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ESTIMATING THE COST OF RAISING CHILDREN IN ISRAEL

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Abstract

What is the cost of raising children in modern Israel? This important question has thus far received little attention in the literature, both methodologically and in terms of the study period. We empirically estimate the cost of raising children as a function of household income, number of children, their ages and the household's material standard of living, based on data from the most recent income and expenditure surveys of the Israeli Central Bureau of Statistics, while overcoming the methodological difficulties in such an estimation. Additionally, we derive a new method for identifying a household's material standard of living based on the expenditure elasticity of consumption items, which can be applied universally and in all periods.

The main result of the study presented in this paper is a formula that can easily be used to calculate the average cost of raising children in Israeli households, based on the household's income, the number of children and their ages. We also present an interactive calculator based on this formula. The estimated costs based on this formula are preferable to those based on personal anecdotes and subjective reasoning. For a household with the median income in our sample, the cost of raising two young children (under 10 years of age) or of one teenager (aged 10 and higher) amounts to between 14 and 27 percent of the household's net income, dependent on the method of estimation. We conclude with proposing a simple method to update the estimated costs annually.

1. FOREWORD AND LITERATURE SURVEY

What is the cost of raising children in Israel? This is an important question from various perspectives – for example, for parents who are considering whether or not to have children

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and wish to calculate the cost before making a decision. This question is also important for the economy, when legislators and tax and welfare authorities compile laws, regulations and policies designed to support children, encourage parents to go out to work, improve their earning capacity, etc. Furthermore, this question is extremely important for judicial authorities. When couples with children divorce, the court is frequently required to determine their custody and visitation rights as well as the resulting cost of raising the children. Nevertheless, despite its considerable importance, the answers to this question have been unsatisfactory. For the most part, they rest on a passing impression based on the outcome of an increase or decrease in the cost of a specific component, be it diapers or day care, which ostensibly incorporates the entire cost of raising the children, or on the use of ad hoc rules of thumb such as standard person equivalence scales which are updated over time.

A study of the cost of raising children in Israel, which is based on a representative sample and actual figures for family expenditure, could provide an answer to this question in the form of reliable estimates. However, even a study of this kind, which is based on actual figures for the costs of raising children, is fraught with pitfalls. At first sight, estimating these costs seems fairly straightforward—we simply need to compare the expenses of households with and without children—but this would be incorrect. First, the outlay on some products and services is not attributed to specific family members, meaning that there is no way of knowing whether the cottage cheese purchased by the household is for the parents, the children, or is used by both in different proportions. Second, a comparison of this kind would be misleading since the expenses of a household with children cannot easily be compared with those of a household without children, and the expenses of a one-child household cannot be compared with the expenses of a household with three children. This is because household consumption changes considerably as the number of children increases. For example, a household with one child will, on average, consume more chocolate spread than a household without children, and an additional child in the family will increase the consumption of chocolate spread but at an incrementally lower rate than for the first child (or larger containers will be purchased, for which the average cost per unit of weight is lower). In contrast, larger households benefit from economies of scale—costs such as rent do not increase significantly when another child is added to the household, given that each additional child in the household increases expenditure on housing at a lesser rate than the rate at which it would increase in the case of a separate adult in a separate home.

A simple comparison of the expenses of households with and without children, even after controlling for income and other demographic variables, will not produce reliable estimates of the cost of raising children. Households choose whether or not to have children and, conditional on this choice, how many children to bear. In other words, there is selection into parenthood which biases the estimations. Moreover, the decision making processes of households with children differ from those without children or from households with a different number of children. In addition to the difference in behavior, there is also reverse causality, namely the effect of the children on the parents, on their behavior and income for which no adjustment can be made in the estimation of a simple econometric regression. In

other words, it is difficult to control this difference in behavior and reverse causality, and as a result it is difficult to estimate the effect of children on household expenditure.

Another problem which interferes with making a simple comparison between households with and without children is evaluating the change in the allocation of time by parents resulting from the birth of children. For example, following the birth of their children, parents may restrict their leisure activities (e.g., going to a restaurant or the cinema) so that, ostensibly, the birth of a child results in a cut in some expenses. Additionally, as argued by Becker (1985), it is probable that following the birth of children the optimum allocation of time between the parents changes, both within the home and in the labor market. In other words, there may be a change in the decision as to whether to work at all and in number of hours worked by each of the parents. It is difficult to estimate whether as a result of the birth of additional children in the household the couple works longer hours in order to support the child or work fewer hours in order to rear and/or spend more time with the child (for the wellbeing of the child, or perhaps the wellbeing of the parents), and the empirical literature on this subject is mixed. Clarke (2018) presents a survey of studies that estimate the effect of the birth of children on the allocation of time and work by parents. The empirical literature surveyed is mixed, but most of the reliable studies on this subject suggest that following the birth of children, women will tend to enter the workforce to a lesser degree (or will give up work if they had been part of the work force), and those who do work will reduce their work hours. The effect of bearing children on fathers' participation in the work force and hours of work has received less attention and the small number of studies makes it difficult to reach a reliable characterization of the direction and scale of the effect.

These difficulties have led to the development of extensive research literature which attempts to address the challenges and estimate these costs. All the methods we will discuss in this paper are based on creating a measure of a household's material standard of living, and comparing different sized households (households with different numbers of children) that share that material standard of living. A comparison between different households with the same material standard of living provides a more reliable cost estimation of raising children, as it is based on households weighting all the factors presented above and the standard of living they share is their optimal, individual solution given their budgetary limitations and choices. It follows that we need to accurately define how to determine that two different households have the same material standard of living. Clearly, total household income is not an adequate criterion for determining the standard of living of its individuals, as a household with four persons and total monthly income of NIS 20,000 does not have the same standard of living as a household with 3 persons and that same income. Likewise, due to the different patterns of consumption of adults and children and the allocation of resources and uses between them, per capita income also does not provide an adequate measure of standard of living.

The research literature on the measure of standard of living began in the 19th century with Engel (1895). In his observations, Engel found that the share of household expenditure on food increases as the household grows, yet at the same time the share of income spent on

food decreases as income rises. This observation has been confirmed by many other studies (e.g., Houthakker, 1957) and share of expenditure on food is in fact a useful indicator in distinguishing between developed and developing economies (Deaton and Zaidi, 2002). From the statistical perspective, any variable can be used as a measure of standard of living if it correlates positively with income or consumption and negatively with household size. This observation, known as Engel's Law, enables the creation of equivalence scales between different sized households and facilitates cost estimation of raising children. Assuming that the "share of expenditure on food" is a measure (indicator) of standard of living (and that it decreases as standard of living rises), we can compare the expenditure of households of different sizes and different incomes (expenditures). For example, the Israeli Central Bureau of Statistics ("ICBS") standard persons equivalence scale is the result of research by the National Insurance Institute which used Engel's Law. The study was published in 1971 and since then further studies have been published that examined alternative and more up-to-date equivalence scales for the State of Israel and their implications.[2] The relationship between equivalence scales and the cost of raising children is clear—the difference between the expenses of a couple without children at any given standard of living and a couple with children at the same standard of living (according to the equivalence scale) is the cost estimate of raising children according to this method (see for example, Banks and Brewer, 2003). Notably, this method is not free of theoretical problems. The assumption that household wellbeing declines as a result of having children and that the children therefore incur a cost raises the question—why were the children born in the first place? In other words, a calculation of the financial cost derived from the decrease in standard of living on a particular index for a couple with children does not take into account the additional utility from the children, which is impossible to measure (Shmueli, Achdut and Shaul, 1989). It should therefore be emphasized that we only use the material standard of living, and clearly for some households the lost utility resulting from their lower material standard of living is infinitely smaller than the increased utility they derive from their children.

Another method for estimating the cost of raising children was initially formulated by Rothbarth (1943), who defined a measure of the standard of living of different households based on the share of expenditure on "adult products"—i.e., products consumed exclusively by the adults in the household, such as alcohol. This contrasts with expenditure on food, for which the intra-family allocation is unknown, or "household public goods", such as

[2] Defining an equivalence scale or standard persons index has broad implications, for example on calculating the incidence of poverty and tax and welfare policy (Shmueli, Achdut and Shaul, 1989). Different equivalence scales are applied in different countries due to the specific characteristics and norms in each one. Dvir and Barnea (2000), who based themselves on Atkinson, Rainwater and Smeeding (1995), show that the Israeli standard persons equivalence scale is unusual among the OECD countries in that it suggests extremely low economies of scale. Barkali, Endweld and Gottlieb (2015) estimate equivalence scales on the basis of ICBS Annual Surveys of Household Income and Expenditure compared with the official standard persons equivalence scale, and their conclusion is that use of the share of income spent on food produces an equivalence scale which is similar to the official scale and there is therefore no reason to update it.

electricity, which are used by the entire household. The variance between households in the share of expenditure on adult products, as well as the variance in size and income level, make it possible to use the share of expenditure as a measure of the standard of living and in this way to estimate the cost of raising children, similar to the Engel method, for example in Gronau (1991). A summary of these key methods (Engel and Rothbarth) and further information about them can be found in Donni (2015), for the European research institute IZA. All the methods are based on an estimation of the actual expenditure on children among households (based on income and expenditure data) using an econometric method that is capable of overcoming the numerous methodological difficulties. It is emphasized that these methods are used for empirical research, namely—they are not based on the expenditure that should be incurred for children (which is a separate question) or on unfounded estimates that are inherently subjective.

It is not only academics who need cost estimations for raising children that are based on actual family expenditure data, but also legislators and policy makers the world over. Examples include recent papers from the United States and Australia—Lino et al. (2017) for the American Department of Agriculture, and Phillips (2013) for the Australian government. In Israel, the Government Committee for Examining the Subject of Child Support in Israel (also known as the Shifman Committee, which submitted its conclusions in 2012) asked Professor Reuben Gronau to estimate the cost of raising children and to prepare this estimate as a formula that the courts could use when determining child support. Gronau's paper was based on Percival and Harding (2005), a study conducted for the Australian government, and on data from the ICBS Survey of Household Expenditure for 2005 and 2006. This study estimated the scope of the expenditure for children as "the difference between the expenditure of a family with a specific income with a specific number of children and the expenditure of a family with a specific income and no children, so that it remains at the same material standard of living". A household's material standard of living is defined as the share of household expenditure on a closed list of "basic products". Gronau's estimates (2012) are therefore less sensitive to the range of issues that we presented in this section, and this current study takes a great deal of inspiration from his paper. The present paper expands on and adds to Gronau (2012) by using more current data, it adds an innovative method for identifying basic products in formulating a measure of "material standard of living" and it also broadens the cost estimations of raising children so that the age of the children is also taken into account.

Another Israeli study on this subject is that of Brender and Strawczynski (2014) which examines household expenditure by the number and age of the children based on ICBS Surveys of Household Expenditure in 2004 and 2012, and which also considers additional characteristics (education of the head of the household, number of breadwinners, etc.). Nonetheless, without any comparison across the standard of living, these estimations do not adequately resolve the problems of such an estimation as we presented above – they do not take into account the differences in behavior and selection between households that make different choices regarding whether or not to have children and the number of children they

choose to bear. It is therefore not surprising that they underestimate the cost of children, as they only answer the narrower question of the difference in monetary expenditure between households with children and those without children.

