Family Allowances and Fertility:

Socio-economic and Religious

Differentials*

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FAMILY ALLOWANCES AND FERTILITY: SOCIO-ECONOMIC AND RELIGIOUS DIFFERENTIALS

Abstract: *Although micro-economic theory predicts that cash benefits will increase fertility, empirical studies generally find a weak, although positive, relationship between cash benefits and fertility. Cash benefits may be more cost-effective, when they target certain sub-populations. One such sub-population, it has been suggested, consists of low-income families. This paper presents the results of an analysis of socio-economic differentials in the effect of family allowances on the fertility of Israeli women using birth histories of women in the last two Israeli censuses of 1983 and 1995. With this kind of sample size it is not only possible to study socio-economic differentials in the effect of family allowances on the likelihood of having a third birth, but also of having a fourth, fifth, or sixth birth. Assuming the existence of economies of scale in a family, the cost of the fifth or sixth child should be lower than the cost of the third or fourth. Thus, child allowances may have a larger effect on the birth of higher birth-order children, since their cost would be lower than those of lower birth-order children. Hence, separate analyses will be performed for each parity. At the higher parities, most couples are religious. Hence, the second aim of this paper is to study religious differentials in the effect of family allowances.*

FAMILY ALLOWANCES AND FERTILITY: SOCIO-ECONOMIC AND RELIGIOUS DIFFERENTIALS

With fertility levels lower than ever in the developed world, some governments are looking for ways to raise fertility. One of the more recent attempts dates from September 2005, when the French government pledged more money for families with three children. There apparently remains among some national leaders a belief in the effectiveness of family allowances in raising fertility (King 2001: 320). Although micro-economic theory predicts that cash benefits will increase fertility, empirical studies generally find a weak, although positive, relationship between cash benefits and fertility (Ekert 1986; Zhang et al. 1994; Gauthier and Hatzius 1997; and McNown and Ridao-Cano 2004). The United States has not implemented such explicit policies as family allowances. However, the federal income tax provides an exemption for dependent children that may implicitly affect the decision to have a child. Using aggregate time-series data, Whittington, Alm and Peters (1990) find that an increase in the tax value of the personal exemption leads to an increase in the demand for children, although the elasticity of the birth rate with respect to the exemption is small. In a related paper that uses individual-level data, Whittington (1992) substantiates the aggregate finding.

Cash benefits may be more cost-effective, of course, when they target certain sub-populations. One such sub-population, it has been suggested, consists of low-income families. Assuming that the cost of children is lower for low-income families than for high-income ones, and that family benefits are paid independently of income, rational choice models would predict family benefits to have a larger impact on the fertility of low-income families (Gauthier and Hatzius 1997: 304).

Studies of socio-economic differentials in the effect of family allowances are rare. Andersson et al (2006) found no important educational differentials in the reaction to a premium given to Swedish women for shortening birth intervals. Perhaps their results are due to the computation of the premium as a percentage of previous income. This paper presents the results of an analysis of socio-economic differentials in the effect of family allowances on the fertility of Israeli women using birth histories of women in the last two Israeli censuses of 1983 and 1995. With this kind of sample size it is not only possible to study socio-economic differentials in the effect of family allowances on the likelihood of having a third birth, but also of having a fourth, fifth, or sixth birth, although the effect of family allowances on the likelihood of giving birth to a fifth or sixth child may only be of academic interest. Assuming the existence of economies of scale in a family, the cost of the fifth or sixth child should be lower than the cost of the third or fourth. Thus, child allowances may have a larger effect on the birth of higher birth-order children, since their cost would be lower than those of lower birth-order children (Gauthier and Hatzius 1997: 295). Hence, separate analyses will be performed for each parity.

Israeli fertility is still above replacement level and much higher than that in most other developed countries. Friedlander and Feldmann (1993) have shown that part of the reason for the relatively high fertility is religiosity. Traditional theories of religious behavior have accorded privileged status to the assumption of non-rationality (Stark, Iannaccone and Finke 1996). Manski and Mayshar (2003), nevertheless, assume a rational choice model when they argue that generous cash benefits are one explanation for the increase in the fertility of religious couples that has occurred in Israel in the last thirty years or so. Hence, the second aim of this paper is to study religious differentials in the effect of family allowances.

POPULATION POLICY IN ISRAEL

Population policy in Israel grew out of a concern for the socioeconomic conditions of disadvantaged social groups and for the low fertility rates of the Jewish majority compared with the Arab minority, on the other. Symptomatic of the latter concern is the initiative of Israel's first prime-minister David Ben-Gurion to pay a cash prize to every woman who gave birth to a tenth child. The Ben-Gurion prize was finally abolished in 1959, one of the reasons apparently being that many Arab women received it (Friedlander 1974). In 1975 Israel instituted a generous non-income tested family allowance program, replacing a complex system of benefits for children that included tax credits, small mandatory child payments by private employers, minor allowances by the National Institute of Insurance to large families, and a more substantial allowance to families of army veterans that had been enacted in 1971. A notable feature of the program that started in 1975 is that the size of the allowance varies with birth order, with the first two children receiving minimal sums, and each child from the fourth on receiving large sums (Manski and Mayshar 2003). Families in which at least one of the parents, grandparents or siblings of the child had served in the Israeli army or other security forces, received enlarged benefits, thus excluding large sections of the Arab minority from the program (Rosenhek 1999).

Figure 1 shows how family allowances evolved over time in New Israeli Shekels (NIS) at constant 1995 prices ($ 1.00 = NIS 3). The erosion of the new family allowance program that set in immediately upon its institution in 1975, and continued until 1985, is due to inflation. In 1983 the allowance for families with four children or more was raised by approximately fifty percent. In 1987 the value of the family allowance was linked to the consumer price index (Mayshar and Manski 2000). To

give a sense of the magnitude of child allowances, consider a family with six children under age 18. In 1994, such a family would have received an annual allowance of about NIS 22,000, which is equivalent to more than $7,300.

[Figure 1 about here]

DATA AND VARIABLES

The use of Israeli data has the advantage of family allowances not being means tested. Thus, the allowance of each family in the sample can be determined without knowing its income. The Arab minority, most of whom are Muslims, had just started its fertility decline in the 1970s and received lower family allowances (Rosenhek 1999; Schellekens and Eisenbach 2006). Perhaps that is why we did not find any statistical evidence for an effect of family allowances among Israeli Arabs. Hence, this sub-population has been omitted from the analysis. The first two parities have been omitted from the analysis, since the first two children received minimal sums.

Using the 'own-children' method in the 20 percent samples of the 1983 and 1995 censuses it was possible to reconstruct birth histories going back to 1972. A woman and her own children represent a partial birth history. Omitted are deceased children and children living elsewhere. Mortality, however, is very low in Israel. Moreover, by limiting the reconstruction to twelve years before each census, only a very small number of children is omitted due to their living elsewhere (Cho et al 1986). Often it is not possible to identify the father of children of remarried and divorced women. Hence, only women who were still in their first marriage at the time of the census have been included. Israel is a country of immigration. Therefore, it is important to exclude women-years spent abroad.

Family allowances are more likely to create period than cohort effects in fertility. Hence, we only use period measures of fertility (Ní Bhrolcháin 1992). Thus, the dependent variable is a variable indicating whether an *i*-th birth occurred in year *t* to a woman with *i*-1 children in year *t*-1. We also use aggregate measures. Infant and child mortality being very low, we estimated the birth rate for parity *p* in year *t* as the number of children born in year *t*, who were still alive at the time of the census, per 1000 women in year *t*, who were in their first marriage at the time of the census and who had *p*-1 children who were born before year *t* and still alive at the time of the census. Figure 2 shows that parity-specific birth rates for all parities declined in the 1970s, while those for the sixth and higher parities were the only ones to show an increase in the second half of the 1980s. The increase in sixth births started in 1984, a year after a large increase in the allowance for families with four children or more (compare with Figure 1). Thus, the increase in family allowances may explain the increase in the number of sixth births. On the other hand, the increase in seventh and higher-order births started in the same year that the allowance increased. Thus, the increase in family allowances in 1983 can explain only part of the increase in the number of seventh and higher-order births in the following year.

[Figure 2 about here]

A comparison of the parity-specific birth rate (PSBR) for the third parity obtained from the reconstruction of fertility histories using the own-children method with the total marital fertility rate (TMFR) at age twenty obtained from current statistics illustrates the reliability of the reconstructed birth histories. Figure 3 shows that trends in both series are very similar. More specifically, the comparison shows that the discontinuity in the PSBR between 1982 and 1983 is not due to a combination of data

from the 1983 and 1995 Census, since it also appears in the TMFR series (and the total number of registered births).

[Figure 3 about here]

The analysis includes two types of measures of family allowances. The first is the expected addition to family income in 1995 NIS in case of the birth of an *i*-th child in year *t*. Since, it takes at least about a year between the decision to have another child and the actual birth, this variable is measured in year *t*-1. The response to family allowances may not be constant over time. Couples, for example, may be slow to respond to a *change* in family allowances, if information about these changes is not widely publicized in the media. To model the pace of response, a set of variables is included that measure the part of the expected addition to family income in the case of the birth of an *i*-th child in year *t* that is due to a *change* in the allowance paid for the *i*-th child that occurred between year *t*-2 and year *t*-1, between year *t*-3 and year *t*-2, between year *t*-4 and year *t*-3, between year *t*-5 and year *t*-4, or between year *t*-6 and year *t*-5. Thus, the second kind of measure is a differenced series of the first kind of measure.

Maternity leave benefits that include the duration of the leave and the pay received during this period may also influence fertility. We were unable to measure these. However, maternity benefits are relatively small compared to cash benefits. There are also tax exemptions for working mothers. These could not be taken into account either, because they depend on the employment status and income level of the woman, which are only known for the year of the census. However, to the extent that they do not correlate strongly with the level of family allowances, omitting a variable measuring the contribution of tax exemptions to family income from the analysis should not affect the coefficients of the allowance variables to a large extent. Below I

will try to show that the inclusion of a measure of the value of tax exemptions and housing loans is unlikely to improve the fit of most statistical models very much.

The analysis includes three independent demographic variables: the age of the woman, marital duration and the number of years since the last birth. Two socio-economic variables are available in the census: the educational level of the woman and that of her husband. The educational level was entered into the analysis as two categorical dummy variables one dummy indicating less than nine years of education and the other twelve or more years – nine to eleven years being the reference category.

