclusions they draw from that, and how this influences their fertility decisions. However, it is at least commonly thought that many people especially in poor countries fear that they, for example, will be unable to give their children a reasonable education if they have many, and that this has implications for their fertility desires.

2.4 Winding up briefly

To summarize, the consequences of childbearing are more or less expected and more or less varying. As explained below, there is an estimation problem if consequences are expected and varying. The unexpected consequences, which may be seen as the differences between the actual and expected consequences (or, even more simplistically, "something that comes in addition to the expected"), are of different types. First, there are some consequences that almost all people consider, but that are hard to foresee exactly; in other words, there are unexpected contributions to those. Second, there are consequences that are probably less often considered, and to the extent that they *are* considered, there are unexpected contributions. In both cases, there is some expert knowledge about what tends to happen as a result of childbearing, but not what people tend to expect. Third, there are general physiological effects probably known only to experts, and fourth, there are "general surprises". The latter are least interesting, for obvious reasons, and therefore do not receive much attention below.

5

3. The problematic estimation of effects of fertility when these are expected, taken into account in fertility decisions and vary between individuals

As an illustration of the estimation problems that may arise, effects of fertility on parents' "happiness" are now considered. This is a particularly relevant example for two reasons. First, the effects involve components that probably are expected and varying. As mentioned, some people may, for example, be able to foresee with much certainty that caring for and interacting with a child will contribute strongly to making them happy, while others may have a different opinion. Second, the expected implications for the overall wellbeing are likely to be very central in people's fertility (and, of course, other kinds of) decision-making (Haybron 2003).

The reasons for the estimation problem are spelt out below, with the help of a few simple hypothetical examples built on the unrealistic assumption that a group of one-child couples expect to attain a certain level of happiness if they have a second child and another level if they do not have that child (perhaps the same as experienced initially), and that these are also the levels of happiness they actually attain if they have or do not have a child (i.e. the consequences are fully expected). No distinction is made between short- and long-term consequences, although some studies have indicated that parenthood may reduce happiness during young adult years and improve it in old age (Margolis and Myrskylä 2011). It is just assumed without further specification that the level of happiness remains at a constant and foreseeable level depending on the number of children born.

Before going further into the discussion of the estimation problem, it is important to define what one should mean by an effect of fertility on happiness for a couple (or individual). A reasonable definition is that the effect is the happiness H_1 that is felt if they have another child minus the happiness H_0 they would have attained otherwise, everything else fixed. Since this typically varies between couples, we are primarily interested in the average, which corresponds to what is referred to in the treatment effect literature as the "average treatment effect" (ATE; for basic terminology and ideas, see e.g. Angrist and Pischke 2009). However, we cannot observe hypothetical outcomes, such as the happiness that would have been attained if the couple who had a child had not had that child. What we can observe is the average H_1 among those who do have a child (we can call this $E(H_1 | 1)$) and the average H_0 among those who do not have a child ($E(H_0 | 0)$) . The difference is equal to the ATE if children are born at random, which they are not, of course.

Most researchers probably have an idea that they must control for factors affecting fertility that also affect happiness in order to find the true effect (ATE) – by including explicit measures of those factors in a statistical model or applying techniques to account for unobserved heterogeneity. Indeed, that would make good sense in the simple situation where i) the effect of childbearing on happiness is the same for everyone, and ii) those who actually have a child tend to have characteristics also associated with low/high happiness for other reasons. We refer to that below as the "standard selection problem". However, there is an additional problem, which is often intertwined with the "standard selection problem" and noted in the treatment effect literature. Speaking in general terms, it arises when the effect of the "treatment" varies across individuals and the effect is linked to the chance of the "treatment take-up". This is referred to below, for simplicity, as the "treatment-effect-heterogeneity problem", although it is not the treatment effect heterogeneity alone that is the problem, but the fact that the treatment effect heterogeneity is linked to the variation in the treatment take-up.

Applied to our case, the treatment-effect-heterogeneity problem is – as already indicated - as follows: First, effects of childbearing do vary, as should be clear from the earlier discussion. For example, some one-child couples may think – taking all advantages

6

and disadvantages into account – that a second child will make their life better than if they remain one-child parents, and they may be right in this judgement in the sense that they *do* attain a higher happiness level if they have a second child. Other one-child couples may reach the opposite conclusion and expect and attain a lower level of happiness if they have a second child. Second, the first group will be more likely to also want and have a second child. Therefore, we may see – to be a bit imprecise - relatively happy parents with two children, who to large extent are from the first group, and also relatively happy one-child parents, who to a large extent are from the second group. However, if those with two children instead had only one child, *they* would be much less happy.

