The Economics of Fertility: The Case of Norway

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THE ECONOMICS OF FERTILITY: THE CASE OF NORWAY

A Thesis Submitted to the Department of Economics
and the Faculty of the Graduate College of Nebraska
In Partial fulfillment of the Requirements for the Degree

MASTER OF ARTS

in

ECONOMICS

University of Nebraska at Omaha

by

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Omaha, Nebraska

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THESIS ACCEPTANCE

Acceptance for the faculty of the Graduate College, University of Nebraska, in partial fulfillment of the requirements for the Master of Arts degree, University of Nebraska at Omaha.

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"Beautiful she had never been, but she had looked kind and happy; now she had fallen off so that you might well believe she was ten years older than her husband, and not only three. Most folk deemed she took the loss of her children harder than most wives - she lived in great plenty and in high esteem, and things were well between her and her husband, so far as people could see; Lavrans did not go to other women, he took counsel with her in all affairs, and, sober or drunk, he never said a harsh word to her. Besides she was not so old but she might yet bear many children, if it were God's pleasure."

From Kristin Lavransdatter by Sigrid Undset.
ABSTRACT.

Economic theories of fertility are tested on Norwegian time series data for the period 1962-1991. The Easterlin hypothesis receives the most attention, and generally little evidence is found to support this hypothesis. Large relative cohort size ratios, however, seem to support the Easterlin hypothesis more than small ones. A New Home Economics model with a special emphasis on male income and female wages is also estimated, and results are obtained favoring this model. Finally, the problem with effective time lags in economic fertility models is tested, and in general an effective time lag of two years is favored.

Since women's liberation is social liberation, the New Home Economics model predicts a rather dark picture of future fertility. Based on the empirical results, increased equality between the sexes will have the inevitable side effect of reduced fertility.
1.0 INTRODUCTION.

Since before the days of Thomas Robert Malthus and David Ricardo, demography and economics have been closely interconnected. In particular, investigations to reveal the interaction or causality between population growth and growth of the economy have received great attention. The question of which came first, the chicken or the egg, is a better known example of a similar causality problem.

The fertility revolution and the demographic transition are notions of interest to a variety of different academics, even though they are demographic concepts. The interest is so dispersed that psychologists, sociologists, economists, anthropologists and geographers, among others, are researching the demographic transition. This makes demography one of the most interdisciplinary research fields, and thus one of the most interesting and controversial.

The population debate has become a distinct subfield in economics, and several models have been developed to explain among other things fertility trends. In this paper I will examine two of the most prominent economic fertility models on Norwegian time series data from 1962-1991. First, I will examine the Easterlin Hypothesis. This is a model that incorporates economic as well as social aspects of fertility behavior, however, Easterlin is a Professor in Economics and the Easterlin Hypothesis is considered an economic model of fertility. Second,
I will examine the New Home Economics (or Chicago School) approach as represented by Butz and Ward (1980). Their model is based on economic microfoundations, and only economic variables are considered. Finally, I will present a discussion on instruments that are expected to influence fertility as well as other population features. This is the policy section, and pronatalist policies are central. Most importantly, I will examine the possible effect pronatalist policy may have in Norway. However, before I start to dig into the essence of this paper, I feel that a historical review is appropriate.

Today, population growth in most less developed countries is extremely high, whereas the situation in developed countries is diametrically opposite, with stagnating or decreasing population. For this reason, the determinants of population growth are quite different among nations and across socio-economic levels. Most populations are at or near their natural marital or biological fertility before the onset of the so-called fertility transition. The natural marital fertility level before the fertility transition displays large variations across populations, but is often considered to be determined by: The Postpartum infecundable period, the Waiting Time to Conception, Intrauterine Mortality, Permanent Sterility, Frequency of Intercourse and breastfeeding.¹

In countries where the fertility transition has been completed, family limitation practices exist. These family limitation practices can be divided into two groups: direct and
indirect family limitation. Direct family limitation are deliberate actions undertaken by married couples to reduce the number of child births, e.g., use of contraception, induced abortion and sexual abstinence. Indirect family limitation on the other hand is a sort of human behavior, which has the secondary effect of reduced childbearing. Indirect family limitation includes prolonged education, inventions or increased opportunities for other goods than children that may raise children's relative cost, increased participation in the labor force and delayed marriage. In most highly industrialized countries today, indirect family limitations are becoming increasingly more important as a determinant of child birth.

1.1 Economic Consequences of Population Features.

Another important aspect is the economic consequence of both increased and reduced population. The consequences of an increased population are obvious. First, when the population increases, more funds have to be locked in as investment capital if capital per person is to remain constant. Second, in scarcely populated areas, increased population may result in a more efficient way to exploit natural resources. Third, a fast growth rate of the population tends to increase unemployment. Finally, it is often assumed that technological progress is dependent upon the rate of population growth.

More recently, geographers and economists have also been
emphasizing the damaging effect a population boom might have on the environment. Most economists seem to agree that there are more disadvantages than advantages with an increasing population, or at least a booming population. A relevant question would therefore be: Is the economy better served with a reduced population? The answer to this question is not an easy one. A decrease in population will increase the amount of natural resources per person, without investments in capital. However, the problem is that the reduced labor force will probably not be able to handle all the capital, e.g., factories, apartments or houses, kindergartens and schoolhouses. The prosperity of rural areas will also become vulnerable as population declines, because the economic foundations may collapse. Schools, post offices and other institutions will become increasingly more expensive to run, because there will be too few customers to cover the fixed costs. With an increased circle of customers, the average cost for these kinds of services will decrease. In economic terminology this is called economies of scale. Thus, a decline in population can eliminate economies of scale in production and services. In response to this declining profitability of capital in depopulated areas, these institutions may reorganize.

Finally, as is the case in developed countries where both mortality and fertility are low, there will be an aging of the population. This aging of the population will give the working population, which will have decreased relatively to the non working population, a greater economic burden because they must
support the non working population as well as themselves. An income tax is the way money is primarily being transferred to the non-working population in Norway. The demand for different consumption and public goods will also change with fluctuations in age structure. In demography, the economic burden of the working population is measured by the total dependency ratio, which is a ratio of economically active to economically inactive people in a population. But often, because of lack of data or severe difficulties in defining economic activity in many countries, a ratio of age groups is used instead. Working age in developed countries is often defined as all people between the ages of 16 or 18 and 64, and the people outside this age range are considered either to be children or elderly. In Norway this dependency ratio is approximately 0.53, or 53 out of 100.3.

This brief, but nevertheless important review of the relevance of variations in population size and its composition to economics, tells a story without clear answers. As explained by economic theories, it seems that both a declining and an increasing population can have adverse effects on the economy. Therefore, on theoretical grounds, it is justifiable to examine the population size and its composition.

1.2 The Demographic Equation.

\[ \text{Dependency Ratio} = \frac{\text{Children} + \text{Elderly}}{\text{Working Ages}} \times 100 \]
There are four components that determine the basic demographic equation, or the population growth.

\[ \text{GrowthRate} = \frac{P_{t+1}-P_t}{MYP} = \frac{B}{MYP} - \frac{D}{MYP} + \frac{INM}{MYP} - \frac{OUT}{MYP} \]

MYP = Mid-year population.
B = Births.
D = Deaths.
INM = Immigration.
OUT = Emigration.

The difference between the birth rate and the death rate is often called natural increases, whereas the difference between the immigration rate and emigration rate is called net migration. In order to predict the population growth for a particular population, one needs to find actual or estimated values for the respective variables. A major advantage that allows for simplification in some small developed countries with a moderately strict immigration policy is that changes in the fertility rate constitute almost all the population growth. This is true in Norway, a country with approximately 4.3 million inhabitants. First, the immigration and emigration rates have been relatively stable since the abrupt decrease in the emigration to the U.S. caused by U.S. immigration quotas.
Emigration from Norway to the U.S. started in about 1825, peaked in the 1890s, and ceased before World War II. During this period one million Norwegians emigrated to the U.S. If one considers the population in Norway during the same period, which ranged from 1 million in 1825 to 3.1 million in 1946 it is easy to realize the enormous impact this emigration had on the Norwegian population and age structure. In fact, more than 40 percent of the natural increase during the period 1840 and 1914 emigrated to the U.S.\textsuperscript{5} The age structure was distorted enormously, because the emigrants were chiefly young resourceful men.

It has been argued that the emigration to the U.S. was caused by both push and a pull factors. It was a push phenomenon, because the rapid growth of the Norwegian population could not provide adequate living conditions for people in the uncultivable regions of Norway. This resulted in farm subdivisions and individual loss of land at a time when Norway's industrial growth was insufficient to absorb the increased population, especially in urban areas. The emigration also reflected a pull phenomenon, primarily because "The New World" had not yet been settled, and vast land areas were available to immigrants. The U.S. Homestead Acts of 1862 and 1872, seemed to be of particular importance because of the opportunities the Acts offered to poor Norwegians.\textsuperscript{6} It has also been argued, with truth I believe, that many more people from Norway would have migrated to the U.S. and Canada if it were not for many intervening obstacles. These obstacles included: financial burdens, physical hardships
associated with long sea journeys and uncertainty about opportunities in the U.S. and Canada.

In the period following World War II, Norway experienced more stability, with both periods of negative net migration and positive net migration. Since the early 1980s, Norway has become a country that attracts foreigners because of its stable political situation and for being one of the richest countries in the world. The net migration to Norway during this period has been relatively stable, averaging four thousand people yearly.

Most of the immigrants to Norway are from other developed neighboring countries, such as Sweden and Denmark. This seems natural, because those two countries have a lot in common with Norway, e.g., history, culture and most important, highly similar languages. Even though Swedes and Danes make up one-third of the total immigration to Norway, their net immigration share is just 10 percent, because of Norwegian countermigration. The countries that constitute the larger share of the positive net immigration to Norway are traditionally poor countries ravaged by wars and political and religious disorder in Asia and Africa. More recently the former Yugoslavia and the U.S.S.R and her independent republics have become increasingly dominant migration forces in Europe. This is chiefly because of ethnic conflicts and wars of independence.

Most of the immigrating people are relatively young, with both hopes and prospects for work. It is interesting that Norway has experienced a positive net immigration from the U.S. since
1980, but with a large share of people fifty years and older (approximately 35 percent). The only other countries with such a large share of older people are Sweden and Denmark with 30 percent. The reasons for this are neither easy to address nor within the scope of this paper.

The trend in mortality is often measured in life expectancy at birth. This measure is also among one of the most commonly used welfare indicators along with infant mortality rates. Low mortality may be used as a general indicator of the level of welfare: Since it gives more weight to premature deaths in young ages than to those in the elderly population, it is also a good measure.

\[ e_0 = \frac{\sum_{x=0}^{\infty} d_x (x+1/2)}{100000} \]

- \( e_0 \) = Expectation of life at birth.
- \( X \) = Age.
- \( d_x \) = Number of people dying in a particular year of life.

More intuitively, expectation of life at age \( x \) can be expressed as a ratio between the total number of person years lived after exact age \( x \) (\( T_x \)) and the number of persons alive at exact age \( x \) (\( l_x \)) see equation 3*. 

- \( e_x \) = Expectation of life at age \( x \).
Both male and female life expectancy has risen markedly in Norway since the 1800s. Systematic improvements in hygiene and health, food production, vaccinations from infectious diseases, and a milder epidemic climate are the most accepted explanations for the rapid decrease in mortality in Norway until 1930.\textsuperscript{8}

\begin{equation}
(3^*) \quad e_x = \frac{T_x}{l_x}, \quad e_0 \text{Males} = \frac{7401362}{100000} = 74.01, \quad e_0 \text{Females} = \frac{809354}{100000} = 80.09
\end{equation}

Data on life expectancy at birth are printed in figure 1. Life expectancy at birth has increased uniformly over the last twenty years. In 1991, life expectancy at birth was 74.01 and 80.09
years for men and women respectively. Since mortality among young people in Norway and other developed countries today is very low, it is mortality among the elderly that needs to be reduced to achieve a higher life expectancy. It seems that the mortality among the elderly is likely to fall somewhat, but that the increase in life expectancy will decline. Therefore, we cannot expect continuously rapid increases in life expectancy, and countries like Sweden, Norway, Iceland and Germany have experienced a stagnation in their life expectancies.

I started this section with a brief review of the economic consequences of population growth and its composition. Then I examined the growth equation, and made it clear that in Norway today it is the fertility level that causes most of the change in population growth. But if more immigrants are accepted, or the mortality rates among the elderly falls, net migration and mortality will become increasingly important in explaining population growth. Therefore, in the case of Norway, a study aimed at examining the fertility trend in the last thirty years with economic, social and political variables will be important in two ways. First, economists are interested in the way economic variables influence fertility. Second, the fertility rate alone causes changes in the population and its composition, which in turn will cause permanent changes in the economy as explained above.

1.3 The History of Norwegian Fertility.
The total fertility rate in Norway was approximately 4.5 in 1850. During the next one hundred years, the period fertility declined to 2.5, with a low of 1.78 children in 1935. This imply that Norway experienced a continuous decline in fertility during this one hundred year period, except for some small, but significant fluctuations (which is consistent with other developed countries). Why did this happen? There seems to be strong disagreements among professionals about this issue. Fortunately, however, there is more disagreement about each factors' relative influence on the fertility decline than about which factors were influential. The factors assumed to have caused this decline include: lower mortality, increased use of birth control, the industrial revolution, economic improvements, and family planning.

1.4 Proposed Reasons for the Fertility Transition.

Along with most other European countries, Norway experienced a concentrated fall in fertility during the transition from a pre-industrial agricultural society to an economically diversified modern society. Thus, one would expect industrialization to have some sort of influence on the fertility decline. The fundamental factor is the transition from a familial mode of production to a mode in which the labor market is external to the family. This development transformed children
from productive farm laborers and a support to their elderly parents, into unproductive and costly investments. This explanation is perhaps the most credible for the rapid decline in fertility, both in Norway and the rest of Europe.\textsuperscript{11} Along with industrialization, came urbanization. Mass education systems in urban areas further reduced the labor utility of children. In 1850, 15.6 percent of the Norwegian population lived in urban areas, today approximately 72 percent of the Norwegian population lives in urban areas, and 25 percent of the total population lives in the three largest cities (Oslo, Bergen, and Trondheim).

Also, increased monetization of the economy (particularly in urban areas) heightened the awareness of the cost of children in terms of purchasable goods, like clothes and food. These socio-economic ideas about marital fertility decline are seen as economically rational. Pre-industrial (or transitional) societies are characterized by a net flow of goods from children to the older generation, whereas this direction is reversed during the transition. A moral legitimation of birth control and family planning programs emerged with the introduction of different contraceptive devices between 1880 and 1910.\textsuperscript{12} Lower mortality, in particular among children, reduced the demand for children because more young people survived to adulthood. In the early 1940s, there was a dramatic increase in the total fertility rate. This trend lasted until 1970, and is called the baby boom experience. In each subsequent year the total fertility dropped and reached an all time low of just 1.66 in 1983, which is far
below the necessary replacement figure of 2.1 children. This baby bust is often seen as a timing phenomenon in Norway, because during this period female labor force participation and educational status increased enormously.