The measure of material standard of living that we used in this paper is the share of total household expenditure spent on basic products. This method is also known as the Iso-Prop method, i.e., method of comparing the proportions. This is because two households may be defined as having the same material standard of living if they devote an equal share (proportion) of their household income on basic products. The Iso-Prop method expands on Engel's Law by including not only food products in the basic basket of products but also other products (see Section 4 in this paper). We will not use Engel's method, given that in developed countries (such as Israel) the relationship between the share of expenditure on food and income and household size is weaker,[3] and use of this index produces biased estimations of the expenditure on children – see for example Deaton and Muellbauer (1986). The share of expenditure on basic products is similar in nature to the share of expenditure on food since it decreases as household income and standard of living rise, yet at the same time the share of expenditure on basic products increases with the number of household members. For example, a household that spends 20 percent of its income on basic products will be defined as having the same standard of living as another household that spends 20 percent of its income on basic products, even if the second household has a higher income.

The purpose of the comparison by standard of living is to overcome the problems we presented above. For example, we can ask what additional expenditure a family with one child would be required to incur so that its standard of living is the same as that of a family without children – this is the expenditure for the first child. Obviously, this expenditure will depend on the family's income and other characteristics such as age of the parents, their education and possibly also the child's age. Similarly, we can ask what additional expenditure a family with two children would be required to incur so that its standard of living is the same as that of a family without children – this is the expenditure for the first two children, and so on.

Econometrically, the Iso-Prop method requires an estimation of two regressions: The first estimates total household expenditure as a function of household income, number of children and other demographic variables. The second estimates the household's standard of living as a function of its total household expenditure and number of children. After estimating the models, we use the characteristics of a specific household (its income and number of children) and obtain the model predictions for the household's total expenditure and standard of living. The next step is to use the standard of living model, change the number of children to 0 and obtain the predicted standard of living for that specific household as if it had no children. Since the standard of living correlates positively with household expenditure and

[3] Namely, the share of expenditure on food is less sensitive to changes in income or consumption and household size compared with the share of expenditure on a broader basket of products. This can also be seen according to smaller coefficients (in absolute value) in the regressions that estimate share of expenditure in Appendix D.

negatively with household size, we will find that if a specific household had no children, it would have a higher material standard of living. The final stage in estimating the cost of raising children is to examine what the expenditure is for a household with children that would have enabled that household to reach the standard of living it would have had if it did not have any children. The econometric and mathematical discussion using the Iso-Prop method is presented in Sections 3, 4 and 5.

This paper is based on ICBS Household Expenditure Surveys for the period 2014 through 2017, which enable us to estimate the cost of raising children in modern Israel. The surveys of household income and expenditure have been expanded and improved since 2012. The sample, as well as resolution of the data, now cover a broader population. For additional information, see the ICBS Survey (2018). In 2014, for the first time, the survey included a question about "level of religious observance",[4] making it possible to identify ultra-Orthodox Jews by subjective association of household members to this group. We therefore use the surveys from 2014 through 2017, which is the most recent survey available at the time of writing this paper. Through the use of these recent and reliable data, and by expanding and relying on methods accepted in the international literature in general and specifically on Gronau (2012), we can estimate the cost of raising children in Israel while considering a broad range of factors – from income and education to the age of the children. We will expand on this point in Section 2.

This study contributes to the research literature and to the question under discussion from several perspectives: First, to the best of our knowledge, this is the first study to estimate the cost of raising children based on the most up-to-date and extensive expenditure surveys carried out in Israel (2017), thus providing the most current estimates regarding the cost of raising children. Second, we identify the cost of raising children according to their age. Finally, we propose an innovative method for identifying material standard of living, stemming from the data and which can be applied in any country and in any period, thus allowing the socioeconomic context to vary but remain comparable over time and space.

The rest of the study is organized as follows: Section 2 describes the data that we utilize, Section 3 presents a range of options for choosing the functional form of the first model which estimates household expenditure, Section 4 presents the generally accepted measures of standard of living and also presents a data-driven method for estimating standard of living for the second model; after estimating the two models, we estimate expenditures for children in Israel and present them in Section 5; in Section 6 we conduct sensitivity tests of the models, examine whether the results are sensitive to changes in the sample, and we also estimate the costs of raising children in Israel by geographical area (district) and population groups. Section 7 discusses the most appropriate type of income to be used in estimating the cost of raising children and in Section 8 we propose and examine a mechanism for updating the costs

[4] The question is worded as follows: "What is the principle lifestyle from the religious perspective of the people who belong to the household?" The possible answers are: secular, traditional, religious, ultra-Orthodox, mixed lifestyle, and other.

of raising children in the future. In Section 9 we compare our estimations with estimations from other countries and Section 10 provides a summary and conclusion.

2. DATA

The dataset that we use is the ICBS Household Expenditure Surveys from 2014 through 2017 (four annual surveys). These four surveys together cover 34,935 households. Each household has a sampling weight which is defined as the inverse probability that this household will be sampled in every annual survey and is calculated by the Senior Branch of Survey Methods in the ICBS. The weight expresses the number of households in the population that the household in the sample represents, so that all the estimates we present below are weighted according to these weights. To prevent double counting due to the consolidation of annual surveys, and based on advice received from the ICBS Senior Branch of Survey Methods, the original weights were divided by the number of surveys that we consolidated. According to the ICBS, the surveys cover 97 percent of the household population in Israel. The sample population is therefore a representative sample of the population in Israel—2.45 million households and 8.07 million people.

Consolidation of the surveys achieves two main objectives: First, it provides a substantially larger number of observations so that our estimations are more accurate. Second, it enables us to minimize possible biases in the surveys in different survey periods, for example the study of Bedouin populations in permanent communities that were not covered by the surveys from 2012 through 2015 due to surveying difficulties, but were included in the surveys from 2016 onwards. Obviously, consolidation of the surveys requires that the variables in the different years are comparable. Demographic characteristics such as nationality are consistent, but monetary variables (income and expenditure) are not. The monetary variables must therefore be adjusted (normalized) to ensure that they are comparable over time. We adjust the monetary variables to 2017 terms using average per capita expenditure, thus taking into account changing prices and real changes in the income and expenditure of Israeli households. In 2015, the level of detail (resolution) for age groups in the 55–74 range was broadened. Nevertheless, the groups do not correspond directly with the age groups in 2014 so that in order to consolidate the survey data in these years, we combined these ages into one group of age 55–74.

The analysis of the cost of raising children was performed on households in which the resources and, at least to a certain degree, the decision making regarding the level and composition of the expenses, are shared by the adult members. We therefore limit the analysis exclusively to households with an adult, married couple (aged 18+), who pool their resources. The focus on two-parent households is generally accepted in the literature (see Percival and Harding (2005) and Donni (2015)) and helps us compare our own study with it. Furthermore, a considerable part of the income of single-parent households is from child support which in itself relies on ad hoc cost estimates prepared by the family and rabbinical courts, thus

creating a problem of simultaneity in estimating the cost of raising children. The focus on two-parent families reduces the number of households included in the analysis from 34,945 to 16,276, representing 1.08 million households. We also omitted several dozen households due to technical limitations of the ICBS data: households in which the continent of birth of the head of the household was reported as "unknown" and households that reported zero or negative net monthly income. After omitting these observations, we were left with 16,235 households, representing 1.079 million nuclear households in Israel—adult married couples with and without children. In Section 6 we also present sensitivity tests—results obtained in the case of slight changes in the sample definition.

The key variables in this study are: total household expenditure (adjusted to 2017), net income (adjusted to 2017),[5] number of children (the number of persons in the family that are the children of one of the parents and are up to the age of 18), and the measure of material standard of living (we will expand on this in Section 4). The analyses also include several demographic variables: age of the head of the household, continent of birth of the head of the household, population group (non-ultra-Orthodox Jewish, ultra-Orthodox Jewish and Arabs), district of residence and number of years of education of the head of the household, as well as labor market variables: monthly work hours of the head of the household and his/her partner.

3. ESTIMATE OF TOTAL HOUSEHOLD EXPENSES – EFFECT OF HOUSEHOLD SIZE AND COMPOSITION

The Iso-Prop method requires a two-regression estimation procedure: The first regression estimates total household expenditure as a function of income, number of children and other demographic variables. Total household expenditure must be estimated (including imputations and consumption "in kind", such as owner occupied housing), given that this figure is not known or available to families and policy makers (it is unobservable, except in expenditure surveys). We therefore estimate it as a function of the household's total income (which is observable), number of children and the demographic variables that we described in Section 2 (we will generally denote them as X):

$$Consumption = f(Kids, Income, X)$$

We therefore need to determine the functional form of f, namely—how the relationships between the different variables are defined, with the emphasis on the key variable which is the number of children. Our data allow us to define this variable in different ways which we examine in this section.

First, and consistent with Gronau (2012), this variable can be defined as the natural logarithm of the number of people in the household. In other words, the estimated relationship

[5] In Section 7, we provide further information about the choice of net income.

is the change in percentage expenditure as a linear function of the change in percent in the number of people in the home, given that we perform a logarithmic transformation of the total consumption expenditure (the dependent variable). We define this variable mathematically as $\ln(2+K)$ where K is the number of children in the household and 2 is the number of adults.

Another way of defining this variable is by defining a separate constant (fixed effect) for each number of children. This functional form provides greater elasticity and does not presume that each additional child in the household has the same effect on the percentage increase in expenditure on children. For example, the percentage change in household expenditure might be different between one and two children and between two and three children. Nevertheless, it requires an extremely broad sample which includes a sufficient number of households (observations) for each number of children. The following table shows the distribution of the number of children weighted according to the sampling weight in the data:

Table 1
Distribution of the number of children

Number of children	Number of households (weighted)	Percentage (weighted)
0	393,920	36.50%
1	137,109	12.71%
2	218,320	20.23%
3	188,235	17.44%
4	80,600	7.47%
5	32,362	3.00%
More than 5	28,588	2.65%
Total	1,079,134	100.00%

The table shows that only 2.65 percent of households have more than five children. This model is therefore only relevant to households with up to five children. To compare this model with the first model, the models must be nested. The first model is nested within the fixed effects model when specific constraints are imposed on the different coefficients so that the marginal increase in expenditure for an additional child will be the same as it would have been from the natural logarithmic function of number of people in the household. We estimated the following two models:

$$\log(C) = \beta_0 + \beta_1 kids_1 + \beta_2 kids_2 + \beta_3 kids_3 + \beta_4 kids_4 + \beta_5 kids_5 + \gamma X \qquad (1)$$

$$\log(C) = b_0 + b_1 \ln(2+K) + cX \qquad (2)$$

Where C is the total household expenditure and X is a vector of other independent variables which includes the net income (log) and its square and the demographic variables

that we described in Section 2. $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ are the coefficients of the separate fixed effects for each number of children: one child, two children, three children, four children and five children, respectively,[6] and b_1 is the coefficient for $\ln(2+K)$. The full regression table for both these models appears in Appendix A.

