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Estimation of the adequate living expenses threshold during the Greek crisis

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ESTIMATION OF THE ADEQUATE LIVING EXPENSES THRESHOLD
DURING THE GREEK CRISIS

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ABSTRACT

The aim of this study is to present the underlying methodology behind the estimation of the Adequate Living Expenses (ALE) Threshold for the Greek population. The ALE threshold was first introduced in 2014 by the Greek authorities as a benchmark, mainly for protecting over-indebted mortgage holders from foreclosure of the primary residence. In this manuscript, we present alternative methodological approaches and specifications considered to estimate this threshold and we report updated estimates for the year 2017. The ALE threshold is defined through expenditure for the purchase of goods and services and interpreted as the income level that the household should possess in order to cover the level of acceptable living expenses, following the median expenditure pattern of Greek households. By taking into consideration the main categories of the Greek Household Budget Survey, we examined different expenditure specifications, based on the necessity of the needs covered by gradually excluding items that could be considered as "luxury" items (four scenarios were developed). Quantile regression and linear robust regression accounting for the presence of outliers was applied and various model specifications were tested. Our results control for household structure, degree of urbanization and mortgage holding, and interactions among them. In 2017, for a family with two children ALE threshold ranged from 1,196€ to 1,497€ per month, reduced by approximately 11.5% compared to 2012, depending on the expenditure specification. The estimated ALE threshold lies considerably above the poverty line in all cases.

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1.   Introduction

The Adequate Living Expenses (ALE) threshold, originally introduced in 2014, is used by the Greek authorities as a benchmark for protecting mortgage-holders from foreclosure of the primary residence. The threshold also serves as a guideline for courts and judiciary on the application of the legislated home protection schemes[1] on household insolvency, as well as for the out-of-court loan restructuring procedure by the banking sector. The aim of this study is (a) to present the methodology for the estimation of the Adequate Living Expenses (ALE) threshold, (b) to update the 2012 estimates to the most recent ones, and, (c) to present alternative methods that can be used to update these estimates on an annual basis.

Periodic updates of the ALE threshold are necessary in the light of changes in the prices of the consumer basket, consumer habits, and household incomes. Furthermore, given that the ALE threshold is a key parameter for the non-performing loans resolution, as the level of ALE and its policy applications (protection of primary residence from foreclosure, state-subsidy to mortgage holders etc.) may affect mortgage-holders behavior itself, it is crucial to investigate the sensitivity of the ALE threshold results to alternative methods and suggest possible improvements.

According to the IMF/EC/ECB Guidance on Household Debt Definitions (12/05/2013) a definition of acceptable living expenses safeguards "a minimum standard of living so as to protect debtors while facilitating creditors in recovering all, or at least a portion of the debts due to them. One of the strengths of using consensual budget standards is the level of transparency it affords in the debt resolution process. It ensures that debtors, creditors and any third-parties involved can recognize a repayment schedule as being fair and thus provides the confidence for all parties to expeditiously agree on new lean terms".

Broadly, ALE is related to the notion of reference budgets. According to the European Consumer Debt Network (ECDN, 2009), "reference budgets are expenditure patterns for different types of households. Based on the household composition (number of members, age), the disposable income and some other characteristics (like housing situation, possession of a car, special needs of members), an expenditure pattern is given that suits the situation of the household. Reference budgets can be based on empirical data (e.g. budget enquiries) or constructed by budget experts." On policy grounds, reference budgets and ALE thresholds are used for multiple purposes including the estimation of an adequate standard

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[1] In particular, laws 3869/2010, 4161/2013, 4346/2015 and 4549/2018, govern the protection scheme for primary residence in Greece.

of living, estimation of additional income support bellow the guaranteed minimum income[2], debt rescheduling, financial education, the calculation of alternative credit scores, measuring the extent of poverty and assessing the adequacy of minimum wages and social benefits (Goedemé et al., 2015; Storms et al., 2014).

There exists a variety of approaches on developing reference budgets (Citro and Michael 1995), but two are predominant in the relevant literature. The first approach, followed in this analysis, is to rely on empirical data and household surveys. Within European countries, Denmark, Germany, Greece, and Latvia follow this approach. Another methodological approach (used in the case of Ireland (ISI, 2013) and other countries) is to form task groups of experts (i.e. nutrition scientists etc.), so as to synthesize baskets of goods and services, a household is "reasonable" to consume, and evaluate their cost on a continuous basis according to the CPI index.

According to a review of reference budgets in Europe, conducted by Storms et al. (2014), 23 EU countries have constructed reference budgets in the past four decades that are still being used.[3] Out of the 61 reference budgets studied (some countries have developed more than one in the past), 47 make use of expert knowledge, 41 use household budgets survey (HBS) data, 22 focus groups decisions, 22 international and regional guidelines, 15 survey data besides HBS and 3 market research; several countries combine more than one data sources such as expert knowledge and focus groups decisions.

The adequate living expenses threshold in this study is estimated through the reported household expenditure for the consumption of selected baskets of goods and services and is interpreted as the income level that the household should possess in an annual basis in order to be able to cover the level of acceptable living expenses. The data of Greek Household Budget Survey (HBS) of the Hellenic Statistical Authority (ELSTAT) are used for the estimation of the threshold.

It is tricky to determine what is "reasonable" or "adequate" when it comes to expenditure or income and one should always try to minimize the risk of subjective assumptions. The main idea in our approach is to propose a "statistically reasonable" definition, by studying the observed household expenditures and try to estimate how much

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[2] See, for example, a recent study by Penne et al (2019), who propose reference budgets as an EU policy indicator to assess adequacy of minimum incomes and illustrate this with the case of Belgium.
[3] Notable examples include: Collins et al. (2012); Hoff et al. (2010); Kemmetmüller and Leitner (2009); Konsument Verket (2009); Preuße (2012). A detailed list of publications outlining relevant work on reference budgets by country can be found here: https://www.referencebudgets.eu/copy-of-publications.

the median Greek household actually spends, after excluding non-prior and luxury expenses. With respect to non-prior expenses we present four different specifications of them, having in mind that adequate expenses should allow each person to receive nutritionally adequate food, have descent clothing, cover daily transportation costs, have access to education and health and be an active member in the society.

The rest of the manuscript proceeds as follows. The second section presents the datasets used, the third section the methodology applied and the fourth section the results of the econometric estimation, including a comparative analysis of the different techniques to update ALE, a comparison with poverty thresholds and a sensitivity analysis when applying the suggested methodology for the whole 2010-2017 period. The fifth section concludes.

2. Data

The estimates of the ALE threshold are based on the micro-data of the Greek Household Budget Survey (HBS) of the Hellenic Statistical Authority (ELSTAT) (see Hellenic Statistical Authority, 2018). HBS is a national survey collecting information from a representative sample of households, on households' composition, members' employment status, living conditions and, mainly, focusing on their members' expenditure on goods and services. The expenditure information collected from households is very detailed. Specifically, information is collected on the basis of total expenditure categories like "food", ''clothing - footwear', "health ", etc., but also separately for each expenditure, for example, white bread, fresh whole milk, fresh beef etc., footwear for men, footwear for women etc., services of medical analysis laboratories, pharmaceutical products etc.

The main purpose of the HBS is to determine in detail the household expenditure pattern in order to revise the Consumer Price Index. Moreover, HBS is the most appropriate source in order to (a) complete the available statistical data for the estimation of the total private consumption, (b) study the households' expenditures and their structure in relation with other economic, social and demographic characteristics, (c) analyze the changes in the living conditions the households in comparison with as previous surveys, (d) study the relation between households purchases and receipts in kind, and (e) study the changes in the nutritional habits of the households of the country.