Jews of Oriental and North-African origin were slower to enter the First and Second Demographic Transition even after controlling for socio-economic characteristics (Friedlander, Eisenbach and Goldscheider 1980; Friedlander and Feldmann 1993). To take this into account, the origin of the woman and that of her husband were added to the model as variables indicating whether they were immigrants from Asia or North Africa.

There is no measure of religiosity in the census. Following Dahan (1998) I measured religiosity in the 1983 Census indirectly by a variable indicating the *last* school of higher education of the husband. If the husband finished his education at a rabbinical seminary (*yeshivah*), then the couple is assumed to be orthodox. In the 1995 Census the questions on schooling were changed to include the number of years at a rabbinical seminary. Hence, for the 1995 Census, a variable indicating whether the husband had *ever* been educated at a rabbinical seminary was included in the analysis. This causes the size of the population identified as orthodox in the analysis to double approximately after 1982. The percentage of 'orthodox' couples thus defined rises from two percent in the third birth interval to more than eleven percent in the

seventh birth interval (see Table 1). These numbers should be compared with an overall figure of 16.5 percent of Jewish women aged 20+ who identified themselves as orthodox in the 2004 Social Survey.

[Table 1 about here]

In spite of its name, the majority of men who went to a rabbinical seminary do not become rabbis. Little is known about the characteristics of those religious men who did not go to a rabbinical seminary. If they are similar in their reproductive behavior to those who went to a rabbinical seminary, then the statistical model will underestimate the true effect of religiosity. If they are more like the secular, then our model will overestimate the true effect of religiosity. A poor estimate of the *size* of the effect of religiosity should not, however, affect our conclusions to any large extent, since we are not interested in providing an estimate of size of the effect of religiosity, but only in finding out whether religious differentials in the impact of family allowances exist at all.

In order to capture the effect of socio-economic and religious differentials, interactions between the two types of allowance variables and the education and religiosity variables were included in the model. The education variable chosen for this purpose is a variable indicating whether the woman has completed less than nine years of education.

In the late seventies and early eighties hyper-inflation may have affected reproductive behavior by causing uncertainty about the immediate future (Gliksberg and Schellekens 2006). To control for this effect, we added the natural logarithm of the consumer price index (CPI) in the previous year (State of Israel 1996: 248).

METHODOLOGY

The reconstructed birth histories are in the form of event histories. A discrete-time hazard model is used to assess the effects of the independent variables on the probability of giving birth. Since the month of birth is missing in the census, we have assumed that the hazard for a birth is constant within annual intervals. Following Allison (1982) we estimate discrete-time event-history models using logistic regression. This kind of analysis can accommodate two common features of event histories: censored data and time-varying variables, such as age and marital duration.

Observations in a time-series are likely to be temporally dependent. Ignoring this may produce misleading results. Following Beck et al. (1998) we added the number of years since the previous event (length of the birth interval). To correct for non-linearity in the numbers of years that have elapsed since the previous birth we also added a lagged dependent variable. Many women contribute more than one year to the analysis. Hence, it is an accepted procedure to add random effects to control for unobserved heterogeneity between women. We used MIXNO, a computer program for mixed-effects logistic regression, to estimate the random-effect variance (Hedeker 1999). The random-effect variance, however, could not be reliably estimated as being different from zero in any of the regression models. In this case, a model without random effects may be warranted (Yamaguchi 1986).

To prevent women who finished their childbearing ('long-term survivors') from biasing the results, birth intervals exceeding approximately five years have been censored (McDonald and Rosina 2001). The dependent variable in the statistical model is the annual log odds of giving birth. The unit of analysis is the “woman-year”; that is, each woman contributes as many units to the analysis as the number for which she is observed.

RESULTS

Table 1 provides some descriptive statistics by birth interval. Note the changing composition of the population when progressing from lower intervals to higher ones. The percentage of women with post-secondary education declines with parity, while the percentage of immigrants from Asia or Africa and the percentage orthodox both increase with parity.

For each birth interval, Table 2 presents a model that only includes one family allowance variable: the expected addition to family income in 1995 NIS in case of the birth of an *i*-th child in year *t*. The effect of this basic family allowance variable is significant and in the expected direction. Assuming a constant effect of family allowances over time, an increase of NIS 1000 will raise the odds of having an additional birth by 3.5 to 12.5 percent, depending on the interval.

[Table 2 about here]

Most of the control variables show the expected effect. Thus, women with low education are more likely to continue childbearing. The same goes for men with low education. Surprisingly, women with higher education are also more likely to continue childbearing than the reference group – women with nine to twelve years of education (compare Andersson et al 2006). An Asian or North-African origin of the woman and her husband raises the likelihood of giving birth. Note that the effect of origin is not significant after the fifth birth. Finally, the effect of the consumer price index suggests that hyper-inflation had an inhibiting effect on reproductive behavior.

To measure the pace at which couples respond to a *change* in family allowances the second model adds a differenced series of the allowance variable. Table 3 shows

that couples seem to respond within one to two years. Family allowances seem to have a maximum effect in the first or second year after a rise in family allowances.

[Table 3 about here]

The effect of family allowances on parity-specific birth rates becomes more apparent when presented in a diagram as a hypothetical scenario over a period of five years following a hypothetical increase of NIS 1000 in family allowances in year t=0. To increase comparability between parities in the response to an increase in family allowances, I present parity-specific birth rates relative to the rate in year t=0. In this diagram the ethnic origin variable is set to zero and the woman and her husband are assumed to have gone through eight to twelve years of schooling. Average values of age and marital duration have been chosen for each parity (see Table 1). All women are assumed to be in the second year after their last birth. Thus, in the diagram the women in the numerator of the predicted (relative) parity-specific birth rates are each year replaced by a new wave of women who are in the second year after their last birth. The initial level of family allowances in year t=0 is set to NIS 1000 per child, while the consumer price index is kept constant at its 1971 level. Figure 4 illustrates the effect of a hypothetical increase of NIS 1000 in family allowances on the number of births per 1000 women over a period of five years by parity relative to the rate in year t=0 when the increase in family allowances was announced. After a relatively strong initial response the relative rates settle at a rate that is five to ten percent above the pre-rise level, except for the rate for the third parity which remains below the initial level after five years.

[Figure 4 about here]

Socio-economic differentials

To study socio-economic differentials the third model adds interaction effects between the allowance variables and one education variable (see Table 4). About half of the interaction effects between the allowance and education variables are significant at five percent and most of these are still significant at one percent. Thus our empirical results suggest that there are socio-economic differences in the response to family allowances. But what do these differentials look like? An answer to this question is not straightforward, because the effect of family allowances is captured by more than one variable. The effect of family allowances becomes more apparent when presented in a set of diagrams as a hypothetical scenario. In these diagrams ethnic origin and the husband's education variables are set to zero. For each parity, average values of age and marital duration have been chosen (see Table 1). All women are assumed to be in the second year after their last birth. The initial level of family allowances is set to NIS 1000 per child, while the consumer price index is kept constant at its 1971 level.

[Table 4 about here]

For each parity, Figures 5a-5e illustrate the effect of a hypothetical increase of NIS 1000 in family allowances on the number of births per 1000 women over a period of five years. Note that the hypothetical scenario only presents the outcome for women in the second year after their last birth. Thus the women in the numerator of the predicted relative parity-specific birth rates are each year replaced by a new wave of women who are in the second year after their last birth. Estimates for two groups are presented – women with 0-8 and 9-12 years of education. Note that what interests us is not the average difference between the two educational categories, but differences in the response of these categories over a five-year period.[1] To increase comparability

between socio-economic groups in the response to an increase in family allowances, Figures 5a-5e do not present the actual predicted parity-specific birth rates, but rates that are relative to the initial rate in year t=0, when the increase in family allowances was announced.

[Figures 5a-e about here]

Although there is some evidence for socio-economic differentials in all intervals, the clearest cases of socio-economic differentials can be found in the fourth, sixth, and seventh and higher-order birth intervals. Socio-economic differentials in these intervals, however, do not exhibit a consistent picture. While women in the lowest educational category in the fourth interval seem to show a stronger response in the first two to three years than do women with 9-12 years of education, the reverse seems to be true in the seventh and higher-order birth intervals, when women with 9-12 years of education are the ones to exhibit a stronger response in the first two years.

Except for the third birth interval and the least educated in the seventh and higher-order birth intervals, our model predicts that there will remain an effect five year after an increase in family allowances among both groups of education. Thus, there are socio-economic differentials in the response to an increase in family allowances not only in the first two to three years but also in the fourth or fifth year after the increase in family allowances. The latter differentials are most pronounced in the sixth and higher-order birth intervals. Contrary perhaps to expectations our model predicts a stronger response for these intervals in the fifth year among women with 9-12 years of education.

Educational differentials show inconsistent effects across intervals. Some of these inconsistencies may be due to compositional effects. Most couples with five children are probably orthodox. The census does not provide an estimate of the percentage of

orthodox. The first Social Survey, however, may provide an indication. In the 2004 Social Survey a small majority of those aged 40-54 with at least five births were orthodox (62 percent of 261 women). While a large majority in the survey aged 40-54 with at least six births were orthodox (82 percent of 138 women), almost all women at that age with at least seven births were orthodox (96 percent of 98 women). Hence, one explanation for the inconsistency in socio-economic differentials in the response across birth intervals could be that there are religious differentials in the response to an increase in family allowances.

Religious differentials

To study religious differentials in the response to a change in the level of family allowances the fourth model adds a religiosity variable and interaction effects between the allowance variables and the religiosity variable (see Table 5). Several of the interaction effects between the allowance and religiosity variables are significant. Thus our empirical results suggest that there are religious differentials in the response to family allowances. After the fourth interval, however, none of the interactions is significant at five percent. This comes as no surprise, since the percentage of orthodox couples including those not identified by us as such rises with parity and comprises a majority by the fifth parity.

[Table 5 about here]

But what do these differentials look like? And to what extent do they persist after five years? Again, an answer to these questions is not straightforward, because the effect of family allowances is captured by more than one variable. Hence, the effect of family allowances is presented in a set of diagrams as a hypothetical scenario. In these diagrams ethnic origin and the educational level are set to be equal to the reference

category for both the woman and her husband (9-12 years). For each parity average values of age and marital duration have been chosen (see Table 1). All women are assumed to be in the second year after their last birth. The initial level of family allowances is set to NIS 1000 per child, while the consumer price index is kept constant at its 1971 level.