Professionals expected that this baby bust would be followed by an increase in the total fertility rate. It was expected that births would be postponed because of the increase in labor force participation and education among women, but that the preference for children had not changed much and that the cohort total fertility rate would be relatively stable. This did occur, and the total fertility rate increased somewhat in late 1980s.

It is important to distinguish between the period total fertility rate and the cohort total fertility rate and their effects on both micro and macro levels. The cohort total fertility rate has some influence on both micro and macro levels. First, it is the cohort total fertility rate that determines the long run population growth. If the cohort total fertility rate is less than approximately 2.1 in the long run, the population will decrease if net immigration is zero. Second, the cohort total fertility rate reflects how many children the women born in the same year or cohort have during their fertile years. The period total fertility rate determines the number of children born every year, and thus the cohort size. Large variations in the period total fertility rate cause, as I mentioned above, trouble for policy makers. An interesting approach is to examine the relationship between the period total fertility rate, and the
cohort total fertility rate. If one lag the cohort total fertility rate by 30 years (which is approximately the mean age of childbirth), one would expect the cohort total fertility rate and the period total fertility rate to be identical. If they are not equal, births are either postponed or accelerated. Figure 2 takes this effect into consideration. If the period total fertility rate is higher (lower) than the cohort total fertility rate for any period, births are accelerated (postponed). Therefore, in Norway births were accelerated between 1950-1970 and postponed between 1971-1990.

Figure 2. Period and cohort fertility.

- The cohort fertility is lagged 30 years.

This reconstruction of Norwegian demographic history, is not much different from the history of other developed countries (or
at least Norway's neighboring countries). Therefore, it serves more as a motivation for the following econometric analysis, but first I would like to stress a very central question: can fertility be explained or analyzed with economic variables?
In economic theories of fertility, it is common to view the decision to have children in the same way as purchases of durable consumer goods. Economic theories of fertility are not meant to explain why couples have children (which is the concern of sociologists and psychologists) but rather how changes in economic variables can be expected to influence fertility. This is not different in principle from the economist's objective to explain demand for other durable goods, like cars and televisions. And as is the case with the demand for children, economists have less interest in (or rather, are not preoccupied with) why people buy such goods as cars and television. It is the changing demand as a function of prices and income that interests economists. Nevertheless, economic fertility theories are disputed matters. Critiques are often directed at the assumption of rationality. If one assumes rationality, one expects the family to make its best decisions based on all available information, which is often not the case.

2.1 The Family.

By a family, I mean a household composed of parents (husband and wife) and children from which the parents receive direct utility. A family unit makes several choices about its fertility. First, the family needs to decide how many children it
wants to have. Second, the family has to decide the quality of the children. By quality I mean the average level of expenditure per child as defined by Becker.¹⁵ Finally, it is important to determine the timing and spacing of births. These are all important issues that families must consider.

2.2 The Classical View of Fertility.

The idea that fertility is closely related to economic factors was promoted already in 1798 by Thomas Robert Malthus in his First Essay on Population. In this essay Malthus formulated a theory about the factors that influence fertility and mortality. In particular, he argued that an increase in family income (above subsistence) would increase fertility. This increase in fertility would be caused by two sources, Malthus argued. First, increased income would accelerate marriages and thus fertility. Second, the infant mortality rate would decline because of improved material standards. Malthus' more famous argument that populations tend to grow faster (geometrically) than food supply (arithmetically), along with his theory about positive and negative checks should require no explanation. Much has changed since Malthus developed his population theories: Most importantly, the industrial revolution changed family life, and possibly families' preferences.

2.3 More Recent Fertility Theories.
Today, it is common to divide the economic theories of fertility into two directions (or schools). One of the schools is represented by Theodore Schultz and Gary Becker, and is called the New Home Economics or the Chicago School. The main "rival" to the Chicago School is represented by Richard Easterlin, in which the Easterlin Hypothesis is central.

2.3.1 Theodore Schultz.

The importance of Schultz in the economics of fertility is perhaps best stated by Willis (1987), I quote:

Theodore Schultz (1974) volume consolidated the theoretical work of the previous decade, struck of in new theoretical directions, and began to address the empirical content of the theory with the aid of large-scale micro data sets and new econometric methods. (see page 69).

Therefore, besides being an important family economist himself, Schultz also assembled much of the previous work in the field and made it available to the public. It was from this point the economics of the family emerged as a distinct subfield in economics. Even though Schultz made important and lasting contributions to family economics, he is probably best remembered
as one of the "forefathers" of endogenous growth.

2.3.2 Becker.

Becker (1960) was the first to utilize neo-classical consumer theory, in which the demand for children can be compared with the demand for durable consumer goods, to analyze fertility. This implies that it is possible to put a price on children. Important assumptions in this theory are, constant preference structures, rational behavior, that the demand for children has positive income elasticity, and that the families have to take price as given. Constant preference structures imply that preferences for children are constant over time. This, as I will explain later contradicts Easterlin's theories. The families have to take the prices as given because they are too small and have no market power.

Many empirical studies have been conducted to test whether or not the assumption about positive income elasticity can be verified, but have had mixed results. In order to explain these results, the quality of children was introduced into the respective families utility functions, along with the other arguments: number of children and other goods. This provides a partial explanation of why the number of children can be negatively related to income (and are therefore not inferior goods). The shadow price of quality (quantity) depends upon the quantity (quality). Quality is assumed to have higher income
elasticity than quantity, but both are positive. An increase in income will therefore influence quality more than quantity, which implies that the shadow price of quality (quantity) decreases (increases). It is also reasonable to assume that the income elasticity for quality of children is higher among high income groups than low income groups (or among developed countries versus undeveloped countries). Becker also incorporates the cost of time in his fertility theories. He realizes that child rearing is time intensive, and that this usage of time has an opportunity cost. Becker's coherent theory is mostly used in cross sectional empirical work to study differential fertility.

Butz and Ward (1979), made a noteworthy extension derived from the New Home Economics. They argued that a complex relation between male and female wages determines fertility. In particular, a woman's participation in the labor force is viewed as a function of her own earning potential and her husbands earnings. If, as Butz and Ward assume, the household time inputs of husbands' and wives' are gross substitutes, then an increase in the wage of one induce the other to substitute away from market work. Therefore, as female real wages increases, the opportunity cost of time spent with children will increase. The opportunity cost of women not in employment will be unaffected, but an increase in wages induces more females to enter the labor force at the expense of fertility. This, Butz and Ward argue, will lead to reduced childbearing and closer spacing of births. Male wages have the opposite effect on fertility. As male wages
increase, the families budget constraints expands. Since both quality and quantity of children have positive income elasticities, both can be expected to rise. I utilize this approach in the empirical section of this paper. Intuitively, this reasoning can be explained in figure 3 Female wages above an imagined reservation level (w1) in 1.a increases the time cost of children, reducing the birth probability. A similar argument can be used with male income, see 1.b Below some level of male income (yl), the wife is in the work force.

As male income rises within this range, the birth probability increase rapidly. Above (yl), the wife is out of work, and the response in birth probabilities will decline.
2.3.3 Easterlin.

Whereas Becker's theories are mostly used to study cross sectional fertility, Easterlin's theories are used to explain time series (in developed countries). Easterlin argues that family preferences for children, their cohort size, and thus relative income determine fertility.

The relative cohort size is an essential argument in Easterlin's fertility theory. Easterlin argues that any relatively large cohort will be at significant economic disadvantage and that the opposite will hold for relatively small cohort sizes. Easterlin uses this argument in his influential book Population Labor Force and Long Swings in Economic Growth (1968) to explain various economic, political, and social conditions. A particularly interesting argument that Easterlin gives is this:

Both the postwar baby boom and the subsequent baby bust were in large part a product of swings in generation size that affected the economic circumstances of young adults. Because of their exceptionally favorable economic situation, those from the small generation of the 1930s tended to marry earlier and have more children, the relatively unfavorable situation of the large generation of the 1950s made for later marriage and reduced childbearing.
This hypothesis has received great attention from scholars in the past fourteen years, primarily because of its testability, but also because the hypothesis offers an alternative perspective to the Chicago School approach. The main difference is that the Easterlin approach synthesizes both economic and sociological factors, whereas the Chicago School primarily considers economic factors. Easterlin's assumptions are somewhat different from the Chicago School, and most importantly, Easterlin believes that preferences are changing over time. More specifically, Easterlin argues that preferences are shaped by people's childhood living standard experiences. The living standards in childhood are primarily determined by wages of fathers. Easterlin therefore uses young men's incomes in proportion to their fathers', as a measure of young men's living standards. Easterlin labels this, "relative income" and it deserves special attention. I quote:

The argument so far can be summarized quite simply: as the relative income of young adults rises, they will feel less economic pressure and hence freer to marry and have children; as their relative income falls, they will feel increasing economic stress, and marriage and fertility will decline.

This definition is valuable to stress, because "relative income" is not, as many believe the same as real income. Since different
age groups do not represent perfect substitutes in the labor market, young men's "relative income" will tend to vary inversely with the number of young men to older men in a population. Thus, young couples' fertility can be expressed as an inverse function of their relative cohort size. The relative cohort size is not the only fertility influential variable according to Easterlin, but rather he stresses that its importance often has been neglected, or at least understated.

\[
(4) \text{Relative income} = \frac{\text{Recent income experience of young man}}{\text{Past income of young man's parents}}
\]

Equation (4) is the Easterlin measure of relative income, but it is often measured as a ratio between old and young people in a population. As I explained above, Easterlin argues it is a good proxy for relative income. If this instrumental variable has the desired properties, empirical testing can be made about the relative income hypothesis. Since, according to Easterlin, the relative cohort size approximately twenty to thirty years ago influences the number of births today, his relative income theory can be used to make predictions about future populations.

A critique or an extension of the Easterlin approach has been suggested by Oppenheimer (1976). She accepted the basic hypothesis, but rejected the way Easterlin measures the standard of living. Oppenheimer argues that the standard of living a person experiences while growing up is influenced by other
factors than just male wages. Among other factors, she argues that the number of children and female wages are influential. Consequently, Oppenheimer realizes that in order to measure relative income, all income should be considered. Relative cohort size, which Easterlin suggested as a measure of relative income, will therefore be misleading.

The Easterlin hypothesis can be counteracted somewhat by Sundts Law. The Norwegian priest and sociologist Eilert Sundt (1817-1875) discovered the following empirical relation: If the number of births in one period has been large, the number of births twenty to thirty years later will be large, because of the large share of females in reproductive ages twenty to thirty years later. If the number of births in one period has been low, the number of births twenty to thirty years later will be low, because of the small share of females in reproductive ages twenty to thirty years later.\textsuperscript{18} This phenomenon is called "generation waves" in demography.

From figure 4, in which the total fertility rate and the relative cohort size is presented for Norway for the period 1962-1991, it is possible to get an initial impression of the relevance of the Easterlin hypothesis in Norway. It seems that when the relative cohort size is rather large, the total fertility rate is also large, thus supporting the Easterlin hypothesis. Some periods, however, do not fit this relation. The largest drop in the total fertility rate (between 1972 and 1977) took place when the relative cohort size increased from its all
time low in 1972 to an average level in 1977. Following the period after 1977, the relative cohort size approached a stable level, but the total fertility rate fluctuated somewhat. Based on figure 4, it seems that the Easterlin hypothesis (if relevant) fits the period before 1972 better than the period after 1972.

![Figure 4. Total fertility rate & relative cohort size.](image)

2.3.4 The Rivalry.

In the 1970s, the rivalry between the two approaches peaked. Several empirical studies of the Easterlin and New Home Economics models have been attempted with mixed results. To draw a
universal conclusion about which model best fits the post-World War II data seems impossible. This division of economics of fertility into two schools was short lived. Sanderson (1976) argued that the two schools have a lot in common. Among other things, both schools emphasize the importance of household budget constraints and biological factors like fecundity and frequency of intercourse. This may be true, but I think some superficial rivalry is still present between the two schools today. Easterlin's critique of Paul Schultz's review of "The Fertility Revolution" in Population and Development Review (1986) may illustrate this point, I quote:

To sum up briefly, what is fundamentally at stake here is the existence of two quite different theoretical perceptions of the fertility decision process: one influenced substantially by certain areas of demographic research, one faithful to certain preconceptions common in economics. This conflict reflects fundamental differences between demographers and economists that would benefit from more explicit recognition and confrontation. (see page 520).

This quotation clearly reflects that some sort of verbal rivalry is still present and that the two schools of thought are central focal points.
2.4 Summary of the economic theories of fertility.

Economic theories of fertility became a distinct subfield in economics in the early 1970s. Easterlin, Becker and Schultz were among this field's pioneers. Today, economics of fertility is still a hot issue, and one can sense a change in attitude among the economists toward more interdisciplinary cooperation. This, however, has not stopped economic fertility models from becoming increasingly sophisticated mathematically.
3.0 PREVIOUS EMPIRICAL LITERATURE.

There is an enormous range of empirical economic work that aims at explaining the post-World War II baby boom and subsequent baby bust. Therefore to cover them all would be beyond the scope of this paper. I will therefore concentrate on those I find most relevant. It is natural to divide the next two subheadings into Easterlin related topics and New Home Economics fertility work.

3.1 Tests of the Easterlin Hypothesis.

Since the Easterlin hypothesis concerns demographers as well as economists, I found many articles about it in demographic and sociology journals. Easterlin himself recommends alternative approaches to test the relative income hypothesis (or the intergenerational taste formation) in Birth and Fortune. (1987). In this book, he uses the total fertility rate as a measure of young couples' fertility. The reason for this, he says, is that changes in the total fertility rate are dominated by changes in fertility among young females. As a measure of relative income, he uses the ratio between young and old men, or the relative cohort size. The relative cohort size is presented as a ratio of males aged 35-64 to males aged 20-34. Then he plots the data for both variables on a graph, and then concludes that the evidence supports the relative income hypothesis, both for the baby boom and baby bust in the U.S.
Robert E. Wright has done several important studies of the Easterlin hypothesis in Canada and Europe. As a measure of fertility he uses the total fertility rate, and the relative cohort size is defined as the ratio of the male population age 30-64 to the male population aged 15-29. Wright explains that the fertility trend in Belgium, England and Wales, Germany, Spain, Switzerland, and Norway have been the same during the period of 1950-1985. In all the cases, Wright explains the trend as an inverted-U, with fertility increasing in the 1950s, reaching a peak in the 1960s, and declining below the replacement level in the 1980s. He examined 16 European countries, divided into four subgroups: Western Europe, Northern Europe, Central Europe, and Southern Europe.