To demonstrate this point, we will examine the relationship between the coefficients so that the marginal expenditure for an additional child is the same for a household that transitions from not having any children to a household with one child, and for a household that transitions from having one child to being a household with two children. The marginal increase in expenditure in the adjustment from a household without any children to a household with one child in Model (1) is:

$$\frac{\Delta\log(C)}{\Delta(kids)} = \beta_0 + \beta_1 - (\beta_0) = \beta_1$$

In Model (2) it is:

$$\frac{\Delta\log(C)}{\Delta(kids)} = b_0 + b_1\ln(3) - (b_0 + b_1\ln(2)) = b_1\ln(\frac{3}{2})$$

The marginal increase in expenditure in the change from a household without any children to a household with two children in Model (1) is:

$$\frac{\Delta\log(C)}{\Delta(kids)} = \beta_0 + \beta_2 - (\beta_0) = \beta_2$$

In Model (2) it is:

$$\frac{\Delta\log(C)}{\Delta(kids)} = b_0 + b_1\ln(4) - (b_0 + b_1\ln(2)) = b_1\ln(\frac{4}{2})$$

We will compare the marginal increase and obtain a set of equations:

$$\beta_1 = b_1\ln\left(\frac{3}{2}\right)$$
$$\beta_2 = b_1\ln\left(\frac{4}{2}\right)$$

We will divide the second equation by the first and obtain the relationship between the coefficients of the fixed effects, which replicates the relationship that would have been obtained under a logarithmic functional form:

[6] The omitted category is zero children.

$$\frac{\beta_2}{\beta_1} = \frac{b_1 \ln\left(\frac{4}{2}\right)}{b_1 \ln\left(\frac{3}{2}\right)} = \frac{\ln\left(\frac{4}{2}\right)}{\ln\left(\frac{3}{2}\right)}$$
$$\beta_2 = 1.71\beta_1$$

And so on for three, four and five children. In conclusion, we impose the following constraints on the Model (1) coefficients:

$$\beta_2 = 1.71\beta_1 \quad \beta_3 = 2.26\beta_1 \quad \beta_4 = 2.71\beta_1 \quad \beta_5 = 3.09\beta_1$$

We reiterate that this limitation can only be examined for households with no more than five children, as a separate coefficient is needed for each specific number of children. Estimating the model with the above constraints allows us to conduct an F test which examines the quality of the predictions in this model. The test statistic is 1.27 and it is far from being significant (p=0.28). The result of this test implies that the predictions of the fixed effects model for household expenditure are not significantly better than the first model (with a functional logarithmic form of number of persons). The fact that this model is more elastic and complex is not significantly better than the simpler model and its limited interpretation for households with up to five children leads us to reject it.

A third option would be to consider not only the number of children in the household, but also their age. The ICBS Household Expenditure Surveys include data regarding the number of children in the households in different age groups: 0-4, 5-9, 10-14 and 15-17 (the meaning is 0-5 less one day, up to 10 less one day, 10-15 less one day, and 15-18 less one day). Previous studies, both in and outside Israel, such as Brender and Strawczynski (2014) and Phillips (2013) point to a difference in the expenditure of households with children as a function of their age and that older children cost more. In order to capture an effect of this kind in a statistical model, we add weights to the natural logarithm for each quantity of children in a specific age group. Mathematically, we define this variable as:

$$\ln(2 + w_1k_1 + w_2k_2 + w_3k_3 + w_4k_4)$$

Where ki is the number of children in age group i and w_i is the weight (relative to an adult) for each age group in the household. This shows, for example, that if all the weights equal 1, the expanded expression equals the simple expression $\ln(2 + K)$ from the first model that we presented in this section.

To estimate the different weights, we estimated total household expenditure as a function of income, number of people in the household $\ln(2 + w_1k_1 + w_2k_2 + w_3k_3 + w_4k_4)$ with different possible combinations for each $w_i \in (0,1]$, and the demographic and labor market variables of the household. Following the estimation, we examine the fit of the model (according to the R^2 measure) and choose the values w_i that result in the maximal R^2. From the econometric perspective, we estimate the regression:

$$\ln(C) = \beta_0 + \beta_1 \ln(Y) + \beta_2 \ln^2(Y) + \beta_3 \ln(2 + w_1 k_1 + w_2 k_2 + w_3 k_3 + w_4 k_4) + \beta_4 X$$

Where C is total household expenditure, Y is total net household income and X includes the other household variables: age of the head of the household, continent of birth of the head of the household, population group, district of residence, number of years of education of the head of the household and his or her years of education squared, as well as the monthly work hours of the head of the household and his/her spouse.

Net income was preferred to gross income since, in practice, net income is the household's disposable income. Additionally, a formula based on net income allows it to remain valid in the future as well, if and when changes are made in the tax system. The choice of net income is discussed further in Section 7 of this study. The addition of a square of the natural logarithm facilitates a non-linear relationship between the relative effect of net income and total household expenditure.

We found that the maximal R^2 is obtained when $w_1 = w_2 = 0.5$ and $w_3 = w_4 = 1$. We therefore combined the 10-14 and 15-17 age groups into one group of ages 10-17, and combined the 0-4 and 5-9 age groups into one group of ages 0-9. These results imply that the weight of a child aged 10 or more in household expenditure is similar to that of an adult, while the relative weight of a child in a younger age group is half of a child in the older age group and of an adult. Thus, for two completely identical families the total expenditure for two young children (up to age 10) is the same as the total expenditure for one teenager (aged 10 and higher). Due to the difference in the relative weights by age, all the results in the rest of this study are presented with specific reference to the number and age of the children.

As we showed earlier, the Gronau model (2012) that does not take the age of the children into account ($\ln(2 + K)$) is a restricted case of the model that takes the children's age into account, and the optimal weights were found to be different from 1. It follows that from the statistical perspective, the model which weighs the children's age in total expenditure is preferable to the model which does not weigh their age. The finding that older children incur higher expenditure is consistent with the research literature and also justified statistically. We therefore conclude that a model which includes children ages' is preferable to the model that does not include these parameters.

4. STANDARD OF LIVING ESTIMATION—DEFINITION OF BASIC PRODUCTS

The second regression in the Iso-Prop method measures the share of household expenditure on basic products, as a function of total household expenditure, number of children and other control variables:

$$Basic\ goods\ share = f(Kids, Consumption, X)$$

This regression allows us to create an equivalence scale so that two households with a similar value for the share of household expenditure on basic products will be considered

equal with respect to their material standard of living. This method helps estimate the expenditure for children, taking into account the income and substitution effects for additional children on household expenditure, and not just the marginal expenditure for another child.

To estimate this regression, we must define what the "basic products" are. The first way of defining basic products is as expenditure on food, as we noted in Section 1. More recent studies use a broader definition which, in addition to food consumed in the home, includes other expenses as well. Nonetheless, this definition is somewhat arbitrary and lacks a firm basis in the data and in economic theory, frequently mixing considerations of what is with what ought to be. For example, in Gronau (2012), which is based on Percival and Harding (2005), the basket of basic products is defined as total expenditure on the following products and services, based on the ICBS Household Expenditure Survey:

- Food products consumed in the home (expenditure on food net of expenditure on food outside the home and alcoholic beverages)
- Expenditure on water, electricity, gas and energy in the home
- Communications services (not including international calls)
- Personal hygiene products (not including cosmetics)
- Household cleaning products

We can see that cleaning products are basic products whereas housing (irrespective of whether the apartment is rented or owner occupied) is not considered as such, even though having a place in which to live is a pre-condition for cleaning it. Additionally, the exclusion of international calls from the basket of communications services is a reflection of the period in which international calls were expensive, and the exclusion of alcoholic beverages from the basket of food products is a reflection of moral judgment rather than having a basis in economics or on data. Additionally, if the household consumes caviar within the home (or on its estate), this would be considered a basic product.

In this paper, we attempt wherever possible to adopt a data-driven approach, based on actual household expenditure and standard of living of households in Israel. We therefore also define a "basic basket of products" from the actual data, and based on economic theory. According to economic theory, a product is "basic" (also known as “necessary”) if the elasticity of the expenditure on it relative to total household expenditure is relatively low, and certainly less than 1, i.e., if a household's total expenditure increases by 1 percent, the expenditure on this product increases by less than 1 percent. This definition is based on the observations of Ernst Engel with respect to expenditure on food, and has since been affirmed in many studies. It follows that we can check whether any product is "basic" by estimating the elasticity of expenditure on it from the actual data. Notably, this study does not make a normative statement in deciding whether or not any particular product is "basic" or “necessary”, and we do not claim that these products are essential.

We base ourselves on Houthakker (1957), who presents a survey of Constant Elasticity Model estimations using studies of household expenses from around the world and in a range of periods, as well as a Constant Elasticity Model estimation using Poisson regressions. The

Poisson regression was preferred over the usual log-linear regression due to the presence of a large number of items on which the reported expenditure is zero. The Poisson regression is robust to such data compared with the log-linear regression that would require these observations to be omitted, or where a correction must be made which leads to bias as shown by Santos Silva and Tenreyro (2006). We estimate expenditure on a particular product as a function of total household expenditure and size as follows:

$$p_i = \exp(\alpha_0 + \beta \ln E + \gamma \ln HS)$$

where p_i is the total expenditure on a particular product, E is total household expenditure and HS is the size of the household in terms of number of persons. Our estimation for β is the elasticity of the expenditure for a particular product. Product i is defined as basic if it is found that $\beta < T$ where T is any threshold that satisfies $T \leq 1$ and where this difference is statistically significant.

We performed this analysis on the database that we described in Section 2 and on the full sample (without focusing on married couples, etc.) consisting of 34,935 households. For each household we added the reported expenditure from the Household Expenditure Survey to each item and at each level of detail (or resolution). The expenditure reported in the ICBS Household Expenditure Survey is divided into three levels of detail, where the 2-digit level is the most general level, comprising 10 primary categories of consumption, e.g. Housing Expenditure. The next level is 3-digit, comprising 67 secondary categories of consumption, such as "expenditure on computers, internet and their products". The highest resolution is that of individual products and services, comprising 730 different products and services, such as "pumpkin".

First, we found that when the basket of goods is defined by elasticity which equals or is lower than 0.5, it cannot be used as a standard of living measure, as it lacks the necessary condition from the statistical perspective of correlating positively with income or expenditure and negatively with household size. For these levels of elasticity, the correlation with household size and income is in the same sign, and we therefore focus on elasticity that is greater than 0.5 and less than or equal to 1. Table 2 presents, for each resolution of items of consumption, the total number of items, the number of items that were found to be basic at each threshold as well as the average share of expenditure on basic products for each resolution and threshold. The bottom of the table shows the average share of expenditure on food consumed in the home and for the traditional definition from Gronau (2012).