The situation can alternatively be stated like this: A problem arises when we set out to estimate an effect of X (having a child) on Y (happiness) if people have expectations about that very effect – which, of course, may influence X (the chance of having a child) – and if these expectations are reasonable and vary from individual to individual. In contrast, if effects were completely unexpected, or if they were the same for all individuals, there would not be an estimation problem.

3.1 Hypothetical quantitative examples

The following very hypothetical quantitative example may strengthen the intuitive understanding of the treatment-effect-heterogeneity problem. Let us assume that there is one group (called Group 1) of 200 one-child couples who expect a happiness level of 12 if they do not have a second child and 17 if they have a second child (see Table 1). These numbers are, of course, completely arbitrary. Furthermore, assume that the expected happiness is the same as what is actually attained in these situations. Thus, the effect of childbearing on their happiness would be 5. In another group of 100 one-child couples (Group 2), the situation is opposite, and the effect on happiness is -5. Thus, the average effect across the two groups is 1.67.

The symmetry in the expectations is meant to symbolize that one fertility outcome is not considered generally inferior to the other. People simply have different ideas about what is good for them, for example because they have different preferences about spending time on own leisure activities compared to spending time caring for or interacting with a child. Those who think it is best to have one child and also do end up with one child are just as happy as those who prefer two children and also end up with two children, and failure to attain the preferred fertility level because of sub- or infecundity or inadequate use of contraception results in the same welfare loss for everyone. (The fact that the preferred fertility level may be different from what they would prefer in an ideal world is another issue which is discussed briefly below.) This simple example should represent well enough a part of reality, and therefore be a relevant starting point.

Let us then make the unrealistic assumption that these ideas about consequences of childbearing have no impact on fertility, so that the proportion having a child is the same in both groups. In Table 2, this proportion is 50% (the conclusion would have been the same if it instead had been set to, for example, 30%). Those who have a second child are referred to as Subgroup a, and those who do not have a second child are referred to as Subgroup b. In this case with "random fertility", the observed difference in happiness between those who end up with one and those who end up with two children is equal to the true average effect of 1.67, so there is no problem.

(Tables 1 and 2 about here)

7

Much more realistically, let us instead assume that a much larger proportion in Group 1 have a child. Say that 90% have a child, in contrast to 30% in Group 2 (see Table 2). In that case, the average level of happiness among those who end up with two children is 16.27, while it is 15.89 among those who end up with one child. The difference is 0.40, which is far from the true average effect of 1.67. It should be noted that if those who end up with two children had had only one, their happiness would have been 12.71. The difference between 16.27 and 12.71, which is 3.58, is the so-called "average treatment effect among the treated".

(Table 3 about here)

As explained in some more detail below, existing statistical techniques cannot give us the true average effect of 1.67 when the situation is as in Table 3. However, they can handle what was referred to above as a "standard selection problem". A simple example of such a problem, building on the earlier illustrations, is that i) the population under study consists only of one main group, such as Group 2, so that fertility has the same effect (-5) on happiness for everyone, but ii) the chance of actually having a child depends on some factor X that affects happiness anyway through other channels. For example, some individuals may not use contraception efficiently, which increases their chance of having another child, and also have a generally low happiness level. In this case, the difference in happiness between two- and one-child couples is not equal to the true (average) treatment effect, but we can deal with this by including X in a statistical model. Alternatively, if there is not data on X, one can resort to twin analysis (assuming that X is shared between twins), as Kohler et al (2005), or do a longitudinal within-couple or within-individual fixed-effects analysis (assuming that X is constant over time), as Myrskylä and Margolis (2014). (Propensity score matching is essentially the same as controlling for X, and one could include earlier happiness in the X vector as an alternative to the within-individual fixed-effects analysis.)

In practice, something that resembles the "standard selection problem" and the "treatment-effect-heterogeneity problem" may well be intertwined. To give an example of that, assume that there are two groups of people with different perceived consequences of childbearing, 5 and -5 as in the examples above. Assume further that those with a certain characteristic X are more likely to be in the group where the effect is -5, therefore also having the weakest fertility desires and lowest fertility. X could, for example, be an indicator of poverty (although a lower fertility among the poor is neither theoretically obvious nor empirically well established). Finally, assume that these poor people also have the generally lowest happiness levels (6 if they do not have a child and 11 if they have a child in one subgroup and the opposite in the other, rather than these numbers being 12 and 17 as in the other examples). Table 4 gives details of this example. The difference in happiness between one and two child couples is 1.92.