What he found universally, except for Finland and Greece, was that the fertility trend in all these European countries has been down since about 1965. Wright argued that the Easterlin hypothesis was not a valid hypothesis for most European countries. He gave two reasons for this belief. First, with the exception of four countries, the relative cohort size has been rising in the 1980s, whereas the total fertility rate has been decreasing. Wright also emphasized that the rather crude way the relative cohort size measures the relative income may invalidate the empirical results. Second, he applied a Granger test of causality to the relationship between the relative cohort size and fertility. The basic idea of such a test is simple. If the relative cohort size causes fertility, then changes in the
relative cohort size should precede changes in fertility. For this to be true, two criteria must be met. First, the relative cohort size should help predict the total fertility rate. For example, in a regression of the total fertility rate to past values of the total fertility rate, the addition of past values of the relative cohort size as independent variables should contribute to the explanatory power of the regression. Second, the total fertility rate should not help predict the relative cohort size. If that is the case, it is likely that one or more other variables are causing both the total fertility rate and the relative cohort size. This can be tested with the Granger test, in which a restricted and an unrestricted model are estimated.

\[ UR: \text{TFR} = \sum_{i=1}^{m} \alpha \text{TFR}_{t-1} + \sum_{t-1}^{m} \beta \text{RCS}_{t-1} + \epsilon_t \]

\[ RR: \text{TFR} = \sum_{i=1}^{m} \alpha \text{TFR}_{t-1} + \epsilon_t \]

- TFR=Total fertility rate. - RCS=Relative cohort size.
- UR=Unrestricted model. - RR=Restricted model.

Wright applied this test to the European countries he studied and found it hard to determine the direction of causality between the total fertility rate and the relative cohort size in most countries. He did find some support for the Easterlin hypothesis in Belgium, England and Wales, France, Finland, and
Italy. Data from the other countries provided no empirical support, and in some countries the causality was reversed which implies that the fertility rate causes the relative cohort size.

Ermisch (1979) tried to explain the relevance of the two schools of fertility theory in Great Britain. He tried to explore the importance of the two schools using time series data for the period 1955-75. Ermisch found that he had to reject the Easterlin hypothesis on the basis of relative cohort size as a measure for relative income. The variant of the Easterlin hypothesis presented by Oppenheimer, in which the relative economic status is a ratio between earnings of young men to total family income, did receive some support. Ermisch wrote:21

We are, therefore, unable to refute or confirm the Oppenheimer variant of the Easterlin hypothesis; while it does receive some support from the evidence of changes in the labor force participation rates of older married women, it is still an open question whether relative economic status, as defined by Oppenheimer is the dominant influence upon fertility. (see page 49).

Ermisch noted that the Oppenheimer approach is based on relative economic status, like the Easterlin approach. Therefore, since the Oppenheimer approach could not be refuted, the Easterlin theory is still intact, even though Easterlin's emphasis on relative cohort size as an instrumental variable for relative
income was proven wrong.

Baird (1987) tests a multivariate time series model of fertility in France, England and Wales, Sweden, and the U.S. based on Easterlin's theories. The fertility model he tested can be written analytically as follows:

\[ F = f(Y, A, R) \]

F=Birth rate.
Y=periodic economic effect.
A=Cohort labor market supply.
R=Relative employment status.

The period economic effect (Y) is lagged one year. This is done to include the waiting time to conception and nine months of pregnancy. The cohort labor market supply (A) is calculated with the help of four different age ratios of the male population. The relative employment status (R) is calculated for the whole time period, and 1950 was the base year.

The inclusion of both (A) and (R) as regressors in Baird's model may seem strange. The most common test of the Easterlin model would be to regress (A) on (F) alone. Baird, however, justifies the inclusion of (R) in the regressions:

In some studies of the Easterlin model, the A regressor is made to stand alone for the measurement of relative
economic status. Conceptually, however, cohort related market supply constraints and relative material aspirations are distinctly different components of relative economic status. Depending upon the history of economic growth, material aspirations trends may be treated independently of cohort labor market achievement potential. (see page 61).

Ordinary least squares were applied, and Baird found the relative employment status (R) to be significant. One problem though was the presence of first order auto-correlation. In order to remove the auto-correlation, Baird performed the Cochrane-Orcutt procedure. Baird's results of this operation provide support for the Easterlin model. In 13 out of 16 regressions, the (R) is significantly positive. Also, in France and the U.S. the (A) regressor is significantly positive, but in the Swedish and English regressions, no (A) regressions are significant. The (Y) regressor was insignificant in all the regressions, save one. This implies that short run employment status (Y), or periodic economic effect, has no influence on fertility. In summary, the multivariate model tested by Baird supports the Easterlin model of fertility.

Pampel (1993) takes on an interesting approach to explain the Easterlin hypothesis. In particular, he argues that institutional structures, increased female labor force participation, and collective social protection influence the
relative cohort size in different nations. In other words, Pampel argues that strong national commitment to full employment may limit the impact of cohort oversupply. Well established social benefit structures, like unemployment benefits, may further reduce the financial damage caused by oversupply of labor. The effect of female labor force participation compensates for the low male income in large cohorts. Therefore, changes in female labor force participation tend to reduce generational differences in economic status. These are the three arguments Pampel believes make up most of the differences among nations and perhaps render relative cohort size as a measure of relative income. Pampel studied the effects of relative cohort size on fertility in 18 high-income industrial and democratic nations from 1951 to 1986.\textsuperscript{24} He found that in general, the European countries did not support the Easterlin hypothesis. The reason for this, he explains, is that institutional and social features affect the degree of influence the relative cohort size has on fertility. Pampel reasons, I quote:\textsuperscript{25}

By moderating the consequences of an oversupply of labor, such forces can hide the link between relative cohort size and fertility. European nations that emphasize a collectivist ideology of social protection may show weak relationship between relative cohort size and fertility. (see page 511).
As usual, support for the Easterlin hypothesis was found in The U.S. and Canada.

Jere R. Behrman and Paul Taubman (1989) examined the relative income hypothesis in the U.S. over two generations, and compared it to a Becker type of model with utility maximizing parents. Behrman and Taubman were among the first to examine the relative income hypothesis over two generations. This approach requires information on income and completed family size for two generations. Thus, their model is dependent upon comparable quantitative time series data for a rather long period. This may be the reason why so few academics have examined the relative income hypothesis over two generations.

The test did not provide much support for either of the models, but the Becker formulation proved to be the best. Again, the data quality must be questioned. Perhaps existing data are too poor to make qualified research.

3.2 Tests of the New Home Economics.

To present a comprehensive and correct discussion of the relevance of the New Home Economics based on empirical research is difficult. More theoretical experimentation or model building than empirical tests have been conducted, and consequently empirical tests have been approached somewhat differently. Two basic doctrines, however, have been central focal points, both of which are considered basic foundations of the New Home Economics.
- Becker's analysis of demand for children with quality and quantity for children as central elements. The idea of altruistic parents must also be emphasized (see e.g., Becker and Barro (1988)). In this theory parents maximize a dynastic utility function that requires equality between marginal benefit and marginal cost of an additional child. Altruism implies that parents do not only receive utility from their own consumption but also utility from their offsprings consumption. 

-The Butz and Ward approach, or operationalization of the New Home Economics.

Both these theories have been discussed previously and need no further presentation. The problem though is that these two methods are closely related, and subsequently a discussion of one approach tends to be relevant to the other approach. This paper primarily considers the Butz and Ward approach, but the demand side should not be neglected.

John Ermisch examined time series data for the period 1950-1975 in Great Britain. He was particularly interested in the Butz and Ward approach to explain fertility trends. Butz and Ward reason that an increase in the husband's income will increase fertility, while an increase in the wife's opportunity cost of time (which is equal to the wage she earns, if she works) increases the cost of children. An increase in the opportunity
cost of time decreases fertility since child care is time intensive. Ermisch found that the ratio of women's real wages to men's real wages was relatively stable in Great Britain for the period 1950-1969. After 1969, the ratio of women's wages to men's wages rose, causing a decline in fertility. This is in accordance with the Butz and Ward approach where an increase in the opportunity cost of time reduces the fertility.

Butz and Ward (1979) tested their theory and found strong positive indications that both female and male wages are important determinants of fertility. They found (using a loglinear model) that the elasticity of fertility with respect to male income is significantly positive and that the opposite is true for female wages (both at 5 percent level of significance). Indeed, in this article they went so far as to propose that a sufficiently large increase in female wages could cause countercyclical fertility.

Siegers (1980) tested the effect of income for husbands and the wages of wives on fertility using time series data for the Netherlands. Sieger found a negative effect on fertility for female wages and a positive effect for male income. In other words, Sieger's work provides support for the New Home Economics approach. He also tested the intergenerational taste formation model, but he found no support for this model.

Butz and Ward (1980) present a dynamic model of fertility behavior using time series data for the U.S. over the period 1949-1975. They found that couples on the average try to avoid
births when prospects for an increase in female wages are high, ceteris paribus. This is in accordance with their theory since an increase in expected female wage will raise their cost of time and, therefore, also change fertility rates.

3.3 Summary of Previous Empirical Findings.

Overall, there seems to be more support for the New Home Economics approach than for the Easterlin Hypothesis (at least in Western Europe). I am not quite sure if that necessarily implies that the New Home Economics approach is better and that the Easterlin approach should be discarded as a promising, but not fruitful approach. One must keep in mind that the Easterlin approach has been tested by professionals of several disciplines, and in a variety of different social science journals. The New Home Economics approach has mostly been tested in economics journals, and one can suspect, perhaps on unjustifiable grounds, that this may cause some bias. This bias may come about because of the nature of publication policy which tends to be more receptive to papers which assert positive results than those which provide inconclusive or negative ones.
I collected Norwegian time series data for several variables for the period 1962-1991 (this period is chosen because of the availability of data), but also because this period covers two important demographic regimes. Those are the so-called baby boom, which started in Norway during second World-War, and the subsequent baby bust that started around 1970, and continued into the mid-1980s. In the period after 1985 Norway, as well as several other developed countries, experienced increased fertility. I will present a short discussion of this period in a chapter about pronatalistic policies, and their possible impact on fertility.

Most of the time series data have been collected at Statistisk sentralbyrå (Statistics Norway), which is the primary source for all the statistic material in this paper. Generally, the statistical information is unpublished material, however, where the statistics have been collected in published articles etc, I will note it.

The data quality presented in this chapter can be expected to be good. Norway along with Sweden were among the first countries in the world to collect coherent information on economic and demographic variables. Statistisk sentralbyrå was established in 1832 as an independent register on demographic as well as economic variables. Even before 1832, registers on vital statistics (births, deaths and migration) were collected in
Norway by religious authorities. Also, in 1935 Norway was the first country in the world to incorporate a complete input-output analysis into the registers (see Frisch (1934)).

4.1 Total Fertility Rate.

The total fertility rate for Norway is calculated with a period perspective. Therefore, as explained above, this measure does not necessarily reflect the fertility of a particular cohort. This is the dependent variable in the Easterlin hypothesis. I found Norwegian age specific fertility rates in the Norwegian Statistical Yearbook (1963-1992). Then I summarized the age specific rates which gave me the total fertility rates. These period fertility rates and the cohort fertility rates for the period of investigation were presented in figure 3.

4.2 Relative Cohort Size.

The publication "Folkemengdens bevegelse" SSB, contains an index of the relative cohort size ($I_t$) for the period 1962-1991. The relative cohort size is presented as a ratio of males aged 35-64 to males aged 20-34 which is the ratio Easterlin suggests. This ratio is expected to be a good instrumental variable for relative income and is therefore used as the independent variable in the simple Easterlin relation. I assume that the relative cohort size and relative income are highly correlated, and in
particular I assume that:

- The correlation between the relative cohort size and the error term approach zero as the sample size gets larger.

- The correlation between the relative cohort size and relative income is nonzero as the sample size gets larger.29

These assumptions need to be satisfied in order to make the relative cohort size a good instrumental variable for the relative income hypothesis.

4.3 Male and Female Wages.

To be able to incorporate the Butz and Ward approach, I collected data for male and female wages. These variables can be found in "Arbeidsmarkedsstatistikk" SSB, but only in nominal terms. I transformed the nominal variables to real variables, by dividing the nominal variables with the Laspeyres' consumer price index for the respective years (with 1970 as the base year).

Unfortunately, I was not able to obtain information about average male and female wages for the whole Norwegian population. My data are for industrial workers only, and therefore I expect the general trend in nominal wages among males and females to be somewhat downward biased. I propose two reasons for this:
First, industrial workers receive lower wages than other occupational groups, such as technical professions and skilled trades which require a higher degree of education. The homogeneity of industrial work also results in reduced bargaining power over wages since most industrial workers are substitutable.

The wage gap between male and female wages in other occupational groups are traditionally greater than in industrial work. The main reason for this is that labor unions are stronger among industrial workers, and thus more able to protect female union members.

Figure 5 reveals that both male and female nominal wages have
been rising for the period 1962-1991. Male wages have been higher than female wages for the whole period, but the wage gap has diminished over the period. According to the Butz and Ward approach, one could expect that the increase in male wages (or income as they actually proposed) would increase fertility (both quality and quantity) and that the increase in female wages would reduce fertility because of an increase in the cost of time. This is the case since the labor force participation among females in Norway is so high that it is reasonable to believe that a majority of Norwegian females will experience an increase in their cost of time (see table 1 for details).

Table 1. Female labor force participation in Norway (for the ages 25-66 in percent).

<table>
<thead>
<tr>
<th>Year</th>
<th>% employed</th>
</tr>
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<tbody>
<tr>
<td>1962</td>
<td>37.02</td>
</tr>
<tr>
<td>1965</td>
<td>38.11</td>
</tr>
<tr>
<td>1970</td>
<td>41.61</td>
</tr>
<tr>
<td>1975</td>
<td>48.69</td>
</tr>
<tr>
<td>1980</td>
<td>62.18</td>
</tr>
<tr>
<td>1985</td>
<td>68.68</td>
</tr>
<tr>
<td>1987</td>
<td>74.42</td>
</tr>
</tbody>
</table>

Source: Arbeidsdirektoratet.

4.4 Child Benefits.

In 1946, the Norwegian government introduced child benefits to parents with children under 16 years of age both for pronatalistic and social reasons. This financial assistance
increased over the next 20 years, and today child benefits in Norway are an important integrated part of the welfare state. Because of the large variations in stability and purpose of child benefits in Norway during the period 1962-1991, I will discuss the benefits in three separate sections. Most of this discussion is based on data in Per Kolstad (1989, see endnote 30).


During this period, there was a relatively stable distribution of benefits. Households did not receive child benefits for the first child, whereas benefits per child (after the firstborn) increased. During both 1963 and 1967, the government pursued a progressive benefit strategy. In 1963, the child benefits increased by 8.3%, 21.8% and 35.78% for second, third and fourth children, respectively.