Table 2
Analysis of basic products by expenditure elasticity level

Resolution	Number of items	Threshold	Numbe of basic items	Average share of expenditure on basic products
2	10	0.75	3	46.8%
		1	4	56.7%
3	67	0.75	20	51.3%
		1	33	68.1%
6	730	0.75	196	50.3%
		1	320	64.9%
Food				14.8%
Traditional				22.6%

We can see that at each resolution and elasticity threshold, the average share of expenditure is higher than in the older definitions. The reason for this simple: in all the definitions, the main housing items were found to be basic,[7] and in themselves they account for a considerable share of expenditure. Nevertheless, to avoid a situation in which most of the expenditure is "basic", we define our basic basket of products at a resolution of 6 digits (the highest level) and with an elasticity level of no more than 0.75. This threshold means that for these products, a 1 percent increase in total expenditure will incur increased expenditure of 0.75 percent at most on these products. Later on, and for the purpose of comparison, we present results according to the traditional definition (as in Gronau (2012)) as well as by elasticity.

5. COST ESTIMATION FOR CHILDREN AND KEY RESULTS

As we noted in the previous sections of this study, the Iso-Prop method is a method of estimation involving several stages that requires an estimation of 2 regressions:

a. The first regression is total household expenditure as a function of income, the number of household members and other control variables, with a logarithmic transformation of the key variables.
b. The second regression is the share of total household expenditure on basic products as a function of total household expenditure, number of household members and other control variables (the same as those in the first regression).

[7] The housing items that were found to be basic are, at the 2-digit resolution: Item c32 – "Housing – total". At the 3-digit resolution: items c322 and c323 – "Monthly rent" and "Housing consumption in kind", respectively. At the 6-digit resolution: c322024, c322016, c324054, c323030, c323022, c323014, c322057 – "Key money rent", "Rent for an apartment or room on a monthly basis (including maintenance fees in sheltered housing)", "Rent paid by others", "Consumption for owner-occupied housing", "Consumption for a Key money apartment", "Consumption for a free apartment" and "Other housing expenses", respectively.

Table 3 shows the results of the regression analyses, where the first column is the first regression, the second column is the second regression where the basic products are according to the traditional definition in the literature, and the third column is the second regression where the basic products are defined according to elasticity from the data, as we presented in Section 3. The regression models in Table 3, and all the models in this paper, are weighted by ICBS sampling weights so that each household in the sample represents a large number of households in Israel and the sample is a representative sample of Israel's nuclear households (married adult couples with and without children). We adjust the monetary variables to 2017 using the average per capita expenditure, which allows us to take into account price changes as well as real changes in the income and consumption levels of Israeli households.

Table 3
Regression Table: Estimated expenditure for children in 2017 terms

Model no.	(1)	(2)	(3)
Dependent variable:	Expenditure (log)	Share of expenditure on basic products: Traditional definition	Share of expenditure on basic products: Definition by elasticity
Net income (log)	-0.448**		
	(0.189)		
Net income (log) squared	0.0520***		
	(0.00966)		
Weighted no. of persons and children (log)	0.199***	0.0792***	0.113***
	(0.0156)	(0.00404)	(0.00443)
Expenditure (log)		-0.0847***	-0.252***
		(0.00201)	(0.00229)
Age group of head of household (base: 18-24)			
25-29	0.106***	0.0328***	0.0185*
	(0.0332)	(0.00766)	(0.0103)
30-34	0.0928***	0.0413***	0.0391***
	(0.0326)	(0.00752)	(0.0101)
35-39	0.107***	0.0503***	0.0472***
	(0.0332)	(0.00768)	(0.0101)
40-44	0.106***	0.0663***	0.0470***
	(0.0340)	(0.00799)	(0.0104)
45-49	0.102***	0.0694***	0.0542***
	(0.0349)	(0.00809)	(0.0105)
50-54	0.0962**	0.0855***	0.0723***
	(0.0381)	(0.00841)	(0.0107)
55-74	0.0910***	0.0989***	0.0987***
	(0.0323)	(0.00746)	(0.00982)

75-79	-0.00360 (0.0359)	0.0934*** (0.00854)	0.0895*** (0.0107)
80-84	-0.00787 (0.0381)	0.0870*** (0.00952)	0.0969*** (0.0116)
85+	-0.130*** (0.0442)	0.0639*** (0.0125)	0.0950*** (0.0133)
Head of household continent of birth (base: Israel)			
Europe + America	-0.0796*** (0.00857)	0.0128*** (0.00187)	-0.00666*** (0.00228)
Africa + Asia	-0.0460*** (0.0136)	0.00419 (0.00314)	0.0119*** (0.00342)
Head of household population group (base: non-ultra-Orthodox Jewish)			
Ultra-Orthodox Jewish	-0.149*** (0.0139)	0.00728** (0.00366)	0.0219*** (0.00405)
Arab	0.0529*** (0.0143)	0.0738*** (0.00370)	0.00350 (0.00414)
No. of years of education	0.0188*** (0.00184)	-0.00438*** (0.000545)	-0.00439*** (0.000543)
No. of years of education squared	-0.000237*** (0.0000352)	0.0000681*** (0.0000117)	0.0000730*** (0.0000113)
Head of household work hours	0.00375 (0.00255)	-0.00110** (0.000551)	-0.00383*** (0.000656)
Spouse work hours	-0.0186*** (0.00276)	-0.00443*** (0.000573)	-0.00296*** (0.000687)
District of residence (base: Jerusalem):			
North	-0.0470*** (0.0158)	0.0139*** (0.00424)	-0.0676*** (0.00483)
Haifa	-0.0434*** (0.0150)	0.00927** (0.00383)	-0.0664*** (0.00466)
Center	-0.00451 (0.0132)	-0.00137 (0.00333)	-0.0151*** (0.00396)
Tel Aviv	0.0326** (0.0141)	-0.00747** (0.00327)	0.00965** (0.00411)
South	-0.0298** (0.0150)	0.0162*** (0.00384)	-0.0581*** (0.00440)
Judea & Samaria	-0.0879*** (0.0181)	-0.00119 (0.00426)	-0.0379*** (0.00554)
Constant	8.576*** (0.918)	0.927*** (0.0202)	2.824*** (0.0239)
No. of observations	16235	16235	16235
R^2	0.535	0.404	0.666

Notes*:* All the models are weighted by the CBS sampling weights.
Robust standard errors in parentheses. * represents p<0.1, ** represents p<0.05, *** represents p<0.01

The results show that the estimations obtained for the effect of income, consumption and number of children are very significant statistically, and that most of the other control variables are also statistically significant. The F test of joint significance of the variables in the different categorical (factor) variables shows that they are all jointly statistically significant as well. Given that the Iso-Prop method involves the use of two regressions, it is difficult to draw conclusions regarding the costs of raising children simply from looking at the coefficients. To interpret the results we must first limit the number of parameters in the models and then combine the regressions to one formula, the outcome of which is the predicted expenditure for children. Our primary goal is to estimate total expenditure for children by income, age and number of children, while maintaining a fixed standard of living (which is estimated according to the share of expenditure on basic products in columns 2 and 3). Therefore, we will take the coefficients of the other variables, that were essential to the estimation process (in order to compare equivalent households wherever possible), and multiply each of them by said variable's mean for continuous variables and by their relative share in the population that belongs to each category of the categorical variables. This process allows us to compare similar households after adjusting for the variance arising from these variables in our key independent variables. We sum up these values and combine them with the constant to obtain a single fixed factor (constant) in each regression. In summary, the regression table yields the following three equations:

1. $\ln(C) = 8.826 - 0.448\ln(Y) + 0.052\ln^2(Y) + 0.199\ln(2 + 0.5k_1 + k_2)$
2. $B = 0.9515 - 0.0847\ln(C) + 0.0792\ln(2 + 0.5k_1 + k_2)$
3. $B = 2.7905 - 0.2521\ln(C) + 0.1131\ln(2 + 0.5k_1 + k_2)$

Where C is total household expenditure, Y is net income (including in-kind incomes), k is the number of children and B is the share of expenditure on basic products. The monetary variables (C and Y) are adjusted to 2017 the average per capita consumption expenditure each year, so that all these variables are in 2017 terms. The fixed factor at the beginning of the first regression includes the effect of the other control variables. After estimating the regressions, we apply the Iso-Prop method to calculate the expenditure on children by income level, number and age of the children. The formula for calculating the cost of the children is:

a. Calculation of the predicted total household expenditure by total net income, number and age of the children from equation (1), which we will denote as C*.
b. We will take the predicted total household expenditure from A and the number and ages of the children and plug it into the standard of living equations (2 or 3, depending on the definition) and obtain the material standard of living for this household, which we will denote as B*.
c. We hold the material standard of living of this household fixed, and reduce the number of children. We then solve for the household expenditure that this household needs to incur to achieve this material standard of living if it had no children, and we will denote it as C_0.

d. The difference between the total household expenditure from A: C* and the total household expenditure from C: C_0, is the total expenditure on children.

We demonstrate these steps with the help of an example of a household with a net income of NIS 10,000 and two small children (under 10 years of age), and standard of living defined by the expenditure on basic products according to elasticity:

A. $\ln(C) = 8.826 - 0.448\ln(Y) + 0.052\ln^2(Y) + 0.199\ln(2 + 0.5k_1 + k_2)$
$\ln(C^*) = 8.826 - 0.448\ln(10000) + 0.052\ln^2(10000) + 0.199\ln(2 + 0.5 \times 2) =$
$\ln(C^*) = 9.330805$
$C^* = 11{,}280$

B. $B = 2.7905 - 0.2521\ln(C) + 0.1131\ln(2 + 0.5k_1 + k_2)$
$B^* = 2.7905 - 0.2521\ln(11266) + 0.1131\ln(2 + 0.5 \times 2) = 0.562344$

C. $0.562344 = 2.7905 - 0.2521\ln(C_0) + 0.1131\log(2)$
$0.2521\ln(C_0) = 2.7905 + 0.1131\log(2) - 0.562344$
$C_0 = \exp\{9.149349\} = 9{,}408$

D. $C^* - C_0 = 11{,}280 - 9{,}408 = 1{,}872$

These steps can be simplified to a single formula: the cost of raising $K = k_1 + k_2$ children, where k_1 is the number of small children (below the age of 10) and k_2 is the number of teenage children (age 10 and higher) for a household with a total net income of Y is defined as:

$$e^{\beta_0+\beta_1\ln(Y)+\beta_2\ln^2(Y)+\beta_3\ln(2+0.5k_1+k_2)} \times \left(1 - \left(\frac{2 + 0.5k_1 + k_2}{2}\right)^{b_2/b_1}\right)$$

Where $\beta_0, \beta_1, \beta_2, \beta_3$ are the coefficients from Regression 1, and b_1, b_2 are the coefficients from Regression 2 (or 3). The formula shows that the combined fixed effects of the standard-of-living regression cancel each other out and that the natural logarithm properties convert the differences from stages B and C into a ratio. Additionally, the resulting formula is general according to the Iso-Prop method, in the sense that it can also be applied directly to future models that will be estimated on more up-to-date data, of different countries, or according to new definitions of the standard of living.

Once again, we emphasize that the cost of children as obtained from the formula is the additional expenditure required to enable a household to maintain the same material standard of living it would have if it did not have any children. For example, let us assume that the cost of raising the children is NIS 1,500. This means that if there are no children in the household at this moment in time, then in order to maintain that same material standard of living, and if its pattern of expenditure is similar to that of other married households in Israel, the household's consumption must increase by a further NIS 1,500 every month.