(Table 4 about here)

How do various existing estimation techniques handle the situation in Table 4 or something similar to that? Three alternatives were checked in an earlier paper (XXXX to preserve anonymity), and the conclusions are summarized here: First, a cross-sectional regression on a sample such as in Table 4 and with poverty included as a regressor did, unsurprisingly, not give the true estimate of 1.67. Second, a female twin sample was set up based on the assumption that poverty was an unobserved characteristic shared between twins,

8

and that even ideas about consequences of childbearing were shared. (Turning from couples who have expectations and bear children to individual women does not undermine the essence of the argumentation, of course.) The sample (magnified for some practical reasons) included 1800 pairs of non-poor twins who agree that the happiness outcomes resulting from having/not-having a second child are 17/12, 200 pairs of poor twins for whom the outcomes are 11/6, and 500 pairs of non-poor and 500 pairs of poor twins who have the opposite view of childbearing, i.e. 12/17 among the non-poor and 6/11 among the poor. Each woman has a chance of actually having a child such as described earlier, i.e. 90% or 30%. In a simple regression based on all women, the effect of childbearing was, of course, 1.92. Adding twin dummies did not give the correct estimate of 1.67, but -0.38. However, the effect was at least the same regardless of whether the poor had a generally lower happiness level.

Thirdly, a sample for within-couple longitudinal analysis was set up by assuming that happiness was measured twice, that all couples had one child at the first measurement, that it was possible to have a second child before the second measurement, and that poverty was an unobserved time-invariant characteristic. Further, it was assumed that the happiness levels at the second measurement were as in Table 4, and that the happiness at the time of the first measurement was the same as it would have been at the second measurement if they had not had a child. A regression based only on the second measurements gave, of course, 1.92. When both measurements were considered and couple dummies were added, the estimate was 3.58, which is again different from the true average treatment effect of 1.67, but equal to the true "treatment effect among the treated".

Also with the latter approach, the estimate was the same regardless of whether the poor have generally lower happiness levels. Therefore, one might say that the techniques deal with the additional bias that comes from the kind of selection that lies in the poor (according to the assumptions) having generally lower happiness levels and expecting less from childbearing. Obviously, that is a meager comfort.

In reality, the consequences of childbearing for happiness is not exactly as described in these examples. While there will be contributions to the consequences that are expected and varying (e.g. some may know they will enjoy interacting with children and that the loss of time for own leisure activities will not bother them, while others have different vies), there are also other types of consequences. First, it is possible that some consequences are expected and somewhat general, though that was not explicitly mentioned in the earlier discussion. For example, one could speculate whether everyone perhaps expects quite correctly to have good feelings about seeing someone, so to speak, living after them. Second, and more importantly, there are unexpected and varying consequences (because of numerous unforeseeable idiosyncratic factors that may make children more or less of a source of happiness), and more general unexpected consequences (e.g. physiological effects or what was referred to as general surprises). If we consider the total effect on happiness as a sum of all these types of contributions, its estimate will be the biased figure such as one gets when there are varying expected consequences (as just explained) plus i) a correct estimate of any general expected consequences, ii) the average of the unexpected and varying consequences, and iii) a correct estimate of the general unexpected consequences. This is easy to see by just modifying the earlier examples a little.

In other words, although the consequences for the happiness are not entirely of the category "expected and varying", the fact they probably are so to a considerable extent means that there is an estimation problem. To be more general: Whenever part of an effect is expected and varying there is an estimation problem. The larger this part is, the larger is the problem.

An obvious implication of this argument is that if we are interested in learning about the unexpected consequences, which could have been estimated more easily if they existed

alone, there are problems because they are part of a broader effect, and this broader effect is even misestimated. This issue is returned to below, where the focus is on the unexpected consequences.

3.2 Summary and conclusion

To summarize and conclude, it is not obvious how useful it is – for politicians, planners and individuals - to learn about the average effects of fertility on happiness if the effects differ widely, as in the examples above (-5 and 5), and are also known to individuals. This issue of usefulness is addressed in more detail below. Besides, this average is even very difficult to estimate. Existing techniques can deal with the "standard selection problem" - more precisely the (additional) bias that comes from unobserved or observed factors operating like X or poverty in the examples - but not this "treatment-effect-heterogeneity problem". At best, one can estimate the effect on happiness for those who do have a child (i.e. the average treatment effect among the treated, which is 3.58), but how interesting is that? The effect of childbearing would be less positive for the others.

Given these problems, one should be very careful when reporting results based on existing techniques, and not give the impression that we know much about how childbearing affects parents' happiness in general. Some economists and sociologists are aware of corresponding problems in their fields (see below), but demographers have not taken this to heart when analyzing effects of fertility on happiness.