In 1970, a financial benefit for the first child of 500 NOK was granted. The child benefits for second, third, and fourth child increased by 228%, 189%, and 160% respectively and resulted in a less progressive benefit distribution. For the rest of this period there was a sustained decrease in real financial aid to children of all numbers with a few exceptions.

In 1980, there was a large increase in benefits that continued through the whole period (and which is continuing). The real percentage increase is largest for the first child, and then decreases with each child born to the same family. Therefore, during this period, the child benefit became even less progressive. The importance of a progressive distribution of child benefits will become evident in the section on population policies.

4.4.4 Application of Child Benefits Data.

It would be desirable to include in the regression procedure the effects of child benefits that are nonlinear functions of birth order. I have not done this for three reasons. First, child benefits that are nonlinear functions of birth order are difficult to obtain. Second, I expect child benefits that are nonlinear functions of birth order as independent variables in a regression procedure to be collinear. I believe this, because there is some sort of colinearity between the benefit variables. Among other things, the benefit variables tend to increase with approximately the same percentage over time. Finally, several independent benefit variables would make the regression procedure very complex. In this paper I am interested in the aggregate effects of child benefits on fertility and therefore I am not
concerned with differentiated child benefits. However, as long as the demand for children is higher than actual fertility, all forms of children benefits can be expected to be positively related to fertility. It has been argued that the real child benefits for second children should be positively related to fertility experiences in developed countries (at least in countries with a total fertility rate below two). This line of thinking is as follows: an increase in the real child benefits for second children gives one child households stronger incentives to have a second child, because of the potentially improved economic conditions.

Figure 6. Child benefit for second child in real NOK. -For the period 1962-1991.

It is also reasonable to assume that in countries in which the total fertility rate is somewhere between two and three, increased real child benefits for the third child can be expected to raise total fertility if economic factors are relevant for households decision making. The child benefits for second children has increased uniformly over the period 1962-1991 (in nominal terms), with an extraordinary large increase in 1970. The general trend has also been rising in real terms for the period but with some periods of stagnation and decline (see figure 5).

4.5 Unemployment Insurance.

Unemployment insurance is paid on a monthly basis to registered unemployed people in Norway (see Figure 7). In order to be eligible for this type of benefit, laborers need one year of full time work experience. If this criterion is not met, laborers have the opportunity to get subsistence benefits from the local authority. Unemployment benefits in Norway are at such high levels that some economists have called for revisions of the unemployment insurance system because they expect that potential laborers put less effort into job search when they receive unemployment insurance.

Another problem is the rather high minimum wage for young workers which makes this group less attractive to employers. The most important problem though is the dramatic increase in duration of unemployment in Norway in more recent years (see
Unemployment insurance is used as a stabilizing instrument in macroeconomic policy but also for social reasons' to provide purchasing power for unemployed people.

Table 2. Average duration (in weeks) of unemployment for the years 1989-1992.

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</tr>
</thead>
<tbody>
<tr>
<td>Duration</td>
<td>23</td>
<td>30</td>
<td>31</td>
<td>33</td>
</tr>
</tbody>
</table>


The effects that unemployment insurance may have on fertility are
not obvious. Several possible paths of development seem possible, depending on male and/or female unemployment in the household. A simple illustration of the effects of unemployment insurance reveals this uncertainty. In a household, there are three possible unemployment situations'. First an unemployed man, an unemployed woman, and two unemployed adults.

-In households with unemployed males, unemployment insurance will moderate the financial loss because of unemployment. Or, inversely, increase the household budget (over the subsistence benefits) and thus also the consumption possibilities. If one assumes, like Becker, that children have positive income elasticities, either child quantity, quality, or both will increase if the male in the household receives unemployment insurance. If the income effect for quantity is higher than the income effect for quality, fertility will increase (and more than quality).

-In households with unemployed females, the effect of unemployment insurance may be different. An important aspect of both male and female unemployment insurance is that the unemployed do not have to work at all: This gives the unemployed people a great deal of leisure time. This leisure time may result in more births since the woman now has more time disposable to give for childrearing (without experiencing a loss of income).
In the case where both are unemployed, the effect of unemployment insurance on fertility is hard to predict. The increased leisure time may increase fertility because of a reduction in the alternative cost of time, and reduce fertility through the detrimental effect of unemployment.

4.6 Availability of Kindergartens.

As I have already discussed, child care is time intensive. Traditionally, the wife in a household is the one that has to sacrifice career and education to take care of the children. Often a choice must be made between bringing up children or pursuing a career. With increased female wages, the opportunity cost of children increase, and as a consequence one can expect the demand for children to go down. With increased access to day care services for children, this picture can change.

I collected time series data for seats in kindergartens per 1000 children under seven years. This is the age at which most children need day care. For example 400 seats available in kindergartens per 1000 children under seven years implies a 40 percent kindergarted coverage. I expect that an increase in seats in kindergartens per 1000 children will have a positive effect on fertility. As seats in kindergartens increase, families have the opportunity to put away their children in day care services, and spend their time on other business. Over the period 1962-1991, the number of seats available in kindergartens per 1000 children
increased from 20 to 399 (see figure 8). Over this period Norway also experienced the greatest increase in female labor force participation.

Figure 8. Number of seats available in kindergartens. -Per 1000 children.

source: Collected from Statistics Norway.

4.7 Number of Female Students.

The number of female students in universities and equivalent institutions in Norway exploded over the period 1962-1991. In 1962, there were 2778 female students at university level in Norway, whereas in 1991, there were 35575 students (see Figure 9). This has occurred because of better job opportunities (and higher wage potentials) and the female rights movement in Norway
during the 1970s. It is also reasonable to assume that improvements in day care for children has had some positive influence.

An increase in the number of female students in higher education can be expected to result in postponements of births (and also in reduction in the cohort fertility rates). This is because, for most females, childrearing and studying is hard to combine. The economic situation for most female students is also different from other females. Female students tend to marry later, and thus they have less economic support than married females at the same age. It has also been established that females in higher education place more emphasis on personal self-
fulfillment, and consequently, children play a less important role in their lives.\textsuperscript{33}

Table 3 provides descriptive statistics for all variables discussed in chapter 4. All variables have 30 observations, and the variables cover the same period.

<table>
<thead>
<tr>
<th>Variable:</th>
<th>N:</th>
<th>St. Dev.</th>
<th>Mean</th>
<th>Max:</th>
<th>Min:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total fertility rate:</td>
<td>30</td>
<td>0.4801</td>
<td>2.16</td>
<td>2.93</td>
<td>1.65</td>
</tr>
<tr>
<td>Relative cohort size:</td>
<td>30</td>
<td>0.1332</td>
<td>1.77</td>
<td>2.17</td>
<td>1.61</td>
</tr>
<tr>
<td>Male wage</td>
<td>30</td>
<td>29.458</td>
<td>38.6</td>
<td>99.51</td>
<td>7.39</td>
</tr>
<tr>
<td>Female wage:</td>
<td>30</td>
<td>25.691</td>
<td>31.81</td>
<td>86.67</td>
<td>5.09</td>
</tr>
<tr>
<td>Female education:</td>
<td>30</td>
<td>8500.2</td>
<td>14752</td>
<td>35575</td>
<td>2778</td>
</tr>
<tr>
<td>Child benefit:</td>
<td>30</td>
<td>3155.2</td>
<td>3458.1</td>
<td>10600</td>
<td>360</td>
</tr>
<tr>
<td>Kindergarten seats:</td>
<td>30</td>
<td>127.62</td>
<td>149.26</td>
<td>399</td>
<td>20</td>
</tr>
<tr>
<td>Unemployment benefit:</td>
<td>30</td>
<td>14909</td>
<td>13852</td>
<td>42101</td>
<td>1039</td>
</tr>
</tbody>
</table>

\* The total fertility rate and the relative cohort size are measured in number of children. Unemployment benefit, child benefit, female wage and male wage are measured in Norwegian Kroner (NOK). Female education is measured in total number of females, whereas the kindergarten variable is measured in seats per 1000 children under seven years.
5.0 **EMPIRICAL RESULTS.**

In this chapter both the Easterlin Hypothesis and a more complex model with elements from the New Home Economics approach will be tested using Norwegian time series data presented in a previous chapter. Most of the discussions evolves around the Easterlin primarily because the Easterlin hypothesis was created to explain the baby boom and the subsequent baby bust period (which is exactly the period of investigation), but also because I have taken several demography classes in which the Easterlin hypothesis was central. The respective models' relevance will be discussed, and conclusions will be drawn. Then I will make mention of the limitations of each model, and their effect on the outcome. Finally, I will make some concluding remarks and give guidelines for future research on the economics of fertility.

5.1 **General Problems.**

A question of significance is the adequacy of a time lag of one year to account for the response in fertility. Both Wright (1989) and Ermisch (1982) set the effective lag length equal to one year, and in general this seem to be the accepted approach among most economists. I argue that an effective lag length of one year is too short because it fails to take into account the waiting time to conception as defined by Bongaarts (1983), I quote:
The data in table 2 suggests average conception waits ranging from five to ten months, with typical values near seven months. This generalization applies to women in their twenties; waiting times tend to be longer for younger women in the years immediately following menarche presumably because the incidence of anovulatory cycles is then higher. (see page 110).

If one takes the waiting time to conception into account, it should be obvious that a one year lag is too short. Presumably, the correct lag should be one and a half years, but because such data are hard to find, I propose a two year effective lag. Therefore, all the following empirical models will be estimated with both one and two year lags, and a comparison will be made. I also estimated most of the models with three years effective lag, in general these models are not able to improve the fit or the significance of the respective variables.\textsuperscript{34}

5.2 The Easterlin Model.

I used ordinary least squares (OLS) to estimate a log linear relation between the total fertility rate and the relative cohort size. I did this for two reasons. First, most of the previous empirical work concerning the Easterlin hypothesis tends to include log linear models. Second, log linear models have several desirable properties which I will explain below. The equations
are:

\[ \ln TFR_t = \alpha_1 + \alpha_2 \ln RCS_{t-1} + \epsilon_t \quad t=1962, \ldots, 1991. \]

\[ \ln TFR_t = \beta_1 + \beta_2 \ln RCS_{t-2} + \epsilon_t \quad t=1962, \ldots, 1991. \]

Table 4 contains the results from the estimation procedures with both one and two years lag. Since I applied log linear models, the dependent variables (relative cohort size) will be in elasticity form and therefore unit free. Consequently, a one percent increase in the relative cohort size for the one and two years lag models will yield a 1.8 percent and 1.91 percent increase in the total fertility rate respectively.

From table 4 one can see that the relative cohort size is significant because of high t-statistics both when lagged one and two years. The t-statistics for the relative cohort size are positively significant at 0.0003 and 0.0001 level for the one and two year lag models respectively, and thus the results support the Easterlin hypothesis. The Adj R-sq is 0.361 when the relative cohort size is lagged one year and 0.458 when lagged two years. This implies that in both models the independent variables (in this case just the relative cohort size) are capable of explaining about forty percent of the variation in the total fertility rate. This is relatively good considering that the relative cohort size is the only independent variable in both regressions. The t-values reveal that the relative cohort size is
more significant in the model in which there is a two year lag:
Also the variance in the total fertility rate is better explained
by the two year lag model. Both these observations support my
claim that a two year lag model does a better job than a one year
lag model to explain the variance in the total fertility rate.

Table 4. Comparison of the statistical significance of
the Relative cohort size using log linear models
lagged one and two years respectively.*

<table>
<thead>
<tr>
<th>Variable:</th>
<th>One year lag</th>
<th>Two year lag</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative cohort size:</td>
<td>1.800</td>
<td>1.910</td>
</tr>
<tr>
<td></td>
<td>(4.101)</td>
<td>(4.886)</td>
</tr>
<tr>
<td>Intercept:</td>
<td>-0.293</td>
<td>-0.370</td>
</tr>
<tr>
<td></td>
<td>(-1.15)</td>
<td>(-1.63)</td>
</tr>
<tr>
<td>Adj R-sq:</td>
<td>0.3610</td>
<td>0.4587</td>
</tr>
<tr>
<td>Number obs:</td>
<td>28</td>
<td>27</td>
</tr>
<tr>
<td>Dw-statistic:</td>
<td>0.099</td>
<td>0.115</td>
</tr>
<tr>
<td>Dw-Critical:</td>
<td>1.33-1.48</td>
<td>1.32-1.47</td>
</tr>
</tbody>
</table>

*All t-statistics are given in parentheses.

The presence of a high degree of positive serial
correlation, however, makes the above discussion more
complicated. Serial correlation will not affect the unbiasedness
or the consistency of the estimators, but it will affect the
efficiency. This loss in efficiency implies that the standard
eerrors obtained from the OLS procedure will be smaller than the
true standard errors. This will lead to the conclusion that the parameters estimated are more accurate than they actually are. This invalidates the t-tests of the parameters.

The observed Durbin-Watson statistic (DW statistics) for the one and two year lag models are 0.099 and 0.115 respectively. For both models an observed value for DW below the low critical value allows me to reject the null hypothesis of no serial correlation. If the DW observed is greater than the high critical value, I will retain the null hypothesis of no serial correlation. An observed DW in the range between the low and high critical values leaves me with inconclusive results. From table 4 where both the DW observed and the DW critical values are reproduced I realize that a high degree of positive serial correlation is present.

A method that is widely used to correct for positive serial correlation in econometric work is to present the variables, both dependent and independent, in first differences of their natural logarithms.\(^3\)\(^5\) Therefore the second model type I estimated is in first differenced form and looks like equation (10) and (11).

\[
\delta \ln TFR_t = \gamma_1 + \gamma_2 \delta \ln RCS_{t-1} + \epsilon_t \quad t=1962, \ldots, 1991.
\]

\[
\delta \ln TFR_t = \zeta_1 + \zeta_2 \delta \ln RCS_{t-2} + \epsilon_t \quad t=1962, \ldots, 1991.
\]

where \(\delta \ln TFR_t = \ln TFR_t - \ln TFR_{t-1}\) and \(\delta \ln RCS_t = \ln RCS_t - \ln RCS_{t-1}\)

The results of these estimation procedures are reproduced in
 Whereas the regression procedure reproduced in table 4 provided unconditional support to the Easterlin hypothesis, the results reproduced in table 5 provide no support for the Easterlin hypothesis. As one can see, the relative cohort size is, statistically insignificant, when lagged both one and two years because of the low t-values even though the relative cohort size is still positively related to the total fertility rate.

Table 5. Comparison of the statistical significance of the Relative cohort size using first differenced log linear models lagged one and two years respectively.*

<table>
<thead>
<tr>
<th>Variable</th>
<th>One year lag</th>
<th>Two year lag</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative cohort size:</td>
<td>0.115</td>
<td>0.330</td>
</tr>
<tr>
<td></td>
<td>(0.470)</td>
<td>(1.364)</td>
</tr>
<tr>
<td>Intercept:</td>
<td>-0.014</td>
<td>-0.013</td>
</tr>
<tr>
<td></td>
<td>(-2.239)</td>
<td>(-2.087)</td>
</tr>
</tbody>
</table>

*All t-statistics are given in parentheses. First differences of natural logarithms implies \( \delta \ln \text{RCS}_t = \ln \text{RCS}_t - \ln \text{RCS}_{t-1} \).

