TWO PAPERS ON FERTILITY - THE CASE OF SWEDEN

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Abstract

This thesis consists of two papers dealing with fertility in Sweden. In paper [1] we discuss possible explanations for the variation in the Swedish fertility. We are primarily interested in economic and social conditions and their impact on the total fertility rate between 1965 and 2003. The period is chosen because of (i) the strong fluctuation in the TFR during the period 1965-2003 and (ii) the positive correlation between fertility and the female labour market participation rate from the early 1980s. This contrasts to earlier periods when the negative relationship was prevalent. The results from the study support a positive effect on fertility from female labour market participation and child allowance while divorces report a negative effect. The model structure that includes short run as well as long run effects seems to be the best specified model of a number of different model structures presented in the paper.

Contrary to the first paper, the second paper [2] has as starting point the number of children born by women in Sweden. A zero inflated Poisson model is applied to analyse if economic and social conditions have any impact on the number of children born by women in Sweden. The study is based upon women who have completed their life-time fertility cycle. The different variables on completed fertility is compared with women who still are in their fertile ages. The results show a difficulty to combine market work and children. The results also support the assumption that women with higher education have fewer children than women with lower education. However, an important conclusion from the study is that the negative correlation between a woman's level of education and her number of children only hold when incomplete fertility is analysed. The relationship between female education and children is not valid when completed fertility is studied.

Keywords: Total fertility rate; Completed fertility; Non-completed fertility; Time series; Count data; Sweden

Classification [JEL]: D19; J13
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Umeå in April 2006

Thomas Westerberg
This thesis consists of a summary and the following two papers:


1 INTRODUCTION

During the 1990s the fertility rate, and the number of new-born children fell quite heavily in Sweden. The main reason was the deep recession in the beginning of the decade and the consequences that followed. It was, however, not until the crisis was over, i.e. during the second half of the decade, that any direct concerns about the drop in the fertility rate were expressed (see e.g. Hoem, 2000; Demografiska rapporter 2001:1). The growing demographic un-balance and the increasing average-age of first-time mothers were two such factors people started to pay attention to. The former because of the excess of deaths over births for the first time in 200 years and a general concern for the future relation between the supporters and the ones supported for. The latter because of the increasing risk women may face by postponement, since becoming childless or having difficulties in getting pregnant are in many cases age-related (see e.g., SOU 2001:79; Björklund et. al., 2001)

By the end of the 1990s fertility had become a hot issue. It was on the agenda by the politicians, researchers, unions, and employers and not least by the media. The attention has since then been immense and also been extended since the scope of interest on this matter has become wider and wider. Today almost all aspects on fertility and family building – economic, regional, social, medical etc – are under study .

Our research interest here is mainly related to the labour market. The relationship between fertility rate and labour market participation has changed. Today economic booms and baby booms are appearing at the same time as economic recessions and low fertility. It is however obvious that besides economic booms and busts changes in labour market conditions, attitudes, prejudices etc also matters. While some young adults experience a negative attitude towards combining work, pregnancy and parenthood, others may meet a lot of understanding and positive attitudes (see Ds 2001:57). The variations may differ due to for example kind of employer and the actual demand and supply of labour. Despite a comprehensive and protective legislation, high unemployment and a high frequency of temporary labour contracts may nevertheless have a discouraging effect on having children (irrespective whether you have a job or not).

2 MEASURES OF FERTILITY

The fertility can be measured in a couple of ways. The most frequently used are the total fertility rate and cohort fertility rate. The total fertility rate (TFR) is a measure of periodic fertility and is defined as the sum of number of children born by women in a specific age (between 16-49) related to the total number of women in that age. The cohort fertility rate (CFR) is the average number of children, which women give birth to during their lifetime fertility cycle. The CFR has so far been a rather stable indicator since it neither depends on annual variations in the number of women in fertile ages nor annual variations in other factors that may affect fertility. CFR is important since it measures whether the completed fertility for women is above the replacement level or not. The replacement level is the number of children per woman (approximately 2.1) needed in order to hold the population constant.

In the figures below the TFR and CFR in Sweden are illustrated.
Figure 1 illustrates the level of fertility during the 20th century and the gradual fall in fertility. In figure 2 the stability in the cohort fertility is obvious. So far, the completed fertility has always been close to the replacement level of 2.1 children per woman. If the CFR will remain at the replacement level or fall below depends on the fertility rate in the future (see, Björklund et. al., 2001; Alm-Stenflo and Persson, 2002).

3 THE ECONOMIC THEORY OF FERTILITY

Among economists the interest in fertility issues is closely related to the family wage income and family preferences usually expressed in a utility function. Becker (1960, 1965), Mincer, (1963) and Becker and Lewis (1973) represent the first and most widely spread approach within economics. They do assume that the demand of children is determined by female wages and family income. The theory assumes a negative relationship between female wage and demand for
children due to the opportunity cost. The higher the cost the fewer the children and vice versa. On one hand, higher income makes families afford a bigger family (more children). On the other hand, instead of having more children when the income increases, a family may prefer fewer. They will substitute quantity for quality i.e. they want to make sure that the offspring are guaranteed good education, a reasonable standard of living etc.

Another path is represented by Easterlin (1961, 1966, 1968, 1976) who focuses on intergenerational taste formation. The Easterlin hypothesis suggests a negative relationship between fertility rate and size of the cohort. The theory states that large cohorts may experience worsened economic conditions due to the crowding effects that follows for example in the labour market, in the schools etc. This may imply fewer children since the prerequisites for family building are not ideal. This does however mean that the small cohort that follows will have a more favourable situation than the previous one.

4 FEMALE LABOUR MARKET PARTICIPATION AND FERTILITY

In the beginning of the 1980s the relation between female labour market participation (FLP) and fertility did change. From being negatively correlated it suddenly became a positive relationship. During the 1980s the female employment rate as well as fertility rate increased simultaneously. The peak was reached in 1991. After 1991 the two rates fell quite dramatically primarily due to the severe economic crises that hit Sweden at that time. The employment rate fell, the unemployment rose and the drop in fertility was substantial. By the end of the 1990s fertility reached a historical minimum. The negative trend did however come to an end with the new millennium and since then there has been a rise in the female employment rate as well as in the fertility rate. Figure 3 illustrates the fertility rate and female labour market participation in Sweden during the period 1963-2005.

Fig. 3: Total fertility and female labour market participation
There are many potential explanations to the development illustrated in the figure above. One factor of specific importance in this context is the Swedish family policy. The direction of the “new family policy” which was introduced in the 1970s and gradually extended during the 1980s was to facilitate the combination of job and family in a reasonable way. Some of the reforms were therefore directed towards the labour market. Possibilities to work part time for parents with small children (below the age of 8), paid parental leave, investment in childcare centres and the introduction of "speed-premium" are all important ingredients in the Swedish family policy (see e.g. Hoem and Hoem, 1996; Andersson, 1999; Rönsen and Sundström, 2002; Sundström and Duvander, 2002; Björklund, 2005).

5 FERTILITY - AN INTERNATIONAL OUTLOOK

Although Sweden has experienced a very low level of fertility during the 1990s, the fertility rate is comparable to most European countries. Figure 4 presents the TFR in four European countries during the period 1960-2002.

The uniqueness of Sweden in an international perspective is the roller coaster pattern (see Hoem and Hoem, 1996). One reason to these fertility swings is the relation between fertility and the business cycle, which is caused by high female labour market participation and a family policy that supports the combination of small children and market work. In Italy and Spain, two countries with low female labour market participation, the fertility rate has been falling constantly since the 1960s. One reason may be difficulties to combining paid work and children (see e.g. Ds 2001:57).
6 SUMMARY OF THE PAPERS


In this paper we examine how economic and social variables influence the variations in the total fertility rate (TFR) in the short and long run respectively. The empirical analysis refers to aggregated data in Sweden during the period 1965-2003. The period is chosen because of (i) the strong fluctuation in the TFR during the period 1965-2003 and (ii) the positive correlation between fertility and the female labour market participation rate from the early 1980s. This contrasts to earlier periods when the negative relationship was prevalent.

The empirical results differ, but variation in fertility seems to depend on the female labour market participation, child allowance and number of divorces. The model structure that includes short run as well as long run effects seems to be the best model specification out of a number of different model structures presented in the paper.


Contrary to the first paper this paper has as starting point the number of children born by women in Sweden. A zero inflated Poisson model is applied to investigate how working experience, educational attainment and some variables related to family background affect the number of children born by women in Sweden. The study is based upon women who have completed their fertility i.e. women who are 50 years or older. The impact from the different variables on completed fertility is compared with women who still are in their fertile ages. The explicit modelling of completed and uncompleted fertility respectively generates important insights into how the independent variables affect the number of children born by women, dependent on the age structure of the sample.

The empirical analysis refers to the supplementary HUS-data survey from 1993 which is a micro database covering the time, money and public services of Swedish households. About 850 individuals aged 16-80 have been sampled from the database and are used in the empirical analysis.

The empirical findings show a difficulty to combine market work and children. The results also indicate that women with a higher level of education have fewer children then low educated women. Both of these findings are consistent with the economic theory of fertility. However, an important conclusion from the study is that the negative correlation between a woman's level of education and her number of children only hold when incomplete fertility is analysed. The relationship between female education and children is not valid when completed fertility is studied.