To illustrate this point, Tables 4 and 5 present the cost estimations for children by the number of children, age of the children and the household's total net income.[8] The total expenditure for children increases with the number of children and also with income. The left side of the tables present the results obtained by applying the methodology of estimating standard of living by elasticity,[9] and the right side of the tables by applying the traditional method. More detailed tables for different family compositions appear in Tables A2 to A6 in Appendix B. Similarly, in Section 8 of this paper, we compare our own results with those of Gronau (2012) after updating them to our period.

Table 4
Expenditure for one child in 2017 terms according to income, children's ages and defined standard of living

Standard of living definition	By elasticity		Traditional method	
Net monthly household income	Young (under 10 years of age)	Teenager (aged 10 and higher)	Young (under 10 years of age)	Teenager (aged 10 and higher)
5,000	746	1,351	1,475	2,563
7,500	899	1,627	1,777	3,087
10,000	1,036	1,876	2,048	3,559
15,000	1,285	2,327	2,540	4,414
20,000	1,513	2,739	2,991	5,196
25,000	1,727	3,126	3,414	5,931
30,000	1,932	3,497	3,819	6,635
40,000	2,322	4,203	4,589	7,973
50,000	2,693	4,876	5,324	9,250
100,000	4,415	7,993	8,728	15,164

The results presented in Tables 4 and 5 show that using the traditional definition of basic products produces higher estimates than those produced by defining the products by elasticity. The traditional definition of standard of living is generally accepted in the research literature and helps us compare our own estimations with estimations from other countries. However, theoretically and empirically, the definition according to elasticity has a more solid basis. All the calculations in the rest of this paper include estimations based on both these methods. Moreover, if we compare the expenditure for two small children from Table 5, we find that it is the same as the expenditure for one teenager from Table 5. This is due to the relative weightings for the age groups (Section 2 in this paper), and is independent of the standard of living definition.

[8] Total net income for a household with a married couple only (both aged 18+).

[9] The small difference between the estimate in the table for a household with two small children and net income of NIS 10,000 at the standard of living by elasticity and the estimate in the method demonstrated above is due to the rounding of numbers after the decimal point in the coefficients.

Table 5
Total expenditure for two children in 2017 terms by income, children's ages and defined standard of living

Standard of living definition	By elasticity			Traditional method		
Net monthly household income	Two young children (under 10 years of age)	Two children (young and teenager)	Two teenage children (aged 10 and higher)	Two young children (under 10 years of age)	Two children (young and teenager)	Two teenage children (aged 10 and higher)
5,000	1,351	1,859	2,298	2,563	3,412	4,102
7,500	1,627	2,240	2,768	3,087	4,109	4,940
10,000	1,876	2,582	3,192	3,559	4,738	5,696
15,000	2,327	3,202	3,958	4,414	5,876	7,064
20,000	2,739	3,770	4,660	5,196	6,917	8,316
25,000	3,126	4,303	5,319	5,931	7,896	9,493
30,000	3,497	4,814	5,950	6,635	8,833	10,619
40,000	4,203	5,785	7,151	7,973	10,615	12,761
50,000	4,876	6,711	8,296	9,250	12,315	14,804
100,000	7,993	11,002	13,599	15,164	20,188	24,270

We emphasize that the net income is for the entire household, i.e., the amount of net income of both spouses (including transfer payments such as child allowance), and these expenditure estimations are the total expenditures for children. These expenditures include, among others, food, housing, furniture, education, health and more, and they also include unusual, one-time and irregular expenses.

In Jewish Law (Mishpat Ivri), the basic obligation of child support is to provide "the essential needs" of children under the age of 6. In a number of verdicts, Israel's family courts have interpreted this concept as "the standard of living of the lowest decile".[10] The concept of "essential needs" is alien to economic science (other than air, the most basic food, and water) and certainly in a developed country such as Israel. Nevertheless, the courts' interpretation changes the question from "essential needs" to "generally accepted expense" in a particular strata of Israeli society. Our formula thus allows us to examine what the expenditure for children should be at the income level of the bottom decile. But this definition can also be refined: does it refer to the bottom decile of the entire population, including, for example, the elderly without children, or the bottom decile of nuclear households with a certain number of children? To demonstrate this, we focus on the deciles according to the net income of households comprising a married couple (parents) and one young child (under 10

[10] Case No. (JM Family Court) 3640/10 A.B. v. Z.B., pars. 102-104; Case No. (JM Family Court) 21412-09-11 S.S. v. M.S., pars. 18-20; Case No. (Nazareth Family Court) 35921-05-13 S.L.G. v. M.G., par. 25.

years of age), and we examine the predicted cost of raising the child according to both our methods. For each decile, we calculate the mean net income (e.g. the mean net income of a household in the bottom decile of this sub-population is NIS 5,355). Figure 1 presents the estimated expenditure for a young child according to these income deciles. This provides an answer to the question "what is the expenditure on raising one young child in the bottom decile" (and in other deciles):

Figure 1
Cost of Raising One Young Child, by Income Deciles in Israel
(NIS per month, in 2017 Terms)

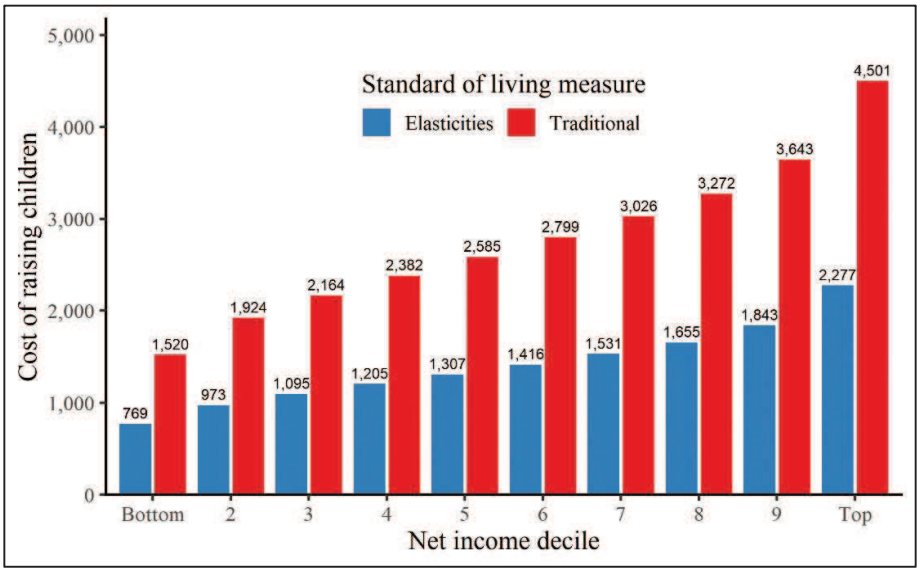


Figure 1 presents the expenditure for one child, but the average expenditure per child declines with the number of children due to economies of scale as well as other factors, as we noted in Section 1. Table 6 presents the expenditure per child for young children (total cost of the children divided by the number of children) at different levels of income:

Table 6
Expenditure per child for young children (under 10 years of age) by income and standard of living

Net monthly household income	No. of young children (under 10 years of age)			
	1	2	3	4
	Standard of living: Definition by elasticity			
5,000	746	675	620	575
7,500	899	814	747	692
10,000	1,036	938	861	798
15,000	1,285	1,163	1,067	990
20,000	1,513	1,369	1,257	1,165
25,000	1,727	1,563	1,434	1,330
30,000	1,932	1,749	1,605	1,488
40,000	2,322	2,101	1,928	1,788
50,000	2,693	2,438	2,237	2,074
100,000	4,415	3,997	3,667	3,400
	Standard of living: Traditional definition			
5,000	1,475	1,281	1,137	1,025
7,500	1,777	1,543	1,370	1,235
10,000	2,048	1,779	1,579	1,424
15,000	2,540	2,207	1,959	1,766
20,000	2,991	2,598	2,306	2,079
25,000	3,414	2,966	2,632	2,373
30,000	3,819	3,317	2,944	2,655
40,000	4,589	3,987	3,538	3,190
50,000	5,324	4,625	4,105	3,701
100,000	8,728	7,582	6,729	6,067

We can see that the expenditure per child decreases with the number of children. For example, if we focus on a household with total net monthly income of NIS 20,000 and standard of living according to the elasticity method—the total cost of one young child is NIS 1,513, whereas the total cost for four young children is NIS 4,659, the equivalent of NIS 1,165 per child. In other words, the cost per child is 23 percent lower for four children as compared with one child. In the traditional method, the cost per child decreases by slightly more than 30 percent for four children compared with one child.

Similarly, Table 7 presents the expenditure per child for teenage children (aged 10 and higher):

Table 7
Expenditure per child for teenage children (aged 10 and higher) by income and defined standard of living

Net monthly household income	No. of teenage children (aged 10 and higher)			
	1	2	3	4
	Standard of living: Definition by elasticity			
5,000	1,351	1,149	1,010	907
7,500	1,627	1,384	1,216	1,092
10,000	1,876	1,596	1,403	1,259
15,000	2,327	1,979	1,739	1,562
20,000	2,739	2,330	2,048	1,838
25,000	3,126	2,660	2,338	2,099
30,000	3,497	2,975	2,615	2,347
40,000	4,203	3,575	3,142	2,821
50,000	4,876	4,148	3,645	3,273
100,000	7,993	6,800	5,976	5,365
	Standard of living: Traditional definition			
5,000	2,563	2,051	1,724	1,496
7,500	3,087	2,470	2,077	1,802
10,000	3,559	2,848	2,395	2,078
15,000	4,414	3,532	2,970	2,577
20,000	5,196	4,158	3,496	3,033
25,000	5,931	4,747	3,991	3,462
30,000	6,635	5,309	4,464	3,873
40,000	7,973	6,381	5,365	4,654
50,000	9,250	7,402	6,224	5,400
100,000	15,164	12,135	10,203	8,852

For teenage children (aged 10 and higher), according to the elasticity method the cost per child is 33 percent lower for four children than for one child. In the traditional method, the cost per child is 42 percent lower for four children than for one child.

For households with children in both age groups, the cost per child is a function of both the number of children and their age composition. The cost per child is therefore different for a household with three children, if two of the children are young and one is a teenager or vice versa, or if all three are young or teenagers. Appendix B contains detailed tables of the expenditure for children with more information about income, number of children and different age compositions. By dividing the total expenditure by the number of children in each cell in these tables, we obtain the cost of raising the children per child.

6. SENSITIVITY TESTS AND DIFFERENT POPULATION GROUPS

In this section, we present sensitivity tests of the models that we estimated. We examine whether slight changes in the sample definitions significantly affect the main results that we obtained in the estimation. As we showed in Section 5, the Iso-Prop method requires a two-regression estimation and in order to obtain the costs of raising the children from both regressions they must be combined into a formula. In this section we therefore present the prediction for each sensitivity test of the costs of raising children for the median household in our sample, which has a net monthly income of NIS 18,305 and two children, one young (under 10 years of age) and one teenager (aged 10 and higher). Appendix C shows the results of estimation for each sensitivity test.