From 2008 it was decided, the Greek HBS survey should be annual and consistent,

namely has duration one year and takes place every year. In the framework of the current analysis we analyzed the data of HBS's of the years 2010 up to 2017. For the period 2010-2013, the sample size is approximately 8,500 individuals and 3,500 households. From 2014 onwards the sample size has increased to approximately 14,500 individuals and 6,000 households. The sample is adjusted so as to resemble the distribution of the total population, using ELSTAT's HBS sampling weights. Various variables of the HBS were used for the current analysis as described in detail below.

The second dataset used is the monthly sub-indices, sub-groups and items of the Consumer Price Index (CPI) published by ELSTAT, along with the corresponding CPI weights. These data are used to examine an alternative method to update ALE thresholds on an annual basis, when only price changes are taken into account.

The third dataset, used for comparative purposes, is the European Union Statistics on Income and Living Conditions (EU-SILC) database. EU-SILC is a cross-sectional and longitudinal sample survey, coordinated by Eurostat, based on data from the EU member states. EU-SILC provides data on income, poverty, social exclusion and living conditions in the European Union. EU-SILC micro data is gathered by the member states of the European Union and collated by Eurostat. There are two data types: Cross-sectional data pertaining to fixed time periods, with variables on income, poverty, social exclusion and living conditions, and longitudinal data pertaining to individual-level changes over time, observed periodically, usually over four years. Social exclusion and housing-condition information is collected at household level. Income at a detailed component level is collected at personal level, with some components included in the 'Household' section. Labour, education and health observations only apply to persons aged 16 and over. EU-SILC was established to provide data on structural indicators of social cohesion (at-risk-of-poverty rate, S80/S20 and gender pay gap) and to provide relevant data for the two 'open methods of coordination' in the field of social inclusion and pensions in Europe. The 2012 and 2017 EU-SILC data are used, so as to compare ALE thresholds for different household synthesis with the poverty thresholds derived on basis of the EU-SILC survey.

3.   Methodology

The applied methodology involves quantile and robust linear regression of total consumption expenditure as formed after the exclusion of certain expenses, according to the household type such as single household, household with two adults, number of

children, number of extra adults, mortgage holding and urbanization. Different versions of the expenditure variable, as well as different model specifications have been tested. In the following paragraphs, we describe the methodology in detail: (a) the construction of the dependent variable, (b) the construction of independent variables, (c) the model specifications and estimation techniques and (d) the strategies used to update ALE thresholds on an annual basis.

3.1 Expenditure variable

The current study seeks to determine an adequate level of expenditure for each type of household, translated as an adequate level of income sources that the household should possess in order to be able to reach the adequate living expenses threshold. Therefore, expenditure is the main variable to be defined. Using the HBS data, we have chosen to exclude (under different exclusion scenarios) from the already calculated total household expenditure variable of the Greek Household Budget Survey certain expenses which are considered to be non-prior or luxury. We took into consideration all the main categories included in the HBS: Food and non-alcoholic beverages, alcoholic beverages and tobacco, clothing and footwear, housing, water, electricity, gas and other fuels, furnishings, household equipment and routine maintenance of the house, health, transport, communications, recreation and culture, education, restaurants and hotels, miscellaneous goods and services.

The rational is that in order to provide alleviation to people in dire economic situation, reasonable cost of living should cover basic needs of descent living. We take into account expenses related to social services provided by the state (i.e. national health system, public schools, public transportation etc.) and we exclude additional or alternative options provided by private sector. Thus, the approach is focused on objective needs of households and not on personal wishes or demands.

Based on the above rational, four different definitions of the expenditure variable have been used for testing the sensitivity of the results, formed by gradually excluding the following groups of expenses: The analytical HBS categories excluded from each expenditure specification are provided in Table 1. In the 1st group of variables excluded are expenses related to rents, private health, private education, private insurance and luxury; in the 2nd group of variables excluded are additional expenses related to travelling, hobbies, alcohol, tobacco and hotel expenses, except pets and veterinary services; in the 3rd group of variables

excluded are also expenses related to household durables like furniture, electrical appliances etc. except repairs of household durables. Finally, the 4th group excludes also restaurants & cafes (apart from canteen expenses). Thus, the expenditure definition that occurs by removing the 4th group of expenses is the most restricted.

Table 1: *Definition of the Expenditure Variable (four specifications)*

HBS expenses categories excluded	Expenditure 1	Expenditure 2	Expenditure 3	Expenditure 4
Group 1: Rents, Private health, Private education, Private insurance, luxury				
he041a: Rent, he042a: Imputed rent	√	√	√	√
he0562a: Domestic services	√	√	√	√
he063a: Hospital care	√	√	√	√
he092a: Residual category culture & entertainment	√	√	√	√
he0943a: Gabbling	√	√	√	√
Variable from PDB[1]: Private education	√	√	√	√
he1231a: Jewelry & valuables	√	√	√	√
he1252a: Accommodation insurance	√	√	√	√
he12532a: Private health insurance	√	√	√	√
Group 2: Travelling, Hobbies, Alcohol & Tobacco, Hotels				
he02a: Alcohol & tobacco		√	√	√
he0733a: Air transports		√	√	√
he093a: Hobbies (but not he0934a: Pets and related products, he0935a: Veterinary services)		√	√	√
he0941a: Athletic & entertainment services		√	√	√
he0942a: Cultural services		√	√	√
he096a: Group trips		√	√	√
he112a: Hotels & rooms to rent		√	√	√
Group 3: Durables				
he051a: Furniture, lamps & decoration items (but not he0513a: Repair of he051a category)			√	√
he052a: Bed furniture & linen			√	√
he053a: Electrical appliances (but not he0533a: Repair of he053a category)			√	√
he054a: Dinnerware (crockery & cultery), (but not he05404a: Repair of he054a category)			√	√
he055a: Tools, home & garden equipment			√	√
he071a: Vehicles purchases			√	√
he082a: Telephone appliances			√	√
he091a: Recording appliances			√	√
he1212a: Styling electrical appliances & other goods			√	√
Group 4: Restaurants & cafes				
he111a: Cafes & restaurants, (but not he1112a: Canteens)				√

Note: In the left column are presented the HBS codes for each category excluded.

In total, we consider Expenditure 3 to be the version that contains all the necessities that the households must have the ability to consume in order to be able to achieve an adequate standard of living, including only one type of entertainment for household members "Cafes and restaurants". In specification 4, the "Cafes and restaurants" (excluding canteens) expenditure has also been removed. In this report, we present the descriptive statistics for the four different definitions of the dependent variable and the regression results for three main alternative model specifications under each version of the expenditure variable.

The definition of expenditure used in the current analysis does not include any kind of imputed expenditure (e.g. from self-production). Moreover, it does not include any expenses for loan installments/arrears and rent or payment of taxes and levies. In this way, the thresholds of adequate living expenses are defined without housing financing costs. Subsequently, an amount for loan repayment can be calculated proportionally to the difference of net household income (after subtracting direct taxes and social security contributions paid[4]) and ALE of each household.

3.2 Factors differentiating household expenditure

The selection of the independent variables was based on scientific criteria on what determinants could affect the expenditure level of a household and on the final need to produce clear, straightforward and coherent guidelines for banks and borrowers. Thus, despite the fact that the exercise could be developed using more potential regressors (i.e. participants' educational level, age, gender, employment status, branch of economic activity, nationality etc.), we had to keep it simple so that the final ALE estimation can be calculated using objective household standards (like the household synthesis) that are acceptable from a legal and policy making perspective. Certainly, from an academic perspective, multiple regressors with regards to the socioeconomic status of the household could be examined in order to identify different patterns of consumption habits, and how the level of consumption differs as these characteristics change.