The Adj R-sq is also very low in both cases, which implies that only a small part of the variance in the total fertility rate can be explained by the relative cohort size. The DW are
still low, which may suggest that a more complex form of correlation between the residuals may be present. Even though this model clearly refutes the Easterlin argument, the two year lag model has a slightly higher Adj R-sq, and the relative cohort size has a higher t-value than one year lag model. This again supports the use of a two year lag model in econometric fertility analysis.

Based on a graphical presentation in one of the previous chapters (see figure 4 page 28), I noted that if relevant, the Easterlin hypothesis seems to fit the period before 1972 better than the period after 1972. An interesting aspect of this is that in the period before 1972 the relative cohort size was high by most standards, and in the period after 1972 the relative cohort size was low. Is this merely a coincidence, or is it a structural pattern which can be confirmed by empirical estimation. Based on figure 4 on page 28, I create a casual hypothesis that high values of the relative cohort size behave according to the Easterlin hypothesis, whereas small values do not.

The reason why I divided the data in high and low observations of the total fertility rate is simply because that approach will give more information than estimation of a pre 1972 model and a post 1972 model. This is so, since a model estimation that only includes high values for the relative cohort size will also contain most observations of the relative cohort size before 1972. Stated differently, a pre and post 1972 model examination will explain if the period before 1972 behaves according to the
Easterlin Hypothesis, whereas a high and low model examination will explain why. Therefore, I divided the thirty year period into two different parts, one period dominated by high values for the relative cohort size, and one dominated by low values for the relative cohort size. Then I ran two separate log linear regressions represented by equations (12) and (13).

\[(12) \ln TFR_{Hi} = \eta_1 + \eta_2 \ln RCS_{Hi-1} + \epsilon_{Hi}\]

\[(13) \ln TFR_{Lo} = \theta_1 + \theta_2 \ln RCS_{Lo-1} + \epsilon_{Lo}\]

The results are reproduced in table 6.

Table 6 reveals an interesting pattern. Low values for the relative cohort size regressed on the total fertility rate completely contradict the Easterlin hypothesis. Not only is the t-value for the relative cohort size low, but its relation to the total fertility rate is also the opposite of what Easterlin predicts. The Adj R-sq is also low.

On the other hand, the explanatory power associated with high values of the relative cohort size is diametrically opposite. The t-statistic are high and positive as predicted by Easterlin. Also, the Adj R-sq is very high for a model with only one independent variable. Thus, the casual hypothesis is confirmed by the data. A partial explanation for this may be the birth timing effects caused by female labor force participation and female education which the simple Easterlin relation fails to
take into account. As discussed previously (see page 14) this may, in fact, be a reasonable explanation.

Table 6. The significance of the relative cohort size using log linear models, when relative cohort size is divided in high and low observations.*

<table>
<thead>
<tr>
<th>Variable:</th>
<th>One year lag</th>
<th>Two year lag</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Low levels:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relative cohort size:</td>
<td>-1.776</td>
<td>-1.044</td>
</tr>
<tr>
<td></td>
<td>(-0.808)</td>
<td>(-0.518)</td>
</tr>
<tr>
<td>Intercept:</td>
<td>1.651</td>
<td>1.233</td>
</tr>
<tr>
<td></td>
<td>(1.432)</td>
<td>(1.058)</td>
</tr>
<tr>
<td>Adj R-sq:</td>
<td>0.0560</td>
<td>0.0238</td>
</tr>
<tr>
<td>Number obs:</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td><strong>High levels:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relative cohort size:</td>
<td>2.944</td>
<td>2.865</td>
</tr>
<tr>
<td></td>
<td>(8.039)</td>
<td>(7.915)</td>
</tr>
<tr>
<td>Intercept:</td>
<td>-1.047</td>
<td>-1.000</td>
</tr>
<tr>
<td></td>
<td>(-4.617)</td>
<td>(-4.442)</td>
</tr>
<tr>
<td>Adj R-sq:</td>
<td>0.8196</td>
<td>0.8259</td>
</tr>
<tr>
<td>Number obs:</td>
<td>14</td>
<td>13</td>
</tr>
</tbody>
</table>

*All t-statistics are given in parenthesis.

The Adj R-sq is also very high for a model that has only one independent variable. I do not know if this is a pattern unique
in Norwegian time series data, but if not, these results surely provide an interesting insight into the Easterlin hypothesis. Among other things, the Oppenheimer approach to the Easterlin Hypothesis may be more adequate than the relative cohort size approach.

A problem that is common in all science is determining whether changes in one variable are a cause of changes in another variable. For example, do changes in the relative cohort size cause changes in the total fertility rate? One approach to this question is a test of causality developed by Granger and Sims. The basic ideas of such a test have been discussed in chapter 3.1 page 32, and deserve no further attention. I estimated an unrestricted and a restricted form of the Easterlin model to test for causality or whether the relative cohort size causes the total fertility rate.

\begin{equation}
UR: lnTFR_t = \sum_{k=1}^{m} \theta_{1k} lnTFR_{t-k} + \sum_{k=1}^{m} \theta_{2k} lnRCS_{t-n-k} + \epsilon_t \quad n=2.
\end{equation}

\begin{equation}
RR: lnTFR_t = \sum_{k=1}^{m} \lambda_{1k} lnTFR_{t-k} + \epsilon_t
\end{equation}

Equations (14) and (15) represent the hypothesis (H1) that the relative cohort size cause changes in the total fertility rate. Since the observed F-values are greater than the critical F-value (see table 7) for both the two and three year effective lag models, I fail to reject the (H1) hypothesis that the relative
cohort size causes the total fertility rate. Even though this observation supports the Easterlin line of thought, I also need to test the inverse Easterlin relation: that the total fertility rate causes the relative cohort size. Equation 16 and 17 represent the hypothesis (H2) that the total fertility rate causes the relative cohort size.

(16) \( UR: \ln\text{RCS}_t = \sum_{k=1}^{m} \kappa_{1k} \ln\text{RCS}_{t-k} + \sum_{k=1}^{m} \kappa_{2k} \ln\text{TFR}_{t-n-k} + \epsilon_t \); \( n=2 \).

(17) \( RR: \ln\text{RCS}_t = \sum_{k=1}^{m} \lambda_{1k} \ln\text{RCS}_{t-k} + \epsilon_t \)

**Table 7. Results of Granger causality tests of the relationship between RCS (Relative cohort size) and TFR (Total fertility rate).** \( m \) is the number of effective lags.

<table>
<thead>
<tr>
<th>( m=2 ) N=26</th>
<th>( m=3 ) N=25</th>
<th>( F_{crit} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Null hypothesis:</td>
<td>( F(2,24) )</td>
<td>( F(3,23) )</td>
</tr>
<tr>
<td>( H_1: \text{RCS} \rightarrow \text{TFR} )</td>
<td>14.64</td>
<td>7.60</td>
</tr>
<tr>
<td>( H_2: \text{TFR} \rightarrow \text{RCS} )</td>
<td>11.27</td>
<td>3.53</td>
</tr>
<tr>
<td>( F_{crit} )</td>
<td>3.4</td>
<td>3.03</td>
</tr>
</tbody>
</table>

All F-tests are at five percent significance.

Since the observed F-values are greater than the critical F-value
for both the two and three year effective lag models, I fail to reject the (H2) hypothesis that total fertility rate causes the relative cohort size.

Failure to reject this hypothesis indicates that the relationship between the total fertility rate and the relative cohort size is likely to be spurious. Acceptance of causation in both directions indicates a potential feedback effect\(^{36}\), and should not be expected. Therefore, the Granger test of causality provides evidence against the Easterlin hypothesis.

5.3 New Home Economics Model.

A brief summary of what has been established in chapter 4. about the relation between the independent variables and the dependent variable may be appropriate. First, male wages (which is used as an instrumental variable for male income) is expected to be positively related to fertility. An increase in wages will increase consumption possibilities, and since the demand for children has positive income elasticity, fertility will increase.

Female wages is expected to be negatively related to the total fertility rate since the opportunity cost of time spent with children will increase. The conjecture that female wages are negatively related to fertility is just an empirical proposition advocated by Butz and Ward (1979), I quote:

An increase in the wife's wage has an income effect
proportional to her hours worked in the market place, in addition to a pure price effect – the usual Slutzky decomposition. The sum of these two effects may be positive or negative. An obvious feature of this formulation is that the income effect may grow over time if women's hours are trending upward – for example, if working women move from part-time to full-time employment. We have ignored this element in our model. (see page 321).

Female wages and male wages in equation (18) represent the Butz and Ward approach.

Female education is expected to be negatively related to the total fertility rate. This is so, since female students tend to marry later, and their economic situation is often worse than other females at the same age.

Child benefits will improve the economic situation of potential parents. This improvement can be expected to give incentives to potential parents to have children. Therefore, child benefits is hypothesized to be positively related to the total fertility rate.

An increase in availability of kindergarten seats implies that parents can have children, and pursue other activities than child care at the same time. Therefore, an increase in kindergarten seats per 1000 children under seven years is expected to be positively related to the total fertility rate.

Finally, unemployment benefits may insulate workers from the
financial risk of unemployment. Since economic stability/support is an important argument for families when they make their decisions about having children, unemployment benefits are hypothesized to be positively related to the total fertility rate.

Table 8 summarizes the effect my so-called New Home Economics model has on the total fertility rate. The estimated model looks like equation (18).

\[
TFR_t = \mu_1 + \mu_2 X_1_{t-n} + \mu_3 X_2_{t-n} + \mu_4 X_3_{t-n} + \mu_5 X_4_{t-n} + \mu_6 X_5_{t-n} + \mu_7 X_6_{t-n} + \epsilon_t
\]

Where \( n=1,2 \). \( t=1962,\ldots,1991 \).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Expected Relationship</th>
</tr>
</thead>
<tbody>
<tr>
<td>X1=Male wages.</td>
<td>(+)</td>
</tr>
<tr>
<td>X2=Female wages.</td>
<td>(-)</td>
</tr>
<tr>
<td>X3=Female education.</td>
<td>(-)</td>
</tr>
<tr>
<td>X4=Child benefit.</td>
<td>(+)</td>
</tr>
<tr>
<td>X5=Seats in kindergarten.</td>
<td>(+)</td>
</tr>
<tr>
<td>X6=Unemployment benefit.</td>
<td>(+)</td>
</tr>
</tbody>
</table>

The signs in the parentheses reflect the hypothesized signs of the different variables.

Most importantly, the Butz and Ward approach to explaining fertility trends seem to be supported in Norwegian time series
data for the period 1962-1991. Female wages are negatively related to the total fertility rate, and significant at a 5 percent level. Male wage is positively related to the total fertility rate, and significant at a 5 percent level.

As explained previously, Butz and Ward argue that male income should be positively related to the total fertility rate. And since the male wage is linearly related to male income by the hours worked, it is also reasonable to expect that male wage is positively related to the total fertility rate. One can expect, however, that male wage as an instrumental variable for male income is biased slightly upward since the numbers of hours worked has decreased uniformly over the whole period.

For both male and female wages, the two year lag model yields more statistically significant coefficients (or equivalently, higher t-statistics), and the Adj R-sq is also slightly higher in the two year lag model. This again supports the usage of two year lag models in econometric fertility models.

The other variables, which according to theory can be expected to influence the total fertility rate, are less successful in explaining fertility movements. The number of females in higher education is expected to be negatively related to the total fertility rate. This hypothesis is confirmed by the regression procedure, and the variable is significant at a 10 percent level. The availability of seats in kindergartens is expected to be positively related to the total fertility rate. This hypothesis cannot be confirmed by Norwegian time series data.
even though the coefficient is positively related to the total fertility rate. An explanation for this result may be the relatively crude way in which the kindergarten variable is measured.

Table 8. OLS model on: Male and female wages, child benefits, seats in kindergarten, unemployment benefits, females in higher education. TFR is still the dependent variable.*

<table>
<thead>
<tr>
<th>Variable</th>
<th>1 Year.</th>
<th>2 Year.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male wage:</td>
<td>311.3858</td>
<td>600.3743</td>
</tr>
<tr>
<td></td>
<td>(1.896)</td>
<td>(3.942)</td>
</tr>
<tr>
<td>Female wage:</td>
<td>-486.3607</td>
<td>-753.3874</td>
</tr>
<tr>
<td></td>
<td>(-2.519)</td>
<td>(-4.177)</td>
</tr>
<tr>
<td>Female edu:</td>
<td>-0.256152</td>
<td>-0.210125</td>
</tr>
<tr>
<td></td>
<td>(-2.075)</td>
<td>(-1.629)</td>
</tr>
<tr>
<td>Child benefit:</td>
<td>0.000581</td>
<td>-0.000006</td>
</tr>
<tr>
<td></td>
<td>(2.334)</td>
<td>(-0.223)</td>
</tr>
<tr>
<td>Kindergarten:</td>
<td>0.025084</td>
<td>0.019649</td>
</tr>
<tr>
<td></td>
<td>(1.028)</td>
<td>(0.933)</td>
</tr>
<tr>
<td>Unempl. benef:</td>
<td>0.038140</td>
<td>0.115038</td>
</tr>
<tr>
<td></td>
<td>(0.839)</td>
<td>(2.939)</td>
</tr>
<tr>
<td>Intercept:</td>
<td>23.70002</td>
<td>2.170511</td>
</tr>
<tr>
<td></td>
<td>(3.234)</td>
<td>(0.326)</td>
</tr>
</tbody>
</table>

**Number of lags.**

<table>
<thead>
<tr>
<th>Number of obs:</th>
<th>29</th>
<th>28</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adj R-sq:</td>
<td>0.8558</td>
<td>0.8673</td>
</tr>
<tr>
<td>DW-statistic:</td>
<td>0.910</td>
<td>1.130</td>
</tr>
</tbody>
</table>

*All t-values are presented in parentheses.
Among other points the demand side for seats in kindergartens is not even considered. Unemployment benefit can be assumed to be positively related to the total fertility rate. This hypothesis is confirmed in the two year lag model, but not in the one year lag model.

The last independent variable, child benefits, is, as expected, positively related and significant at low levels for the one year lag model. In the two year lag model the effect of child benefits on the total fertility rate is reversed, which contradicts what I would expect. The t-statistic, however, explains that even though unemployment benefits in the two year lag model seems to be negatively related to the total fertility rate, the coefficient is not significant.