Figures 6a and 6b illustrate the effect of a hypothetical increase of NIS 1000 in family allowances for the third and fourth parity, respectively. To increase comparability between the groups in the response to an increase in family allowances, Figures 6a and 6b do not present the actual predicted parity-specific birth rates, but rates that are relative to the initial rate in year t=0, when the increase in family allowances was announced. Estimates for two groups are presented – women identified as orthodox in the census and other women.

[Figures 6a and 6b about here]

Unlike others, couples identified by us as orthodox show a sustained response to the rise in the allowance for the third child. In the fifth year the response remains substantial. In the fourth birth interval, however, the most striking difference between orthodox couples and others is the strength of the initial response. In the first two years orthodox couples show a stronger response than others.

Although differences in religious composition between the parities may explain some of the inconsistencies in the *socio-economic* differentials in the response to an increase in family allowances across birth intervals, religious composition is unlikely to be the sole explanation for these inconsistencies because there are also inconsistencies in the *religious* differentials in the response to an increase in family allowances across birth intervals. These inconsistencies may be due to omitted variables.

Omitted variables

The quality of our statistical model may be affected by the omission of variables that measure the effect of other government policies on reproductive behavior, such as housing loans and tax deductions. One way to investigate this possible problem of under-specification, is to evaluate the ability of our statistical model to account for the temporal component of the variation. If the variables included in our model account for much of the temporal component of the variation, then the effect of these omitted variables on the coefficients in our model is unlikely to be large.

Figures 7a-7e present observed and predicted parity-specific birth rates. We present two predicted series. The first series is based on a model which includes the individual characteristics and CPI variable, but no family allowance variables (coefficients for Model 0 not presented here). The second series is based on a model that includes all allowance variables including interactions with education (Model 3 in Table 4). The definition of the religiosity variable differs between the two censuses. To prevent this change of definition over time to influence the temporal fit of our model, the religiosity variable has been omitted. In any case, the omission of a small number of couples identified by us as orthodox is unlikely to influence the predicted series.

The prediction of the number of third births by year is the least satisfactory. While both models predict the long-term decline in third births, they also predict a dip in the number of births in the mid 1980s that never happened (due to inclusion of the CPI variable). But at least, Model 3 predicts part of the steep decline in the late 1970s. For higher parities, however, the predictive power of Model 3 is more satisfactory,

suggesting that this model does not omit any major determinant of temporal trends in the number of higher-order births, including any unmeasured government policies.

[Figures 7a-7e about here]

CONCLUSION AND DISCUSSION

It has been suggested that cash benefits may be more cost-effective, when they target women with lower education. This argument has a long history. For Malthus family allowances which increase on the birth of every child reduce the cost of having children and encourage the poor to have larger families (Boyer 1989). While there is now a growing consensus concerning the effect of family allowances on fertility, little is still known about socio-economic differentials in the effect of family allowances. This paper reports evidence for socio-economic differentials in the response to an increase in family allowances. The largest differentials were found in the number of higher-order births that do not contribute much to the total number of births in most developed countries. Moreover, part of these socio-economic differentials is in the *initial* response to an increase in the allowance. Our empirical results suggest that in the longer run cash benefits for third and fourth births are not more cost-effective among women with lower education.

Assuming the existence of economies of scale in a family, child allowances may have a larger effect on the birth of higher birth-order children (Gauthier and Hatzius 1997: 295). Our empirical results provide some support for this section of micro-economic theory of fertility. This, however, could also be due to a selection effect, because a majority of couples that continue childbearing beyond their fifth child is orthodox.

Our measure of religiosity only captures a minority of orthodox couples in the sample. Although the percentage of orthodox couples among those not identified as such increases with each parity, the effect of religiosity remains strong, suggesting that the orthodox couples who were identified as such are not a representative sample of orthodox couples. In most birth intervals we found evidence for religious differentials. Except for the third interval, orthodox couples were more likely to exhibit an initially strong response. In the third interval we found evidence for a more stable and sustained response among the orthodox. Thus, the larger effect of family allowances on the birth of higher birth-order children may at least partly be due to religiosity. Unfortunately, we cannot test this hypothesis properly, because our control for religiosity is only partial.

Manski and Mayshar (2003) estimate that fertility among ultra-orthodox couples of European descent has increased from less than three per woman among those who married before 1955 to six or more births among those who married after 1970. They argue that generous cash benefits explain part of this increase. Although our empirical results indicate that family allowances have a larger effect on the fertility of orthodox couples, the effect of family allowances is probably not large enough to explain the rise in ultra-orthodox fertility.[2] Manski and Mayshar (2003) develop a rational choice model to explain the increase in ultra-orthodox fertility. Our finding that family allowances have a larger effect on orthodox fertility, however, does not provide unequivocal support for a rational choice model, because orthodox couples tend to exhibit a more exaggerated initial response in the first two to three years, a kind of behavior that may not be so rational.

At least in one aspect, our empirical results show that micro-economic theories of fertility are consistent with the data. One of the puzzles in micro-economic theory is

why fertility is negatively correlated with income. Gary Becker proposed to solve this problem by adding the notion of 'child quality.' The demand is not for children, but for child services which equals number of children times an average quality per child. Child-quality is elastic with respect to income, while quantity is not (Robinson 1997). If this is correct, than fertility should be positively correlated with income, when child quality is kept constant. Analyses of the effect of family allowances on fertility provide a test of this part of micro-economic theory, because an increase in cash benefits is conditional on an additional birth, which means that the money cannot be invested in child-quality.

While econometric studies of the effect of cash benefits confirm the existence of a positive, although weak, correlation between income and fertility, there are also findings that may be more difficult for micro-economic theories to explain. Family policies seem to have more of an impact in the first few years after implementation. For example, the family policies adopted in the German Democratic Republic in 1976 had an undeniable impact on the number of births. But this effect was limited in time, affecting the timing of births more than completed fertility (Monnier 1990). Our empirical results also show that the effect of an increase in family allowances is generally strongest in the first couple of years. The predominance of such short-term effects of cash benefits has also been observed for other demographic phenomena, such as marriage (Prioux 1993).

The decline in the effect of cash benefits over time poses a challenge to rational choice models. One explanation could be that couples only tend to change the timing of planned births, rather than plan more births, in order to cash in on the increase in family allowances as soon as possible suspecting that state generosity will last for only a short period. This explanation does not fit our data very well because this

pattern remains after controlling for stage in the family building process. Women who are in the same stage in terms of parity and number of years after their last birth behave differently depending on the number of years after the increase in family allowances. Thus, women who are at a certain stage of the family building process five years after the increase in family allowances do not seem to want to cash in on the increase in family allowances to the same extent as women who are in the same stage one to two years after the increase.

Economic theories are the dominant explanatory paradigm in fertility (Robinson 1997). As in other areas of economic thought, rational choice is central to economic theories of fertility. Research in the past two decades, however, has shown that human decision making is not as rational as economic theories would want us to believe. Some argue that individuals are at least boundedly rational, by which they mean to say that they are cognitively limited in their ability to process information. Others argue that humans cannot be described as being rational, because they deviate in fairly systematic ways from the predictions made by utility theory (Carley 2001). The latter form of the argument about the rationality of human decision making owes much to the work of Kahneman and Tversky (1979). Although they provide a long list of deviations from utility theory, I will highlight only one of these. They noted that our perceptual apparatus is attuned to the evaluation of *changes* or *differences* rather than to the evaluation of absolute magnitudes. Thus, their theory could account for our empirical finding that a *change* in family allowances seems to have a larger effect than the *absolute level* of family allowances. Their theory is not inconsistent with our finding that an increase in family allowances seems to have a stronger initial effect, especially, on couples identified by us as orthodox and possibly also on less educated women, two groups that are sometimes associated with less rational behavior.

NOTES

1. Confidence intervals for the two socio-economic groups do not overlap (Figures not shown). This is mostly due to the effect of education. For the method used to compute confidence intervals see Sofroniou and Hutcheson (2002).

2. The increase in orthodox fertility seems to be simultaneous with the increase in family allowances instead of showing the expected one-year lag, suggesting omitted variables. Berman (2000) suggests that increased subsidies to *yeshiva* students in 1977 explain part of the increase in fertility. Our data, however, do not show any change in orthodox fertility before the 1980s (Figures not shown).

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Table 1. Means of variables in regression analyses by interval.

Variable	3rd	4th	5th	6th	7th and higher
Births (%)	13.15	7.31	7.20	9.63	12.71
Age	29.67	33.44	35.36	36.26	36.02
Marital duration	7.82	12.03	14.51	15.94	15.98
Woman's education					
< 9 years	9.26	15.07	27.82	40.77	47.59
≥ 13 years	36.70	31.97	23.93	19.51	18.30
Husband's education					
< 9 years	11.59	16.79	26.79	37.43	43.00
≥ 13 years	35.83	30.92	23.27	17.96	16.01
Woman born in As.-Afr.	19.94	28.30	43.91	58.26	63.93
Husband born in As.-Afr.	25.42	34.14	50.49	64.10	60.69
'Orthodox'	1.85	2.28	4.37	8.41	10.58
Women years	281,841	230,171	99,482	37,685	64,979

Table 2. Logistic regressions of the odds of giving birth by interval (Model 1).

	3rd		4th		5th		6th		7th and higher	
Variables	**e^b**	**Sig.**	**e^b**	**Sig.**	**e^b**	**Sig.**	**e^b**	**Sig.**	**e^b**	**Sig.**
Age	0.977	0.000	0.932	0.000	0.920	0.000	0.930	0.000	0.943	0.000
Mar. duration	0.858	0.000	0.849	0.000	0.856	0.000	0.867	0.000	0.956	0.000
Year of interval	1.436	0.000	1.228	0.000	1.090	0.000	1.014	0.368	0.863	0.000
Birth (t-1)	0.615	0.000	0.457	0.000	0.395	0.000	0.405	0.000	0.372	0.000
Woman's education										
< 9 years	1.344	0.000	1.367	0.000	1.283	0.000	1.105	0.034	1.204	0.000
≥ 13 years	1.154	0.000	1.308	0.000	1.696	0.000	1.603	0.000	1.533	0.000
Husband's educ.										
< 9 years	1.207	0.000	1.100	0.000	1.074	0.027	1.045	0.321	1.004	0.894
≥ 13 years	0.934	0.000	1.003	0.893	1.010	0.787	0.938	0.253	0.858	0.000
Woman's ethnicity	1.239	0.000	1.315	0.000	1.233	0.000	1.017	0.736	1.048	0.217
Husband's ethnicity	1.272	0.000	1.269	0.000	1.096	0.004	0.991	0.852	0.949	0.160
Ln(CPI)	0.963	0.000	0.939	0.000	0.886	0.000	0.852	0.000	0.893	0.000
Allowance	**1.030**	**0.000**	**1.064**	**0.000**	**1.125**	**0.000**	**1.052**	**0.003**	**1.052**	**0.000**
Constant	0.288	0.000	1.865	0.000	6.408	0.000	15638	0.000	4.571	0.000
Woman years	281,841		230,171		99,482		37,685		64,979	
Nagelkerke R^2	0.077		0.105		0.128		0.133		0.099	

Table 3. Logistic regressions of the odds of giving birth by interval (Model 2).