3.3 Estimation problems when studying other consequences than happiness

There has been no consciousness about this estimation problem in studies of other effects of childbearing on parents' and children's lives either, even though it is relevant whenever the effect to a large extent is expected and varying and is taken into account in the fertility decision-making. Consider, for example, the importance of the number of siblings for children's education in a poor setting. This effect typically varies between families: Some will send their children to school regardless of how many children they have, because it is affordable and practically possible, while others may not be able to send all to school if they have many. Then, if there is general agreement about education being important for children's wellbeing (which parents are likely to take into account) and perhaps also for the parents themselves, families with many children may to a particular extent include those who think they can afford to educate so many children, and who may well be right about that. Thus, if those with a more moderate number of children had an unwanted child, there might be somewhat more adverse effects of that on the children's education than the difference between high- and medium-fertility groups would suggest. Whereas all research on how sibship size affects education takes into account - with varying degree of sophistication - that many individual and community factors may lead to high fertility as well as low education (Kravdal et al. 2013), this additional problem due to subjective evaluations of how childbearing may affect education and the link between these and the fertility desires remains.

However, there is one important difference between such studies of more specific outcomes and analyses of the fertility-happiness effect: While the more specific consequences of childbearing may vary between individuals, and may be taken into account, they probably carry less weight in the fertility decision-making and are less important for the actual childbearing than the expected consequences for happiness. Any such specific consequence is only one among several that contribute to the effect on happiness.

10

To broaden this even more, a similar problem arises also when analyzing effects of some other demographic events, such as the effects of divorces on children's wellbeing: Parents who are particularly likely to expect that a child will benefit from a disruption rather than being harmed, and who may well be right in that judgement, may be overrepresented among those who decide to end an unsatisfactory relationship. This argument hinges, of course, on the quite obvious assumption that children's wellbeing matter for people, so that they take it into account when making decisions.

3.4 Assessing the magnitude of the problems and searching for better solutions

Obviously, it would be valuable to know how large the estimation problem actually is in various analyses, to avoid some types of studies and present results from others with the due amount of caution. One step towards that could be to ask people, in prospective and retrospective surveys, how they think or thought a child might affect their lives and that of their children in different ways (suggesting specific alternatives), how important each of these arguments is or was for their fertility desires or actual fertility, and whether the expectations have been met. However, it is, of course, hard to answer such questions about earlier considerations and expectations and to make judgements about how childbearing has influenced their lives. An even better alternative, but requiring more patience, would be to combine prospective surveys with follow-up interviews several years later.

Questions of this type have been asked in some qualitative studies (Newman 2008; Marczak 2014) and in quantitative surveys such as GGS, but they have typically considered a smaller range of possible consequences of childbearing and have not addressed the links to actual fertility and actual consequences of childbearing.

Xie et al. (2012) suggested another way to gain insight into the magnitude of the problem: They pointed out that one could check whether the "treatment" effect varies with the "treatment take-up" by estimating the interaction between the "treatment" variable and the predicted propensity to "take the treatment". An important limitation of this strategy, however, is that the propensity score is calculated from observed variables exclusively.

It would, of course, also be valuable to develop statistical techniques that are better than those currently existing. One possible approach when analyzing effects of fertility on happiness is to group the population by "family attitudes" (Balbo and Arpino 2014). Within each such category, there is still variation in the expected effects of childbearing, but less, so one may say that the problem remains in a smaller version. Furthermore, Blundell et al. (2005) suggested an instrumental-variable approach that involves the use of a so-called control function. A central assumption was that there is a common unobserved factor behind the "treatment" (fertility), the outcome and the effect of the "treatment" on the outcome. However, an exclusion restriction would be required, as with other types of instrumental-variable estimation, and it may not be easy to find a variable affecting only fertility and not the outcome under study.

4. A welfare and policy perspective on the distinction between expected and unexpected consequences of childbearing

4.1 Possibilities for welfare improvements through research and dissemination of research-based evidence

In addition to being methodologically important, the distinction between expected and unexpected consequences of childbearing is important from a population welfare perspective. This is because, in theory, families' wellbeing could be higher if adults making fertility decisions knew about and took into account the consequences that are currently unexpected to them. Some families would have been better off in total if more children were born (the unexpected consequences on the whole being positive), while others would be better off if fewer children were born.