The research literature which discusses the costs of children, frequently includes various limitations of the sample (Gronau, 2012; Percival and Harding, 2005), such as the exclusion of families with a large number of children, households in which the head of the household is older than the generally prevailing age of parenthood and households where the data indicate that the reported expenditure (or income) is less reliable. These limitations arise from the concern that outliers will bias the estimations and this is particularly true for small samples (of a single year) or countries in which the share of households with a large number of children is extremely small. In this study, we were not constrained by such limitations due to our large sample, which was the result of consolidating four annual surveys, and also by the distribution of the number of children which is skewed to the right in Israel compared with other developed countries. Nevertheless, we use this type of limitation to conduct sensitivity tests of our models when we perform the analysis conducted in Section 5 on these sub-samples.

Table 8 shows the prediction for each sub-sample and the full sample for the above-mentioned household:

Table 8
Total expenditure for children in 2017 terms: sensitivity tests for households with net income of NIS 18,305 and two children: One young (under 10 years of age) and one teenager (aged 10 and higher)

Sample / Standard of living definition	Definition by elasticity	Traditional definition	No. of observations
Full	3,582	6,572	16,235
Families with up to 4 children	3,570	6,550	15,207
Families in which the head of household is less than 74 years old	3,626	6,760	14,996
Families in which the expenditure to income ratio is less than 2	3,598	6,478	15,518

The results presented in the table indicate that they show very little sensitivity to changes in the definition of the sample. The maximum difference in the traditional definition between the estimation in the sub-sample and the preferred estimation according to the full sample is NIS 44, which is 1.2 percent of the expenditure according to the preferred specification of the full sample. For the definition according to elasticity, the maximum difference is NIS 187, which is 2.9 percent of the expenditure according to the preferred specification of the full sample. The greatest difference is in the sub-sample in which the head of the household is less than 74 years old. The difference is due to the fact that there are no households in which the head of the household is in the oldest age group (aged 75 and higher) and has children. This is also evident from the negative or non-significant coefficients in Table 3, Column 1 for these age groups. In conclusion, the results are extremely robust to the sample definitions. In other words, we can say with a reasonable measure of certainty that the results represent and reflect nuclear households in Israel (married couples with and without children) and are not driven by outlier households that were sampled in the survey and distort the expenditure data and estimations.

The ICBS Household Expenditure Survey is a representative survey of Israel's entire population. Our estimation therefore uses the largest possible sample, while at the same time allowing us to use different household characteristics (age, education, population group, etc.) as control variables.

To examine the question of expenditure on children in specific population groups, we take the models from Table 3 and instead of using the means / relative frequencies in the full sample to create the general fixed effect, we use the values in each population group to create a fixed effect for each sub-population. So for example, heads of household in the 30-34 age group account for 16.5 percent of the entire sample, whereas among non-ultra-Orthodox Jews their share is 14.9 percent of the sample, among ultra-Orthodox Jews their share is 22.2 percent and among Arabs their share is 20.7 percent.

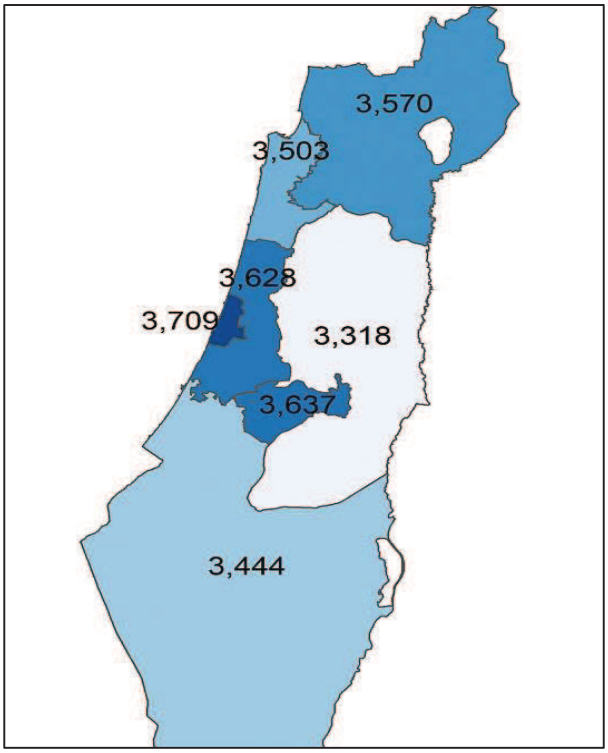
To demonstrate this point we will focus on a household which, in the sample, has net median income of NIS 18,305 and two children, one young (under 10 years of age) and one teenager (aged 10 and higher). For the entire population, the expenditure for children, where the standard of living is defined according to elasticity, is NIS 3,582. For non-ultra-Orthodox Jews the expenditure for children is NIS 3,584 and for ultra-Orthodox Jews is it NIS 3,278. For Arabs the expenditure for children is NIS 3,759. We can therefore see that the difference between the minority groups and the majority group is between 4.9 percent and 8.5 percent.

These differences can be attributed to the different distribution of the independent variables in these groups but it is worth noting that while the models already account for the effect of income, but the variance in the income distribution was not taken into account in this regression. If, instead of comparing the expenditure on children for a household with the same income level among the different population groups we use the net median income in each group in our sample, we obtain much greater differences: the median income of non-ultra-Orthodox Jews is NIS 21,336 and the cost of raising two children—one young and one teenager—according to the elasticity method, is NIS 3,918. Among ultra-Orthodox Jews the

net median income is NIS 12,743 and the cost of raising two children in NIS 2,683. Among Arabs, the net median income is NIS 10,563 and the cost of raising two children is NIS 2,787. The difference between the groups is due to the differences in income as well as the differences in the distribution of the other independent variables, for example – distribution of the ages of the heads of the household.

In the spatial context, we examine the cost of raising children in different districts of Israel—Jerusalem, the North, Haifa, Center, Tel Aviv, the South, as well as Israeli localities in Judea and Samaria. We apply the same method as in the previous paragraph so that in each district we calculate the mean of independent continuous variables and the share of the population of the categorical variables. There is considerable geographical variance in the demographic variables in our sample. For example, the highest share of ultra-Orthodox Jews in the sample is in Jerusalem—29 percent, whereas the lowest share of ultra-Orthodox Jews is in the North district, at just 2.94 percent. The following map presents total expenditure on children by region for the same household from the previous paragraph. The darker the color, the higher the expenditure:

Figure 2
Expenditure for Children, by Districts of Israel (NIS per month, in 2017 terms)



The highest expenditure is in Tel Aviv (NIS 3,709 according to the elasticity method) while Judea and Samaria has the lowest (NIS 3,318 according to the elasticity method). Several factors may drive these differences. First, the household's choice of district of residence has repercussions for the cost of housing, income and level of services, as well as the products and prices available to the household, whether for total expenditure or spending on children. Second, the comparison made here takes into account the difference in the central tendency measures (means and shares) of the independent variables, but it also holds income at a fixed level of NIS 18,305, net. If we examine the cost of raising children by district using the net median income in each region, we obtain greater disparities: for two children, one small (under 10 years of age) and one teenager (aged 10 and higher), the cost of raising children in the Center and Tel Aviv districts is highest at NIS 4,097 and NIS 4,074, respectively, according to the elasticity method, whereas the district with the lowest cost of raising children is the North, where the cost is NIS 3,044. The difference is mainly due to the difference in median income between the regions. In the Center district, net median income is NIS 22,540 whereas in the North district it is NIS 13,752.

7. WHAT IS NET INCOME?

In this paper, we estimated the cost of raising children according to the household's total net income. In addition to income from work and business, the total net income also includes capital income, the imputed value of income from property, and transfer payments from different sources, all net of mandatory tax payments (income tax, National Insurance Institute payments and health tax). We preferred to use the net amount as this is in fact the disposable income that the household allocates among the uses for the individual household members.

Let us consider the components that make up the total net income. For example, it includes the imputed value of the use of owner-occupied housing. Thus, if a person lives in a rented apartment for which he pays NIS 3,000, and another person lives in an identical apartment but does not pay NIS 3,000 a month in rent because he owns the apartment, the second person's income is NIS 3,000 higher than the first's because of the value of the rent that is saved as a result of ownership of the apartment. The ICBS calculates the imputed value of use of housing exclusively by locality and number of rooms. This component is therefore exposed to measurement errors. Nevertheless, excluding this component in net income would be an even greater error as there is a high share of home ownership in Israel and in our sample it is more than 70 percent. Income arising from housing is a significant source of income for Israeli households and it allows not only the current monetary income to be taken into account, but also income from property (albeit not perfectly).

Another component of total net income is the value of child allowances received by the parents (usually the mother). If the government reduces the child allowance (as it did in 2003) or increases the allowance (as it did in 2016), the net income of the allowance recipients will change accordingly.

It is also important to emphasize that a distinction must be made between the net income of salaried employees from their wages (which appears clearly in the wage slip as "net salary") and the amount actually deposited in the salaried employee's bank account as a result of receiving that wage, which is generally lower than the net salary. The net salary is the gross salary minus mandatory payments. However, salaried employees generally also make provision for pension and in some cases provision to a study fund ("Keren Hishtalmut", both of which include tax benefits), and there may also be repayment of a loan received from the work place in the past, etc. In these cases, the amount deposited in the bank account when the salary is paid will be lower than the net salary and reflects decisions to allocate the net income between current income and long-term savings and loan repayments that financed consumption in the past. In conclusion, the variable that is (and should be) taken into account when calculating net income for the purpose of calculating expenditure for children is the net salary on the wage slip and not the amount paid into the bank account when the salary is received.

Additionally, households may receive discounts from government companies and agencies on a variety of payments, such as housing assistance, reduced municipal taxes and subsidized electricity. For the most part, these discounts are given to households based on their size and / or per capita income and they can be substantial. Nonetheless, due to the complexity of the conditions of eligibility for these discounts, the difficulty in calculating them (even by the ICBS) and the fact that often they are only partially utilized by households, we recommend that they should not be taken into account when calculating net income and in fact we did not take them into account in our estimation.

8. FORWARD-LOOKING AND REVISED ESTIMATIONS FROM THE PAST

The estimations presented in this paper are based on actual income and expenditure data according to the different expenditure items in the ICBS Surveys of Household Income and Expenditure in the period 2014–17. To ensure that these estimates are also relevant for coming years, an update mechanism must be defined since clearly, net income of NIS 10,000 in 2017 is not equivalent to net income of NIS 10,000 in 2027, due to price changes as well as real changes in household income and consumption levels.

The first option for revising the estimates is that in future the methodology applied in this study can be taken and applied on the basis of new, more up-to-date data. As we showed in Section 5, the formula that we developed for calculating the cost of raising children makes such an update fairly simple, as long as we use the Iso-Prop method. Additionally, science is constantly progressing and it is therefore probable that more reliable methods of estimating the costs of children will be developed in the future that will be even better than the ones used in this paper. Nevertheless, we can safely assume that the data used for such estimation will be time lagged, for example the last Household Expenditure Survey that was available to researchers in June 2019 is the 2017 survey.