The Durbin-Watson statistics indicate that there may be a problem with positive serial correlation in both the one and two year lag models which may cause the t-statistics to be overstated. However, the DW observed in both the one and two year lag models are in the grey or indeterminate area, which may be due to serial correlation in the independent variables and not in the error terms. I also estimated a semi log relation of this model. Generally the results were the same, but the coefficients were less significant.
By "population policies", I mean deliberate action undertaken by the government to influence the size, the age structure, the regional distribution, and the growth of a population. The most common instruments in population policy are:

- Immigration regulations.
- Different laws concerning abortion.
- Information and distribution of contraceptive devices.
- Child benefit.
- Other financial transfer devices.
- Medical healthcare.

Population policies can be undertaken to reduce fertility (as in China and India) or to increase fertility (as in Germany before and during World War II, and in Italy and France today). In economic and sociological terminology, population policies undertaken to increase fertility are labeled pronatalist. In most developed countries today, the fertility rate is far below the replacement level. This implies a decrease in population in the future, ceteris paribus. In order to stabilize, or increase a population, governments may want to pursue a pronatalistic policy. A pronatalist policy can embrace two major strategies. First, restrictions on access to contraceptive devices can be established. Second, an attempt to influence attitudes toward
childbearing and childrearing through provisions of financial incentives can be made. However, there are several moral issues associated with pronatalist policy that may serve as a partial explanation why most Western European countries have been reluctant to pursue active pronatalist policy. First, Western European governments are reluctant to disturb the basic human right of family size choice. Second, following the Malthusian population doctrine and the persistent view in genetics concerning heredity and the quality of a population, those that are opposed to pronatalistic policy argue that any fertility increase would take place among the poor and the inferior. Third, many feminists see pronatalism as a means of restoring male superiority by forcing women back into the kitchen. Finally, there is also an economic justification problem associated with pronatalistic policy. Generally, pronatalist policy incurs costs, whereas the produced benefits associated with pronatalist policy are hard to establish with certainty.

Antinatalist policies are pursued in most undeveloped and developing countries in Southeast Asia and Africa today. The main goal of antinatalist policies is to reduce fertility, with family planning programs as the major policy instruments.

6.1 The Effects of Pronatalistic Policy.

Some empirical studies have been conducted that reveal the effect of pronatalistic policies in developed countries. Most of
these case studies show that pronatalistic policies have little or no effect on fertility. Brunborg (1985), found pronatalist policy to influence fertility positively with approximately 10 percent in Norway. All other empirical studies I examined, with the exception of Hwang (1990), found pronatalist policies to have less effect on fertility. Hwang discussed the importance and differences in desired family size and actual family size. In particular he established that as long as desired family size is close to actual family size, pronatalist policy will have little or no effect. Inversely, if the desired family size is significantly greater than actual family size, pronatalist policy may be effective. In a case where the desired family size is lower than the actual family size, family preferences and attitudes for children need to be influenced in order to increase fertility. In the early 1980s, desired family size was significantly greater than actual family size for all age groups in Norway (with the exception of the age group 16-20, desired family size was approximately at replacement level). This may explain the large impact Brunborg found pronatalist policy to have on fertility in Norway.

6.2 Immigration Policy.

Immigration policies have been pursued successfully in the U.S for a long period of time. More recently, however, illegal immigration from Mexico and the caribbean islands in particular,
have caused problems for the U.S. government. Historically, immigrants tend to be a very select group. The immigrants to the U.S. in the 19th century were chiefly young, resourceful men and women (even today this is true). This made the population composition or age structure in the U.S. advantageous since most people were in the working and childbearing ages, and thus able to support themselves. Today, immigrants are still young and resourceful, but also usually well educated, richer and more ambitious than non migrants. Therefore, in order to counteract the aging of the population as well as depopulation caused by low mortality and low fertility in developed countries, migration policy may be a valid instrument.

An argument often advocated by those that oppose immigration is that the young immigrants will grow old one day, and to accept immigrants just implies a postponement of the age structure problem. That argument is just partly true. A stable positive net migration of young adults implies a larger labor force than would have been the case without a positive net migration.

In order to be able to discuss the relevance and importance of the migration policy in Norway it would be helpful to examine the basic principles underlying Norwegian immigration policy. These basic principles are:

-A relatively strict control of immigration. (Norway has practiced an immigration ban since 1975).
—All applicants for immigration should be treated equally, regardless of sex, religion, race, education and so on.

—All kinds of refugees (political, religious, war) are treated on an individual basis, and are generally accepted.

—International commitments. These commitments include special treatment of refugees and other non privileged immigrants.

Foreign citizens intending to stay in Norway for more than 6 months are registered in the Central Population Register (CPR). All people intending to stay in Norway for more than six months receives an identification number. That number is used in all statistical sources on the individual level, and makes analyzing of behavior possible. Therefore, Norwegian society is continuously surveyable, which makes the Norwegian data somewhat unique, at least in European context. From 1987, all types of asylum seekers are also included in this register.

Norway has maintained a relatively strict immigration policy since the 1960s. There are several reasons for this. Among other points, Norwegians are somewhat sceptic of foreign influence and conservation of their natural peculiarities are highly valid arguments to most Norwegians. This is perhaps why Norway still is being referred to as Europes best kept secret. Also most Norwegians are concerned with the prospect that imported cheap labor may lead to a reduction in the wage level, and in the worst
scenario, to unemployment. Generally, there has also been an increasing hostility towards "visible" immigrants in Norway as their numbers have grown. The fear of mass immigration culminated when Folkeakson Mot Innvandring FMI (peoples front against immigration) was established in 1984. The political impact of this party, however, is relatively small with its one member in the Norwegian parliament. Also, at the local elections in 1991, Norway had three minor parties with anti immigration as their primary goal.

As noted before (see chapter 1.2 page 8), Norway has experienced positive net immigration of approximately four thousand persons annually since the early 1960s. Also most of the net migration is from relatively poor countries in Africa, Southeast Asia, and Eastern Europe. In 1990, immigration from Europe constituted approximately 50 percent of the total immigration to Norway, whereas just four percent of the net immigration. Generally, the emigrants from Norway to Europe tend to be of the same age as the immigrants from Europe to Norway.41

At this point it is important to distinguish between the characteristics of an immigrant and a refugee. In statistical reports, refugees are considered immigrants to simplify matters. However, refugees are different from immigrants in several respects, and most importantly, refugees tend to be of all ages. Thus, an increase in the number of immigrants to Norway will influence neither the age structure nor fertility in Norway much if the larger part of the immigrants are refugees. Moreover, in
years when the number of asylum seekers or refugees is high, the Norwegian government tend to further reduce the number of other immigrants in order to keep the total number of immigrants fairly stable. Therefore in years with where there are many asylum seekers and refugees, the Norwegian population will increase. However, a relatively large share of the immigrants will be infertile. In 1991 the total number of refugees was 1486, which includes reunification cases and persons given a permit to stay for humanitarian reasons. The refugees tend to be from poor countries which have experienced recent wars, political or religious disorder, and famine among other factors. Typically, those countries are also the ones that make up approximately 90 percent of the net immigration to Norway.

Table 9 presents the immigration to Norway after country of origin. In this table, 1991 is used as a reference year. The reason why I use 1991 as a reference year is that 1991 was an average year, with no large cyclical fluctuation in immigration to or emigration from Norway. Also 1991 is a fairly recent year, which may give a good picture of what to expect in the near future. Even though data are available for 1992 and 1993, I chose not to use those data as reference, because of the unusual large impact the refugees from former Yugoslavia have on total immigration as well as net immigration to Norway.

As can be seen in table 9, most of the net immigration is from Asia. Viet Nam, Iran, Sri Lanka, and Pakistan are the countries that contributes most to positive net migration to
Norway. I argued, and explained why these immigrants necessarily do not increase the total number of births in Norway significantly, since many of the immigrants from Asia are refugees.


<table>
<thead>
<tr>
<th>Country</th>
<th>Immigration</th>
<th>Emigration</th>
<th>Netmigration</th>
<th>% share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe total:</td>
<td>7396</td>
<td>7202</td>
<td>194</td>
<td>3.33 %</td>
</tr>
<tr>
<td>Denmark</td>
<td>1809</td>
<td>1982</td>
<td>- 173</td>
<td></td>
</tr>
<tr>
<td>Finland</td>
<td>187</td>
<td>366</td>
<td>- 179</td>
<td></td>
</tr>
<tr>
<td>Iceland</td>
<td>284</td>
<td>303</td>
<td>- 19</td>
<td></td>
</tr>
<tr>
<td>Sweden</td>
<td>1082</td>
<td>1123</td>
<td>- 41</td>
<td></td>
</tr>
<tr>
<td>Turkey</td>
<td>515</td>
<td>139</td>
<td>376</td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td>321</td>
<td>224</td>
<td>97</td>
<td></td>
</tr>
<tr>
<td>United Kingdom</td>
<td>715</td>
<td>1433</td>
<td>- 718</td>
<td></td>
</tr>
<tr>
<td>USSR</td>
<td>200</td>
<td>11</td>
<td>189</td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td>459</td>
<td>238</td>
<td>221</td>
<td></td>
</tr>
<tr>
<td>Yugoslavia</td>
<td>826</td>
<td>468</td>
<td>358</td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>180</td>
<td>325</td>
<td>- 145</td>
<td></td>
</tr>
<tr>
<td>Netherlands</td>
<td>181</td>
<td>228</td>
<td>- 47</td>
<td></td>
</tr>
<tr>
<td>Rest of Europe</td>
<td>637</td>
<td>362</td>
<td>275</td>
<td></td>
</tr>
<tr>
<td>Africa total:</td>
<td>1358</td>
<td>348</td>
<td>1010</td>
<td>17.34 %</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>229</td>
<td>27</td>
<td>202</td>
<td></td>
</tr>
<tr>
<td>Gambia</td>
<td>48</td>
<td>17</td>
<td>31</td>
<td></td>
</tr>
<tr>
<td>Morocco</td>
<td>217</td>
<td>28</td>
<td>189</td>
<td></td>
</tr>
<tr>
<td>Nigeria</td>
<td>37</td>
<td>8</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>Rest of Africa</td>
<td>827</td>
<td>268</td>
<td>559</td>
<td></td>
</tr>
<tr>
<td>Asia total:</td>
<td>5013</td>
<td>814</td>
<td>4199</td>
<td>72.11 %</td>
</tr>
<tr>
<td>Philippines</td>
<td>400</td>
<td>48</td>
<td>352</td>
<td></td>
</tr>
<tr>
<td>India</td>
<td>239</td>
<td>82</td>
<td>157</td>
<td></td>
</tr>
<tr>
<td>Iran</td>
<td>733</td>
<td>106</td>
<td>627</td>
<td></td>
</tr>
<tr>
<td>China</td>
<td>325</td>
<td>47</td>
<td>278</td>
<td></td>
</tr>
<tr>
<td>Pakistan</td>
<td>578</td>
<td>163</td>
<td>415</td>
<td></td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>587</td>
<td>115</td>
<td>472</td>
<td></td>
</tr>
<tr>
<td>Republic of Korea</td>
<td>129</td>
<td>20</td>
<td>109</td>
<td></td>
</tr>
<tr>
<td>Thailand</td>
<td>241</td>
<td>17</td>
<td>224</td>
<td></td>
</tr>
<tr>
<td>Viet Nam</td>
<td>1004</td>
<td>26</td>
<td>978</td>
<td></td>
</tr>
<tr>
<td>Rest of Asia</td>
<td>777</td>
<td>190</td>
<td>587</td>
<td></td>
</tr>
<tr>
<td>Region</td>
<td>Total</td>
<td>Norway</td>
<td>Immigrants</td>
<td>Total</td>
</tr>
<tr>
<td>----------------------</td>
<td>-------</td>
<td>--------</td>
<td>------------</td>
<td>---------</td>
</tr>
<tr>
<td>N. America total</td>
<td>1022</td>
<td>966</td>
<td>56</td>
<td>0.96 %</td>
</tr>
<tr>
<td>Canada</td>
<td>86</td>
<td>322</td>
<td>-</td>
<td>236</td>
</tr>
<tr>
<td>USA</td>
<td>857</td>
<td>612</td>
<td>245</td>
<td></td>
</tr>
<tr>
<td>Rest N. America</td>
<td>79</td>
<td>32</td>
<td>47</td>
<td></td>
</tr>
<tr>
<td>S. America total</td>
<td>695</td>
<td>311</td>
<td>384</td>
<td>6.59 %</td>
</tr>
<tr>
<td>Brazil</td>
<td>84</td>
<td>44</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>Chile</td>
<td>262</td>
<td>216</td>
<td>46</td>
<td></td>
</tr>
<tr>
<td>Colombia</td>
<td>230</td>
<td>7</td>
<td>223</td>
<td></td>
</tr>
<tr>
<td>Rest S. America</td>
<td>119</td>
<td>44</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>Oceania total</td>
<td>101</td>
<td>121</td>
<td>-</td>
<td>20</td>
</tr>
<tr>
<td>Australia</td>
<td>81</td>
<td>95</td>
<td>-</td>
<td>14</td>
</tr>
<tr>
<td>New Zealand</td>
<td>20</td>
<td>25</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td>Rest of Oceania</td>
<td>0</td>
<td>1</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Total:</td>
<td>15585</td>
<td>9762</td>
<td>5823</td>
<td>100.00 %</td>
</tr>
</tbody>
</table>

Source: Norweginan Bureau of Statistics.

Immigrants from Africa and Asia that are still in their fertile years, however, tend to give birth to more children than Norwegian born females. This is because they are accustomed to different fertility patterns in their respective home countries. Østby (1992) examined the fertility for immigrant women by length of stay in Norway and country of origin. Generally, he found that women from Pakistan, Turkey and Morocco have the highest total fertility rates, and that women from other industrial countries have the lowest total fertility rates.

This implies that immigrant women in their reproductive ages from developed countries have a much higher fertility than immigrants from developed countries. In 1987, Norwegian born women had a total fertility rate of 1.720, and women born abroad had a total fertility rate of 2.193. The total fertility rate for all women in Norway in 1987 was 1.745, which implies that foreign
born women increased the total fertility rate in Norway by 0.025 in 1987. For the years 1988-1991, foreign born women in Norway "caused" the total fertility rate to increase by approximately 0.02. The total fertility rate among the immigrants from developed countries (excluding refugees) displays a strong association between fertility and duration of stay in Norway. This implies that immigrants from the third world countries adapt to Norwegian fertility patterns relatively fast.