A comparison of the two paper shows that despite the high participation rate among women their absence from the labour market may be substantial due to child birth. Absence of leave may be long or short but in most cases it is due to number of children and the division of responsibility for the children within the family. The length as well as the design of the parental leave (paid and unpaid) is therefore of crucial interest here. In some instances the length has been questioned due
to the fact that women are the ones that (still) take the lion-part of it. It seems reasonable that the proposal for an equal split of the paid parental leave between the parents ought to become a subject for further research.
References

Variations in Fertility - a Consequence of Other Factors Besides Love?

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Abstract

The purpose of this paper is to discuss possible explanations for the variation in the Swedish fertility rate. We are primarily interested in economic and social conditions and their impact on the total fertility rate between 1965 and 2003. The results from the study support a positive effect on fertility from the female labour market participation and child allowance while divorces report a negative effect on fertility. The model including level as well as differences in the variables has been found to give the best results.

Key Words: Total fertility rate; Economics; Sweden; Time-series

JEL Classification: D19; J13

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1 Introduction

In the process of becoming a parent today there are many more factors involved than ever before. A low or high level of fertility may therefore be an effect of actual macroeconomic situations as well as different conditions on the micro level. Social infrastructure, level of social welfare, labour market situation for both women and men, together with current trends among young people and their life-style in general may all have an impact on fertility.

One historical factor of special significance is of course the transition of women from being primarily (unpaid) household workers to be a considerable part of the paid labour force in Sweden. The development since the 1960s has been increasing employment among women and strong variations in fertility. In the beginning the correlation was negative i.e. increasing female labour market participation and decreasing fertility rate (see figure 1 below). The explanations of the negative relationship were many e.g. lack of facilities which made it almost impossible for mothers to combine paid work and children in a reasonable way. Very limited supply of childcare is perhaps the best example here. Another explanation has to do with traditional gender roles. Despite the fact that more and more women became "bread-winners" their main responsibility for the children (and family) remained unchanged. A third reason may be rising opportunity costs. As soon as women became a part of the paid labour force a "cost" was associated with becoming a mother since she had to leave the market, temporarily or permanently. The paid parental leave, introduced in 1974, was a way to mitigate this.

In the beginning of the 1980s the relation between female participation and fertility did change. From being negative for a long time it suddenly became positive. During the 1980s female employment rate as well as fertility rate did increase simultaneously. The peak was reached in 1991. At that point of time fertility in Sweden was among the highest in the western world and so was the female employment rate, 2.14 and 80 percent respectively.1 After 1991 these two rates fell quite dramatically. The reason was primarily the severe economic crisis that hit Sweden at that time. The employment rate fell, the unemployment rose and the drop in fertility was substantial. By the end of the 1990s the fertility rate reached a historical minimum at 1.5. This negative trend did however come to an end with the new millennium and since then there has been a rise in female employment rate as well as in fertility rate. In 2005 the former was approximately 77 percent and the latter 1.77.

1Ireland and Iceland were the only countries with a higher TFR.
The purpose of this paper is to find out reasonable causes behind the variations in fertility in Sweden during the period 1965-2003. The question of specific interest is: What impact does the female labour market participation have on the fertility rate during this period? The period 1965-2003 is chosen simply because a very distinct pattern for female participation and fertility and secondly because it shows the contrasting relationship, first negative and then positive, between the two variables.

The structure of the paper is as follows. The next section presents the theoretical considerations. In section 3 the model, empirical specification and the data are presented. The results are presented in section 4 and in section 5 the paper is summarized.

2 Theoretical considerations

2.1 The traditional economic theory of fertility

The underlying assumption in the economic analysis of fertility is that households are rational economic units that act optimally in any given situation and that the intentions of the two partners in the household will therefore always...
be equal.\textsuperscript{2} The child is assumed to provide a utility to the household which is compared to that of other goods via the family utility function. The parents’ expenditures for their children’s upbringing can be divided into two parts: direct costs associated with the children’s food, clothes, toys etc., indirect costs related to the time-consuming effect of children on their parents’ time. Population economics focuses mainly on the indirect costs, which are correlated with the income the parents must give up by spending time bringing up their children. The higher the wage rate, the more expensive it will be not to work. If the spouses freely allocate their time between labour market activities and child care, an economically rational choice is to let the individual who earns less spend all her/his time at home raising the children. Since women on average earn less, and reinforced by tradition and existing gender contracts, they are in many cases expected to take the main responsibility for the household work and the children. When the female wage rate exceeds the reservation wage, the supply of female labour increases and the opportunity cost of children raises. The economic theory of fertility therefore assumes a negative relationship between female supply and observed fertility (see Leibenstein 1957; Becker 1960, 1965, Mincer 1963).\textsuperscript{3}

\textbf{2.2 Female labour market participation and fertility}

The support for a negative relationship has, as stated earlier, become weaker in most countries over recent decades (see e.g. Ahn et al., 2002; Engelhardt et al., 2004; Kögel, 2004). In Sweden the female labour market participation rate and the fertility rate did simultaneously increase in the 1980s and decrease in the 1990s.

A positive relationship between female labour market participation and the probability of having a child is found in e.g. Hoem (2000a). She analyses whether the decision to have a first child was influenced by the dramatic changes in the labour market between 1986 and 1997. The results show that first-fertility rates for women rise and fall with employment in different municipalities.

In another paper by Hoem (2000b), where female labour income was used to study differences in the risk for the first child, a strong effect of income on the first child was found. Fertility was lower among those with low or no labour income than among women with high income. It is important to remember, however, that the low probability of a first birth in low-income groups may partly be due to the female students included in this group.

In a paper by Andersson (1999), a number of economic variables and their impact on the probability to give birth at common birth orders in Sweden during the 1980s and 1990s are analyzed. The women were all born in Sweden between 1945 and 1979. The economic information considered in the study was

\textsuperscript{2}It is of course possible that the intentions of the spouses not initially are equal and the household’s decision is the result from a game theoretical process. However, such aspects of the decision procedure is outside the scope of this paper.

\textsuperscript{3}The negative relationship is also well documented empirically, see e.g. Butz and Ward, 1979), Winegarden (1984); Lee and Chuen (1989) and Wang and Famoye (1997).
unemployment benefits, study allowance, pensions, vocational-training program allowance and labour income for the period 1985-1995. The main conclusions were that women with relatively low wages and those in education, exerted lower birth risk than others and that the increase of women in these two groups did cause the falling birth rates during the 1990s. However, the study did not find any effect of unemployment on fertility, which is contradictory to the result in Hoem (2000a). This difference may be due to Andersson’s use of individual data, while Hoem uses aggregated data on unemployment. It is reasonable to assume that a high level of unemployment has a discouraging impact on men’s and women’s plans regarding children, irrespective of whether they are unemployed or not, for example due to a higher degree of insecurity and pessimism.

Following the assumption that good economic conditions may encourage young people to start a family, we would expect the contrary to be discouraging. Gauthier and Hatzius (1997) state that high unemployment in general may also have a discouraging effect on women already in permanent jobs, since the risk of not being re-employed on the same terms as before childbirth or not having the same career opportunities will be too high. A similar result, a strong negative relationship between the local unemployment rate and the probability of a first and second birth, was found on Norwegian data for women aged 20-39 during the period 1989-1995 (Naz, 2000). The effect on fertility from unemployment is, however, not clear cut since women without jobs will also face lower opportunity costs, at least in the short-run.

2.3 Family policy in Sweden

The expansion of the Swedish welfare system is assumed to be one important explanation for the positive correlation between fertility and female labour supply during the 1980s. The effect of family policy on the positive relationship is documented in many studies (see e.g. Sundström and Stafford 1992; Hoem 1996; Björklund, 2005). Reforms concerning children and families have been extensive in Sweden since the 1970s: parental insurance, gradual extension of paid parental leave, speed premium, increased child allowances, extra allowances for families with more than two children, reduced working time for parents of pre-school children and a gradual expansion of day care facilities are important elements of family policy. However, some of these reforms are connected to employment status prior to childbirth, which implies that parents must have had a paid job (eight months or more) to enjoy full benefits. Paid parental leave for example reduces the pecuniary losses when leaving the labour market, which is contrary to the theory suggesting that a woman loses her entire wage income when leaving the labour market. In the case of Sweden, a mother (or father) with a paid job prior to childbirth will enjoy 13 months of paid parental leave and retain 80 percent of their income while on leave. The results in Hoem and Hoem (1996) confirm this, as they found a major impact from social reforms - primarily the expansion of day care facilities and parental leave - on the fertility rate during 1965-1996. The falling fertility rates during the 1990s may similarly be a consequence not only of the economic recession, but also of negative
changes to family policy.

Andersson (1999) for example suggests that the positive relationship depends on the income-replacement character of the parental leave system, which creates strong incentives for women to acquire as high a level of income as possible before having children. Moreover, the norm for young people has long been first education, secondly a secure position in the labour market, and thirdly start a family. Since this norm comprises both men and women, this has also reinforced the idea of sharing responsibility for children. Young women no longer accept the role of sole responsibility for the children and an increasing proportion of young men are reluctant to be the main economic provider. There are primarily two types of costs related to children: direct pecuniary losses when leaving the labour market (for shorter or longer periods), and indirect losses associated with loss of future opportunities. Re-entering on a part-time instead of a full-time basis may also involve a cost if the opportunities in the labour market become more restricted. The general economic situation as well as rules and legislation surrounding female employees are therefore very important in the case of pregnancy. A secure position in the labour market (due to for instance tighter regulations) will lower the cost, while a looser, more insecure and temporary one will raise the costs.