Table 2 presents the regressors considered which can be grouped into three categories: (a) household synthesis, (b) regressors capturing potential differentiated

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[4] In terms of the actual implementation of the scheme, it should be taken into account that taxes paid may differ from assessed taxes. Thus, it is important to ensure that the taxes that are subtracted during the judgement for the payment capacity of households have actually been paid. To this end, assessment based only on tax-returns clearance is not enough.

behavior of mortgage holders and (c) regressors capturing the level of urbanization of the household residence.

Table 2: Independent Variables

Independent Variables	
Variable Name	**Variable Label**
A. Household (hh) synthesis	
dummy_one_adult	One adult in the hh
dummy_twoplus_adults	At least two adults in the hh
num_add_adults	Number of additional adults in hh >2
num_dep_children	Number of dependent children in hh
B.Mortgage holding effect	
dummy_mortgage	Mortgage holding (1: mortgage, 0: home ownership/free-leasing/rent)
int_num_dep_children_mortgage	Interaction number of dependent children with mortgage holding
int_twoplus_adults_mortgage	Interaction at least two adults with mortgage holding
int_num_add_adults_mortgage	Interaction number of additional adults with mortgage holding
C.Urbanization effect	
dummy_urban	Urban areas
dummy_semi_urban	Semi-urban_areas
dummy_agr	Agricultural_areas
int_num_dep_children_agr	Interaction number of dependent children with agriculture
int_twoplus_adults_agr	Interaction at least two adults with agriculture
int_num_add_adults_agr	Interaction number of additional adults with agriculture

The main variable used in terms of policy to differentiate the ALE threshold is the household synthesis. By testing various specifications, we have concluded that the best way is to use as baseline group the single adult household type, introduce a dummy to capture the existence of second adult in the household and then introduce linearly the number of additional adults, since there is limited number of observations for households with three or more dependent adults in HBS. It is important to note that the additional adults in a household may or may not have a personal taxable income. However, they consume and raise the expenditures of a household. Thus, we propose in practice, when comparing the taxable income of the debtor to the households' adequate living expenses, to use the ALE of additional adults only in the case they are considered as dependent individuals to the debtor by the tax office.

With regards to the children, we used the number of children linearly, since there was a limited number of observations with four or more children in the sample, while such a solution would be in favor of families with one child as opposed to families with more children, which might be an awkward result from a social policy point of view. It must be noted that we have also tested various age groups for distinguishing dependent children

categories. However, the sample size is a limitation for pursuing properly this exercise, while this division also complicates the formula for the calculation of ALE for each family type and demands frequent updates following the growing-up of children, which might not be convenient for a long-term rescheduling of loan repayments and is costly from an administrative point of view. For the needs of the ALE estimation dependent children are defined as individuals aged 0-17 years old, or individuals aged 18-24 who are economically inactive (students, soldiers, those with disabilities) and reside in the same household.

Mortgage holding of primary residence[5] is introduced as a dummy in the regression taking the value of `1' if the household holds a mortgage for the primary residence and '0' for home-ownership, free-leasing or rent of the primary residence. Interactions of the mortgage holding dummy with the household synthesis variables are considered so as to capture differentiated behaviors of mortgage holders in different household types.

For the construction of the urbanization dummies the HBS coding of regions into urban, semi-urban and rural areas was used. It must be noted that we have also tested additional specifications based on the NUTS 1 division of regions (Northern Greece, Central Greece, Attica, Aegean islands and Crete). However, the size of the sample did not permit to estimate more detailed regional divisions and the results based on this categorization cannot replicate the high heterogeneity within these regions. Thus, considering the data availability and that the division on basis of NUTS 1 codes is rather general and based solely on administrative criteria, we propose as a more robust scenario to divide areas among urban/semi-urban and agricultural.

It has to be noted that from the variables presented above, in the practical application of ALE threshold only the household synthesis variable is used. As already mentioned, the inclusion of any additional characteristic (e.g. diversification between urban and rural areas) may be considered as discreet treatment, which is not acceptable from a legal and political perspective. For example, if a lower threshold is estimated for agricultural regions then those living in cities may have more beneficial terms in their loan restructuring. Also having different thresholds for those holding a mortgage than those who don't (taking into account that loan payments and rents are exempted from all expenses specifications) can lead to unfair situations when ALE thresholds are used in political courts and judiciary in general.

Moreover, we have not included a dummy to capture the existence of disable or

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[5] The mortgage holding indicator concerns only housing loans and no other loans that might have as collateral the first residence.

chronic ill individuals in the household, because this should be assessed on a case by case basis by financial institutions, either for loan repayment or for not starting a home-foreclosure process, irrespectively of the consumption/ expenditure patterns of these households.

3.3 Model specifications and estimation methods

Given the definitions of dependent and independent variables, we have estimated three model specifications: Specification A including only the household synthesis variables (A in Table 2), Specification B including the household synthesis and mortgage holding effect variables (A & B in Table 2) and Specification C including the household synthesis and urbanization effect variables (A & C in Table 2).

Note that with respect to household synthesis one adult in the household is kept as a reference category (i.e. is not included in the regression) and with respect to urbanization effect the reference category includes both urban and semi-urban areas, since the sample was more limited in semi-urban areas and significant differentiation was mainly observed in agricultural areas.

One of the main methodological issues when analyzing expenditure (or income) data is the presence of outliers and the right-skewness of the distribution (see Figure 1). That is, there are relatively few individuals with rather high expenses. This causes the estimates of the average expenditure to be significantly higher than the median and thus not representative of the consumption patterns of a typical household. We employ two alternative econometric techniques to cope with this issue: (a) linear robust regression in which standardized residuals with large absolute values (i.e. >2) are omitted from a second step robust regression and (b) quantile regression which seeks to estimate the median expenditure.

In all cases we employ a linear model of the form

$$y = X\theta + \varepsilon,$$

where y is the $(n \times 1)$ vector containing one of the four alternative specifications for expenditure variable, X the $(n \times p)$ matrix containing the independent variables under specification A, B or C above, θ the $(p \times 1)$ vector with the unknown regression parameters to estimate and ε the $(n \times 1)$ vector with the error terms. In total, we estimate for the HBS data of a given year 24 regressions (3 sets of independent variables with 4 different

specifications of the dependent variable, using either linear robust regression or quantile regression).

Robust linear regression (see Huber, 1964, 1981; Rousseeuw & Leroy, 1987) is a common method used to perform linear regression in the presence of outliers and heteroscedasticity. This involves an iterative reweighted least squares algorithm that minimizes the standardized residuals, which are multiplied with a loss function associated with Cook's distance. However, the robust linear regression has been reported efficient when there exist isolated outliers. In the presence of clusters of outliers the method does not guarantee to identify all leverage points (Rousseeuw and Van Zomeren, 1990).

Keeping in mind that we want to identify a reasonable level of expenses, so that resembles the expenses of a "typical" household, we are mainly interested with the main mass of the expenditure distribution, where most of households lie. Thus, omitting clusters of outliers that lie in the tails of the distribution is not in contrast with the purposes of this analysis.

Consequently, in order to reduce the probability the robust linear regression estimates to be affected by clusters of outliers we remove cases the absolute standardized residuals take values above 2, corresponding to approximately 5% of observations, and re-run the robust linear regression (for a description of similar techniques see Ben-Gal, 2005).

The second method employed is quantile regression (see Koenker, 2005). Under this method, median regression estimates are obtained, conditional on the values of the independent variable, which are not affected by outliers. One of the drawbacks of quantile regression is that the estimated conditional quantiles are empirical, so they could be affected easily by small size samples in each category of the independent variables. To our best knowledge, it is the first time that a consumer basket for different household types, estimated with the quantile regression method, has been applied to an analysis of reference budgets. Yet, quantile regressions has been found useful on obtaining robust estimates on poverty analysis, a literature that is very close to our focus in the present study (see, for example, Muller (2002), Muller and Bibi (2010), Brück et al (2010)).