	3rd		4th		5th		6th		7th and higher	
Variables	**e^b**	**Sig.**	**e^b**	**Sig.**	**e^b**	**Sig.**	**e^b**	**Sig.**	**e^b**	**Sig.**
Age	0.976	0.000	0.931	0.000	0.919	0.000	0.931	0.000	0.943	0.000
Mar. duration	0.858	0.000	0.849	0.000	0.856	0.000	0.866	0.000	0.955	0.000
Year of interval	1.436	0.000	1.228	0.000	1.091	0.000	1.014	0.372	0.863	0.000
Birth (t-1)	0.614	0.000	0.456	0.000	0.394	0.000	0.404	0.000	0.372	0.000
Woman's educ.										
< 9 years	1.348	0.000	1.368	0.000	1.290	0.000	1.103	0.039	1.202	0.000
≥ 13 years	1.155	0.000	1.308	0.000	1.695	0.000	1.604	0.000	1.532	0.000
Husband's educ.										
< 9 years	1.209	0.000	1.101	0.000	1.077	0.022	1.044	0.338	1.003	0.927
≥ 13 years	0.936	0.000	1.003	0.882	1.013	0.724	0.938	0.250	0.856	0.000
Woman's ethn.	1.242	0.000	1.316	0.000	1.240	0.000	1.013	0.802	1.046	0.239
Husband's ethn.	1.278	0.000	1.271	0.000	1.100	0.003	0.989	0.819	0.949	0.155
Ln(CPI)	0.953	0.000	0.931	0.000	0.875	0.000	0.849	0.000	0.890	0.000
Allowance	**1.034**	**0.000**	**1.069**	**0.000**	**1.137**	**0.000**	**1.052**	**0.004**	**1.054**	**0.000**
Differences:										
t-1	**1.031**	**0.040**	**0.983**	**0.150**	**1.068**	**0.093**	**1.111**	**0.024**	**1.086**	**0.003**
t-2	**0.978**	**0.146**	**1.026**	**0.135**	**1.065**	**0.068**	**1.042**	**0.333**	**1.051**	**0.064**
t-3	**0.962**	**0.010**	**0.972**	**0.072**	**0.913**	**0.012**	**0.974**	**0.554**	**0.957**	**0.114**
t-4	**0.928**	**0.000**	**0.957**	**0.007**	**0.882**	**0.000**	**0.957**	**0.321**	**0.954**	**0.093**
t-5	**0.931**	**0.000**	**0.972**	**0.100**	**0.950**	**0.161**	**1.063**	**0.181**	**0.977**	**0.436**
Constant	0.309	0.000	1.943	0.000	6.754	0.000	15.358	0.000	4.567	0.000
Woman years	281,841		230,171		99,482		37,685		64,979	
Nagelkerke R^2	0.078		0.105		0.129		0.133		0.100	

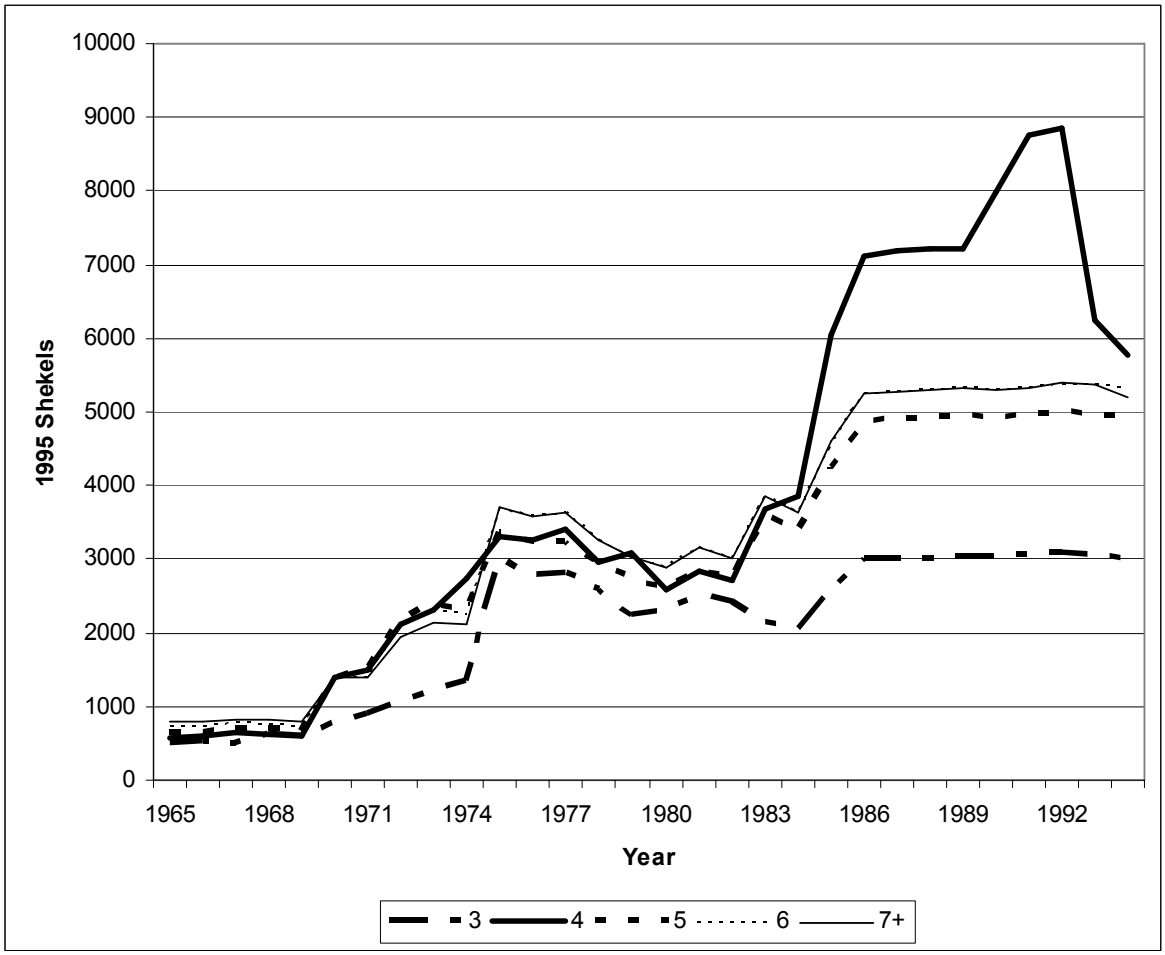
Table 4. Logistic regressions of the odds of giving birth by interval (Model 3).

	3rd		4th		5th		6th		7th and higher	
Variables	**e^b**	**Sig.**	**e^b**	**Sig.**	**e^b**	**Sig.**	**e^b**	**Sig.**	**e^b**	**Sig.**
Age	0.976	0.000	0.932	0.000	0.920	0.000	0.932	0.000	0.943	0.000
Mar. duration	0.858	0.000	0.849	0.000	0.856	0.000	0.866	0.000	0.953	0.000
Year of interval	1.437	0.000	1.228	0.000	1.092	0.000	1.016	0.318	0.866	0.000
Birth (t-1)	0.614	0.000	0.456	0.000	0.394	0.000	0.404	0.000	0.370	0.000
Woman's educ.										
< 9 years	1.504	0.000	1.663	0.000	1.700	0.000	1.491	0.000	2.877	0.010
≥ 13 years	1.153	0.000	1.301	0.000	1.671	0.000	1.555	0.000	1.497	0.000
Husband's educ.										
< 9 years	1.209	0.000	1.100	0.000	1.076	0.024	1.041	0.367	0.995	0.887
≥ 13 years	0.936	0.000	1.003	0.904	1.015	0.684	0.934	0.225	0.865	0.000
Woman's ethn.	1.239	0.000	1.309	0.000	1.231	0.000	1.012	0.819	1.039	0.326
Husband's ethn.	1.275	0.000	1.269	0.000	1.100	0.003	0.988	0.813	0.961	0.286
Ln(CPI)	0.957	0.000	0.951	0.000	0.897	0.000	0.886	0.000	0.942	0.000
Allowance	1.045	0.000	1.084	0.000	1.182	0.000	1.109	0.000	1.166	0.000
Differences:										
t-1	1.016	0.334	0.968	0.013	1.020	0.696	1.019	0.773	1.097	0.012
t-2	0.971	0.077	1.001	0.970	1.017	0.691	0.955	0.435	1.029	0.416
t-3	0.949	0.001	0.959	0.015	0.893	0.011	0.894	0.058	0.917	0.309
t-4	0.915	0.000	0.961	0.024	0.855	0.000	0.940	0.275	0.953	0.171
t-5	0.930	0.000	0.966	0.066	0.908	0.026	1.076	0.195	0.945	0.123
Interactions:										
Educ. × allow.	**0.924**	**0.002**	**0.917**	**0.000**	**0.880**	**0.000**	**0.875**	**0.000**	**0.737**	**0.000**
Educ. × dif.:										
t-1	**1.109**	**0.008**	**1.069**	**0.078**	**1.136**	**0.116**	**1.203**	**0.050**	**1.039**	**0.502**
t-2	**1.080**	**0.051**	**1.180**	**0.000**	**1.148**	**0.056**	**1.272**	**0.005**	**1.111**	**0.052**
t-3	**1.132**	**0.001**	**1.136**	**0.006**	**1.122**	**0.129**	**1.303**	**0.003**	**1.203**	**0.001**
t-4	**1.140**	**0.002**	**1.014**	**0.779**	**1.176**	**0.031**	**1.118**	**0.223**	**1.134**	**0.033**
t-5	**1.031**	**0.495**	**1.083**	**0.130**	**1.211**	**0.017**	**1.002**	**0.986**	**1.192**	**0.005**
Constant	0.297	0.000	1.694	0.000	5.387	0.000	10.760	0.000	2.626	0.000
Woman years	281,841		230,171		99,482		37,685		64,979	
Nagelkerke R^2	0.078		0.105		0.129		0.135		0.104	

Table 5. Logistic regressions of the odds of giving birth by interval (Model 4).