2.4 Human capital

Investment in human capital is a way of improving competitiveness in the labour market. These investments may however make women (and men) postpone the first child (see Gustafsson, Kenjoh and Wetzels, 2001). Depending on a woman’s age, postponing may mean fewer children and in some cases no children at all. However, the expected negative effect of higher education on the fertility rate must be treated with caution. Cigno and Ermish (1989) show in a theoretical model that women with relatively greater human capital will have their first child later in life, but this does not necessarily mean that they will have fewer children. They can have as many children as those women who became mothers at a younger age, only the spacing between children is shorter.

2.5 Cost of living and tendency for family building

The normative pressure of having a reasonable standard of living makes the supply of dwellings and their prices an interesting determinant of fertility (see e.g. Andersson 1999). Lack of apartments seems to be a problem mainly in the larger cities, but since there is (and has been for quite a while) a tendency among young people to move into the cities, lack of housing may be a problem. A combination of a younger population in the larger cities and increasing difficulties in finding suitable housing - considering price, size and location - may result in a lower probability of starting a family.

The economic theory of fertility treats the two partners in the household as married in a permanent constellation, see e.g. Becker (1991). From this starting point, analyses concerning the number of births or the timing and
spacing of births are made. Such an approach does not allow study of the impact of changes in preferences for marriage on fertility. We believe that the general tendency in society concerning family formation is important and must be taken into consideration. Number of divorces and number of marriages will be used as crude approximations of the actual trend. The assumption is that a high number of marriages may encourage young men and women to marry and form a family while the opposite may have a discouraging effect. A high number of divorces may exert a negative influence on fertility in the following way: First, if the "survival risk/chance" of female-male relationships is small due to increased divorce rate, there is an evident risk of becoming a lone parent, which may have a discouraging effect on fertility. Secondly, a high divorce risk may stress the importance, for women in particular, of attaining a permanent position in the labour market before becoming a parent in order to avoid the poverty trap. This may at least have a postponing effect on fertility. Thirdly, due to negative experiences of divorces (e.g. as a child, relative or friend), a high divorce rate may result in a reluctance among young people to start a family of their own.

2.6 Summary

The theoretical considerations presented above make the background to the data chosen for the empirical analysis. According to the discussion above we assume that female labour market participation, introduction of family policy reforms and marriages may all have a positive effect on fertility, while cost for living, women enrolled in higher education and divorces are assumed to have a negative effect.
3 Empirical model

Economic models of fertility often focus on the number of children in the household or the timing and spacing of children during the woman’s life cycle (see e.g. Tasiran, 1993; Melkersson and Rooth 2000; Westerberg, 2006). Such studies are often based on individual data. In this case we will use aggregate data for a set of macro variables, including fertility rate, for the period 1965-2003.  

3.1 Structure of the model

A birth begins with the parents’ decision to have a child, thereafter it may take some time to conceive, which is followed by the gestation period. For this reason, we must distinguish between the time when the parents decide to have a child and the time when the birth is actually recorded. When estimating the total fertility rate at time \( t \), most optimal information is given by a set of covariates \( x \) that describe the variables that may affect the fertility decision some nine months or so before the time of birth. As an approximation we use the value of the independent variables from the preceding calendar year (see Gauthier and Hatzius 1997 and Poot and Siegers 2001). This means that we will estimate the fertility rate at time period \( t \) from a set of covariates at time period \( t-1 \).

Slow-moving influences may cause serial correlation of the residuals in time series estimation. Therefore, an autoregressive component will be included in the model. The autoregressive component captures potential sluggish adjustment of fertility to changes in the independent variables (see Gauthius and Hatzius, 1997).

The discussion concerning the long-run effects on fertility from the independent variables can be formalized in the following way:

\[
y_t = \alpha + \gamma y_{t-1} + \beta' x_{t-1} + \varepsilon_t
\]  

where \( \alpha, \gamma \) and \( \beta \) are parameters, \( y_{t-1} \) the autoregressive part of the model and \( \varepsilon_t \) the residual.

However, changes in different factors may sometimes be more important for the fertility decision than the actual level of these factors. Gauthius and Hatzius (1997) for example discuss that changes in unemployment may be more relevant than the level of unemployment for the fertility decision. If the man or the woman, or both, are unemployed and the prospects for tomorrow is still high unemployment then nothing has changed. On the other hand, if one or both of them are employed but the risk of loosing a job increases due to increasing unemployment in general during this or next year, then the probability of having a child may have diminished.

\footnote{Econometric analysis of fertility in Sweden using the same approach is e.g. Wilkinson, 1973. Their study covers the period 1870-1965 and is based on non-linear autoregressive estimators. The results are interesting since they point out a positive relationship between male wage rate and fertility for the full period but a negative relationship between female wage rate and fertility in the end of the period (1940-1965).}
We believe that the arguments put forward by Gauthius and Hatzius will be true for most variables i.e. not only the rate of unemployment. Therefore, we will also estimate a model which use the differences for all variables including the dependent variable, i.e. TFR between \( t \) and \( t-1 \). Model 2 is used to illustrate in what matter the "change" in fertility can be explained by the "change" in the independent variables.

Considering the short-run effects on fertility from the independent variables equation 2 can be written:

\[
\Delta y = \tau + \lambda y_{t-1} + \omega' \Delta x + \varepsilon_t
\]  

(2)

where \( \Delta \) is a difference operator, e.g. \( \Delta y = y_t - y_{t-1} \) and \( \tau, \lambda, \omega \) are parameters

As an alternative to the two models presented above we will also estimate a model where all variables, besides the TFR-variable, are represented both by "level" and by "change".

Equation 3 considers short-run as well as long-run effects on fertility from the independent variables and can be written:

\[
y_t = \kappa + \psi y_{t-1} + \phi' x_{t-1} + \eta' \Delta x + \varepsilon_t
\]  

(3)

where \( \kappa, \psi, \phi \) and \( \eta \) are parameters.

The Ljung-Box Q-statistic is used for testing serial correlation by summarizing the autocorrelations. The Ljung-Box Q-statistic is given by:

\[
\Omega = T(T+2) \sum_{j=1}^{p} \frac{r_j^2}{T-j}
\]  

(4)

where \( r_j \) is the j-th autocorrelation and \( T \) is the number of observations. The Q-statistic can be used to test the hypothesis that all of the autocorrelations are zero; that is, that the series are white noise (see Box and Pierce, 1970).

### 3.2 Test for structural break

The relationship between the female labour market participation and the TFR was negative until the end of the 1970s, but from the beginning of the 1980s it is positive (see figure 1 above). Several studies such as Sundström and Stafford (1992), Hoem and Hoem (1996) and Björklund (2005) stressed that the change from a negative to a positive relationship between the two variables depends on improvement in the family policy considering support to families with small children.

The changed relationship between the variables during the period, caused by family policy reforms or other reasons, may result in a structural break in the estimation. In that case it will not be possible, a priori, to assume parameter stability during the period 1965-2003. We use the CUSUM-test to test for constancy of regression relationships (see Brown et al., 1975),
where \( \hat{\sigma} \) is the standard error of the regression fitted to all \( T \) sample points. \( W_t \) is the cumulative sum of the recursive residuals and will be plotted against \( t \). If there is a structural break in \( \beta \) then \( W_t \) will tend to diverge from \( E(W_t) = 0 \). If the CUSUM-test indicates one (or several) structural break(s), we can split the data into subperiods and compare the mean values of the estimators from the regressions concerning period 1 (\( \hat{\beta}_1 \)) and the subperiods (\( \hat{\beta}_i \)) respectively, where \( i = 2 \ldots n \) using the Chow test (see e.g. Greene 1997).

### 3.3 Data

Data in this study is from official statistics, Statistics Sweden, and cover the period 1965-2003. The dependent variable is the total fertility rate (TFR).\(^5,6\)

The independent variables are sorted into three categories. The first category consists of three variables aimed to measure the economic influence on fertility. The prime interest in the analysis is the female labour force participation rate (\( FLP \)) and its impact on fertility. We are expecting a positive sign since the positive relationship, between participation and fertility, seems to have surpassed the negative one during the last decades. The second variable has to do with direct costs related to having a family. As a crude measure for "cost of living" we will use an annual index for the rent of a three-bedroom apartment (\( rent \)). The expected sign is negative i.e. the more expensive it is to rent a flat of decent size, the less probability to start raising a family, or make it bigger. The third variable in this category is women’s enrollment in higher education. Our assumption is that women’s increasing enrollment in education in general, and on higher levels in particular, may have exerted a negative effect on fertility, temporarily or permanently. We know that postponement of the first birth is common today and one consequence is increasing average age for first-time mothers. In 1980 the average age was 25.5 years, in 1990 26.3 and in 2004 it was 29.0 years. During the period 1965-2003 the number of new female entrants to higher education rose every year, from about 7000 to around 40 000.\(^7\) The variable (\( femstudent \)) is created by relating the number of newly registered female students to all women in the age of 19 to 30. The sign is expected to

\[ W_t = \frac{\sum_{k+1}^{r} w_j}{\hat{\sigma}} \]  

\(^5\)The fertility is measured as total fertility rate (TFR) which is the sum of the age specific fertility rate for women in the ages 16-49 years old. The age specific fertility rate is the number of children borned by women in a specific age related to the total number of women in that age.

\(^6\)TFR is related to women in fertile ages, i.e. non-completed fertility. A measure for completed fertility is the cohort fertility rate (CFR). CFR measures the sum of age specific fertility for a specific cohort older then 49 years old.