<table>
<thead>
<tr>
<th>Length of stay:</th>
<th>-2</th>
<th>2-4</th>
<th>5-6</th>
<th>7-9</th>
<th>10-12</th>
<th>13+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Country:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scandianavia:</td>
<td>1.4</td>
<td>2.1</td>
<td>2.2</td>
<td>2.2</td>
<td>1.8</td>
<td>1.7</td>
</tr>
<tr>
<td>Europe (minus Turkey):</td>
<td>2.4</td>
<td>2.2</td>
<td>1.9</td>
<td>1.6</td>
<td>1.4</td>
<td>1.5</td>
</tr>
<tr>
<td>Oth. industrialized countries:</td>
<td>1.9</td>
<td>2.0</td>
<td>1.9</td>
<td>1.5</td>
<td>1.8</td>
<td>2.0</td>
</tr>
<tr>
<td>Pakistan, Turkey, Morocco:</td>
<td>6.8</td>
<td>4.8</td>
<td>3.5</td>
<td>3.4</td>
<td>3.0</td>
<td>2.9</td>
</tr>
<tr>
<td>Oth. third world countries:</td>
<td>3.4</td>
<td>2.6</td>
<td>2.5</td>
<td>2.0</td>
<td>2.2</td>
<td>2.1</td>
</tr>
</tbody>
</table>


Another important aspect to consider is repatriation. Repatriation is not a distinct part of Norwegian immigration policy, even though more recently an increasing share of immigrants have returned to their country of origin. Most of the return migrants are people from developed countries, whereas people from less developed countries tend to become permanent citizens of Norway.

6.2.1 EC Membership and Migration.
The Norwegian government recently sent in an application to join the European Community (EC), and we will have a referendum in November of this year. As one can expect, small farmers and coastal fishermen generally oppose membership (because of potentially worsened economic conditions), whereas capitalists and large corporations tend to advocate a possible EC membership. Most EC and European Free Trade Association (EFTA) countries have an interest in evaluating the possible effect of the Single Market for immigration within the member countries. In Scandinavia, we have had a free Nordic labor market since 1954. The total effect of this agreement on migration between the Scandinavian countries is not clear. What is clear, however, is that labor force conditions are important for the migratory pattern. There have been short term streams between the Scandinavian countries when one or more of the countries experience abnormal fluctuations in the unemployment level. Also, when the general level of wages is higher in one or more of the Scandinavian countries, people from the other countries tend to migrate.

Membership in the EC can be expected to have approximately the same influence on the Norwegian migratory pattern as the free Nordic labor market. The free movement of people between the European countries will be dependent on work prospects and the general wage level, as well as the distance between countries. The regional distribution of people in Norway, on the other hand, can be expected to change dramatically. The common agricultural
policy in the EC will harm the Norwegian farmers, since they will have trouble with staying competitive. Internal migration to more urban areas in Norway (the southeast coast, and the west coast) must be expected.

At this point, it is also uncertain how integrated the EC will become in the future. If both goods and capital markets become completely integrated, international trade issues become regional in nature. The main difference between regional trade issues and international trade issues is in the mobility of factors of production. Factors of production are highly mobile between regions, but less mobile between nations. This causes regions to compete for the mobile factors of production (people included). Therefore, in the long run trade will be based on absolute advantage rather than comparative advantage. In the extreme case, people and other factors of production would move to the regions that pay the most (or the ones with the highest productivity), and less productive regions would just disappear. A general perception among economists as well as demographers is that the most productive areas tend to cluster around urban centers. Therefore, it is reasonable to assume that an extremely integrated EC would further reinforce the urbanization process.

The potential urbanization process that may take place in Norway due to an EC membership is undoubtedly one of the strongest arguments against EC membership for Norway. Recent surveys show that approximately 54 percent of the Norwegian population opposes EC membership. When it comes to population
policy, regional aspects have an important position in Norway. This is because of geographic location, and the mere shape of the country. Norway is extremely elongated, approximately eighteen hundred miles in length and just three hundred miles at its widest points, averaging just ninety miles. Therefore, in Norway it is important to maintain strategic rural population districts in order to be able to support all sorts of infrastructure between the various regions of the country. Without hesitation, it is reasonable to claim that people as well as policy makers in Norway today are more concerned with regional population issues than with the prospect of a depopulation in the future.

6.3 Empirical Results in Retrospect.

The empirical section (see chapter 4) examines several variables expected to influence fertility. Of those variables, only child benefits can be looked upon as a direct instrument used for pronatalist purposes. Therefore, child benefits will be addressed in a separate chapter (see chapter 6.3.1). However, in its broadest sense, all policy that influences fertility can be considered pronatalist. The total number of seats available in kindergartens can be viewed as a pronatalistic instrument, and also as an instrument used to create job opportunities. The primary purpose of Unemployment benefits is to level out differences in disposable income in the same way as progressive taxes. The potential effect unemployment benefits can have on
fertility is of a secondary nature, and not considered when policy makers develop the structure and provision of unemployment benefits. Therefore, unemployment benefits must be viewed as an indirect pronatalist instrument. The other variables, female and male wages, and female education all have influence on fertility, but in a strict sense they are not pronatalist variables.

The empirical results in chapter 5.3 provide some information on how to increase fertility in Norway. It seems that an increase in male wages, child benefits, unemployment benefits, and seats available in kindergartens will increase the total fertility rate, whereas an increase in female wages and the number of female students will decrease fertility.

To decrease the number of female students and female wages in order to achieve increased fertility is an unacceptable policy in developed countries today. Equality among the sexes is among the main goals of most developed countries, and a reversal of this process is neither possible nor desirable. Assuming like Butz and Ward that male and female time inputs are gross substitutes, an increase in male wages relative to female wages might induce females to leave the labor market and perhaps have children instead. However, this type of policy is also unacceptable by the same reasoning as above. Therefore instead of an increase in the male to female wage ratio, it is reasonable to assume that the male to female wage ratio will decrease. This again will increase the opportunity cost of time for females, and
thus reduce fertility. It may seem that because women's liberation is social liberation, we will have to accept the inevitable side effect of reduced fertility. In order to compensate for this reduction in fertility, other policy instruments must be considered.

The first best policy would be to decrease the opportunity cost of time for females without having to distort labor market conditions. Since real income determines the opportunity cost of time, higher tax rates would influence the opportunity cost but also the labor force participation among both sexes. In some countries, this may be a good policy. In Norway, on the other hand, tax rates are among the highest (if not the highest) in the world, and would therefore be difficult to increase much more.

Social changes that give incentives to females to have children while staying employed have been fruitful approaches in Norway. Among other things, paid maternity leave, parents' right to part-time work, child benefits, and public daycare have been policies utilized to increase fertility. Paid maternity leave and parents' right to part-time work deserve special attention, because of the unique position maternity leave and part-time work have in Norway. When a woman gives birth to a child in Norway, she has the right to a 52 week full paid maternity leave immediately after the birth. Few countries in the world have maternity leaves of this length and the same level of economic compensation. The only other developed countries with equivalent arrangements are Sweden and Denmark. In Sweden, the wage
compensation is 90 percent, but the maternity leave is eight weeks longer. In both Norway and Sweden the maternity leave can be extended for a period of time, but the compensation is decreased. Also, the father of a child can take a maternity leave of 90 days. Generally, the wage compensation for fathers is lower than that for mothers. Part time work during pregnancy and after childbirth is also common among women in Norway. The reason why the Norwegian government facilitates labor force participation among pregnant women and mothers is twofold. First, it gives potential mothers the opportunity to have a child without having to quit working. Second, being out of job for a period of time may lead to possible long term costs to the woman's career. Therefore, the Norwegian government emphasizes both social and pronatalist aspects in its facilitation of part time work.

An increase in the availability of kindergarten seats and increased child benefits incurs cost to the society. In terms of increased child benefits, an important question needs to be answered. What is the monetary value of a child to society? Put in another way, the marginal cost to society of a marginal increase in the number of children should be equal to the marginal benefit of a marginal increase in the number of children. Unarguably it is almost impossible to ascertain the monetary value of a child to society. Therefore, child benefits can be argued either to be too high or too low dependent upon subjective opinions about the value of a child. Since child
benefit payments have increased dramatically in Norway over the last 30 years, it is reasonable to assume that the value of a child to society has increased. It should also be emphasized, however, that the cost of childrearing has increased almost by the same amount in this period. An increase in the number of kindergarten seats is positively related to fertility. This increase will incur costs as in the case of child benefits. However, an increase in the number of kindergaren seats will create job opportunities as well. This positive side effect implies that one instrument (an increase in the number of kindergarten seats) can satisfy two objectives: increased fertility as well as the creation of job opportunities. I personally believe that instruments with this property should be pursued by developed countries that want to increase fertility. In France, perhaps the developed country that emphasizes pronatalist policy the most, increases in the capacity in kindergartens have been the chief instrument along with dramatic changes in the tax system.

The effects of a pronatalistic policy depend on what type of policy instrument is being used, as well as the intensity of the policy (e.g., how much money is being spent on child care services). Today, there is limited research available about the efficiency of different pronatalistic policies. Consequently, a comparison of different pronatalistic policy instruments, and a critical evaluation of the different policies is difficult.

With the dark picture painted by Brunborg and others in
mind, one can question how expensive progressive or pronatalistic policies can be justified. I am not proposing that pronatalistic policies should be abandoned but rather that policy makers should be aware of the possible inefficiency in these types of policies. Perhaps inexpensive, indirect pronatalist policies instead should be pursued by policy makers.

6.3.1 Child Benefits as Pronatalistic Policy in Norway.

A real pronatalistic policy should be arranged in a way that gives women economic incentives to have more children. This will be the case if, and only if, child benefits increase progressively with the number of children (and desired family size is less than current family size).

When child benefits were introduced in Norway in 1946, they were arranged as a constant increasing function of the number of children. At that time the number of births had increased for several years and more social than pronatalistic considerations were taken into consideration.

In 1963, the Norwegian government made child benefits progressive. Nevertheless, it seems unreasonable to assume that progressive child benefits were introduced for pronatalistic reasons since Norway at that time experienced its highest total fertility rate in 40 years.

As I explained above, child benefits have become increasingly less progressive over the period 1967-1991, and this
is still an ongoing trend. What are the reasons for this? Two answers seem possible:

-The Norwegian government has no pronatalistic attitude.

-Child benefits are not viewed as a pronatalist instrument but rather as a social instrument used to level out differences in economic status.

6.4 Some Remarks About Future Population Features in Norway.

This section presents a brief discussion of what to expect in the future as far as fertility, the size of the population and age structure are concerned. First, however, I would like to present the baby boom and baby bust period in total number of births. The total number of births in a period will cause generation waves approximately 25 to 35 years later according to Sundt. Sometimes in demography this effect is referred to as the echo effect, or population momentum. Figure 10 presents the total number of births in Norway during the period 1962-1991. The total number of births was fairly stable, around 55 to 60 thousand in the 1950s.

As one can see, the total number of births in Norway displayed large variations over the period 1962-1991. The 1960s was dominated by a large number of births every year, and is considered the baby boom era. The peak of the baby boom occurred
in 1969, never before had the total number of births exceeded 70 thousand in Norway. During the next eight years, Norway experienced its sharpest continuous decline in the number of births in recent history. The total number of births decreased from 70201 in 1969 to 50708 in 1977, which implies a 27 percent decrease in the number of births in just eight years.

From 1977, the total number of births remained stable at around 50 thousand until 1984, which is considered the end of the baby bust period in Norway. After 1984, Norway experienced an increase in fertility much due to increased fertility among women above thirty years of age (see table 11). The echo effect from the
1960s when the number of births were high also serve as a partial explanation why the number of births have increased in the late 1980s.


<table>
<thead>
<tr>
<th>Year</th>
<th>25-29</th>
<th>30-34</th>
<th>35-39</th>
</tr>
</thead>
<tbody>
<tr>
<td>1984</td>
<td>123,7</td>
<td>68,20</td>
<td>22,20</td>
</tr>
<tr>
<td>1985</td>
<td>125,5</td>
<td>70,90</td>
<td>22,70</td>
</tr>
<tr>
<td>1986</td>
<td>129,4</td>
<td>74,40</td>
<td>22,20</td>
</tr>
<tr>
<td>1987</td>
<td>131,7</td>
<td>79,70</td>
<td>24,60</td>
</tr>
<tr>
<td>1988</td>
<td>138,6</td>
<td>85,10</td>
<td>27,70</td>
</tr>
<tr>
<td>1989</td>
<td>140,6</td>
<td>91,30</td>
<td>29,70</td>
</tr>
<tr>
<td>1990</td>
<td>144,0</td>
<td>95,20</td>
<td>32,30</td>
</tr>
<tr>
<td>1991</td>
<td>145,1</td>
<td>97,30</td>
<td>35,10</td>
</tr>
<tr>
<td>1992</td>
<td>144,8</td>
<td>99,60</td>
<td>38,80</td>
</tr>
</tbody>
</table>


Assuming an echo effect of 25 to 35 years, Norway can expect an increase in the total number of births in the period 1990 to 2005. However, if the period total fertility rate remains low, the new boom in the 1990s will have less impact than the boom in the 1960s.

Since the total fertility rate is far below replacement level, which is 2,08 in Norway, the Norwegian population will start to decline sometime in the future. As argued in chapter 6.2.2 the present net migration level to Norway is neither sufficient to prevent a population decline nor to increase the total fertility rate above replacement level. In Christiansen (1992) I did several projections of the future population in Norway based on the so called component method.
The results of the different model specifications are presented in table 11. From table 11, one can realize the enormous impact different fertility levels have on the future population. If the total fertility rate had dropped to 1.38 (model 1) in 1990, Norway would have experienced a population decline in the 1990s. In the most likely case in which the total fertility rate is 1.72 (model 2), the Norwegian population will increase and reach a maximum of 4.35 million people in 2010. The reason why the Norwegian population will increase even though the total fertility rate is below the replacement level is because of the large cohorts of women in their reproductive ages, and small cohorts of elderly people. In the final model (model 3), the total fertility rate is pegged at the replacement level for the whole period. In this model the population will increase and almost reach the 5 million mark in 2040.

The results presented in table 11 are sensitive to changes in demographic components, and must be considered mere supposition rather than solid research. Also, the time horizon is rather long, which implies that the extrapolated values of the population size are uncertain.

If the death and fertility rates are constant over time in a closed economy (no migration), a constant age structure is achieved and the population grows or declines at a constant rate (stable population). This is advantageous for age specific allocation of resources. If the number of people within the different age groups remain constant over time, the allocation of
resources can stay the same provided the relative affluence of the different age groups is to remain constant.

Table 12. Projection of future population in Norway.*

<table>
<thead>
<tr>
<th>Year</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1.38)</td>
<td>(1.72)</td>
<td>(2.08)</td>
</tr>
<tr>
<td>1990</td>
<td>4.24</td>
<td>4.24</td>
<td>4.24</td>
</tr>
<tr>
<td>2000</td>
<td>4.23</td>
<td>4.33</td>
<td>4.46</td>
</tr>
<tr>
<td>2010</td>
<td>4.15</td>
<td>4.35</td>
<td>4.59</td>
</tr>
<tr>
<td>2020</td>
<td>3.98</td>
<td>4.32</td>
<td>4.77</td>
</tr>
<tr>
<td>2040</td>
<td>3.46</td>
<td>4.08</td>
<td>4.98</td>
</tr>
</tbody>
</table>

*All numbers are in millions.