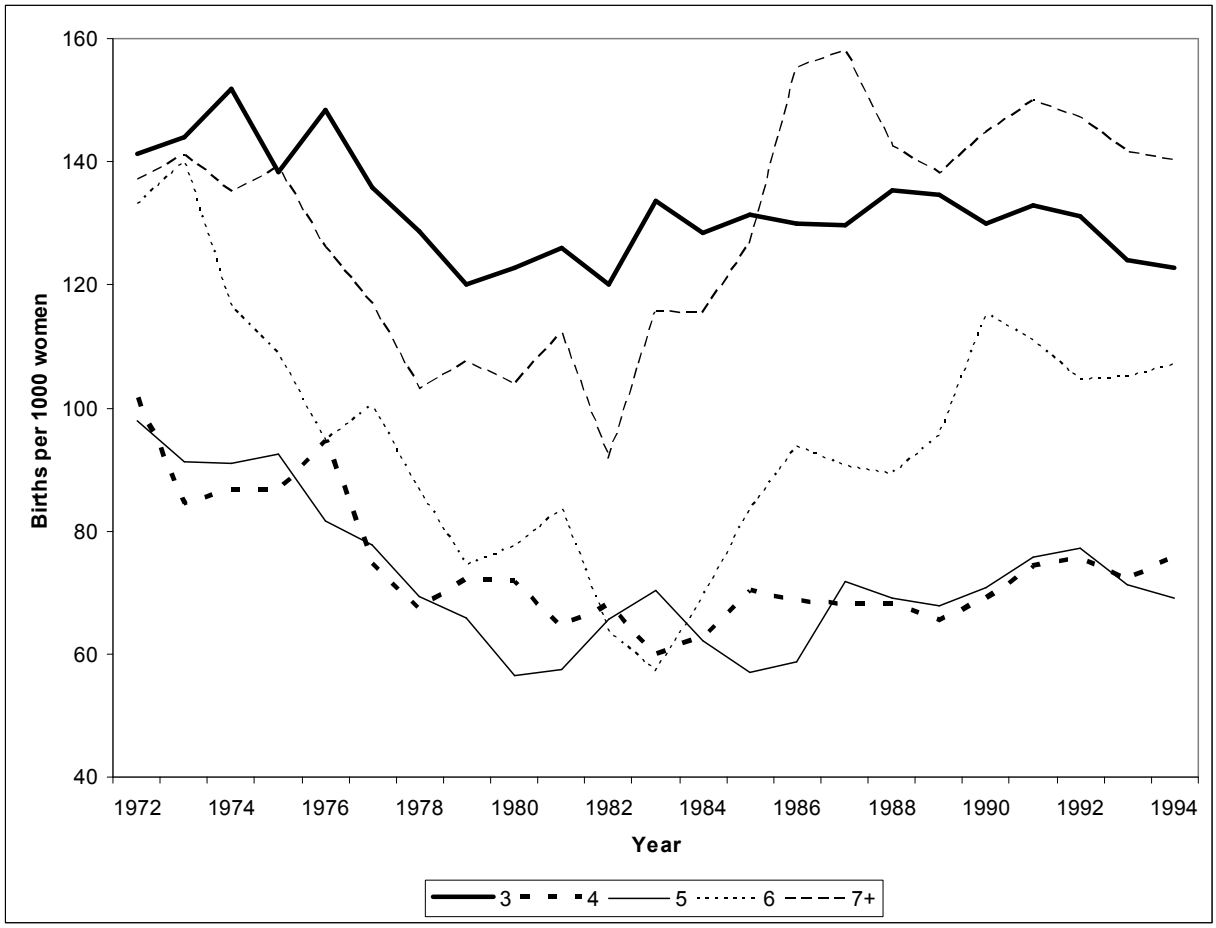
	3rd		4th		5th		6th		7th and higher	
Variables	**e^b**	**Sig.**	**e^b**	**Sig.**	**e^b**	**Sig.**	**e^b**	**Sig.**	**e^b**	**Sig.**
Age	0.981	0.000	0.944	0.000	0.931	0.000	0.939	0.000	0.948	0.000
Mar. duration	0.861	0.000	0.854	0.000	0.861	0.000	0.868	0.000	0.938	0.000
Year of interval	1.441	0.000	1.229	0.000	1.092	0.000	1.017	0.281	0.889	0.000
Birth (t-1)	0.600	0.000	0.445	0.000	0.386	0.000	0.402	0.000	0.358	0.000
Woman's educ.										
< 9 years	1.473	0.000	0.981	0.914	1.506	0.000	1.339	0.036	2.358	0.000
≥ 13 years	1.086	0.000	1.160	0.000	1.415	0.000	1.330	0.000	1.218	0.000
Husband's educ.										
< 9 years	1.200	0.000	1.093	0.000	1.090	0.008	1.065	0.165	1.078	0.022
≥ 13 years	0.945	0.000	1.007	0.772	1.017	0.657	0.952	0.384	0.948	0.141
Woman's ethn.	1.241	0.000	1.270	0.000	1.241	0.000	1.017	0.734	1.067	0.101
Husband's ethn.	1.290	0.000	1.294	0.000	1.168	0.000	1.058	0.272	1.038	0.331
Ln(CPI)	0.970	0.000	0.900	0.000	0.901	0.000	0.888	0.000	0.959	0.007
Allowance	1.008	0.456	0.988	0.763	1.117	0.000	1.062	0.013	1.070	0.000
Orthodox	**1.404**	**0.052**	**2.164**	**0.000**	**1.588**	**0.010**	**1.689**	**0.023**	**1.502**	**0.002**
Differences:										
t-1	1.041	0.015	1.242	0.000	1.034	0.525	1.030	0.686	1.097	0.021
t-2	0.999	0.966	0.978	0.681	1.019	0.693	0.988	0.853	1.037	0.340
t-3	0.975	0.122	0.718	0.000	0.899	0.027	0.902	0.116	0.949	0.181
t-4	0.935	0.000	0.863	0.005	0.866	0.026	0.950	0.428	0.988	0.757
t-5	0.944	0.000	0.952	0.309	0.924	0.095	1.147	0.032	0.988	0.767
Interactions:										
Educ. × allow.	0.933	0.006	1.076	0.254	0.910	0.002	0.909	0.009	0.789	0.000
Educ. × dif.:										
t-1	1.104	0.012	1.270	0.027	1.131	0.135	1.186	0.078	1.034	0.567
t-2	1.074	0.071	1.214	0.042	1.159	0.045	1.235	0.017	1.114	0.050
t-3	1.126	0.002	1.122	0.309	1.133	0.106	1.290	0.005	1.185	0.003
t-4	1.137	0.002	1.095	0.338	1.181	0.031	1.102	0.306	1.100	0.114
t-5	1.026	0.563	1.130	0.179	1.201	0.025	0.947	0.581	1.145	0.035
Orth. × allow.	**1.503**	**0.000**	**1.082**	**0.000**	**1.154**	**0.001**	**1.047**	**0.345**	**1.153**	**0.000**
Orth. × dif.:										
t-1	**0.816**	**0.045**	**1.056**	**0.132**	**1.024**	**0.863**	**1.008**	**0.957**	**1.148**	**0.107**
t-2	**0.813**	**0.034**	**1.040**	**0.537**	**1.017**	**0.892**	**0.833**	**0.207**	**0.973**	**0.743**
t-3	**0.865**	**0.130**	**0.992**	**0.891**	**0.986**	**0.907**	**1.009**	**0.948**	**0.939**	**0.461**
t-4	**0.859**	**0.117**	**1.141**	**0.017**	**1.006**	**0.956**	**1.083**	**0.542**	**1.018**	**0.824**
t-5	**0.945**	**0.542**	**0.884**	**0.042**	**0.965**	**0.756**	**0.805**	**0.100**	**0.945**	**0.498**
Constant	0.245	0.000	1.936	0.000	3.678	0.000	8.052	0.000	2.604	0.000
Woman years	281,841		230,171		99,482		37,685		64,979	
Nagelkerke R^2	0.088		0.116		0.142		0.142		0.123	

Figure 1. Annual value of family allowance for each additional child (NIS in constant 1995 prices).



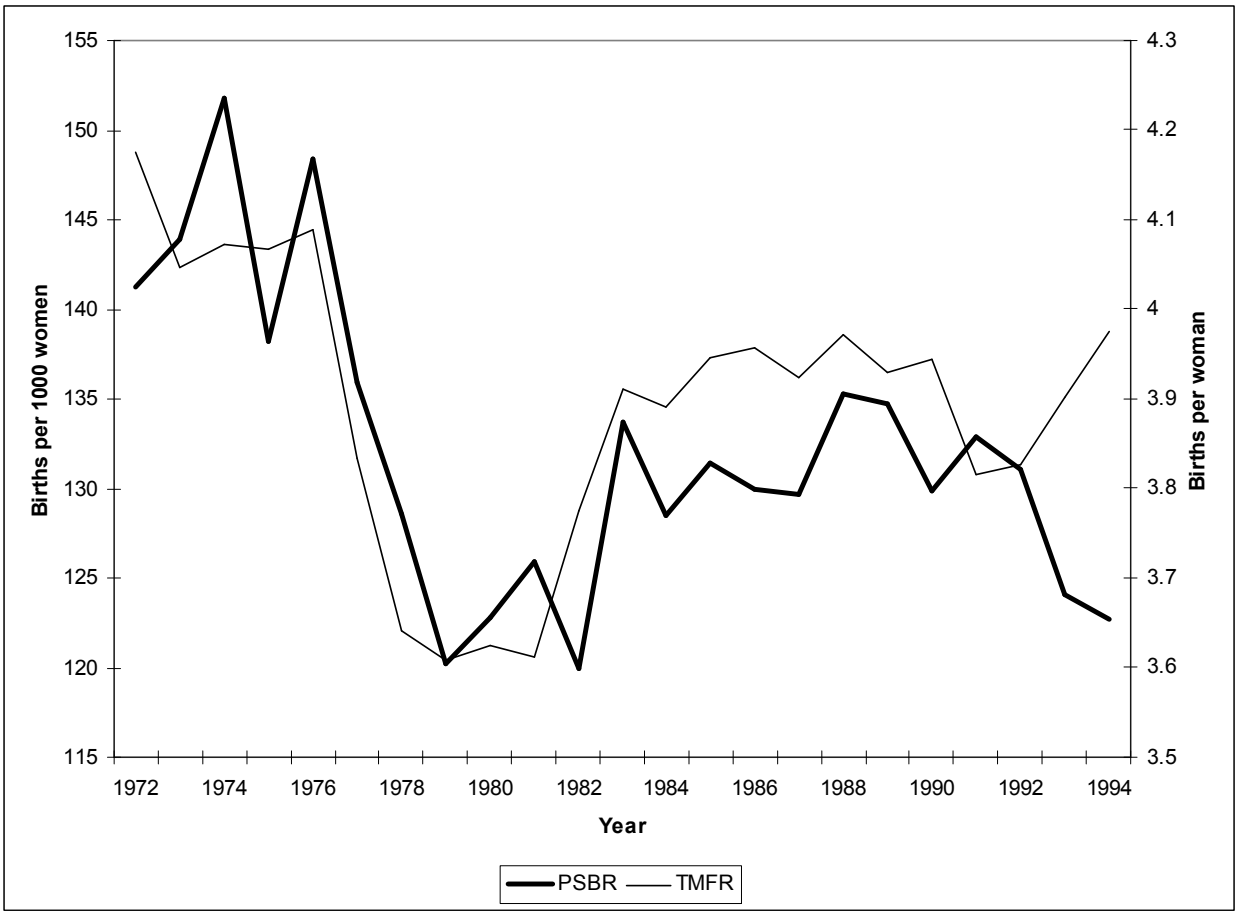
Source: Mayshar and Manski (2000).