\(^7\)Due to the university reform in 1977 the number of registred students did increase dramatically. We have adjusted for this in the estimations.
be negative, i.e. the more women enrolled in higher education, the lower the fertility rate.8

The second category considers the family policy. This is however not an easy task to measure, since almost all parts of the family policy was introduced and has been gradually improved, changed or expanded, during this period of time. This makes it almost impossible to statistically isolate the effect of a single program or reform. In order to control for any possible effect we decided to pick child allowance (chall) as a representative element of the policy. Child allowance, introduced in 1947, is the oldest ingredient in Swedish family policy. It is still very important although there are questions raised whether wealthier families really are in need for the allowance today. The sign is expected to be positive since the immediate effect should be to lower the "costs" of having children.9

The third category consists of variables related to the "private sphere". There are several factors influencing our private lives, but only a few are possible to measure as aggregates suitable for statistical analysis. In this analysis we believe that rate of divorces and rate of marriages may give a crude picture of the private sphere.

The two variables in this category are intended to capture changes related to man and woman as a couple. In 1974 Sweden passed a new legislation simplifying the process of divorce. One immediate effect of that was a substantial increase in the number of divorces, from approximately 15,000 to 25,000 in one year. During the following years the figure stabilized and has been around 20,000 per year from then on.10 The number of marriages, on the other hand, fell very quickly from 60,000 in 1965 to less than 40,000 in 1973. This number has since then remained rather stable, about 35,000, although there were years in the 1990s with as low as 32,000 marriages.

The dramatic decrease in the number of new marriages at the beginning of the period was however counterbalanced by an almost equal rise in the number of couples cohabiting. This way of living together, without being married, indicates that there are probably a lot of non-registered "divorces/marriages" during a year. Since cohabiting is still very frequent, our use of marriages and divorces in the statistical analysis may be of limited value. Being aware of this we will use them anyway. The expected sign for divorces (divorce) is, not surprisingly, negative and for marriages (marriage) positive. Contrary to men and

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8 An alternative to using the annual influx of female students would be the ratio of female students in the age group 19-30 to the total number of women aged 19-30.

9 We have also tested other family policy variables in the estimations (e.g. the introduction of the parental leave, the extension in the parental leave during the 1980s and the right for parents with small children to work part-time). However, the inclusion of these dummies (separate or in combination with others) give no significant results and are therefore not included in the model.

10 In 1989 a change in the pension system made it more beneficial (for women) to be married in case of death of the partner. This become a strong incentive to get married among those couples living together without being legally married. The number of new marriages reported for 1989 which deviates strongly from other years have been adjusted.
women just cohabiting we believe that people who decide to marry has made a declaration of intention. An intention where children will be a natural part of their common plans.

The data presented above is illustrated in appendix A.

3.4 Empirical specification of the model

Three different structures are used for estimating the fertility rate for the period 1965-2003. The dependent variable in model 1 is total fertility rate (TFR) at time $t$ and the independent variables are lagged one year ($t-1$). Model 1 estimates the long-run effects on fertility from the independent variables. The specification of model 1 is the following:

$$TFR_t = \alpha_0 + \alpha_1 TFR_{t-1} + \alpha_2 FLP_{t-1} + \alpha_3 femstudent_{t-1} + \alpha_4 chall_{t-1}$$
$$+ \alpha_5 rent_{t-1} + \alpha_6 divorce_{t-1} + \alpha_7 marriage_{t-1} + \varepsilon_t \quad (6)$$

$TFR_{t-1}$ is the autoregressive part of the model; $FLP$, is female labour market participation; $chall$, is the size of the child allowance; $rent$ is the annual index of the rent for a three-bedroom apartment; $femstudent$ is the relative level of new registered female students every year; $divorce$, is the number of divorces; $marriage$, is the number of marriages. $\varepsilon_t$ is the residual, $\alpha_0$ is the constant and $\alpha_1 - \alpha_7$ are the coefficients.

Contrary to the model above, model 2 estimates the short-run effects on fertility from the independent variables. The difference of fertility, $\Delta TFR$, is as the independent variables measured between time $t$ and $(t-1)$. The specification is as follows:

$$\Delta TFR = \phi_0 + \phi_1 TFR_{t-1} + \phi_2 \Delta FLP + \phi_3 \Delta femstudent + \phi_4 \Delta chall$$
$$+ \phi_5 \Delta rent + \phi_6 \Delta divorce + \phi_7 \Delta marriage + \varepsilon_t \quad (7)$$

where $\Delta$ is the difference operators equal to e.g. $TFR_t - TFR_{t-1}$, $\phi_0$ is the constant and $\phi_1 - \phi_7$ are the coefficients.

Model 3 estimates the short-run as well as the long-run effects on fertility from the independent variables. This means that the model will explain fertility from a "level-perspective" as well as from a "difference-perspective" in order to find out if any of the two matters more than the other. Model 3 can be written as:

$$TFR_t = \beta_0 + \beta_1 TFR_{t-1} + \beta_2 FLP_{t-1} + \beta_3 femstudent_{t-1} + \beta_4 chall_{t-1}$$
$$+ \beta_5 rent_{t-1} + \beta_6 divorce_{t-1} + \beta_7 marriage_{t-1} + \beta_8 \Delta FLP + \beta_9 \Delta femstudent$$
$$+ \beta_{10} \Delta chall + \beta_{11} \Delta rent + \beta_{12} \Delta divorce + \beta_{13} \Delta marriage + \varepsilon_t \quad (8)$$

where $\beta_0$ is the constant and $\beta_1 - \beta_{13}$ are the coefficients.
4 Empirical results

The results of the CUSUM tests are based on equation (5) and presented in Appendix B. According to the test, we cannot reject $E(W_t) = 0$ for any of our three models. Because of the results from the CUSUM tests, we estimate the data in one continuous period for the three models respectively.

The results from the first estimation are presented in table 4.1 below. Ordinary least square (OLS) is used for estimation of model 1.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coeff.</th>
<th>t-values</th>
<th>Coeff.</th>
<th>t-values</th>
</tr>
</thead>
<tbody>
<tr>
<td>$TFR_{t-1}$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$FLP_{t-1}$</td>
<td>0.007</td>
<td>2.602</td>
<td>0.008</td>
<td>4.344</td>
</tr>
<tr>
<td>$Chall_{t-1}$</td>
<td>0.008</td>
<td>4.361</td>
<td>0.001</td>
<td>0.892</td>
</tr>
<tr>
<td>$Rent_{t-1}$</td>
<td>0.000</td>
<td>1.670(10)</td>
<td>-0.000</td>
<td>-1.641</td>
</tr>
<tr>
<td>$Femstudent_{t-1}$</td>
<td>-0.132</td>
<td>-5.079</td>
<td>0.019</td>
<td>0.667</td>
</tr>
<tr>
<td>$Divorce_{t-1}$</td>
<td>-0.023</td>
<td>-4.274</td>
<td>-0.013</td>
<td>-3.552</td>
</tr>
<tr>
<td>$Marriage_{t-1}$</td>
<td>0.020</td>
<td>5.962</td>
<td>0.003</td>
<td>0.902</td>
</tr>
<tr>
<td>Constant</td>
<td>0.737</td>
<td>2.606</td>
<td>-0.118</td>
<td>-0.530</td>
</tr>
</tbody>
</table>

adj $R^2$: 0.841 adj $R^2$: 0.934

In the first estimation (column1) all parameter estimates are significant and all signs are as expected. Female labour market participation, child allowance (a crude measure of family policy), rent and marriage will exert a positive effect on fertility while divorces and more women enrolled in higher education decrease fertility. Including the autoregressive variable, $TFR_{t-1}$, into the model (column 3) does reduce the number of significant parameters to three. Only $TFR_{t-1}$, the employment rate and divorce parameters are significant. However, the Q-statistics presented in appendix C indicate autocorrelation both with the inclusion and exclusion of the autoregressive component. The results of model 1 must therefore be treated with caution.

In the second model we use difference variables. The dependent variable is $(TFR_t - TFR_{t-1})$ and the independent variables are as in the previous estimation. The results are presented below.
Table 4.2: Determinants for Swedish TFR, 1965-2003

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coef.</th>
<th>t-values</th>
<th>Coef.</th>
<th>t-values</th>
</tr>
</thead>
<tbody>
<tr>
<td>$TFR_{t-1}$</td>
<td>-</td>
<td>-</td>
<td>-0.127</td>
<td>-2.349</td>
</tr>
<tr>
<td>$\Delta FLP$</td>
<td>0.004</td>
<td>0.009</td>
<td>0.008</td>
<td>0.862</td>
</tr>
<tr>
<td>$\Delta Chall$</td>
<td>0.002</td>
<td>1.551</td>
<td>0.002</td>
<td>1.542</td>
</tr>
<tr>
<td>$\Delta Rent$</td>
<td>0.000</td>
<td>0.615</td>
<td>0.001</td>
<td>1.624</td>
</tr>
<tr>
<td>$\Delta Femstudent$</td>
<td>-0.075</td>
<td>-1.548</td>
<td>-0.046</td>
<td>-0.876</td>
</tr>
<tr>
<td>$\Delta Divorce$</td>
<td>-0.005</td>
<td>-0.828</td>
<td>0.001</td>
<td>0.119</td>
</tr>
<tr>
<td>$\Delta Marriage$</td>
<td>0.014</td>
<td>2.804</td>
<td>0.008</td>
<td>1.608</td>
</tr>
<tr>
<td>Constant</td>
<td>-</td>
<td>-</td>
<td>0.199</td>
<td>2.028</td>
</tr>
<tr>
<td>$\text{adj R}^2$:</td>
<td>0.108</td>
<td></td>
<td>0.239</td>
<td></td>
</tr>
</tbody>
</table>

In the first estimation (column 1) the coefficient for marriages is positive and significant. The positive effect of changes in the number of marriages is as expected since a marriage (normally) is a formal way of expressing two persons ambition, or intention, to form a family (including children) contrary to couples with just an informal, or a non-existent, contract.