One appealing characteristic of the model specification is its simplicity, which is desirable for policy implementation purposes. So under Specification A, by holding the variable "dummy_one_adult" as the reference level, the estimated constant of the regression is actually the ALE threshold for one adult. Then, by adding the coefficient of the variable "dummy_twoplus_adults" the ALE threshold for a two adult household is

calculated. By adding two times the coefficient of the variable "num_dep_children" we obtain the ALE thresholds for a family with two children. Similarly, one can add additional adults or children. In this way, since ALE are derived directly by the actual regression coefficients, the calculation is completely transparent and any update with new waves of the HBS straightforward.

3.4 Annual updates of the ALE thresholds

On basis of the above, one way to update annually the ALE thresholds is to re-run the model(s) based on either robust linear regression or quantile regression, on basis of the latest HBS data, which is the proposed strategy followed in this manuscript.

However using as a basis older HBS data could provide an alternate estimate of adequate living expenses, especially when there is rapid decline or increase in real incomes, which is not accompanied by an analogous change of prices. Anchored methods (keeping still the base period) to determine certain thresholds (i.e. poverty line) can prove robust during rapid recession or rapid development periods.

In such cases, one can use the ALE thresholds of a base period and update the thresholds taking into account the changes in CPI categories. As an exercise we updated ALE thresholds up to 2017 on basis of this method, taking the 2012 published ALE thresholds as baseline. More specifically, for each expenditure specification (see Table 1) and year, we constructed the corresponding re-weighted CPI index, taking into account the sub-groups and items in the expenditure specification, on basis of ELSTAT's CPI data and weights. Then, the 2012 ALE thresholds increased or decreased inter-temporally according to evolution of the re-weighted CPI index.

This method has the property that the reported ALE thresholds are not affected by changes in income or consumer behaviors, but only from changes in prices. This is equal to estimating at a particular point in time a specific basket of goods (according to the consumption habits of this period) and keeping it constant through a time. For periods of recession, it might be more appropriate because specific household types may be more financially constrained than others and then squeeze more their consumption. Thus, the changes in expenditures might not reflect changes in necessities or consumption patterns, but changes in liquidity for different household types. This method can be used as an alternative short-term strategy to update the ALE thresholds, especially in periods of rapid income changes, but is not appropriate for long-term use, since it does not capture changes

in consumer consumption patterns.

4. Results

4.1 Descriptive statistics

In Table 3a is presented the distribution of the four definitions of expenditure on basis of the 2012 HBS data and in Table 3b, on basis of the 2017 data. In Tables 4a and 4b, the distribution of the four expenditure variables for the year 2017 is presented according to the household composition (number of adults and number of dependent children), the mortgage holding variable, and the urbanization.

As indicated by the difference among the mean and median of the expenditure variables (see Tables 3a, 3b and Figure 1) the distribution is right-skewed with the presence of outliers, i.e. there exist few observations with relatively high values. For this purpose in the regression analysis we adjust for the presence of outliers, using alternative inference techniques.

According to the descriptive results of our analysis using the Household Budget Survey (HBS) data:

- The average (median) total household expenditure amounted to 21,796€ (17,263€) per year in 2012 and 19,210€ (15,986€) per year in 2017, down by 11.9% (7.4%).
- The average (median) total household expenditure if we remove rent and imputed rent amounted to 21,065€ (16,552€) per year in 2012 and 18,578€ (15,420€) per year in 2017, down by 11.8% (6.8%).
- The average (median) household expenditure excluding the 1st group of expenses (rents, private health, private education, private insurance, luxury) amounted to 19,960€ (16,101€) per year in 2012 and 17,574€ (14,967€) per year in 2017, down by 11.9% (7.0%). Note that for households below the 30% percentile, Expenditure 1 approximates the total expenditure if we remove only rent, signaling that these households indeed consume very less of the other types of goods and services included in the 1st group (such as private education, private health and luxury).
- The average (median) household expenditure excluding the 1st group and 2nd group of expenses (travelling, hobbies, alcohol & tobacco, hotels) amounted to 18,410€ (14,913€) per year in 2012 and 16,268€ (13,785€) per year in 2017, down by 11.6% (7.6%).

- The average (median) expenditure excluding the 1st, 2nd and 3rd group of expenses (durables) amounted to 16,903€ (14,450€) per year in 2012 and 15,049€ (13,220€) per year in 2017, down by 11.0% (8.5%).
- The average (median) expenditure for all households as formed after the exclusion of all the above expenses and restaurants and cafes (expenditure 4 variable) amounted to 14,952€ (12,791€) per year in 2012 and 13,235€ (11,722€) per year in 2017, down by 11.5% (8.4%).

Table 3a: Distribution of expenditure variables for the year 2012

		Total expenditure (excluding own-consumption)	Total expenditure (excluding own-consumption, rent and imputed rent)	Expenditure 1	Expenditure 2	Expenditure 3	Expenditure 4
Mean		21796	21065	19960	18410	16903	14952
Median		17263	16552	16101	14913	14450	12791
Std. Deviation		17367	17314	15369	13946	11405	9651
Minimum		378	378	378	327	327	327
Maximum		147024	147024	146024	112695	107249	88753
Percentiles	10	7265	6768	6673	6278	6147	5728
	20	9962	9268	9055	8425	8207	7568
	30	12437	11538	11219	10468	10229	9274
	40	14814	13898	13663	12531	12145	10987
	50	17263	16552	16101	14913	14450	12791
	60	20034	19403	18894	17601	16801	15091
	70	23706	22991	22268	20625	19782	17275
	80	29778	28600	27734	25316	23389	20650
	90	39319	38816	36547	33802	30155	25893
Mean expenditure, with respect to total expenditure, is reduced by:			-3.4%	-8.4%	-15.5%	-22.4%	-31.4%
Median expenditure, with respect to total expenditure, is reduced by:			-4.1%	-6.7%	-13.6%	-16.3%	-25.9%

No. of observations: 8719 individuals, weighted using ELSTAT weights

Table 3b: Distribution of expenditure variables for the year 2017

		Total expenditure (excluding own-consumption)	Total expenditure (excluding own-consumption, rent and imputed rent)	Expenditure 1	Expenditure 2	Expenditure 3	Expenditure 4
Mean		19210	18578	17574	16268	15049	13236
Median		15986	15420	14967	13785	13220	11722
Std. Deviation		14388	14182	12264	11105	9056	7773
Minimum		26	26	26	26	26	0
Maximum		204325	185125	126471	107106	85094	70178
Percentiles	10	6819	6390	6237	5802	5681	5190
	20	9210	8653	8495	8018	7791	7010
	30	11453	10812	10486	9956	9597	8605
	40	13608	13031	12619	11848	11301	10025
	50	15986	15420	14967	13785	13220	11722
	60	18514	17988	17487	16206	15304	13406
	70	21711	21039	20371	19000	17815	15710
	80	25693	24802	24118	22549	21124	18427
	90	34206	32471	30509	28628	26121	22770
Mean expenditure, with respect to total expenditure, is reduced by:			-3.3%	-8.5%	-15.3%	-21.7%	-31.1%
Median expenditure, with respect to total expenditure, is reduced by:			-3.5%	-6.4%	-13.8%	-17.3%	-26.7%

No. of observations: 14457 individuals, weighted using ELSTAT weights.