Given the theoretical possibility of such a welfare gap, in either direction, it would make sense to check the situation empirically – with an eye to the overall wellbeing as well as to specific outcomes, which families may place different relative weight on in their judgements of the overall wellbeing. If statistical analysis reveals that there actually *is* a gap between expected and actual consequences - on average across the population or a subgroup of the population - information about that should be spread to the public. People might then take other fertility decisions, so that families on average would attain a higher level of wellbeing. Thus, the total welfare of the population could be improved if the costs of the information campaign and research are not too high. Obviously, if analysis instead reveals that unexpected effects vary around zero, and people are informed about that, they would and should not feel the same need to make other fertility decisions than they otherwise would do. In other words, information about such a pattern would be much less useful. At least, this would be a relevant argumentation with respect to what was referred to as the unexpected social-behavioural consequences. The physiological consequences are more general. Besides, some are already documented and it seems likely – even without having done any investigations – that they to a large extent are unknown to the public. All these issues are elaborated on below.

A complicating factor is that it is not obvious how one should summarize wellbeing across adults and children in the family. For example, what is consider good for the children may be bad for the adults or vice versa, and it may be difficult to weigh these consequences against each other. For simplicity, this problem is not further discussed.

Social-behavioural effects. As mentioned, a number of studies have tried to shed light on how childrearing affects various aspects of people's life and lifestyle - such as work activity, health behaviour or the inclination to take risks. However, no attempt has been made to separate out the unexpected component. In principle, one could analyse that component explicitly through surveys that allow people to make comparison between how they *thought* a child would affect their life and lifestyle and what they *judged* to be the *actual* consequences of having or not having that child. Such assessments are, of course, very difficult to make, but some people may conclude, for example, that they regret they did not have more children. Considering their entire life, they may think that a larger number of children would have given them some advantages that they did not expect when they decided against further childbearing many years earlier. One reason could be that they at that time underestimated the benefits with respect to old age support. Surely, there will be much variation in these assessments, and some would reach the opposite conclusion. However, if people on average have been too pessimistic or optimistic about the consequences of having children, information about that should be disseminated in an attempt to help the younger generation to take "better" fertility decisions and attain a higher level of wellbeing.

One limitation of this argument – in addition to the obvious difficulties involved in forming opinions about consequences of hypothetical behaviour - is that the consequences that have been unexpected for the currently quite old may not be relevant for those who are about to make their decisions; there may not be much persistence in these unexpected

12

consequences. Besides, one may wonder how valuable it would actually be to know the average when there is much variation. If statistical analysis shows, for example, that having few children *tends* to have even more adverse impact on old age loneliness than expected, while it is clearly opposite for many, how would this information be used by decision-makers? Would it inspire some additional pondering on the pros and cons of childbearing? Would they know something about themselves that could make them conclude that they are less likely than others to expect too little value of children in this particular respect?

As an alternative to exploring unexpected consequences of childbearing explicitly one might consider studying effects of fertility on life and lifestyle without trying to separate out the unexpected – based on an idea that it cannot be a large problem for people to learn something they already know or expect. However, a problem with such an approach would be that, when the consequences include unexpected components as well as expected (and varying) components, the estimate of these broader consequences may- as just explained – be biased. (In contrast, the same estimation problem would not be present if the unexpected consequences existed alone.)

To conclude, it would in principle be valuable to learn about the pattern in the unexpected social-behavioural consequences, primarily if i) these consequences tend to go in a certain direction (i.e. average not zero), and ii) they do not vary much over time and across individuals. Estimation is difficult, however.

Physiological effects. As mentioned, there is some expert knowledge about physiological effects that most people are probably unaware of. Presumably, these effects are rather persistent and general, so it would be particularly helpful for people to learn about them. Admittedly, there are not huge changes in the disease risk as a result of childbearing. For example, having three children rather than one has in a meta-analysis been found to reduce the chance of a relatively common disease such as breast cancer by one-seventh (Collaborative Group on Hormonal Factors in Breast Cancer 2002). It is possible that relatively few people would take risks of that magnitude into account in their decision-making. Moving the focus a little, there are larger effects of the timing of first birth on breast cancer (Grundy and Kravdal 2010), but they may still be too small to be widely considered. Of course, there may be other consequences of this type that are still not identified, and these could well be larger, so ideally further research should be carried out to learn more about such effects and the findings should be disseminated. Such research adds, of course, also to the pool of knowledge about human physiology, which has a much broader value.