Figure 2. Parity-specific birth rates for third to seventh and higher-order parities 1972-1994.



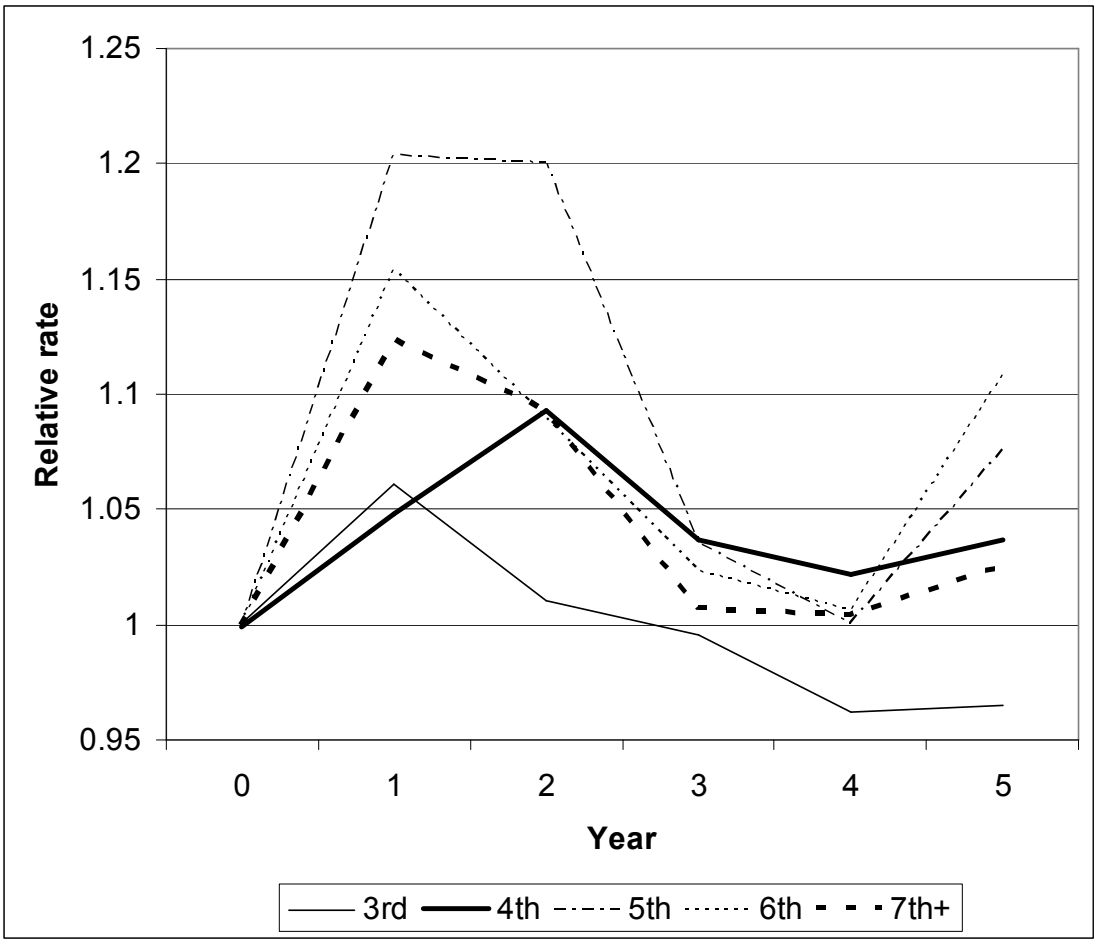
Source: 1983 and 1995 Census.

Figure 3. Parity-specific birth rate (PSBR) for the third parity and the total marital fertility rate (TMFR) at age 20, 1972-1994.



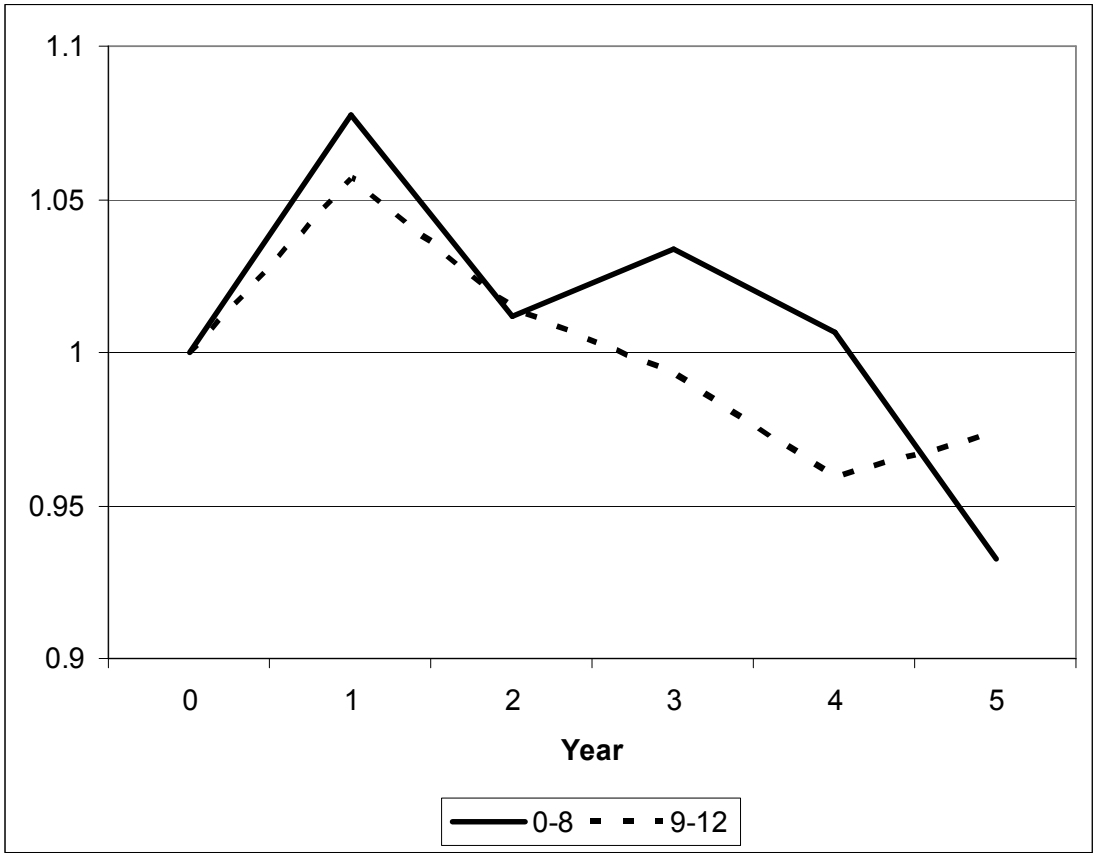
Source: 1983 and 1992 Censuses and Statistical Abstracts of Israel.

Figure 4. Parity-specific birth rates after a 1000 NIS rise in the family allowance in year *t*=0 relative to rates in year *t*=0: regression estimates.



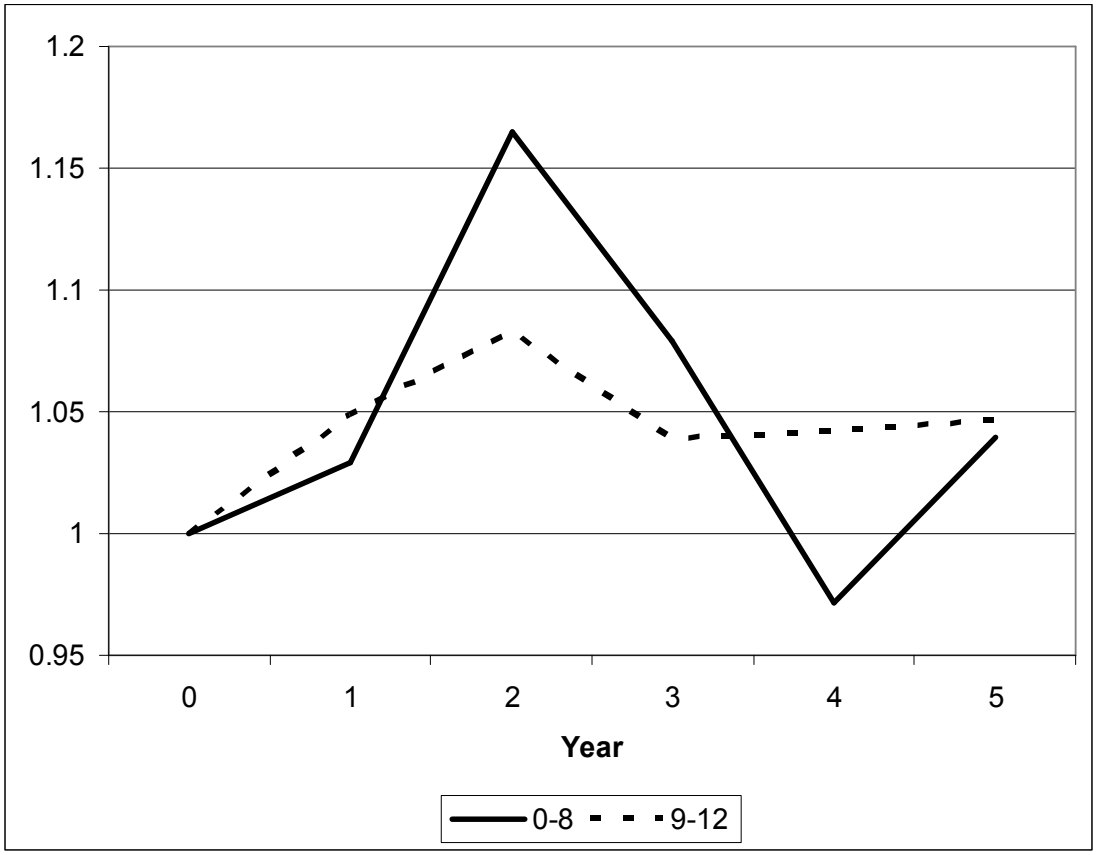
Source: Table 3.