Figure 1: Histograms of expenditure variables for the year 2017
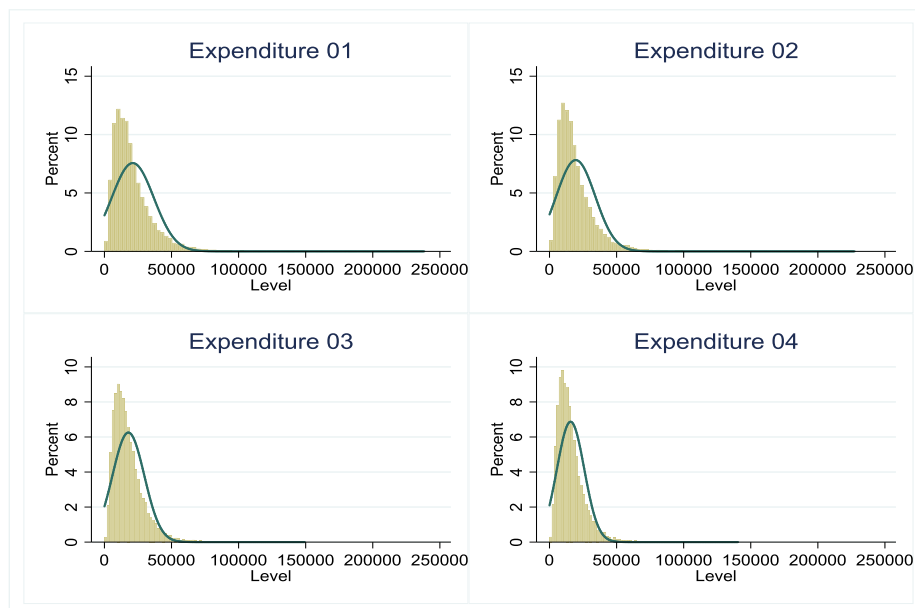
With respect to the expenditure pattern when other household characteristics are taken into account (see Tables 4a and 4b), the most interesting results are related to the mortgage holding variable. In particular, those holding a mortgage, as compared to those owning a house, staying with free-leasing or paying a rent, seem to spend on average higher amounts; excluding the 1st group of variables and housing finance costs, mean (median) Expenditure 1 is up by 24.1% (35.6%) for mortgage holders versus the rest.

This is an important finding, because it depicts the level of consumption after removing the total amount of expenditure for serving the loan for mortgage holders and rent for renters, thus bringing all households to the same basis, disentangling the level of expenditure from the housing cost. Consequently, even after removing the expenses for paying the loan installments, the consumption of mortgage-holders is higher than of the rest of households (renters and home-owners without a mortgage).

Yet, it is not straightforward why mortgage holders appear to have higher consumption patterns and this finding needs to be further investigated. With the information provided from the expenditure level data, we can draw two conjectures. First, the finding may signal that mortgage holders have higher incomes than outright homeowners and their income is translated to expenditure. Indeed, according to the HBS, the annual median equivalized (using modified OECD equivalence scales) disposable household income for mortgage-holders in 2017 is 10,004 €, while for home owners without a mortgage 9,152 € and 8,000 € for renters. Note that mortgage-holders were granted a loan by the bank on the basis of a certain income threshold among other criteria.

A second conjecture is that for the same level of income, mortgage holders have different consumption habits, with consumption elasticities being more persistent to income changes. While this case is consistent with classical theories of consumption relating to permanent income across the life-cycle (Modigliani and Brumberg, 1954; Friedman, 1957), it comes in contrast with recent evidence suggesting that mortgage-holders with binding borrowing constraints engage in sharper consumption adjustments in response to income and wealth shocks (see, for example, Dynan, 2012; Baker 2018; de Roiste, 2019). From a life-cycle perspective, households smooth consumption over their life-span and owning a house allows them to buffer against adverse shocks (Carroll et al., 2003). Additionally, mortgage holders are expected to spend more than renters, as having a mortgage significantly reduces the uncertainty that a household faces regarding how much to save each month in order to be able to buy a house. This reduced uncertainty can lead to substantial increases in household consumption (Aiyagari, 1994).

This puzzle deserves further investigation, as it might reveal the large presence of strategic defaulters on non-performing loans (NPLs)[6], as well as the high re-default probability of these borrowers after a loan restructuring. If this is the case, the policy implication for NPLs is that restructuring and protection schemes should ensure that the thresholds set do not allow the non-performing borrowers to continue an "excessive consumption" habit compared to the rest of the population, but to direct this extra expenditure to the repayment of the loan.

As it concerns the regressors related to household composition the results are as expected. Generally, the higher number of adults, the higher the expenses. A large difference is observed among one and two adults (expenses more than double), whereas the additional expenses for extra adults in the household are relatively small, reflecting higher economies of scale[7]. We observe also a large difference in expenditure when moving from zero to one child and a smaller difference when moving from one to two children, reflecting much larger economies of scale in the subsequent children. However, the median expenditures for families with four children are lower or comparable to families with three children. This can be attributed to the sociodemographic characteristics of families with many children, as well as to the relatively small sample size of households with a high number of children.

Total expenditure is higher in urban and semi-urban areas compared to agricultural areas, by 13.45% on average or 4.57% on basis of the median. However, it is interesting to note that for more conservative specifications, such as Expenditure 3 and Expenditure 4 the median expenditure does not differ considerably on basis of urbanization. This indicates that some of the "luxury" items that are included in specifications 1 and 2 are consumed to a much lesser extent in rural than urban areas.

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[6] According to an analysis performed by the Council of Economic Advisors, using administrative data from tax returns and information from the Hellenic Bank Association, the number of non-performing borrowers holding a mortgage loan in December of 2018 was 148,650 over 588,530 borrowers (25%), holding a total debt of 14.7 billion € over 43.9 billion € of mortgage loans (33%).

[7] An interpretation regarding very low economies of scale in households with one and two adults may relate to the age profile of the household. We estimated the mean consumption controlling for age of household residents, and indeed the economies of scale are more evident in older ages. For example, for 2017, the total consumption of households below 60 years of age increases by 68% as we move from the first to the second adult. The corresponding increase for those 60 and over is above 90%. This heterogeneity may reveal different consumption patterns across households of different ages.

Table 4a: Mean of expenditure variables by household characteristic; 2017 HBS data

Characteristic	Total expenditure (excluding own-consumption)	Total expenditure (excluding own-consumption, rent and imputed rent)	Expenditure 1	Expenditure 2	Expenditure 3	Expenditure 4
Home ownership/Free-Leasing/Rent	18771	18049	17045	15774	14591	12791
Mortgage	22171	22150	21149	19606	18142	16235
No. adults 1	9820	9186	8668	7997	7634	6668
No. adults 2	20241	19510	18301	17031	15598	13899
No. adults 3	20600	20179	19129	17647	16169	13857
No. adults 4	20315	19933	19348	17864	17080	14687
No. dep. children 0	15299	14876	14192	13116	12320	10654
No. dep. children 1	22277	21286	19845	18270	16844	14902
No. dep. children 2	23156	22320	20987	19387	17870	15891
No. dep. children 3	25742	25102	23843	22461	19995	17947
No. dep. children 4	27481	26967	26204	24855	22040	19948
Urban or semi-urban areas	19849	19062	17963	16616	15316	13489
Agricultural areas	17496	17280	16532	15334	14334	12554

Table 4b: Median of expenditure variables by household characteristic; 2017 HBS data

Characteristic	Total expenditure (excluding own-consumption)	Total expenditure (excluding own-consumption, rent and imputed rent)	Expenditure 1	Expenditure 2	Expenditure 3	Expenditure 4
Home ownership/Free-Leasing/Rent	15435	14623	14140	13294	12668	11131
Mortgage	19785	19774	19176	17632	16961	15249
No. adults 1	8075	7314	6943	6546	6399	5580
No. adults 2	16620	15822	15306	14188	13567	12107
No. adults 3	17421	17084	16623	15233	14739	12758
No. adults 4	19255	18997	18543	17129	16762	14068
No. dep. children 0	12577	12066	11624	10844	10508	9197
No. dep. children 1	18551	18077	17476	16012	15119	13336
No. dep. children 2	19172	18283	17828	16519	15876	14142
No. dep. children 3	23057	22231	21913	21244	20449	17299
No. dep. children 4	21796	21796	21621	20960	20092	18427
Urban or semi-urban areas	16716	15886	15412	14114	13501	11892
Agricultural areas	14226	14052	13668	12812	12502	10944

4.2 Estimation results for 2017 and comparison to 2012

The current section presents the main regression results with regards to the Adequate Living Expenses (ALE) estimates based on the specifications described in Section 3. The results for all specifications based both on linear robust regression, where the outliers are

removed (mean estimates), and on quantile regression (median estimates) are presented in Annex B. The corresponding Adequate Living Expenses (ALE) estimates are presented in Annex A.