Another, more accessible option is to update our detailed results (i.e., the table that shows the relationship between household income, household size, composition of the age of the children and expenditure on the children) by a fixed factor so as to adjust them to the terms of any future year. For this purpose, we propose using an estimate (or forecasts) of the nominal per-capita private expenditure in a given year, compared with the corresponding data for 2017. This is generally accepted practice both in Israel and other countries so that, for example, the National Insurance Institute updates its tax thresholds and rates every year according to the mean wage in the economy.

According to the latest ICBS publication available at the time of compiling this study[11], the annual increase in nominal per capita private consumption in 2013 was 3.5 percent, in 2014 it was 2.6 percent, in 2015 it was 1.7 percent, in 2016 it was 3.7 percent, in 2017 it was 1.6 percent and in 2018 it was 2.9 percent. Moreover, macroeconomic forecasts of various institutions can be used to calculate the changes expected in 2019 and 2020 as well as in later years.

This method can also help us to update Gronau's estimations (2012). Gronau's estimation was calculated on the basis of the ICBS Household Expenditure Survey for 2005–06 and we therefore update the estimations to 2017 terms. Gronau's estimations (2012) are also based on gross income. To obtain a revised estimate for 2017, we first adjust the gross income and expenditure for children from 2006 terms to 2017 terms, using the change in per capita nominal annual expenditure between 2006 and 2017, which increased by 56.9 percent (from NIS 51,107 to NIS 80,161). We also estimate net income as a function of gross income using the 2017 survey of household expenditure and obtain the following regression, where Y is total net income and y is total gross income:

$$\ln(Y) = -3.777 + 1.856\ln(y) - 0.049\ln^2(y)$$

We demonstrate the method as follows:

Gronau (2012) found that for gross income of NIS 14,000 (in 2006 terms) the expenditure for two children is NIS 4,351. In 2017 terms, after multiplying the 2006 amount by 1.569 (for a 56.9 percent increase), total gross income is NIS 21,966 and the total expenditure obtained is NIS 6,826. Using the regression that we estimated above, we convert the gross income adjusted for 2017—gross income of NIS 21,966 is translated into net income of NIS 19,663. We then examine the expenditure for children using our model. Table 9 shows the comparison between the estimations in this paper and Gronau's estimation (after adjustment to 2017 terms).

[11] Central Bureau of Statistics: Israel's National Accounts for 2018, Table 7.

Table 9
Total expenditure in 2017 terms for two children compared with Gronau (2012)
Gross income of NIS 21,966 translated into net income of NIS 19,663

Gronau (2012)	6,826	
Age of children / defined standard of living	By elasticity	Traditional
Two small children (under 10 years of age)	2,712	5,145
One small (under 10 years of age) and one teenager (aged 10 and higher)	3,733	6,849
Two teenagers (aged 10 and higher)	4,614	8,234

We can see that, assuming that our proposed adjustment method is valid, Gronau's results (2012) can be translated into 2017 terms, and that this estimation is extremely similar to our own estimation of expenditure for children in a family with one young child and one teenager (according to the "traditional" method of defined standard of living used by Gronau (2012)). However, our model allows us to take the children's ages into account and we find that the total expenditure for two young children is significantly lower than the estimation for a balanced age composition, and the total expenditure for two teenage children is significantly higher. Furthermore, if we use the standard of living according to elasticity, which is based on data for actual expenditure, the estimations for each composition of ages is significantly lower than in Gronau (2012).

9. INTERNATIONAL COMPARISON

As we showed in Section 1 of this paper, Israel is not the only country in which income and expenditure data served as the basis for estimating the costs of raising children. In this section, we will attempt to conduct an international comparison between our results and those of previous studies from other countries. It should be emphasized that this comparison is in no way straightforward—contrary to our own position, most of the studies use gross income rather than net income. Additionally, to avoid large, confusing tables, some of the reported results are presented by ranges of income rather than income as a continuous variable. Despite these difficulties, such a comparison can provide us with an overview of the costs of raising children in Israel relative to other countries.

To overcome the problem of prices, currencies, and different family size between the countries, we chose to focus on a representative household that we compare with the representative household reported in the studies, and we compare the expenditure on children as a share of income. In our study, the representative household has the net median income in the sample of NIS 18,305. To compare it with international estimations, we will use the regression from Section 8 in the reverse direction and translate the net income into gross income which yields an estimated gross income for this household of NIS 20,253. Applying

the regressions from Section 5 results in an expenditure of NIS 2,841 for one young child (under 10 years of age) according to the traditional method and NIS 1,437 according to the elasticity method. These amounts are 14 percent and 7 percent, respectively, of the household's gross income. Expenditure for one teenager (aged 10 and higher) is 24 percent and 13 percent, respectively, of the household's gross income.

Donni (2015) presents a survey of the literature on the cost of raising children for the European research institute IZA. His study analyzes six papers that estimate the cost of raising children in the United States for a household comprising a married couple and one child. The cost estimations (for a household with average income) from these papers range from 10 percent to 32 percent of income. However, these estimations are old and the most recent one was published in 2003 and is based on 1998 data. Since in these estimations the children are not separated into age groups, we compare them to the mean of our age-specific estimations, which amount to 19 percent of gross income according to the traditional method and 10 percent according to the elasticity method.

Phillips (2013) estimates the cost of raising children in Australia based on data from 2012, in a similar way to Percival and Harding (2005), which formed the basis for Gronau (2012). Like our own paper, Phillips (2013) also separates the cost of children by age, into four categories: 0-4, 5-9, 10-14 and 15-17. To compare this with our own estimations, in which we combined the two lower age groups into one group and the two upper age groups into one group, we will use the mean among each of these two age groups in Phillips (2013). For a household with the mean income in the sample, the cost of raising one young child (under 10 years of age) is 7 percent of income and the cost of raising one teenager (aged 10 and above) is 13 percent of income.

Lino et al. (2017) estimate the costs of raising children in the United States on the basis of data from 2015 for the US Department of Agriculture. This study uses several methods to obtain estimations of the total cost of children as well as the cost of housing. For example, it uses the cost of adding a bedroom (from external sources) in order to estimate the marginal cost of housing for an additional child. In this study too, estimations of the cost of raising the children include allocation into six age groups: 0-2, 3-5, 6-8, 9-11, 12-14 and 15-17. To compare this with our own estimations, we use the mean for the three lower age groups (0-8) as representing young children, and the average for the three upper age groups (9-17) as representing teenagers. For a household with the average income in the sample, the cost of raising one young child (under 9 years of age) is 20 percent of the income, and the cost of raising one teenager (aged 9 and above) is 21 percent of the income.

In conclusion, our estimations are within the accepted range in the global literature. Applying the elasticity method produces cost estimations of raising children that are similar to Australia according to Phillips (2013), and applying the traditional method produces cost estimations of raising children that are similar to those in the United States according to Lino et al. (2017). The estimations presented by Donni (2015) present a much broader range, probably due to not considering the children's ages, which as noted in this study and in Phillips (2013) strongly affect the result for the "average" child.

10. SUMMARY

In this paper, we reviewed the research literature on the subject of the costs of raising children and we discussed the numerous problems entailed in estimating these costs by comparing the total household expenditure of households without and without children. In response to these problems, research literature has developed which, despite the econometric challenges, attempts to estimate the costs of raising children, and it does so by drawing a comparison across the material standard of living as a means of identifying the costs of raising children.

Gronau's work (2012) was the first to attempt to estimate the costs of raising children in Israel using methods that overcome these challenges, by basing himself on the ICBS Household Expenditure Surveys for 2005 and 2006 and using a measure of the material standard of living comprising pre-defined items of expenditure.

In this paper, we present revised estimations of the costs of raising children in Israel, based on the most recent surveys of the ICBS available at the time of writing this paper. Additionally, our estimations are more sophisticated and they also take the children's ages into account, given that we found that the marginal increase in expenditure per child differs significantly between young children (up to age 10) and teenagers (aged 10 and above). We also developed a novel method for estimating the material standard of living by the share of expenditure on basic products which are defined according to the elasticity of their expenditure, which is estimated from the actual data. This method helps take into account the economic context in each country and in every period, and it can be applied in all parts of the world as well as in the future. This contrasts with the traditional method (in which the definition of basic products is somewhat arbitrary) where some items of expenditure become irrelevant (such as international phone calls) and others are irrelevant in other countries.

With the help of these two methods, the traditional method and the elasticity method, we estimated the cost of raising children in contemporary Israel. These estimations are based on a large, representative data sample of nuclear households in Israel (married couples with and without children) from the ICBS Household Expenditure Survey. These estimations are preferable to those based on personal anecdotes that are unreliable and cannot be used for drawing conclusions regarding the entire population. These estimations enable parents (and future parents) to prepare and forecast their expenditure on raising children. These estimations can also be used as a basis for further research on a variety of subjects, as data for policymakers addressing a range of welfare and taxation issues, and as a cost estimation of the costs of raising children for family courts. When family courts discuss visitation rights and child support for divorced parents, they will be able to use the cost estimations of raising children we have presented here as a basis for the costs to be shared between the parents.

In order to better facilitate usage of the formula, we have published an interactive calculator[12], where the user is required to input the total net household income, number of children and their ages. The calculator's result is the estimated cost of raising children from

[12] On the Kohelet Forum website.

the formula as a range between the two methods we have utilized in this paper. The calculator is available both in Hebrew (https://kohelet.org.il/מחשבון-עלות-גידול-ילדים) and English (https://en.kohelet.org.il/cost-of-raising-children-calculator).

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APPENDICES

Appendix A

Table A1
Regression table: Cost estimation for children in 2017 terms: Number of children variable

Model no.	(1)	(2)
Dependent variable:	**Expenditure (log)**	
Net income (log)	-0.416**	-0.421**
	(0.194)	(0.193)
Net income (log) squared	0.0503***	0.0506***
	(0.00988)	(0.00987)
No. of children (base: no children):		
One child	0.0567***	
	(0.0168)	
Two children	0.119***	
	(0.0161)	
Three children	0.159***	
	(0.0168)	
Four children	0.168***	
	(0.0197)	
Five children	0.185***	
	(0.0246)	
Total persons and children (log)		0.163***
		(0.0149)
Age group of head of household (base: 18-24)		
25-29	0.101***	0.100***
	(0.0336)	(0.0336)
30-34	0.0877***	0.0860***
	(0.0333)	(0.0332)
35-39	0.103***	0.103***
	(0.0339)	(0.0337)
40-44	0.114***	0.114***
	(0.0345)	(0.0342)
45-49	0.120***	0.120***
	(0.0352)	(0.0349)
50-54	0.120***	0.119***
	(0.0383)	(0.0381)
55-74	0.110***	0.109***
	(0.0354)	(0.0332)
75-79	0.0134	0.0125
	(0.0389)	(0.0368)

80-84	0.00982 (0.0410)	0.00886 (0.0390)
85+	-0.112** (0.0466)	-0.113** (0.0449)
Head of household continent of birth (base: Israel)		
Europe + America	-0.0815*** (0.00874)	-0.0817*** (0.00873)
Africa + Asia	-0.0448*** (0.0137)	-0.0449*** (0.0137)
Head of household population group (base: non-ultra-Orthodox Jewish)		
Ultra-Orthodox Jewish	-0.148*** (0.0153)	-0.151*** (0.0150)
Arab	0.0568*** (0.0144)	0.0561*** (0.0144)
No. of years of education	0.0194*** (0.00186)	0.0193*** (0.00186)
No. of years of education squared	-0.000235*** (0.0000346)	-0.000234*** (0.0000346)
Head of household work hours	0.00341 (0.00259)	0.00334 (0.00259)
Spouse work hours	-0.0183*** (0.00279)	-0.0182*** (0.00279)
District of residence (base: Jerusalem):		
North	-0.0442*** (0.0162)	-0.0434*** (0.0163)
Haifa	-0.0426*** (0.0154)	-0.0415*** (0.0154)
Center	-0.00210 (0.0137)	-0.000994 (0.0137)
Tel Aviv	0.0383*** (0.0146)	0.0390*** (0.0146)
South	-0.0253 (0.0155)	-0.0248 (0.0155)
Judea & Samaria	-0.0807*** (0.0196)	-0.0820*** (0.0196)
Constant	8.539*** (0.940)	8.450*** (0.940)
No. of observations	15709	15709
R^2	0.538	0.537

Notes*:* All the models are weighted by the CBS sampling weights.