In the second estimation (column 3), with the autoregressive term included one estimate is significant, the positive and significant estimate for $TFR_{t-1}$. The significant estimate of $TFR_{t-1}$ indicates a persistence in the behavior of fertility. However, the Q-statistics indicate autocorrelation both with inclusion and the exclusion of $TFR_{t-1}$. The results from this estimation must therefore be treated with caution.

In model 3 both the variables’ level and change are included. In table 4.3 the results are presented.
Table 4.3: Determinants for Swedish TFR, 1965-2003

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coef.</th>
<th>t-values</th>
<th>Coef.</th>
<th>t-values</th>
</tr>
</thead>
<tbody>
<tr>
<td>$TFR_{t-1}$</td>
<td>-</td>
<td>-</td>
<td>0.656</td>
<td>3.473</td>
</tr>
<tr>
<td>$FLP_{t-1}$</td>
<td>-0.002</td>
<td>-0.793</td>
<td>0.006</td>
<td>1.809</td>
</tr>
<tr>
<td>$\Delta FLP$</td>
<td>-0.013</td>
<td>-0.987</td>
<td>0.007</td>
<td>0.528</td>
</tr>
<tr>
<td>$Chall_{t-1}$</td>
<td>0.009</td>
<td>5.493</td>
<td>0.004</td>
<td>1.754</td>
</tr>
<tr>
<td>$\Delta Chall$</td>
<td>0.005</td>
<td>2.937</td>
<td>0.003</td>
<td>2.398</td>
</tr>
<tr>
<td>$Rent_{t-1}$</td>
<td>0.000</td>
<td>1.687</td>
<td>-0.000</td>
<td>-0.724</td>
</tr>
<tr>
<td>$\Delta Rent$</td>
<td>0.003</td>
<td>3.359</td>
<td>-0.000</td>
<td>0.271</td>
</tr>
<tr>
<td>$Femstudent_{t-1}$</td>
<td>-0.121</td>
<td>-5.820</td>
<td>-0.009</td>
<td>-0.254</td>
</tr>
<tr>
<td>$\Delta Femstudent$</td>
<td>-0.181</td>
<td>-2.458</td>
<td>-0.054</td>
<td>-0.758</td>
</tr>
<tr>
<td>$Divorce_{t-1}$</td>
<td>-0.012</td>
<td>-2.131</td>
<td>-0.011</td>
<td>-2.461</td>
</tr>
<tr>
<td>$\Delta Divorce$</td>
<td>0.004</td>
<td>0.581</td>
<td>0.002</td>
<td>0.295</td>
</tr>
<tr>
<td>$Marriage_{t-1}$</td>
<td>0.023</td>
<td>7.114</td>
<td>0.007</td>
<td>1.396</td>
</tr>
<tr>
<td>$\Delta Marriage$</td>
<td>0.012</td>
<td>2.158</td>
<td>0.007</td>
<td>1.398</td>
</tr>
<tr>
<td>Constant</td>
<td>0.914</td>
<td>3.190</td>
<td>-0.133</td>
<td>-0.346</td>
</tr>
</tbody>
</table>

adj $R^2$: 0.923 | adj $R^2$: 0.946

In the first estimation (column 1) the coefficients for child allowance, marriages, changes in child allowance, changes in marriages and changes in rent are positive and significant while the share of female students, divorces and changes in the share of female students are negative and significant.

The significant and positive effects of child allowance, marriages, changes in child allowance and changes in marriages are as expected, as are the negative effect from divorces, female students and changes in female students. Whether the last results are short-term effects, caused by postponement, or not is uncertain. The positive and significant coefficient of rent indicates that when the rent level increases the fertility rate increases and vice versa. A somewhat surprising result.

In the second estimation (column 3) the autoregressive term, $TFR_{t-1}$, female participation, child allowance and changes in child allowance are positive and significant. The parameter estimate for divorces is negative and significant. When the number of divorces goes up the fertility rate goes down and vice versa. The positive effect of female labour market participation supports our assumption but also the results from previous studies on participation and fertility in Sweden. It confirms what we have seen in the descriptive statistics during the last 20-25 years. The interpretation may not be clear cut, but there are reasons to believe that women’s labour force attachment no longer is an obstacle for becoming a mother today. Put it another way: If it is hard to find a job in general and for women in particular it should not be any surprise if there also would be a drop in fertility. The insignificant estimate for changes in employment does not disturb this, since we believe it is the level that matters here.
The significant and positive effects of changes in child allowance is as expected. When the child allowance increases the fertility rate increases. The coefficient of divorces indicates that high number of divorces may have a negative effect in fertility.

The Q-statistics indicate autocorrelation with the autoregressive term excluded, but not with the autoregressive term included.

5 Summary and conclusion

The point of departure of this paper is the strong variation in the Swedish periodical fertility rate (TFR) between 1965 and 2003. Three alternative model structures were used to find reasonable explanations to this. The model including long-run as well as short-run effects seem to give the best results. Female participation rate and child allowances did have a positive and significant effect on fertility while number of divorces had a negative effect. None of these results are of any surprise, rather than the opposite.

The most important result is of course the positive effect of female participation on fertility. The unanswered question is if a high degree of female activity on the labour market has pushed for a social infrastructure adjusted for mothers wanting to work, or if it is the other way around? Our belief is that the existence and the gradual expansion of a social infrastructure enables women (and men) to combine family and work in a reasonable way, may have been an strong driving force. We have not been able to analyze the social infrastructure and the whole range of family policy reforms introduced during the period under study, which may be necessary for the complete scenery. But despite of that we are convinced that the probability of a shift in the relationship between female participation and fertility (from negative to positive) had been small without these reforms. Furthermore, the variations in fertility can be seen as an effect of the actual business cycle. Women's chances to get a job is nowadays probably as much important as it has always been for men.

The CUSUM test does not indicate any structural breaks during the period. This emphasizes that the positive correlation between total fertility rate and female labour market participation has been valid during the entire period 1965-2003. The result deprives to some extent the improvement in the Swedish family policy, during the 1970s and 1980s, as the only cause for the positive correlation between these variables. The positive correlation between the variables can likewise depend on spurious regression caused by omitted variables, such as changes in social norms and changes in gender role for both women and men in the market as well as in the household. Here, much more research is needed.
References


Appendix A

Fig. A1: Total fertility rate (TFR)

Fig. A2: Female labour market participation (FLP)

Fig. A3: Annual child allowance per child to constant prices (Chall)

Fig. A4: Rent index (Rent)

Fig. A5: Relative number of newly registered female students to the number of women in the ages 19-30 (Femstudent)

Data are adjusted to the university reform in 1977

Fig. A6: Marriages and divorces (Marriage, Divorce)

Data considering number of marriages are adjusted for pension system reform in 1989
Appendix B

Fig. B1: CUSUM-test of model 1 with the autoregressive term excluded

Fig. B1.1: CUSUM-test of model 1 with the autoregressive term included

Fig. B2: CUSUM-test of model 2 with the autoregressive term excluded

Fig. B2.1: CUSUM-test of model 2 with the autoregressive term included

Fig. B3: CUSUM-test of model 3 with the autoregressive term excluded

Fig. B3.1: CUSUM-test of model 3 with the autoregressive term included
### Appendix C

#### Model 1

<table>
<thead>
<tr>
<th>TFR_{t-1} excluded</th>
<th>TFR_{t-1} included</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q-stat</td>
<td>Prob</td>
</tr>
<tr>
<td>3.99</td>
<td>0.05</td>
</tr>
<tr>
<td>4.54</td>
<td>0.10</td>
</tr>
<tr>
<td>7.03</td>
<td>0.08</td>
</tr>
<tr>
<td>9.05</td>
<td>0.06</td>
</tr>
<tr>
<td>9.26</td>
<td>0.10</td>
</tr>
<tr>
<td>10.87</td>
<td>0.09</td>
</tr>
<tr>
<td>11.74</td>
<td>0.11</td>
</tr>
<tr>
<td>12.07</td>
<td>0.15</td>
</tr>
<tr>
<td>12.39</td>
<td>0.19</td>
</tr>
<tr>
<td>12.40</td>
<td>0.26</td>
</tr>
</tbody>
</table>

#### Model 2

<table>
<thead>
<tr>
<th>TFR_{t-1} excluded</th>
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<tbody>
<tr>
<td>Q-stat</td>
<td>Prob</td>
</tr>
<tr>
<td>5.46</td>
<td>0.02</td>
</tr>
<tr>
<td>8.58</td>
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<tr>
<td>8.59</td>
<td>0.04</td>
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<tr>
<td>8.87</td>
<td>0.06</td>
</tr>
<tr>
<td>11.65</td>
<td>0.04</td>
</tr>
<tr>
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<td>15.40</td>
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<td>16.83</td>
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<tr>
<td>17.72</td>
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<tr>
<td>17.74</td>
<td>0.06</td>
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#### Model 3

<table>
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<th>TFR_{t-1} included</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q-stat</td>
<td>Prob</td>
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<td>0.49</td>
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<td>2.06</td>
<td>0.36</td>
</tr>
<tr>
<td>9.34</td>
<td>0.03</td>
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<td>10.41</td>
<td>0.06</td>
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<td>10.68</td>
<td>0.10</td>
</tr>
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<td>13.29</td>
<td>0.07</td>
</tr>
<tr>
<td>13.63</td>
<td>0.09</td>
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<tr>
<td>14.36</td>
<td>0.11</td>
</tr>
<tr>
<td>14.84</td>
<td>0.14</td>
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</tbody>
</table>
More Work, Less Kids - The Relationship Between Market Experience and Number of Children

Thomas Westerberg*

May 22, 2006

Abstract

The purpose of this study is to analyze if economic and social conditions have any impact on the number of children born by women in Sweden. The results support (not surprisingly) a negative correlation between women’s working experience and number of children. The results do also support the assumption that women with higher education have fewer children than women with lower. However, this holds only when non-completed fertility is analyzed. It is not valid for the group of women with completed fertility.