Linear robust regression provides in general higher ALE estimates for one and two adults, while quantile regression higher estimates for the child and extra adult multiplier (see Annex A and B). However, the ALE level estimates for a four member family (two adults and two dependent children) are similar under the two methods. The linear robust regression models provided R-squared in the range of 0.17-0.28 and the quantile regression models pseudo R-squared in the range of 0.09-0.15 (see Annex B). Both are considered as low, however one must keep in mind that the target of this analysis is not to display a model with high predictive ability where additional characteristics (i.e. participants' educational level, age, gender, family status, employment status, branch of economic activity, nationality etc.) could be incorporated in the analysis, but to breakdown the adequate expenditure level according to the household composition for policy purposes. In any case the linear robust regression method seems to describe better the data, while quantile regression seems to be affected by the limited number of observations with respect to households with many (i.e. above 3) children or adults, thus providing lower constant estimates and higher estimates with respect to the child and extra adult multiplier.

With regards to Specification B of the Model that includes a dummy for mortgage-holders, significantly higher ALE thresholds are estimated, especially for households consisting of one or two adults, signaling that these people have probably on average higher income and higher propensity to consume compared to the rest (which is also related to their ability or intension to grand a mortgage on the first place). However as noted above, to specify an ALE threshold which would be stricter for people not holding a loan is socially unfair. Moreover, as far as NPLs are concerned, an ALE thresholds should not allow for non-performing borrowers a space to consume more than the median household in the population, because then any policy towards the protection of the first residence of non-performing borrowers or any subsidy of NPLs from the state budget would be regressive.

Furthermore, concerning the use of urbanization variable in Specification C, for a family with two children, those living in rural areas display in 2017 lower ALE threshold by 6.2% on basis of Expenditure 1, by 17.4% on basis of Expenditure 2, almost equal ALE threshold on basis of Expenditure 3 and lower ALE threshold by 3.4% on basis of Expenditure 4. Thus, when it comes to consumption of goods and services of prior need, there seems to be lower differentiation on basis of urbanization. Also, it is interesting to note that the

differences on basis of urbanization for 2012 are higher compared to 2017, signaling that consumption patterns tend to be more homogenous across the country as years advance. In any case, specifying stricter (lower) ALE thresholds for people living in rural areas seems social unfair, whereas it creates motivation for these people to move into urban areas.

In view of the above we propose as main scenario Specification A (with mean estimates), since the use of a different scale according to urbanization or mortgage holding criteria is also related to legal standards and on whether such a differentiation would be social fair and practical in terms of implementation.

Table 5 displays the ALE estimates under the first specification (A) for each expenditure variable on basis of robust linear regression (main scenario). For a family with two children the 2017 monthly ALE threshold is estimated equal to 1,497€ on basis of Expenditure 1 (down by 13.0% compared to 2012), 1,431 € on basis of Expenditure 2 (down by 10.5% compared to 2012), 1,327 € on basis of Expenditure 3 (down by 11.8% compared to 2012) and 1,196 € on basis of Expenditure 4 (down by 11.2% compared to 2012). It is interesting to note that the 2017 ALE thresholds differ with respect to 2012 by -5.0% to -6.5% for one adult household and only by -2.5% to +2.8% for two adults household (depending on expenditure specification). Thus, the main reduction is observed in the child multiplier (by 29.4% to 39.3% depending the expenditure variable) and in the extra adult multiplier (by 53.4% to 64.2%). This signals that households with more members decreased more their per capita consumption.

Table 5: Adequate Living expenses estimates based on specification A (robust linear regression, mean) under each expenditure variable

Panel A: 2012 HBS data

Yearly	Expenditure 1	Expenditure 2	Expenditure 3	Expenditure 4
One adult	8180	7655	7337	6448
Two adults	13917	12921	12142	10866
Child multiplier	3361	3126	2955	2648
Extra Adult multiplier	3550	3117	2962	2497
Two Adults with two children	20639	19173	18052	16161

Monthly				
One adult	682	638	611	537
Two adults	1160	1077	1012	906
Child multiplier	280	261	246	221
Extra Adult multiplier	296	260	247	208
Two Adults with two children	1720	1598	1504	1347

Yearly	Expenditure 1	Expenditure 2	Expenditure 3	Expenditure 4
One adult	7771	7180	6853	6094
Two adults	13877	13285	12121	10594
Child multiplier	2046	1942	1904	1878
Extra Adult multiplier	1415	1121	1376	1007
Two Adults with two children	17968	17168	15928	14350

Monthly				
One adult	648	598	571	508
Two adults	1156	1107	1010	883
Child multiplier	170	162	159	156
Extra Adult multiplier	118	93	115	84
Two Adults with two children	1497	1431	1327	1196

As discussed in Section 3.4 an alternative strategy that can be used in periods of rapid recession or growth, but only in the short-term, is to update the thresholds estimated on basis of data of older years, taking into account the evolution of CPI sub-categories and weights that match each of the four expenditure specifications. The results for 2017, taking the 2012 ALE thresholds as a basis are presented in Table 6.

Table 6: 2017 Adequate Living expenses estimates on basis of CPI changes

Yearly	Expenditure 1	Expenditure 2	Expenditure 3	Expenditure 4
One adult	7908	7144	6843	5947
Two adults	13454	12058	11325	10023
Child multiplier	3249	2917	2756	2442
Extra Adult multiplier	3432	2909	2763	2303
Two Adults with two children	19953	17893	16838	14906

Monthly				
One adult	659	595	570	496
Two adults	1121	1005	944	835
Child multiplier	271	243	230	204
Extra Adult multiplier	286	242	230	192
Two Adults with two children	1663	1491	1403	1242

General CPI index in 2017 compared to 2012 was down by 3.6%, reweighted CPI index on basis of products and services included in Expenditure 1 specification was down by 3.3%, reweighted CPI index on basis of Expenditure 2 components was down by 6.7%, reweighted CPI index on basis of Expenditure 3 components was down by 6.7% and reweighted CPI index on basis of Expenditure 4 components was down by 7.7%, indicating analogue reductions in 2017 ALE thresholds.

Comparing the 2017 ALE thresholds estimated on basis of the two strategies (Table 5 and Table 6), it appears that the analysis on basis of HBS data produces similar thresholds for one adult households, slightly higher thresholds for two adult households and lower child and extra adult multipliers. For a household with two children the HBS data produce lower estimates by 3.7% to 10.0% (depending on the expenditure specification), signaling that besides the reduction in prices, there was also a reduction in consumption.