Robust standard errors in parentheses. * represents p<0.1, ** represents p<0.05, *** represents p<0.01

Appendix B

Tables of the cost of raising children by detailed income levels and additional family composition (1, 2, 3 children).

Table A2
Household expenditure in 2017 terms for one child by income, child's age and standard of living definition

Standard of living definition	**By elasticity**		**Traditional method**	
Net monthly household income	**Young (under 10 years of age)**	**Teenager (aged 10 and higher)**	**Young (under 10 years of age)**	**Teenager (aged 10 and higher)**
5,000	746	1,351	1,475	2,563
7,500	899	1,627	1,777	3,087
10,000	1,036	1,876	2,048	3,559
12,500	1,164	2,107	2,301	3,998
15,000	1,285	2,327	2,540	4,414
17,500	1,401	2,536	2,770	4,812
20,000	1,513	2,739	2,991	5,196
22,500	1,621	2,935	3,205	5,568
25,000	1,727	3,126	3,414	5,931
27,500	1,830	3,314	3,618	6,286
30,000	1,932	3,497	3,819	6,635
32,500	2,031	3,677	4,016	6,977
35,000	2,129	3,855	4,209	7,313
37,500	2,226	4,030	4,401	7,646
40,000	2,322	4,203	4,589	7,973
42,500	2,416	4,374	4,776	8,297
45,000	2,509	4,543	4,960	8,618
47,500	2,602	4,710	5,143	8,935
50,000	2,693	4,876	5,324	9,250
100,000	4,415	7,993	8,728	15,164

Table A3
Household expenditure in 2017 terms for two children, by income and children's ages. Standard of living: by elasticity

Net monthly household income	**Two young children (under 10 years of age)**	**One young child and one teenager**	**Two teenagers (aged 10 and higher)**
5,000	1,351	1,859	2,298
7,500	1,627	2,240	2,768
10,000	1,876	2,582	3,192
12,500	2,107	2,901	3,586
15,000	2,327	3,202	3,958
17,500	2,536	3,491	4,315
20,000	2,739	3,770	4,660
22,500	2,935	4,040	4,994
25,000	3,126	4,303	5,319
27,500	3,314	4,561	5,638
30,000	3,497	4,814	5,950
32,500	3,677	5,062	6,257
35,000	3,855	5,306	6,559
37,500	4,030	5,547	6,857
40,000	4,203	5,785	7,151
42,500	4,374	6,020	7,441
45,000	4,543	6,253	7,729
47,500	4,710	6,483	8,014
50,000	4,876	6,711	8,296
100,000	7,993	11,002	13,599

Table A4
Household expenditure in 2017 terms for two children, by income and the children's ages. Standard of living: traditional definition

Net monthly household income	**Two young children (under 10 years of age)**	**One young child and one teenager**	**Two teenagers (aged 10 and higher)**
5,000	2,563	3,412	4,102
7,500	3,087	4,109	4,940
10,000	3,559	4,738	5,696
12,500	3,998	5,323	6,399
15,000	4,414	5,876	7,064
17,500	4,812	6,406	7,701
20,000	5,196	6,917	8,316
22,500	5,568	7,413	8,912
25,000	5,931	7,896	9,493
27,500	6,286	8,369	10,061
30,000	6,635	8,833	10,619
32,500	6,977	9,288	11,166
35,000	7,313	9,737	11,705
37,500	7,646	10,179	12,237
40,000	7,973	10,615	12,761
42,500	8,297	11,046	13,280
45,000	8,618	11,473	13,793
47,500	8,935	11,896	14,301
50,000	9,250	12,315	14,804
100,000	15,164	20,188	24,270

Table A5
Household expenditure in 2017 terms for three children, by income and children's ages. Standard of living: by elasticity

Net monthly household income	**Three young children (under 10 years of age)**	**Two young children and one teenager**	**Two teenagers and one young child**	**Three teenagers (aged 10 and higher)**
5,000	1,859	2,298	2,685	3,030
7,500	2,240	2,768	3,234	3,649
10,000	2,582	3,192	3,728	4,208
12,500	2,901	3,586	4,188	4,727
15,000	3,202	3,958	4,624	5,218
17,500	3,491	4,315	5,041	5,689
20,000	3,770	4,660	5,443	6,143
22,500	4,040	4,994	5,833	6,583
25,000	4,303	5,319	6,214	7,013
27,500	4,561	5,638	6,586	7,432
30,000	4,814	5,950	6,950	7,844
32,500	5,062	6,257	7,309	8,249
35,000	5,306	6,559	7,662	8,647
37,500	5,547	6,857	8,009	9,039
40,000	5,785	7,151	8,353	9,427
42,500	6,020	7,441	8,692	9,810
45,000	6,253	7,729	9,028	10,189
47,500	6,483	8,014	9,361	10,564
50,000	6,711	8,296	9,690	10,936
100,000	11,002	13,599	15,886	17,929

Table A6
Household expenditure in 2017 terms for three children, by income and children's ages. Standard of living: traditional definition

Net monthly household income	**Three young children (under 10 years of age)**	**Two young children and one teenager**	**Two teenagers and one young child**	**Three teenagers (aged 10 and higher)**
5,000	3,412	4,102	4,679	5,173
7,500	4,109	4,940	5,636	6,231
10,000	4,738	5,696	6,498	7,184
12,500	5,323	6,399	7,300	8,070
15,000	5,876	7,064	8,058	8,909
17,500	6,406	7,701	8,785	9,713
20,000	6,917	8,316	9,486	10,488
22,500	7,413	8,912	10,166	11,240
25,000	7,896	9,493	10,829	11,973
27,500	8,369	10,061	11,477	12,689
30,000	8,833	10,619	12,113	13,392
32,500	9,288	11,166	12,738	14,083
35,000	9,737	11,705	13,352	14,762
37,500	10,179	12,237	13,959	15,433
40,000	10,615	12,761	14,557	16,094
42,500	11,046	13,280	15,149	16,749
45,000	11,473	13,793	15,734	17,396
47,500	11,896	14,301	16,314	18,036
50,000	12,315	14,804	16,888	18,671
100,000	20,188	24,270	27,685	30,609

Appendix C

Table A7
Regression table: Cost of children in 2017 terms, sensitivity tests – first regression

Model no.	(1)	(2)	(3)
Dependent variable	**Household expenditure (log)**		
Sample:	**Family with up to 4 children**	**Families in which the head of household is less than 74 years old**	**Families in which the expenditure / income ratio is less than 2**
Net income (log)	-0.428**	-0.583***	1.770***
	(0.194)	(0.180)	(0.143)
Net income (log) squared	0.0510***	0.0581***	-0.0562***
	(0.00988)	(0.00920)	(0.00733)
No. of persons and children weighted (log)	0.222***	0.205***	0.194***
	(0.0186)	(0.0156)	(0.0137)
Fixed factor	8.708	9.566	-2.519
Control variables	✓	✓	✓
No. of observations	15207	14996	15518
R^2	0.540	0.512	0.635

Notes: All the models are weighted by the CBS sampling weights.
Robust standard errors in parentheses.

The fixed factor includes the constant and the effect of the control variables which include: categories of age of the head of household, head of household's continent of birth, population group (non-ultra-Orthodox Jewish / ultra-Orthodox Jewish / Arab), head of household's years of education and years of education squared, work hours of head of household and his/her spouse, and residential district.

Table A8
Regression table: Cost of children in 2017 terms, sensitivity tests—second regression

Model no.	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	**Share of expenditure on basic products**					
Basic products definition:	**Traditional**	**By elasticity**	**Traditional**	**By elasticity**	**Traditional**	**By elasticity**
Sample:	**Families with up to 4 children**		**Families in which the head of household is up to age 74**		**Families in which the expenditure / income ratio is less than 2**	
Household expenditure (log)	-0.0977***	-0.248***	-0.0963***	-0.248***	-0.0977***	-0.249***
	(0.00169)	(0.00220)	(0.00205)	(0.00284)	(0.00172)	(0.00226)
Weighted no. of persons and children (log)	0.0915***	0.117***	0.0923***	0.134***	0.0904***	0.129***
	(0.00366)	(0.00447)	(0.00314)	(0.00380)	(0.00308)	(0.00367)
Fixed factor	0.961	2.787	0.928	2.798	0.959	2.776
Control variables	✓	✓	✓	✓	✓	✓
No. of observations	15207	15207	14996	14996	15518	15518
R^2	0.402	0.666	0.408	0.659	0.398	0.661

Notes: All the models are weighted by the CBS sampling weights. Robust standard errors in parentheses.

The fixed factor includes the constant and the effect of the control variables which include: categories of age of the head of household, head of household's continent of birth, population group (non-ultra-Orthodox Jewish / ultra-Orthodox Jewish / Arab), head of household's years of education and years of education squared, work hours of head of household and his/her spouse, and residential district.

Table A9

Regression table: Relationship between household size, household consumption and share of expenditure according to different definitions

Model no.	(1)	(2)	(3)	(4)
Dependent variable:	**Share of expenditure on food**	**Share of expenditure on food (excluding food consumed outside the home)**	**Share of expenditure on basic products: Traditional definition**	**Share of expenditure on basic products: Definition by elasticity**
Household expenditure (log)	-0.0394***	-0.0490***	-0.0847***	-0.252***
	(0.00197)	(0.00180)	(0.00201)	(0.00229)
Weighted no. of persons and children (log)	0.0358***	0.0595***	0.0792***	0.113***
	(0.00406)	(0.00382)	(0.00404)	(0.00443)
Control variables	✓	✓	✓	✓
No. of observations	16235	16235	16235	16235
R^2	0.185	0.286	0.404	0.666

Notes: All the models are weighted by the CBS sampling weights. Robust standard errors in parentheses.

The fixed factor includes the constant and the effect of the control variables which include: categories of age of the head of household, head of household's continent of birth, population group (non-ultra-Orthodox Jewish / ultra-Orthodox Jewish / Arab), head of household's years of education and years of education squared, work hours of head of household and his/her spouse, and residential district.