However, there are challenges and limitations also when it comes to these physiological consequences. First, there are several such consequences, which go in different directions, and it may therefore be hard for people to "summarize" them in order to form a conclusion about the optimal family size. Second, there is uncertainty about the consequences; estimation is difficult, just as with the social-behavioural consequences. One issue is that existing studies typically have been based on observational designs, which involve obvious selection problems (unobserved factors affecting both fertility and the health outcome under study). Besides, although the estimated effects may make good sense in light of what we know about physiological mechanisms from laboratory investigations, they may also capture social effects, such as the changes in lifestyle that often take place because of responsibility for children. For example, the mentioned consequences of childbearing for breast cancer could be partly a result of lower alcohol intake among women with many children (Bagnardi et al. 2015), rather than reflecting a purely physiological process. Estimation is, as pointed out earlier, difficult when the unexpected physiological consequences we are interested in are embedded in a broader set of consequences, and even

more so when this includes a social-behavioural component that may be expected and varying and taken into account in decisions.

This also means that it is not very helpful to consider epidemiological studies of associations between fertility and overall health or mortality (Grundy and Kravdal 2010) as an alternative to "summarizing" the evidence from studies of specific health outcomes where physiological mechanisms are particularly likely to play a role. These broader studies capture consequences on many other diseases, which involve social pathways to a very large extent.

4.2 Policies in response to concerns about individual- and family-level effects of low-fertility

These ideas about potential welfare improvements through research and dissemination of research-based evidence about unexpected consequences of childbearing are clearly relevant for discussions about how to respond to the potential individual- and family-level disadvantages linked to low fertility. The argument would then be that, since it is possible that people on the whole would have been better off with more children (rather than fewer), it would be reasonable with a public involvement in activities such as mentioned. By supporting research to see whether a higher fertility level actually would have been better for the families, and spreading information, it might be possible to increase the level of wellbeing in the population – provided that the costs of these activities are not too high.

Furthermore, if experts know that a certain behaviour – such as having a child – would be better for a group of people than they expect themselves, it could even make sense not only to spread knowledge about that, but also encourage the behaviour through subsidization. This would be relevant if the knowledge is not spread adequately or people for some reason do not take their knowledge properly into account. An amount will then be spent to reduce childbearing costs – down to a level that makes more people conclude that what they expect to benefit from having a child matches the costs – but this may be counteracted by the additional welfare gains from having that child that the parents did not take into account or were not aware of. However, for such a strategy to be good from a societal welfare perspective, there should also be a total net gain when the transaction costs involved in the subsidization are considered.

In addition to this possibility that <u>fertility desires are not optimal</u> for the families themselves, are there any other individual- or family-level disadvantages linked to low fertility that could justify political interventions?

<u>Wanted vs. ideally wanted children.</u> One possible reason for concern about low fertility could be that some people, for example, might have wanted two children in an ideal world where they were richer or childcare were available at a lower price, but want only one in the situation that they actually experience. It has sometimes been argued that such a gap between "ideal fertility" and actual fertility desires is a "problem" that calls for political attempts to raise fertility (see e.g. Commission of the European Communities 2006; Fahey and Spéder 2004). However, it is far from obvious that interventions are really justified, as pointed out also by Lutz (2007).

To illustrate this through a rather simplistic economic argument, let us first assume that, for some people the additional wellbeing derived from having another child would not match the "price" of having that child. For that amount they would be able to buy or do something else that would give them more satisfaction. In other words, they might have wanted a child if childbearing had been less expensive, but not in the actual situation. If the childbearing costs were pushed slightly below what those people see as the value of a child, for example by subsidizing childcare, they might have a child and thus improve their wellbeing slightly. In other words, the public money going into childcare would not produce

14

much additional welfare in the population, unless there are positive externality effects of higher fertility. Also, in the absence of externalities, why could we not instead subsidize Rolls Royce cars, to change the situation for those who would find many pleasures in driving such a vehicle, but not consider it worth its current price?

The argument could be twisted a little by instead assuming that the costs of having a child are not higher than the value of the child - so that the person indeed would be interested in spending on childbearing - but that the income is so low that the costs simply cannot be met. Then, if the costs are covered by the public, the person can have a child, and his or her welfare gain because of that will exceed the public subsidization costs. However, this argument would be more relevant if we considered something even more expensive and of even higher value, such as advanced lifesaving treatment. More importantly, why should we help people who ideally would like to have a child to have that child rather than helping those who would derive just as much pleasure from something else that costs more than they can afford, assuming again no externalities?

Finally, one might consider increasing people's incomes through public transfers. That would typically increase their wellbeing, perhaps by a corresponding amount, but not necessarily because they can "buy" a child. Some would instead use their additional purchasing power to buy luxury goods or take long vacations, and then increase their wellbeing by just as much.