4.3 Comparison of ALE thresholds with poverty threshold and median equivalized income

Table 7 presents the median equivalized household income reported in EU-SILC database for years 2012 and 2017, as well as the respective poverty threshold defined as the 60% of the median equivalized income . According to the EU-SILC, the poverty line for 2017 (60% threshold) is for one adult 4,560 € per year, while for a family with two children equal to 9,576 €. ALE thresholds lie in all cases significantly above the poverty line, up by 46% to 77%, depending on the household type. It is indicative that for certain household types such as two adults with none, one or two children ALE threshold approximates or lies above the median equivalized income.

It should be noted that the equivalized income is based on the modified OECD scale which weights 1 for the first adult, 0.5 for each additional adult and 0.3 for every child. 2017 ALE threshold implies a significantly higher multiplier for the second adult, equal to 0.77 and lower for the subsequent adults, equal to 0.20. For the children the 2017 ALE multiplier is 0.28, close to that of modified OECD scale.

Yet, we should emphasize that ALEs estimated in the current analysis do not include rents or loan installments. This remark should be taken into account when comparing with the poverty line or with a reference salary. The rational for such an ALE definition, is that an amount for loan repayment can be added according to the difference of household income and ALE of each household. As taxes and social security contributions are concerned, both the poverty line that occurs from the definition of the disposable income, as well as the ALE

threshold are net of social security contributions and taxes. To this end, when designing protection schemes, the eligibility of individuals should be judged on the basis of net household income, removing all direct taxes (personal income tax, extra solidarity contribution, property taxes), as well as social security contributions paid by household[8].

Table 7: Comparison with poverty line and median equivalized income

Household type	Poverty threshold (60% of median equivalised income)	Median equivalized income (EU-SILC)	ALE threshold (Expenditure 3)	Ratio of ALE with respect to poverty threshold	Ratio of ALE with respect to median equivalized income
2012					
Single person	**5,708**	9,513	**7,337**	128.5%	77.1%
Two Adults	**8,562**	14,270	**12,142**	141.8%	85.1%
Child multiplier	1,712	2,854	2,955	172.6%	103.5%
Extra Adult multiplier	2,854	4,757	2,962	103.8%	62.3%
Two adults with one child	**10,274**	17,123	**15,097**	146.9%	88.2%
Two adults with one child and one extra adult	**13,128**	21,880	**18,059**	137.6%	82.5%
Two adults with two children	**11,986**	19,977	**18,052**	150.6%	90.4%
Two adults with two children and one extra adult	**14,840**	24,734	**21,014**	141.6%	85.0%
Two adults with three children	**13,698**	22,831	**21,007**	153.4%	92.0%
2017					
Single person	**4,560**	7,600	**6,853**	150.3%	90.2%
Two Adults	**6,840**	11,400	**12,121**	177.2%	106.3%
Child multiplier	1,368	2,280	1,904	139.2%	83.5%
Extra Adult multiplier	2,280	3,800	1,376	60.4%	36.2%
Two adults with one child	**8,208**	13,680	**14,025**	170.9%	102.5%
Two adults with one child and one extra adult	**10,488**	17,480	**15,401**	146.8%	88.1%
Two adults with two children	**9,576**	15,960	**15,928**	166.3%	99.8%
Two adults with two children and one extra adult	**11,856**	19,760	**17,304**	146.0%	87.6%
Two adults with three children	**10,944**	18,240	**17,832**	162.9%	97.8%

Finally, with regards to the practical implementation of the ALEs Threshold, we should emphasize that this must be considered as a lower limit, which should be revised upwards if there are special circumstances in a household. Such examples are the presence of chronic ill individuals, individuals with physical or mental health disabilities or with health problems that need special pharmaceutical or surgical treatment, individuals paying marital compensation and generally individuals having fixed annual expenses, which objectively cannot be reduced.

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[8] See footnote 1.

4.4 Sensitivity analysis for the period 2010-2017

In order to evaluate the robustness of the methodology and the variation of the ALE estimates through the years, we estimated the main specification A (with robust linear regression) for the whole period 2010-2017, using the HBS data of each year acquired by ELSTAT.

As observed in Figure 2, the ALE estimates for one adult and two adults households fall in 2011 compared to 2010 (by 11.8% for one adult and by 8% for two adults, under expenditure 3 definition), after the start of the implementation of the first economic adjustment programme for Greece, and then remain at comparable levels thereafter with both negative and positive fluctuations from one year to another. However, the child multiplier continued to fall significantly both in years 2012 (by 29.3% compared to 2011 under expenditure 3) and 2013 (by 46.7% compared to 2012 under expenditure 3) and remains at comparable low levels thereafter. This signals that given the budget constraints, households with more members had to limit their total household expenditure throughout the crisis, taking advantage of "economies of scale", since many types of expenditures do not rise linearly with the number of household members. It seems that during the period of intense crisis, households gave priority to common expenses that offer utility to all members of the household, rather than individual expenses that offer utility only to specific members.

Figure 2: Adequate Living expenses estimates for the period 2010-2017, based on specification A (robust linear regression, mean) for different household types

One adult

	2010	2011	2012	2013	2014	2015	2016	2017
Expenditure 1	832	703	682	758	702	716	667	648
Expenditure 2	785	657	638	701	658	665	620	598
Expenditure 3	709	625	611	672	627	635	601	571
Expenditure 4	615	546	537	586	559	549	527	508

Child multiplier

	2010	2011	2012	2013	2014	2015	2016	2017
Expenditure 1	422	387	280	144	186	127	156	170
Expenditure 2	394	367	261	131	167	134	152	162
Expenditure 3	370	348	246	131	162	119	150	159
Expenditure 4	332	313	221	127	143	115	148	156

Two adults

	2010	2011	2012	2013	2014	2015	2016	2017
Expenditure 1	1403	1258	1160	1199	1126	1133	1136	1156
Expenditure 2	1304	1172	1077	1117	1053	1047	1048	1081
Expenditure 3	1188	1094	1012	1044	997	1004	985	1010
Expenditure 4	1043	973	906	939	904	898	874	883

Extra adult multiplier

	2010	2011	2012	2013	2014	2015	2016	2017
Expenditure 1	479	392	296	188	213	159	102	118
Expenditure 2	413	338	260	148	183	129	108	93
Expenditure 3	386	294	247	148	161	104	112	115
Expenditure 4	298	226	208	101	114	79	85	84

Two Adults with one child — ALE (€ per month)

	2010	2011	2012	2013	2014	2015	2016	2017
Expenditure 1	1825	1645	1440	1344	1312	1261	1292	1327
Expenditure 2	1697	1539	1337	1248	1220	1181	1199	1243
Expenditure 3	1558	1442	1258	1175	1158	1123	1136	1169
Expenditure 4	1375	1286	1126	1066	1047	1013	1022	1039

Two Adults with two children — ALE (€ per month)

	2010	2011	2012	2013	2014	2015	2016	2017
Expenditure 1	2247	2032	1720	1488	1498	1388	1449	1497
Expenditure 2	2091	1906	1598	1379	1388	1316	1351	1405
Expenditure 3	1928	1789	1504	1306	1320	1243	1286	1327
Expenditure 4	1707	1600	1347	1193	1190	1128	1170	1196

Two Adults with two children and an extra adult — ALE (€ per month)

	2010	2011	2012	2013	2014	2015	2016	2017
Expenditure 1	2726	2424	2016	1675	1711	1548	1550	1615
Expenditure 2	2504	2244	1858	1527	1571	1445	1459	1498
Expenditure 3	2314	2084	1751	1454	1481	1347	1398	1442
Expenditure 4	2005	1826	1555	1294	1305	1207	1255	1280

Two Adults with three children — ALE (€ per month)

	2010	2011	2012	2013	2014	2015	2016	2017
Expenditure 1	2669	2420	2000	1632	1684	1516	1605	1668
Expenditure 2	2485	2272	1858	1511	1555	1450	1503	1566
Expenditure 3	2297	2137	1751	1437	1482	1362	1436	1486
Expenditure 4	2039	1913	1567	1320	1334	1243	1318	1352

Similar trend stands for the extra adult multiplier that fell by 16% in 2012 compared to 2011 (under expenditure 3 definition) and by 40% in 2013 compared to 2012. With respect to the extra adult multiplier, it is observed that broader expenditure definitions' estimates approximate the results of the expenditure 4 definition in the recent years, signaling that additional adults consume gradually less of the "luxurious" types of goods and services included in broader expenditure definitions, during the crisis. As a result of the above, ALE estimates for different types of households with three members and above show similar decreasing trends during the period 2010-2013 and relative stabilization thereafter. Therefore, it turns out that families with children and more members were the ones most affected by the crisis.