Key Words: Completed fertility; Non-completed fertility; Economics; Count data; Sweden

JEL classification: D19; J13

*The author would like to thank Åsa Löfström, Jonas Nordström, Magnus Wikström and Jörgen Hellström for valuable comments and suggestions.

†The financial support from the Swedish council for working life and social research is gratefully acknowledged.
1 Introduction

The total fertility rate (TFR)\(^1\) in Sweden has shown a varying pattern during the 20th century (see figure 1). From 1900 until the mid 1930s, the fertility dropped from approximately four children per woman to less than two. After that, and probably due to the introduction of several new reforms and legislations, economic as well as social ones, the fertility rate started to increase.\(^2\) The cohorts born in the 1940s are today well-known as the big baby-boom groups. The “fertility peak” was however already reached by mid 1940s. From then on the rate fell but not as much as earlier. During the 1950s the fertility rate was rather stable, about two children per women on average, a figure equal to the replacement level\(^3\). Next phase with record-high fertility rates occurred in the mid 1960s. Within a couple of year the TFR did rise quite dramatically reaching a peak at 2.5 in 1965. After that the rate fell continuously during a long period of time. By the end of the 1970s and in the beginning of the 1980s the level was almost as low as it was in the 1930s. However, during the remaining part of the 1980s there was a sudden change and the fertility started to rise again. In the years 1989 to 1992 the fertility rate was above replacement level, i.e. two, but the peak was already reached in 1990-91.

\[\text{Fig. 1: Total fertility rate, 1900-2005}\]

Source: Statistics Sweden (SCB)

\(^1\)The TFR is the sum of the age specific fertility rate for women in the ages 16-49 years old. The age specific fertility rate is the number of children borned by women in a specific age related to the total number of women in that age.

\(^2\)Some of the reforms which were introduced during the late 1930s are maternity leave, maternity benefit for all mothers, laws against dismissal because of pregnancy etc.

\(^3\)The replacement level is 2.1 children per woman.
The peak-figure, 2.14, was among the highest in the industrialized world at that time\(^4\) although much lower than the peak in the 1960s. The drop in fertility after that became substantial and the rate was as low as 1.5 in 1999. After this historical minimum the fertility rate has been slowly, and still is, increasing (see e.g. Hoem and Hoem, 1996, 1997).

The figure above shows very clearly that fertility is sometimes increasing and sometimes decreasing and it seems reasonable to believe that variations are the normal thing. These variations in fertility may however reflect other changes as well and in that respect be difficult to predict in advance. In a long-run perspective it is obvious that all types of economic and social changes, including changes in fertility, are more or less connected to each other. Examples with relevance here is the legislation from 1939 that prohibited employers from dismissing women when they got married or became pregnant, and the increasing demand for female labour in the 1960s and onwards.

One direct consequence of both spouses performing paid work is of course rising family wage income but also rising "costs" of having children. The latter is due to loss of income when women have to leave the labour market, temporarily or permanently, when becoming mothers. This "cost" may however vary a lot depending on the financial support the society provide to families and whether the parental leave is paid or not and for how long.

The demand for children has been a topic of several empirical studies and women’s wages have often been the crucial variable in these studies see e.g. Butz and Ward (1979), Winegarden (1984), Lee and Chuen (1989), Wang and Famoye (1997), Caudill and Mixon (1995), McIntosh (1999). The findings are often unambiguous: Women’s wages do matter for the demand but also other economic variables such as female educational attainment.

The purpose of this study is to analyze the impact different variables may have on the number of children. Our focus is related to the labour market although we are fully aware of the complexity in the process of becoming a parent and all that precedes such a decision. The development shown in the figure above is in a sense also the history of women’s closer and closer association to the labour market. Rising female participation rate and falling fertility rate is a common phenomenon world wide. This was also the case in Sweden at least until the beginning of the 1980s. From then on rising participation rate and rising fertility do appear simultaneously as is falling participation and falling fertility (see figure 1 in Löfström and Westerberg, 2006). Our interest here is to find out whether this is visible or not in a statistical analysis based on individual data. The theoretical framework is based on the new home economic approach (NHE) and the data used in the study are from Swedish household market and non-market activities (HUS) data from 1993.

The paper proceeds as follows. The next section will present the theoretical framework. Section 3 contains a discussion about the data and the empirical model is presented in Section 4. Section 5 gives the results and the paper

\(^4\)Only the TFR in Ireland and Iceland was higher.
concludes with Section 6.

2 The theoretical framework

The pioneering work in the field of household fertility behavior was carried out by Leibenstein (1957), Becker (1960, 1965) and Mincer (1963). Becker (1960) suggested, that children might be viewed as a durable good. This implies that the family makes the decision to have children as if it was calculating the costs and benefits of a "commodity" whose end result is a flow of utilities over time, and a flow of costs, given income and prices. The household is assumed to be a rational economic unit with perfect foresight. It acts optimally in any given situation and the preferences of the two partners of the household are always the same. The child is assumed to provide utility to the household, which is compared with that of other goods via the family utility function. This function is determined by the relative preferences for children. Since children are assumed to be a commodity in the family’s "shopping basket", the relative prices between children and other goods are essential.

The NHE-approach used in this paper is simple and straightforward. It assumes that the family maximizes the utility function where the number of children and of all other commodities are arguments in the function, subject to a budget and a time constraint.

If children are seen as a normal good, it is reasonable to assume that higher income may result in more children. However, adding a quality argument to the discussion there is a possibility that the demand for children decreases when income increases. The reason to this may be that families not only take into account the number of children they want, but also the quality of life they want for their children. Wealthier families may therefore have as many (few) children they want while families with low incomes have no alternative than few children. This is however not as simple since "children" represent a lot more to parents that may easily exceed the "costs" for them. The reason why wealthier families do not have as many children as they can afford may nevertheless be that they prefer to spend relatively more on each child. The correlation between "quality" and "quantity" is according to Becker and Lewis (1973) negative in this respect.

2.1 Measures of cost for children

Parents' expenditures on their children’s upbringing are normally split into two parts: direct costs e.g. food, clothes, toys and indirect costs related to the time-consuming effect children may have on their parents’ time. Indirect costs are correlated with the wage income due to the time parents have to give up

---

5The ideas underlying NHE are originally based on the theory of labor supply as an individual choice theory (see Hicks, 1963).

6It is possible that the intentions of the spouses not initially are equal. The household’s decision may therefore be a result of a game theoretical process. However, such aspects of the decision procedure is outside the scope of this paper.

7Household and family are used as synonymous in this paper.
on the market when spending time at home bringing up children. Since wages normally are dependent on investment in human capital, i.e. education, work experience etc., the hypothesis is that the longer the work experience and the higher (longer) the level of education the fewer the children are.

Higher level of education does not necessarily mean fewer children but we know that postponing the first child is common among women attending universities or colleges (see Gustafsson, Kenjoh and Wetzels, 2001). The reasons are primarily difficulties to combine care for small children and time-consuming studies and young women's (and men's) wishes to be established in the labour market before they start building a family. Irrespective of motive the consequence of postponement may be of no problem for some but become a major problem for others. Fewer children than planned and problems in getting pregnant, due to the so called biological clock, are not unusual. However, the expected negative effect of higher (longer) education on the fertility rate must be treated with caution. Cigno and Ermish (1989) show in a theoretical model that women with relatively greater human capital will have their first child later in life, but this does not necessarily mean that they will have fewer children. They can have as many children as those women who became mothers at a younger age, only the spacing between children is less.

Pregnancy, delivery and breast-feeding are biological factors that separate women and men. These factors have also been, and still is, important when the differences in time allocation between the spouses, before and after a childbirth, are discussed and explained. While the time allocation between paid and non-paid job is almost un-changed for the male partner the opposite is the case for the female. After the period of paid parental leave approximately ten percent of the men did some changes in favor for more time with the child/children while 90 per cent did not. The figure for women were not exactly the opposite but approximately 60 per cent did reduce the working time (see Löfström, 2003). As long as the market wage is lower for women than for men and/or the female and male roles in home production are not interchangeable, as for delivery and nursing, this unbalanced time-allocation may be expected. In a sense it may also be seen as efficient. It is obvious that childbirth does imply a certain time of absence from the labour market for the woman and as long as she continues to take the lion-part of the parental leave and after that decide to reduce the working time, a negative relationship may be expected. However this negative relationship, between number of children and female labour market experience, may have become weaker due to the positive relationship between fertility and female labour market participation since the 1980s.