Getting fewer children than wanted. A related issue is that some people have fewer children than they want because of sub- or infecundity (while others have more children than they want because of inadequate contraceptive use, which is a particular concern in poor countries). For example, some one-child mothers or fathers may have wanted more children, but been physically unable to satisfy that desire. Furthermore, some people are childless because they are unable to conceive (although some of them might have been able had they tried earlier). It has been indicated in some studies that around one-third of those who remain childless may be in this "involuntarily childless" category (TeVelde et al. 2012).

In some cases, people may be able to have the child that they want if existing medical technology is applied, although one could argue as above that it may not be a public responsibility to cover the expenses - these being part of the childbearing costs just as the childcare expenses mentioned earlier. The situation is different if the value of a medical treatment is huge and clearly would exceed the costs, but these costs are higher than an individual can afford. As already explained, a total welfare gain for society may then be achieved if the costs are covered by the public, which one can think of as everyone else paying a little share. (This is, in fact, one of the ideas underlying private and public health insurance systems.) Fecundity-related treatment may not fall into that category, however.

Obviously, it could also make good sense to support the development of new medical techniques that can help people who are not physically able to have the child that they otherwise would want: The costs of this research could well be outweighed by the increased wellbeing for these parents (taking also into account that they may have to pay for the treatment).

4.3 Low-fertility externalities?

In addition to the mentioned individual- or family-level disadvantages linked to low fertility - and which not necessarily justify public concern and interventions - there are macro-level effects that more obviously deserve attention and may be good motivations for interventions. In particular, low fertility leads to an older population than one would otherwise have and lower, and perhaps even negative, population growth. With such a demographic situation it

15

may be more difficult to finance pensions and health care. On the other hand, there may also be advantages because of a more slowly growing labour force to equip for production, fewer children to educate, and compensatory savings. Thus, it is not so obvious that low fertility, on the whole, will be harmful to the economy, and especially if it is only moderately below the replacement level (Bloom et al., 2010; Lee and Mason 2014). Furthermore, an older and smaller population may lead to less environmental degradation (McDonald et al. 2006).

To the extent that low fertility has a net adverse effect through such societal effects, policies to raise fertility – for example through subsidization of childbearing costs - may be justified. The requirement is, of course, that the costs involved in encouraging people to want and have more children do not exceed the societal-level gains from a higher fertility level. Evidence for this will, of course, often be hard to establish.

Besides, there is what one may call a secondary or indirect externality: The effects that a couple's fertility has on their own and their children's lives—for better or worse—may also have implications for others (which they are not likely to take into account in their decision-making). One example is that those with no or few children may be more weakly integrated into the community. While this may be acceptable to them - and perhaps foreseen and considered an accepted cost - there may be less positive implications for other people, one reason being the possibly positive health effects of social cohesion (Islam et al. 2006). Another individual-level effect of low fertility is that the mothers will be more likely to have paid work. This will probably have important, and perhaps largely positive, societal implications. Yet another type of spill-over effect is that the entire society may be influenced if it is the case that children without siblings tend to be less sociable than other children.

Given the possibility that there are such individual- or family-level consequences of fertility with further implications for society, it might be valuable for politicians and planners to know about them – to prepare for or make the most out of what comes if fertility falls or rises. Going back to the main classification, the consequences of childbearing can be expected and varying, expected and general, unexpected and varying, and unexpected and general. As explained, it would be particularly valuable for individual decision-makers to be aware of the latter, although they might also benefit from knowing the average of the unexpected and varying consequences and get an idea about the amount of variation. The situation is different for politicians and planners. For them, the distinction between what is expected and what is unexpected (for individuals) would not be so important. They might benefit from knowing about especially the *general* consequences – regardless of whether they are expected or unexpected - because if fertility goes up or down in the future, and if the consequences of childbearing vary between individuals, a key issue will be whether the fertility change will take place among the groups for whom the consequences of childbearing are large or small, or negative or positive. That will typically be difficult to know.

5. The bottom line

To summarize, consequences of childbearing are more or less expected and more or less varying. If the consequences are expected and varying (for example, some people may know they will be happy interacting with children, while others are less enthusiastic about this) they are very hard to estimate. This methodological problem is particularly large when estimating the consequences for happiness, but it is also relevant when studying consequences for other outcomes, and also when studying, for example, consequences of parental disruption. Researchers should be aware of this problem, and it is an obvious goal to learn more about it, so that subjects where the problem is most pronounced can be avoided and findings interpreted as cautiously as needed. Besides, attempts to develop methods mitigating the problem should, of course, be welcome.