The age structure in the future in Norway has been examined thoroughly by Brunborg (1985). He argues that (based on different assumptions on the components of the basic demographic equation) there will be a large scale aging of the population. Based on constant mortality rates and yearly immigration of 4000 as well as a total fertility rate of 1.72, Brunborg found that the share of people aged 66 or older would increase from 13 percent in 1985 to 16.4 percent in 2020, and that there would be large increases among the super elderly (80+). At the same time, the share of people under 16 years of age would decrease from 23.2 percent in 1985 to 17.3 percent in 2020. However, it seems that the the number of people that need economic support will remain fairly stable in the future (when the share of people aged 66 or more increases, the share of people aged 16 or less decreases).
An interesting article by Hoem (1990) examines the increase in total fertility rate experienced in Sweden since approximately 1985. Hoem argues persistently that the increase in total fertility rate is due to changes in Swedish social or population policy that intentionally or otherwise provides a financial incentive to closer spacing of births. What is even more interesting is the way he compares the fertility increase shared by the Scandinavian countries Sweden, Norway, and Denmark since the mid-1980s. Most other European countries have not experienced this same upward trend in fertility during this period. Hoem argues:

I know of no other country with a similar political system and at a comparable stage of industrial development that has so consequently tried to facilitate women's entry into the labor market and their attachment to it at minimal cost to childbearing and childrearing. Ideally, the record high and continuously growing labor force participation of Swedish women, combined with comparatively high and generally increasing fertility should be a reward for such efforts. (see page 740).

Hoem then explains that Norway, and to some degree Denmark, closely trail Sweden because of similar efforts in the respective
countries. I cannot tell if this in fact is a reasonable explanation, but if it is, pronatalistic policies may have a future after all. One problem, however, in Hoem's article is that the time span is less than ten years, which I feel is a rather short time to base conclusions on.
7.0 CONCLUSION.

The discussion of the economometric work gave useful answers to several important questions in economic fertility theories. Two well known theories have been tested using Norwegian time series data (the Easterlin hypothesis, and the New Home Economics approach). Some other variables that are expected to influence fertility have also been included. The Easterlin hypothesis in its simplest form was not supported in Norway for the period 1962-1991, even though I suggested that high values for the relative cohort size seem to explain fertility trends better than low values. Also a Granger test of causality provided evidence against the Easterlin hypothesis. All discussion of the Easterlin hypothesis is based on Easterlin's assumption that relative cohort size is a good instrumental variable for relative economic status. Therefore, even though I found evidence against the relative cohort size and its impact on past fertility trend in Norway, I am not able to completely reject the Easterlin hypothesis (that is if the relative cohort size is a bad instrumental variable for the relative income hypothesis).

The New Home Economics approach with its emphasis on male income and female wages is supported in Norway. Male income is, as expected, positively related to the fertility rate, and female wage is negatively related to the fertility rate. The other variables in this model proved less significant, but the model provides support for a negative relation between female education
and the fertility rate. Most of the models are tested with both one and two years effective lags, and the models with two years effective lag generally are the best ones. The two year lag models are the ones that take the waiting time to conception, as described by Bongaarts, into consideration.

As always, however, several important issues have been neglected because of data collecting problems, and because of lack of knowledge. A more delicate discussion of the Easterlin hypothesis with the Oppenheimer approach as a central theme could perhaps provide some important insight into the Easterlin hypothesis. An extension of the Granger test that includes not only the direction of causality, but also the signs of the coefficients would also be useful. As for the New Home Economics model, much could have been done to make the analysis more realistic. Among other things, a single equation model with six independent variables is not able to explain the interdependencies that may exist among the independent variables. For example, it is reasonable to assume that female wage is positively related to female education. Also, a more complex child benefit approach that includes child benefits that are nonlinear functions of birth order would be interesting to consider in future research. A pooled New Home Economics model using time series data and cross sectional data for the Scandinavian countries, for example, may provide some additional insight. This procedure will result in more observations and thus more efficient parameter estimates.
From the discussion provided in this paper it seems obvious that the New Home Economics approach fits the post World War II experience in Norway better than the Easterlin hypothesis. In particular, the Butz and Ward approach seems to fit Norwegian material particularly well. In simplicity the Butz and Ward approach is based on a complex relation between male and female wages. They argue that the baby boom was primarily due to rising male income, and that the baby bust was due to rising female wages. This seems to be a likely explanation for the post World War II fertility experience in other European countries as well. Most of the European countries have experienced rising male income and rising female wages. The male-female wage ratio has declined, and female labor force participation has increased. These are all factors that support the Butz and Ward approach. I, therefore, believe that future research aimed at testing New Home Economics models in most European countries would be fruitful. Finally, it would be interesting to see the New Home Economics model applied to undeveloped and developing countries. My guess is that the New Home Economics model would be inappropriate in such countries because of low female labor force participation and large male to female wage ratios.

7.1 What Can be Expected from Migration Policy?

Based on the discussion, the effect of a migration policy in Norway is at least uncertain. It is obvious that positive net
migration will increase the population, but the current net migration level of approximately four thousand people annually is not sufficient to prevent a decrease in the Norwegian population in the long run (see the discussion in chapter 6.4). A more selective migration policy, biased toward young immigrants from third world countries, could change this picture, but such a policy can be hard to enforce when immigrants from third world countries already contribute about 90 percent of the total net migration. Lifting the immigration ban is a possible, but not a realistic, option in Norway today. However, adopting some form of immigration quotas may be an alternative that would be acceptable to most of the political parties. A possible EC membership will not change population features in Norway much more than what the free Nordic labor market has accomplished. When Norway experiences good times, the net labor migration from the other Nordic countries tends to increase and vice versa. In the extreme case, when the EC is completely integrated (in which each country is like a state in a larger country, as in the U.S.) absolute advantage in production may cause large rural areas in Norway to be completely depopulated. To sum up briefly, institutional arrangements, immigration ban, and the large share of refugees among the immigrants in Norway makes migration policy somewhat sterile in influencing the inevitable depopulation of Norway in the future (with current levels of the total fertility rate). In any circumstances, it is unrealistic to expect that fertility among immigrants alone can raise the total fertility rate above
replacement level.
APPENDIX.

In this appendix I provide the results obtained from the three year lag model of the Easterlin hypothesis, as well as a semi log model of the New Home Economics model. The implication of these results are not discussed, so the models are just included for interested readers.

\[ \text{Model (1) } \ln TFR_t = \alpha_1 + \alpha_2 \ln RCS_{t-3} + e_t \quad t=1962, \ldots, 1991. \]

Table 1. The statistical significance of the relative cohort size using a log linear model (model 1) lagged three years.*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Three year lag.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative cohort size:</td>
<td>1.870</td>
</tr>
<tr>
<td></td>
<td>(4.747)</td>
</tr>
<tr>
<td>Intercept:</td>
<td>-0.406</td>
</tr>
<tr>
<td></td>
<td>(-2.051)</td>
</tr>
<tr>
<td>Adj R-sq:</td>
<td>0.4465</td>
</tr>
<tr>
<td>Number obs:</td>
<td>26</td>
</tr>
<tr>
<td>DW-statistic:</td>
<td>0.186</td>
</tr>
<tr>
<td>DW-critical:</td>
<td>1.30-1.46</td>
</tr>
</tbody>
</table>

*All t-statistics are given in parentheses.
Model (2) \( \delta \ln TFR_t = \beta_1 + \beta_2 \delta \ln RCS_{t-3} + \varepsilon_t \quad t=1962, \ldots, 1991. \)

where \( \delta \ln TFR_t = \ln TFR_t - \ln TFR_{t-1} \) and \( \delta \ln RCS_t = \ln RCS_t - \ln RCS_{t-1} \)

Table 2. The statistical significance of the relative cohort size using a first differenced log linear model lagged three years (model 2)*

<table>
<thead>
<tr>
<th>Variable:</th>
<th>Three year lag.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative cohort size:</td>
<td>0.156</td>
</tr>
<tr>
<td></td>
<td>(0.613)</td>
</tr>
<tr>
<td>Intercept:</td>
<td>-0.014</td>
</tr>
<tr>
<td></td>
<td>(-2.167)</td>
</tr>
<tr>
<td>Adj R-sq:</td>
<td>-0.0256</td>
</tr>
<tr>
<td>Number obs:</td>
<td>25</td>
</tr>
<tr>
<td>DW-statistic:</td>
<td>0.840</td>
</tr>
</tbody>
</table>

*All t-statistics are given in parentheses.
Model (3) \( \ln TFR_{HI} = \gamma_1 + \gamma_2 \ln RCS_{HI-3} + \epsilon_{HI} \)

\( \ln TFR_{LO} = \zeta_1 + \zeta_2 \ln RCS_{LO-3} + \epsilon_{LO} \)

Table 6. The significance of the relative cohort size using log linear models, when relative cohort size is divided in high and low observations (model 3).*

<table>
<thead>
<tr>
<th>Variable:</th>
<th>Three year lag</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Low levels:</strong></td>
<td></td>
</tr>
<tr>
<td>Relative cohort size:</td>
<td>-0.138 (-0.076)</td>
</tr>
<tr>
<td>Intercept:</td>
<td>0.732 (0.769)</td>
</tr>
<tr>
<td>Adj R-sq:</td>
<td>-0.090</td>
</tr>
<tr>
<td>Number obs:</td>
<td>12</td>
</tr>
<tr>
<td><strong>High levels:</strong></td>
<td></td>
</tr>
<tr>
<td>Relative cohort size:</td>
<td>2.757 (8.110)</td>
</tr>
<tr>
<td>Intercept:</td>
<td>-0.944 (-4.433)</td>
</tr>
<tr>
<td>Adj R-sq:</td>
<td>0.8437</td>
</tr>
<tr>
<td>Number obs:</td>
<td>12</td>
</tr>
</tbody>
</table>

*All t-statistics are given in parenthesis.
Model (4) \( \ln TFR_t = \delta_1 + \delta_2 X_{1,t-n} + \delta_3 X_{2,t-n} + \delta_4 X_{3,t-n} + \delta_5 X_{4,t-n} + \delta_6 X_{5,t-n} + \delta_7 X_{6,t-n} + \epsilon_t \)

Where \( n=1,2 \), \( t=1962,...,1991 \).

Table 8. Semi log model on: Male and female wages, child benefits, seats in kindergarten, unemployment benefits, females in higher education. TFR is still the dependent variable (model 4).*

<table>
<thead>
<tr>
<th>Variable:</th>
<th>1 Year.</th>
<th>2 Year.</th>
</tr>
</thead>
<tbody>
<tr>
<td>X1=Male wage:</td>
<td>14.19977</td>
<td>24.89061</td>
</tr>
<tr>
<td></td>
<td>(1.761)</td>
<td>(3.139)</td>
</tr>
<tr>
<td>X2=Female wage:</td>
<td>-21.91278</td>
<td>-31.10592</td>
</tr>
<tr>
<td></td>
<td>(-2.311)</td>
<td>(-3.312)</td>
</tr>
<tr>
<td>X3=Female edu:</td>
<td>-0.008055</td>
<td>-0.005526</td>
</tr>
<tr>
<td></td>
<td>(-1.329)</td>
<td>(-0.823)</td>
</tr>
<tr>
<td>X4=Child benefit:</td>
<td>0.000033</td>
<td>-0.00005</td>
</tr>
<tr>
<td></td>
<td>(2.750)</td>
<td>(-0.039)</td>
</tr>
<tr>
<td>X5=Kindergarten:</td>
<td>-0.000059</td>
<td>0.000390</td>
</tr>
<tr>
<td></td>
<td>(-0.050)</td>
<td>(-0.356)</td>
</tr>
<tr>
<td>X6=Unempl. benef:</td>
<td>0.002644</td>
<td>0.006325</td>
</tr>
<tr>
<td></td>
<td>(1.184)</td>
<td>(3.103)</td>
</tr>
<tr>
<td>Interccpt:</td>
<td>1.225174</td>
<td>0.348547</td>
</tr>
<tr>
<td></td>
<td>(3.405)</td>
<td>(1.006)</td>
</tr>
</tbody>
</table>

Number of obs: 29 28
Adj R-sq: 0.8146 0.8154
DW-statistic: 0.677 0.853

*All t-values are presented in parentheses.
LIST OF WORK CONSULTED.


Christiansen, Terje. "Fruktbarhetsutviklingen i Norge fra 1850 fram til i dag, hvor går vi fra her?" (Semesteroppgave, University of Oslo, 1992)


Sanderson, Warren C. "On Two Schools of the Economics of


ENDNOTES.


3. Data were collected from Statistisk Årbok, 1993. Throughout the rest of the paper, each time I give numbers without references, I used a volume of Statistisk Årbok.

4. This is widely used terminology, as in Colin Newell, Methods and Models in Demography (London: Belhaven Press, 1988), 9.


7. Expectation of life at birth is the average number of years that would be lived by an arbitrary number of persons born in the same year assuming that the age specific death rates of that year would be maintained through the period of the individuals' lives.


11. This is based on the so called model of inter-generational wealth flows, described in e.g. Huw Jones, Population Geography (London:Paul Chapman Publishing Ltd, 1990), 100.
12. Preben Munthe, Befolkningslære (Oslo:Universitetsforlaget a/s, 1990), 82.


20. Western Europe includes: Belgium, England and Wales, France, Ireland, and the Netherlands.

   Northern Europe includes: Denmark, Finland, Norway, and Sweden.

   Central Europe includes: Austria, West Germany, and Switzerland.

   Southern Europe includes: Greece, Italy, Portugal, and Spain.

21. See page 49, in Ermisch's article.

22. The lag of one year seems rather short. Usually, the waiting time for conception is between six and ten months. E. g. Bongaarts (1983) found that the estimated mean time for conception in the U.S. was ten months. With an average time of pregnancy of nine months, a more correct lag should perhaps have been two years.

23. See page 61, in Baird's article.
24. Pampel lagged the relative cohort size two years, to allow for waiting time for conception and length of pregnancy.

25. See Pampel's article page 511.


28. See note 20.


30. Much of the discussion in this part is based on numbers and information from Per Kolstad, "Fruktbarhet og økonomi - Utviklingen i fruktbarheten i Norge i årene 1962 til 1987 sett i forhold til reallønnsutviklingen for kvinner og menn og barnetrygd," (Hovedoppgave, University of Oslo, 1989), 50.


34. The empirical results of three year lag models (of the Easterlin hypothesis) is provided in appendix 1. Also included in appendix 1 is a semi log model of the New Home Economics approach.


37. As defined in Jones (1990).


40. FMI (Folkeaksjon mot invandring), a Norwegian political party with Arne Myrdal as the central character. This party condemns immigration, and in particular people from Africa and Asia.

41. This has been discussed in Hwang (1990). Most importantly, the female share of the net migration to Norway from the rest of Europe is just 2 percent.

42. See Østby (1992 page 54).

43. See Østby (1992 page 23).


46. Most developed countries have experienced a sharp increase in the age specific fertility rates for women aged 30+ in the 1980s. For a discussion on Norway, see Brunborg (1984 page 12).