Figure 5a. Number of third births relative to the initial number of third births in *t*=0 per women with two children after a NIS 1000 rise in the family allowance in year *t*=0 by women's education: regression estimates.



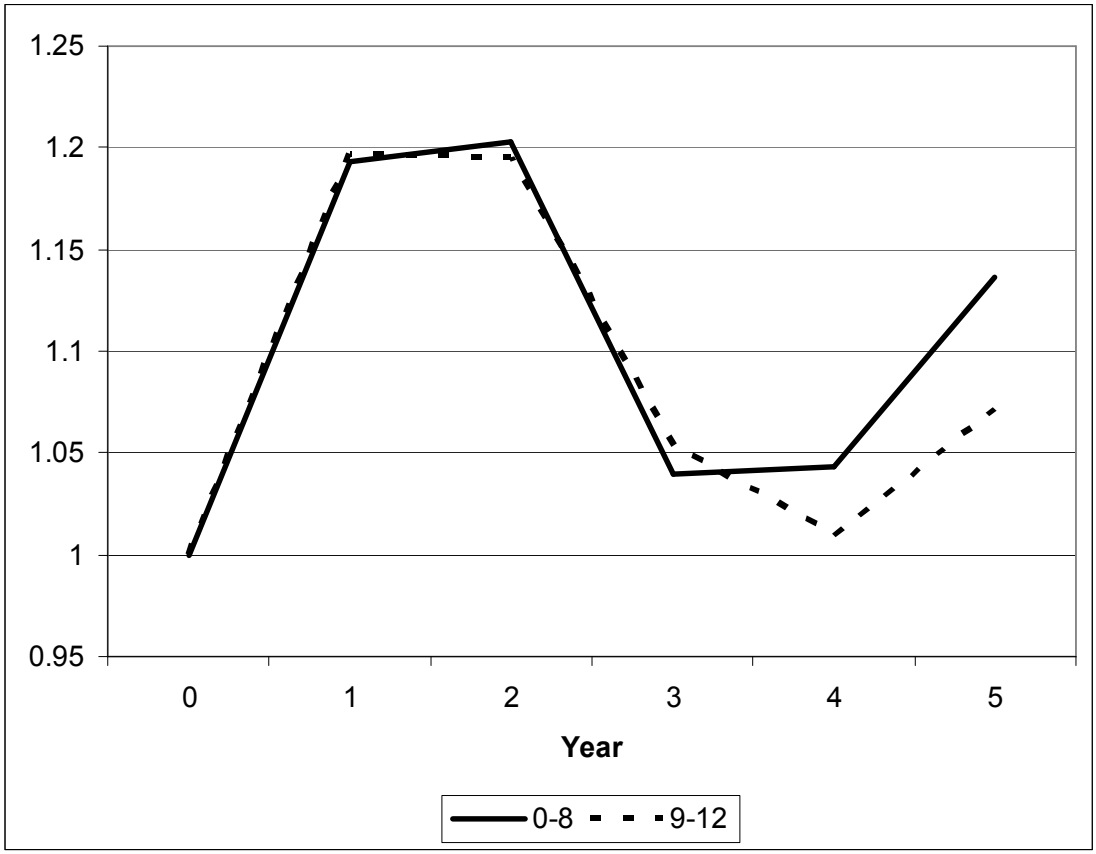
Source: Computations based on Table 4.

Figure 5b. Number of fourth births relative to the initial number of fourth births in *t*=0 per women with three children after a 1000 NIS rise in the family allowance in year *t*=0 by women's education: regression estimates.



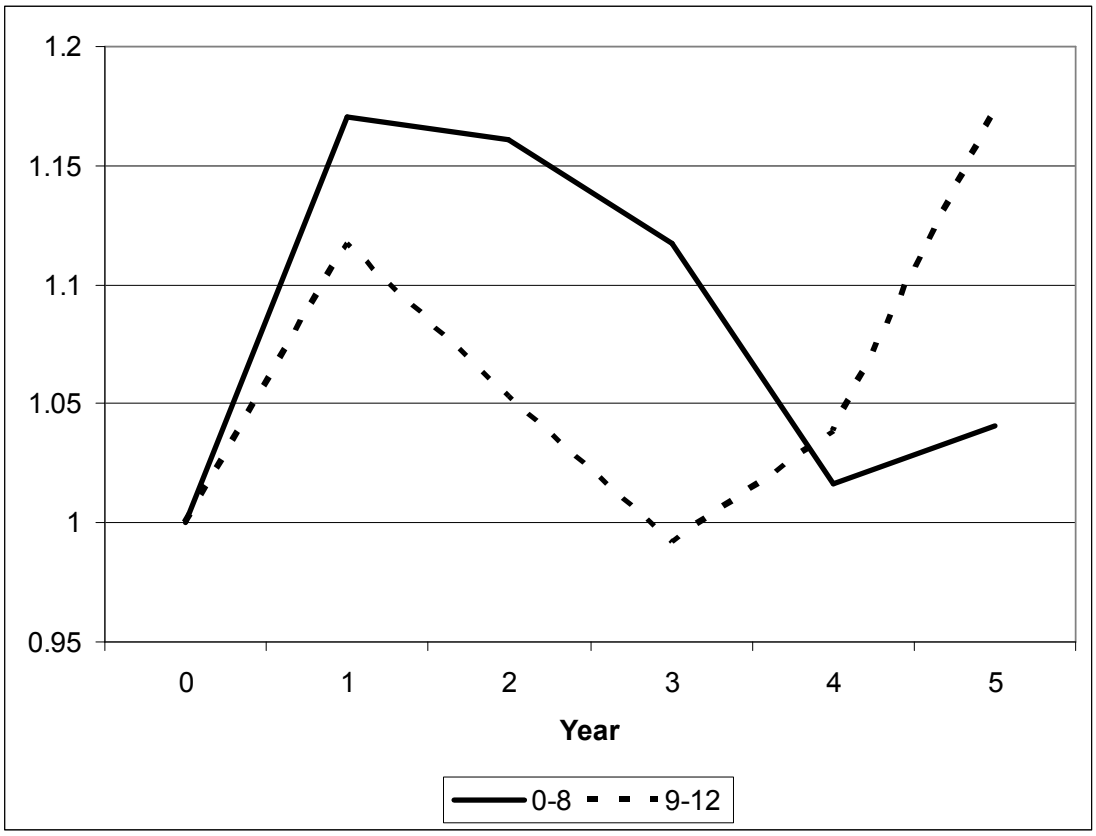
Source: Computations based on Table 4.

Figure 5c. Number of fifth births relative to the initial number of fifth births in *t*=0 per women with four children after a 1000 NIS rise in the family allowance in year *t*=0 by women's education: regression estimates.



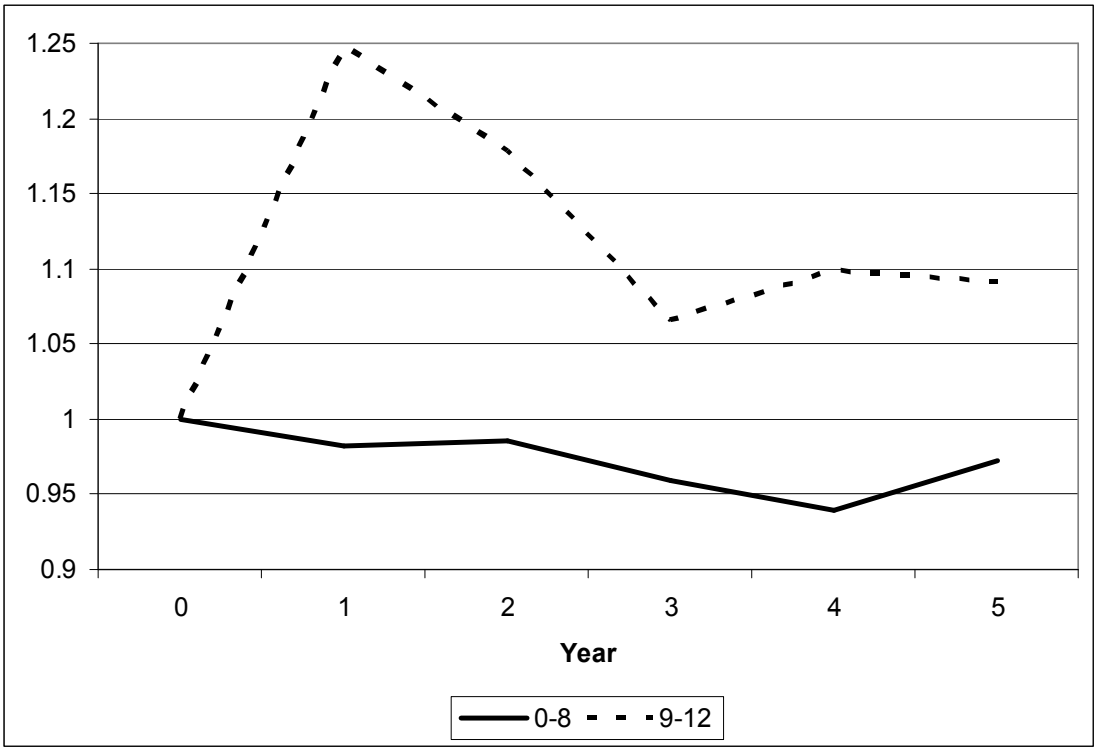
Source: Computations based on Table 4.

Figure 5d. Number of sixth births relative to the number of sixth births in year *t*=0 per women with five children after a 1000 NIS rise in the family allowance in year *t*=0 by women's education: regression estimates.