As has already been told, female participation rate and fertility rate in Sweden did simultaneously increase in the 1980s, decrease in the 1990s and increase again from year 2000. One reason for this "paradigm-shift" is that the labour market situation has become much more important in the decision of raising a family. Today it is as important for a woman to have a paid job as it is (and always has been) for a man. The family policy program introduced in the 1970s, on a larger scale, and successively expanded was also aimed to facilitate for both parents to combine paid work with a family. The variations in fertility
rates we have seen since the 1980s may therefore rather mirror changes in the economic situation in general, and the labour market situation in particular, than absence of relevant family policy or dramatic deteriorations in the same (see also Bernhardt 1993; Hoem and Hoem, 1996, 1997; Hoem 1998, 2000 and Andersson, 1999, Björklund, 2005)

2.2 Preferences for children

According to Becker (1976) the American transition from a rural to an urban community during the early 20th century raised the average cost of children. It was "cheaper" to raise children on the countryside. Becker (1976) also stressed that unequal knowledge of contraception in the society implied fertility patterns which may differ between ethnic groups. The knowledge of contraception, the right to use them as well as their availability did increase during the 20th century. However, there are still regions in the world where the resistance against using contraceptives is common.

The direct cost for raising children in rural relative urban communities has converged but the opportunity cost for raising children may still be higher in urban communities. The supply of both jobs and better career prospects as well as interesting and demanding leisure opportunities raise the alternative cost for family building in urban societies (see e.g. Löfström, 2003).

Besides the direct and indirect cost a new "cost-category" may also be added. Costs associated to the "social sacrifices" a parenthood may be the cause of. Whether these costs exceed the benefits of becoming a parent or not is of course a question of purely individual assessment. Having children make most parents change focus in life and in most cases this means changes in order of priorities. Depending on the extent of these changes, reached through more or less comprehensive negotiations with partners, employers and/or friends, these "costs" may be big or just marginal. In former days these "costs" were probably neither existent nor discussed while today the reverse are more accurate. Young men and women of today have a much more open discussion on this matter. What they, as a mother or a father, have to "sacrifice" in type of lost job-opportunities and careers, of lost friends, of lost leisure prospects etc. but also about the risk of separation/divorce. New alternatives and a huge range of different opportunities within as well as outside the labour market may therefore make many young persons be at a loss what to do.

3 Data

The data used in this study are from the supplementary HUS-data survey, a micro data-base covering the time, money and public services of Swedish households in 1993. The samples in our analysis consists of women sorted according to the following criteria:

(i) women with completed fertility (50-80 years of age), (ii) women with non-completed fertility (16-49 years of age), (iii) women with completed and
non-completed fertility (16-80 years of age) and lastly (iv) all women in the age of 16-64 years.

The dependent variable is the number of children a woman has given birth to up to the date of the survey i.e. the year of 1993.\textsuperscript{8} The independent variables are the following: First labour market experience (Experience). This variable is expected to be negative due to the fact that the more time a woman have spent in the labour market the fewer the children and vice versa. (The problem with endogenity is discussed later.) The information on labour market experience (number of years) is from the respondents themselves. The second variable is level of education and the expected sign is also here negative. The higher the level of education the fewer the children and vice versa. The education data include both years in the formal school system and years in vocational training. We assume, however, that the respondents’ formal school attainment is the major part of her total education where low level of education (Low) ranges from 0 to 9 years, medium (Medium) from 10 to 12 years and high (High) from 13 years and above.

The third and fourth variable are dummies aimed at capturing information on different social preferences and their presumed effect the fertility decision. The first dummy variable indicates whether the respondents did grow up, and still are living, in a rural area (Rural). The expected sign of the estimate is positive since the opportunity cost for children is assumed to be lower for those living in a rural area compared with people living in an urban area. The second dummy variable indicates whether the respondent’s father and/or mother are born in Sweden or outside (Parents). The assumption is that a respondent with at least one parent from another country may have more children - due to e.g. other family priorities or/and religious, traditional, cultural or other reasons - compared to respondents with parents born in Sweden. The weakness with this variable is its broad definition. Parents refer to all irrespective of origin, i.e. if they are from Denmark, India, Turkey, Somalia or USA.

As a complement to the samples (i), (ii) and (iii) we also analyze a sample of women 16-64 years of age (iv). In this analysis we want to test whether women’s relative wage (Wage) may be a determinant for number of children or not. The variable is, according to theory, assumed to be negative since the more the female partner contribute to the relative family wage income the higher the opportunity cost for children and vice versa. The variable used here can however only be a crude proxy for income distribution within the family since the female relative wage rate refers to 1993 while the fertility decision (most likely) have been taken at another point of time.

4 Econometric Issues

Consider the variable $Y_i$ the number of children born by woman $i$. Since $Y_i$ is a non-negative integer we are dealing with count data. A model frequently used

\textsuperscript{8}The number of children includes all children borned by the woman.
for count data is the Poisson model. Conditional on explanatory variables \( \mathbf{x}_i \), \( Y_i \) is Poisson-distributed with density:

\[
f(y_i \mid \mathbf{x}_i) = \frac{e^{-\mu} \mu^{y_i}}{y_i!}, \quad y_i = 0, 1, 2, \ldots
\]

(1)

In the log-linear version of the model the mean parameter is parametrized as \( \mu_i = \exp(\beta' \mathbf{x}_i) \) to ensure \( \mu > 0 \). However, this distribution assumes that the mean and the variance are equal for the dependent variable i.e.:

\[
E(Y_i \mid \mathbf{x}_i) = \mu = V(Y_i \mid \mathbf{x}_i)
\]

(2)

If the variance is lower than the mean, underdispersion will occur and the standard Poisson model will yield an upward bias in the estimated covariance matrix, with the asymptotic standard errors being too large (see e.g. Winkelmann and Zimmermann, 1994). The inverse implication is true in the case of overdispersion i.e. when the variance exceeds the mean (see e.g. Caudill and Mixon, 1995).

To test for under-/overdispersion a Wald test has been carried out based on the estimates from the standard Poisson model. Dispersion can be defined as:

\[
V(Y_i \mid \mathbf{x}_i) = \mu + \alpha g(\mu)
\]

(3)

where \( \alpha \) is an unknown parameter, taking a positive value if there is overdispersion and a negative value if there is under-dispersion. \( \mu \) is the mean value and \( g(\mu) \) is a known function, usually assumed to be equal to \( \mu \) or \( \mu^2 \).

Following Cameron and Trivedi (1998) we estimate a Poisson model to predict the fitted values \( \hat{\mu} = \exp(\hat{\beta}' \mathbf{x}_i) \). The test is then carried out by estimating:

\[
\frac{(y_i - \hat{\mu})^2 - y_i}{\mu} = \alpha \frac{g(\hat{\mu})}{\hat{\mu}} + \varepsilon_i
\]

(4)

by OLS. For each sample we obtain the results presented in Table 1. \( \alpha_1 \) and \( \alpha_2 \) denote the estimated parameters for \( g(\hat{\mu}) \) and \( g(\hat{\mu}^2) \) respectively.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Estimate</th>
<th>t-value</th>
<th>Estimate</th>
<th>t-value</th>
<th>Estimate</th>
<th>t-value</th>
<th>Estimate</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \alpha_1 )</td>
<td>-0.016</td>
<td>-1.581</td>
<td>0.046</td>
<td>0.922</td>
<td>0.089</td>
<td>1.496</td>
<td>-0.224</td>
<td>-2.994</td>
</tr>
<tr>
<td>( \alpha_2 )</td>
<td>-0.072</td>
<td>-1.597</td>
<td>-0.030</td>
<td>-0.437</td>
<td>0.042</td>
<td>1.118</td>
<td>-0.121</td>
<td>-2.470</td>
</tr>
</tbody>
</table>

Note: \( \alpha_1 \) occurs if \( g(\alpha_1) = \hat{\mu} \)
and \( \alpha_2 \) occurs if \( g(\alpha_2) = \hat{\mu}^2 \)

The Wald test rejects the null hypotheses of both \( \alpha_1 \) and \( \alpha_2 \) on a 99-per cent significance level for the sample related to women in the ages 16-64. For all other samples, the Wald test reveals no significant difference between the variance and the conditional mean. It implies that for three of four samples the
standard Poisson model can be used while a more flexible model should be used for the fourth sample.

One popular alternative which allows the mean and variance to differ is the negative binomial regression model. In this model, $\lambda_i$ is specified so that:

$$
\lambda_i = \exp(\beta' x_i) + \varepsilon
$$

where $\varepsilon$ is assumed to have a gamma distribution with mean 1 and variance $\phi$. The distribution function that follows is:

$$
f(y_i | \varepsilon) = \exp(-\lambda_i) \exp(\varepsilon) \lambda_i^{y_i} / y_i!
$$

(5)

To yield unique estimates from the negative binomial model and the Poisson model respectively we use maximum likelihood.

4.1 The Data Generating Process

The data generating process in the standard Poisson model and in the negative binomial model respectively does not separate between zero and positive counts. This is a short-coming since there are reasons to believe that the zero and positive counts are generated by different mechanisms. Silvia and Covas (2000) stress for example that some couples do not have children by choice but as a result of biological reason. Such reasoning will consequently result in a heterogeneous mean which in turn makes the standard Poisson and negative binomial models improper.

The process that generates any positive number of children may thus differ from the process that generates "decisions" to remain childless. To allow the data generating process to differ a zero-inflated count data model may be used. Following Greene (1994) and Lambert (1992) the probability for the Poisson model of the various outcomes can be written as:

$$
\begin{align*}
\text{prob}[y = 0] &= \text{prob}[z = 0] + \text{prob}[z = 1] \text{prob}[y = 0 | \text{poisson}] \\
\text{prob}[y > 0] &= \text{prob}[z = 1] \text{prob}[y = j | \text{poisson}]
\end{align*}
$$

(7)

The zero inflated model is based on construction of a model for $z$, such as the probit model, which is then integrated into the Poisson or negative binomial data setting. $z = 0$ if the outcome would always be 0, 1 if a negative binomial/poisson model applies, $y_i$ is the observed response.