Turning to the other side of the coin, the fact that there are also many unexpected consequences of childbearing is important from another perspective: Families' wellbeing could be higher if, hypothetically, people who make fertility decisions knew about and took into account the consequences of childbearing that are currently unexpected to them. Thus, welfare gains could, in principle, be made by taking four steps. First, one could spread existing expert knowledge about physiological consequences of childbearing that are probably largely unknown to the public, although there is uncertainty about them. Second, one could carry out research to see if there are additional such consequences and disseminate results from that research. Third, one may try to find out whether there are social-behavioural consequences that tend to go in a certain direction, which is far from easy. Fourth, one may spread information about the latter, although it is not obvious how useful such knowledge would be for the decision-makers.

It is, of course, possible – and especially in low-fertility settings - that families on the whole had been better off with more children (rather than fewer). A reasonable state response to such a possibility would be to be to get involved in the mentioned activities. By supporting research to see whether a higher fertility level actually would have been better for the families, and spreading information, it might be possible to increase the level of wellbeing in the population, unless the costs of these activities are too high. If there are strongly positive consequences of childbearing that are unexpected to the decision-makers, it could also in some situations make sense for politicians to try to encourage childbearing through subsidization. It is not obvious that other types of individual- or family-level welfare disadvantages that have been suggested to be linked to low fertility can actually justify political intervention, but there may be good macro-level arguments for intervention (although externality effects of low fertility are not exclusively adverse).

In addition to individual decision-makers' possible benefits from learning about consequences that that they are currently not aware of, and especially if they are of a general nature, it could be argued that knowledge about consequences that are quite general could be valuable from a projection and planning perspective – regardless of whether they are expected or unexpected. In contrast, consequences that to a large extent are both varying and expected – and which are hard to estimate - would not be very *useful* to estimate either.

Hopefully, these reflections will contribute to improve population policy debates by strengthening their theoretical underpinning. Besides, they should be highly relevant for discussions about the motivation for continued analyses of the consequences of fertility and the methodological challenges in that research area.

6. Acknowledgements

17

7. References

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Table 1. Effects of hypothetical childbearing on happiness in two groups.

Group	Number of couples	Expected happiness (=actual)		Effect
		If not 2nd child	If 2nd child	
1	200	12	17	5
2	100	17	12	-5
		Average effect: 1.67		

Table 2. Differences in happiness between those who have one and those who have two children, when fertility is unrelated to the expected effects of fertility on happiness.

Group	Sub-group	Number of couples	Expected happiness (=actual)		Effect	Having 2nd child? (% of group)	Actual happi-ness
			If not 2nd child	If 2nd child			
1	a	100	12	17	5	Yes (50%)	17
1	b	100	12	17	5	No (50%)	12
2	a	50	17	12	-5	Yes (50%)	12
2	b	50	17	12	-5	No (50%)	17

Average effect: 1.67

Average happiness among those with 2: 15.33

Average happiness among those with 1: 13.67

Difference :   1.67

Table 3. Differences in happiness between those who have one and those who have two children, when fertility is related to the expected effects of fertility on happiness.

Group	Sub-group	Number of couples	Expected happiness (=actual)		Effect	Having 2nd child? (% of group)	Actual happiness
			If not 2nd child	If 2nd child			
1	a	180	12	17	5	Yes (90%)	17
1	b	20	12	17	5	No (10%)	12
2	a	30	17	12	-5	Yes (30%)	12
2	b	70	17	12	-5	No (70%)	17

Average effect: 1.67

Average happiness among those with 2: 16.29

Average happiness among those with 1: 15.89

Difference : 0.40

Table 4. Differences in happiness between those who have one and those who have two children, when fertility is related to the expected effects of fertility on happiness, and there are two groups with different general levels of happiness and different expected effects of fertility on happiness.

Group	Subgroup		Number of couples	Expected happiness (=actual) If not 2nd child	If 2nd child		Having 2nd child? (% of group)	Actual happi-ness
1 non-poor	a		162	12	17	5	Yes (90%)	17
1 non-poor	b		18	12	17	5	No (10%)	12
1 poor	a		18	6	11	5	Yes (90%)	11
1 poor	b		2	6	11	5	No (10%)	6
		Total	200					
2 non-poor	a		15	17	12	-5	Yes (30%)	12
2 non-poor	b		35	17	12	-5	No (70%)	17
2 poor	a		15	11	6	-5	Yes (30%)	6
2 poor	b		35	11	6	-5	No (70%)	11
		Total	100					

Average effect: 1.67

Average happiness among those with
2children (i.e. 1a+2a, poor and non-poor; 210 couples in total):   15.34
1child   (i.e. 1b+2b, poor and non-poor; 90 couples in total):   13.42
                                                            Difference: 1.92