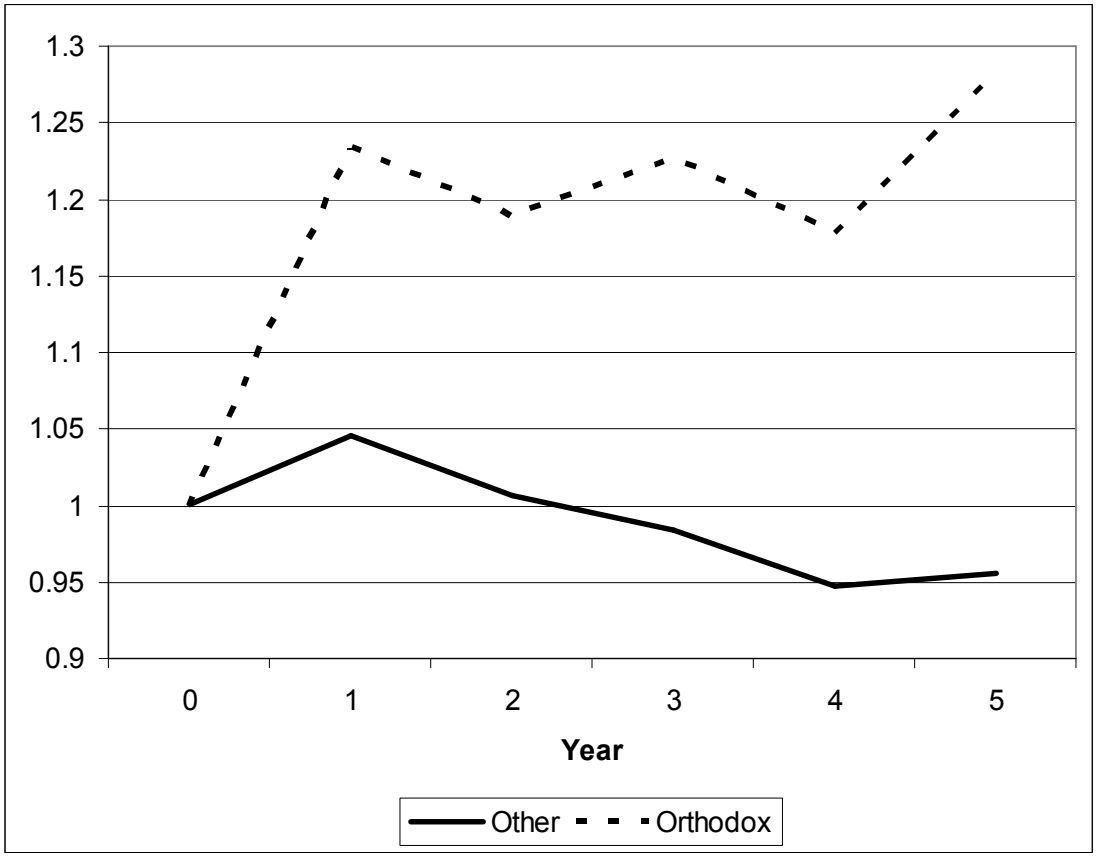
Source: Computations based on Table 4.

Figure 5e. Number of seventh and higher-order births relative to the initial number of seventh and higher-order births in year *t*=0 per women with six children at least after a 1000 NIS rise in the family allowance in year *t*=0 by women's education: regression estimates.



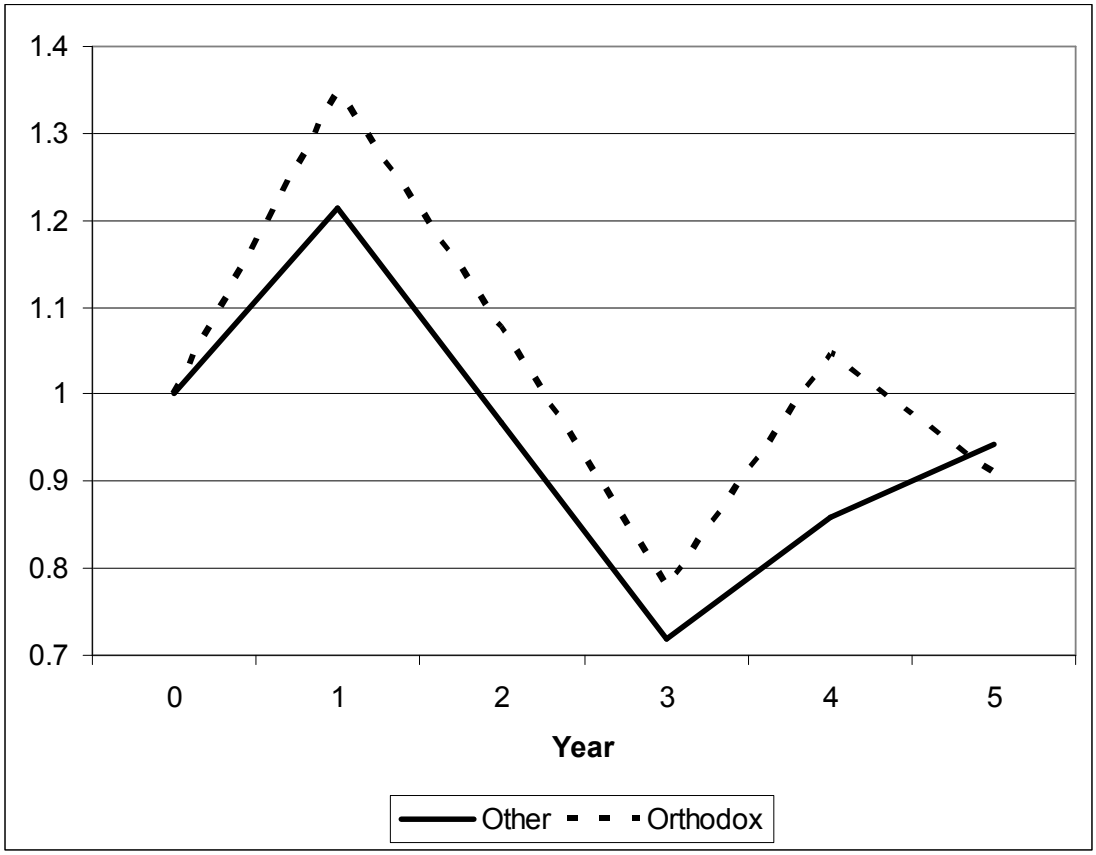
Source: Computations based on Table 4.

Figure 6a. Number of third births relative to the initial number of third births in year *t*=0 per women who have two children after a 1000 NIS rise in the family allowance in year *t*=0 by religiosity: regression estimates.



Source: Computations based on Table 5.

Figure 6b. Number of fourth births relative to the initial number of fourth births in year *t*=0 per women who have three children after a 1000 NIS rise in the family allowance in year *t*=0 by religiosity: regression estimates.



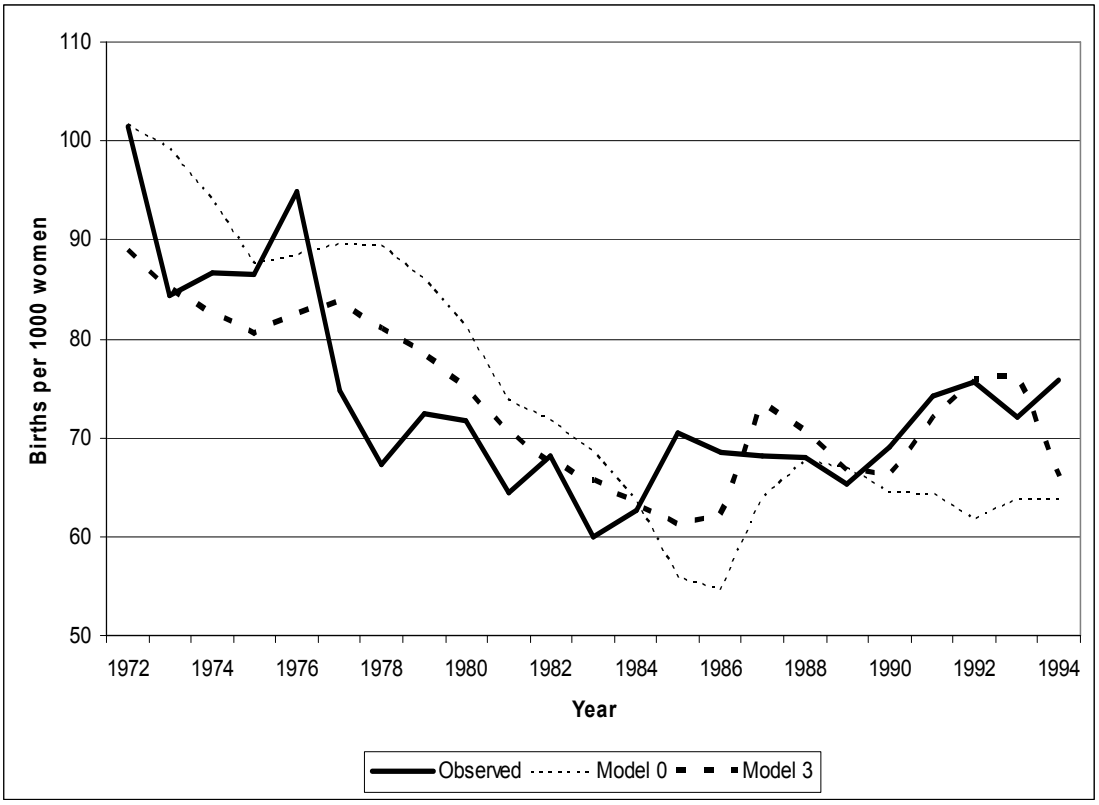
Source: Computations based on Table 5.

Figure 7a. Number of third births per 1000 women who have two children: observed and predicted values.

Note: Model 0 = model without family allowance and religiosity variables.

Source: Table 4 for Model 3.

Figure 7b. Number of fourth births per 1000 women who have three children: observed and predicted values.



Note: Model 0 = model without family allowance and religiosity variables.

Source: Table 4 for Model 3.

Figure 7c. Number of fifth births per 1000 women who have four children: observed and predicted values.

Note: Model 0 = model without family allowance and religiosity variables.

Source: Table 4 for Model 3.

Figure 7d. Number of sixth births per 1000 women who have five children: observed and predicted values.

Note: Model 0 = model without family allowance and religiosity variables.

Source: Table 4 for Model 3.

Figure 7e. Number of seventh and higher-order births per 1000 women who have at least six children: observed and predicted values.

Note: Model 0 = model without family allowance and religiosity variables.

Source: Table 4 for Model 3.