The Voung test statistic is used for testing the standard poisson/negative binomial model against the zero inflated versions of the model (see Voung, 1989; Greene 1994).

4.2 Completed versus non-completed fertility

The data in our study include women aged 16-80 in 1993. The age span makes it possible to compare the impact from economic and social covariates $x_i$ on the number of children $y_i$ related to respondents in different ages.
The primary division is between those who have completed their fertility, i.e. women 50 years or older, and women who have not, i.e. women below 50 years. When women with completed fertility are analyzed all respondents experience an exposure time for fertility which is of equal length for all observations. Further, since all respondents have completed their fertility the observed number of children per woman equals the actual number of children per woman during her fertility life cycle. This is contrary to women in the ages of 16-49. For this group a censoring problem occurs since some of the women may have experienced a long time of exposure for fertility while some of the women are just in the beginning of their life time fertility cycle. In such a case it is important to incorporate a measure of exposure time in the model. McIntosh (1999) approaches this problem with reduced form methods while Caudill and Mixon (1995) based their censoring on age as a proxy for completion. In our paper we control for different exposure times by incorporating the logarithm of the individual observed fertility exposure ($\text{Lnexposure}$) in the model and fix the coefficient to unity\textsuperscript{10} (see Winkelmann and Zimmermann, 1994).

### 4.3 Endogeneity

A number of count-data studies report estimates of the relationship between female labour market experience or female wage rate and fertility (see e.g. Caudill and Mixon, 1995; Gensler, 1997; Nguyen-Dinh, 1997 and Wang and Famoye; 1997) without any discussion of the endogenity problem with such approach. Our paper does also use female labour market experience as an explanatory variable of number of children. We are well aware that this may cause endogenity problem. Female labour market experience is assumed to have an effect on fertility decision but it might be an effect of the fertility decision as well. Despite this we find it reasonable to interpret a negative parameter estimate for female labour market experience as a sign of difficulties in combining market work with children, irrespective of the endogenity between the variables.

### 5 Empirical results

Table 5.1 presents the parameter estimates and standard deviations for the groups analyzed here. The samples (i), (ii) and (iii) are estimated with maximum likelihood in a zero inflated Poisson model while (iv) is estimated with maximum likelihood in a zero inflated negative binomial model. The Voung statistic is reported for each sample and is testing the non-nested hypothesis of the zero inflated model versus the non inflated model. Large positive values of the statistics supports the zero inflated model while values less than two (2) does not favour any of the models (see e.g. Greene, 1997).

\textsuperscript{9} The fertility exposure time for women 50 years old and above is defined as 34 years.

\textsuperscript{10} Fertility exposure time is defined as age minus 16 for women up to the age of 49.
Table 5.1: Estimation results for the poisson and negative binomial models respectively

<table>
<thead>
<tr>
<th>Variable</th>
<th>Est. (i)</th>
<th>s.e. (i)</th>
<th>Est. (ii)</th>
<th>s.e. (ii)</th>
<th>Est. (iii)</th>
<th>s.e. (iii)</th>
<th>Est. (iv)</th>
<th>s.e. (iv)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experience</td>
<td>-0.018 **</td>
<td>0.004</td>
<td>-0.033 **</td>
<td>0.004</td>
<td>-0.026 **</td>
<td>0.003</td>
<td>-0.032 **</td>
<td>0.004</td>
</tr>
<tr>
<td>Low</td>
<td>Ref. case</td>
<td></td>
<td>Ref. case</td>
<td></td>
<td>Ref. case</td>
<td></td>
<td>Ref. case</td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td>-0.158</td>
<td>0.129</td>
<td>-0.066</td>
<td>0.082</td>
<td>0.014</td>
<td>0.056</td>
<td>-0.168</td>
<td>0.145</td>
</tr>
<tr>
<td>High</td>
<td>-0.116</td>
<td>0.107</td>
<td>-0.335 **</td>
<td>0.084</td>
<td>-0.227 **</td>
<td>0.057</td>
<td>-0.280</td>
<td>0.147</td>
</tr>
<tr>
<td>Rural</td>
<td>0.107</td>
<td>0.133</td>
<td>0.022</td>
<td>0.097</td>
<td>0.045</td>
<td>0.074</td>
<td>0.055</td>
<td>0.106</td>
</tr>
<tr>
<td>Parental</td>
<td>-0.398</td>
<td>0.153</td>
<td>0.051</td>
<td>0.078</td>
<td>0.032</td>
<td>0.067</td>
<td>-0.012</td>
<td>0.020</td>
</tr>
<tr>
<td>Wage</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-0.020</td>
<td>0.017</td>
</tr>
<tr>
<td>Lnexposure</td>
<td>-</td>
<td>-</td>
<td>1.000</td>
<td>-</td>
<td>1.000</td>
<td>-</td>
<td>1.000</td>
<td>-</td>
</tr>
<tr>
<td>Constant</td>
<td>1.293 **</td>
<td>0.124</td>
<td>-1.721 **</td>
<td>0.088</td>
<td>-1.888 **</td>
<td>0.058</td>
<td>-1.514</td>
<td>0.232</td>
</tr>
</tbody>
</table>

Note: **) Significant at a 0.05-per cent level
*) Significant at 0.10-per cent level

In the first group (i), women with completed fertility, only one of the estimates was significant, female labour market experience. The other variables are insignificant although the signs are in most cases as expected. The simple interpretation of the first negative estimate for experience is that more of experience will give fewer children while less will give more. This negative relationship is hardly surprising since women in this group are old (born between 1913 and 1943). For many of them the prime fertility age was e.g. far ahead the coming reforms within the family policy area. The expansion of this, from the 1970s and onwards, may in that respect have come "too late" for many women wishing to combine family and paid work.

Looking at the younger group, (ii), does however not indicate any changes in this respect. The estimate is still significant and negative. A straightforward interpretation is that longer experience is equal to few children and shorter to many. However, it is hard to tell whether a long experience has resulted in fewer children or if fewer children has caused long labour market experience. The difficulty interpreting the causality between these variables is stressed by the fact that the negative and significant relationship is also valid, if labour market experience is used as dependent variable and number of children is used as an independent variable.

It is possible that a future analysis of this group of women, i.e. when their fertility is completed, will give a non-significant or even positive estimate. The former indicates that labour market experience has lost its significance while the latter indicates that experience and number of children might not be a contradiction any longer. This statement depends, however, on the design of the parental leave in the future. Will it be split into two parts of equal size - one part for each parent - or will it be kept as it is today?

Contrary to the group of women with completed fertility (i), the estimates
for higher education is also significant for the younger group (ii) as for all women (iii). Women with a higher (longer) education tend to have fewer children than women with lower educational level. This result supports the theoretical approach by Cigno and Ermisch (1989) as well as the empirical result by McIntosh (1999), who found that women who invest in human capital (education) have their children later in life but compensate for the postponement by shorter space between the births. No differences can be found between high educated and low educated women when the life time fertility period is completed. The assumption that high educated women give birth to fewer children can consequently not be supported.

Living in a rural area seems to have a positive effect, but is not significant. Whether the woman has Swedish-born parents or not does not have any impact on the number of children. In the last group (iv) female relative wage was also included as an independent variable. The estimate was as expected negative, although not significant. The Young test statistic is less than 2 in the estimation of the first group (i). This is not surprising since the group only includes women who have completed their fertility. The other groups (ii)-(iv) include "younger" women who have not completed their life time fertility cycle. Since the probability to give birth to at least one child increases with the time of exposure, the share of childless respondents is smaller in the first group (i) compared with the samples (ii)-(iv).11 Irrespective of the reason for why the respondent is childless, the need for including an "extra" probability for a zero outcome seems to be larger in the samples including women with incompleted fertility.

11 The share of childless respondents in group (i) is 13%. The share of childless respondents in the other groups (ii)-(iv) is 38%, 33% and 30% respectively.
6 Conclusions

The purpose of this study was to analyze the effects of a few economic and social variables on the number of children. The results are mixed, but the only significant results occurring in all estimations is the negative and significant parameter estimate for female labour market experience. In Sweden we have noticed a positive relationship between female labour market participation and total fertility rate the last decades, but this is obviously not transferable to market experience and number of children. The reason why it fails to hold is the differences between the key variables: Female labour force participation and fertility rate versus female labour market experience and number of children. Despite of the high participation rate among women in Sweden, their absence from the labour market at child birth are still considerable. Absence of leave may be long or short, but in most cases the length of it depends on the number of children and the division of responsibility for the children within the family. The length as well as the design of the parental leave (paid and unpaid) is therefore of crucial interest. In some cases the length has been questioned, due to the fact that women are the ones that (still) use the lion-part of it. As an effect of that, the proposition of an equal split between the parents of the paid parental leave can be seen.

The results support the assumption that women with a (longer) higher level of education have less children. This result is however not significant in the oldest group (i) which may indicate that this might be a stronger effect among the younger and if this is true may become stronger in the future. The results may also indicate a catching-up effect, which means that higher educated women have their children later in life, but the intervals between the births are shorter.

The results presented here are solely based on female respondents. We have deliberately disregarded variables associated with their male partners, except for the one concerning the female relative wage. In a future research we have to involved the role of the male partner more thoroughly.
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