In order to check the robustness of the estimation method we also performed an analysis by changing the threshold used to remove outliers in the robust linear regression. As described in Section 3.3, in order to reduce the probability the robust linear regression estimates to be affected by clusters of outliers we remove cases the absolute standardized residuals take values above 2, corresponding to approximately 5% of observations, and re-run the robust linear regression. In Table 8 are provided the results of robust linear regression under the main Specification A for 2017, when we do not remove any outlier, as

well as in the case we remove residuals with absolute value above 1.65. It is clear that the removal of residuals with absolute value above 2 affects significantly the results of the robust linear regression. These outliers as expected lie in the right tail of the distribution (see also Figure 1) with mean yearly expenditure 37,996 €, as opposed to 13,947 € for the rest of the sample. This signals that the robust linear regression is indeed significantly affected by the top 5% of observations and thus the strategy followed to remove these, is in the right direction to approximate the main mass of the distribution. However, removing additional observations, i.e. for which the residuals take absolute values above 1.65, has a rather smaller effect in the results whereas reducing further the sample size.

Table 8: Sensitivity analysis of robust linear regressions estimates on basis of percentage of outliers removed

Yearly	Without excluding outliers	Excluding residuals with absolute value > 2	Excluding residuals with absolute value > 1.65
One adult	7096	6853	6874
Two adults	13191	12121	11605
Child multiplier	2051	1904	2148
Extra Adult multiplier	1201	1376	1382
Two Adults with two children	17292	15928	15902
No. of observations removed	0 out of 14457	564 out of 14457, corresponding to 4.8% of the weighted sample	873 out of 14457, corresponding to 8.0% of the weighted sample
Mean outlier expenditure (std. dev.)		37996 (15257)	32605 (15687)
Mean sample expenditure (std. dev.)	15050 (9056)	13947 (6946)	13643 (6496)

Note: Are reported the 2017 Adequate Living expenses estimates on basis of Specification A and Expenditure 3 definition.

Finally another sensitivity analysis conducted so as to approximate the ALE thresholds of every year, was to run the robust liner regression estimation on basis of the total HBS data of the whole 2010-2017 period and introduce dummies for each reference year and interactions among years and the household synthesis variables. This strategy produced results rather close to those reported above (i.e. with estimating every year separately), with differences being less than 3% depending on the household type and reference year.

5. Conclusions

In this manuscript, we presented a general methodological framework to determine the Adequate Living Expenses Threshold, based on the data from the Greek Household Budget Survey in the period of crisis 2010-2017. We run numerous scenarios for alternative expenditure compositions, adjusting for multiple effects, using different econometric

methods. The main scenarios proposed, lie in general much above the poverty line and closer to the median income.

In view of the purpose of setting the ALE threshold for actual policy making decisions, that counteract with other policies and need to endure a fairness across the income and consumption distribution with regards to the protection of the first residence and the allocation of possible state-subsidy to non-performing borrowers, we assume that the mean or median family expenditure (after extracting non-prior and luxury expenses) should reflect the adequate living expenses. This means that the approach is relative and in the case the income and subsequently the expenditures of the sample population rise (fall), so does the adequate living expenses threshold.

Although our article engages in a variety of computational estimations, the main model proposed for policy use is the one explained by household composition. Besides the fact that a policy tool must be practical and easy to be implemented, this is mainly done so as to avoid social unfair situations in which poorer people have and lower ALE; rather we seek to approximate an objective threshold applicable to the general population.

The alternative methodological approach (i.e. used in the case of Ireland and other countries) would be to form task groups of experts, so as to synthesize baskets of goods and services, a household is "reasonable" to consume, and evaluate their cost on a continuous basis according to the CPI. Thus an estimation of the Adequate Living Expenses with this method as well would be desirable, so as to identify any potential differences. Yet, the basket method has the discrepancy that in period of rapid recession when all households are losing income and are forced to squeeze their consumption, public policy design (like protection and subsidy to non-performing borrowers) cannot depend on an "ideal" basket of goods that not even the median household of the population can consume. Following such an approach might lead to the design of regressive policies, which at the end harm the poorest which never had access to borrowing or those that prioritize the repayment of their debts towards satisfying other needs.

In total, the methodology proposed for the calculation of ALE possesses the advantage of simplicity and transparency in calculations and ensures equity in the treatment across different groups of the population and across the total income (consumption) distribution. Therefore, its proper use in the design of public policies can generate a progressive effect in terms of policy making. To this end, also the frequent update of the thresholds, if not every year, but every two years is deemed necessary.

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ANNEX A:

Alternative adequate living expenses estimates based on various model specifications

Table A.1: Adequate Living Expenses estimates (in €) based on Expenditure 1 and various model specifications, for the years 2012 and 2017

	Specification A		Specification B				Specification C			
	2017 ALE thresholds		**2017 ALE thresholds**				**2017 ALE thresholds**			
	All households		**Non Mortgage holders**		**Mortgage holders**		**Urban or semi-urban region**		**Agricultural region**	
Yearly	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
One adult	7771	6688	7684	6625	10468	8767	7945	6855	7137	6051
Two adults	13877	12354	13540	11994	16343	15701	14142	12803	12693	10786
Child multiplier	2046	2447	1983	2373	1910	2237	2013	2396	2175	3013
Extra Adult multiplier	1415	2170	1787	2469	144	1001	2006	2450	1333	1859
Two Adults with two children	17968	17248	17505	16741	20163	20175	18167	17596	17043	16812
Monthly	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
One adult	648	557	640	552	872	731	662	571	595	504
Two adults	1156	1029	1128	1000	1362	1308	1178	1067	1058	899
Child multiplier	170	204	165	198	159	186	168	200	181	251
Extra Adult multiplier	118	181	149	206	12	83	167	204	111	155
Two Adults with two children	1497	1437	1459	1395	1680	1681	1514	1466	1420	1401
	2012 ALE thresholds		**2012 ALE thresholds**				**2012 ALE thresholds**			
	All households		**Non Mortgage holders**		**Mortgage holders**		**Urban or semi-urban region**		**Agricultural region**	
Yearly	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
One adult	8180	6392	7894	6196	13278	11025	8499	6932	7444	5813
Two adults	13917	11833	13438	11448	18530	16571	14275	13042	13447	11445
Child multiplier	3361	4157	3104	3971	2367	2171	3483	4336	3172	3866
Extra Adult multiplier	3550	3880	3614	4005	2225	3120	4168	4347	2815	3531
Two Adults with two children	20639	20147	19645	19389	23265	20914	21241	21713	19791	19176
Monthly	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
One adult	682	533	658	516	1107	919	708	578	620	484
Two adults	1160	986	1120	954	1544	1381	1190	1087	1121	954
Child multiplier	280	346	259	331	197	181	290	361	264	322
Extra Adult multiplier	296	323	301	334	185	260	347	362	235	294
Two Adults with two children	1720	1679	1637	1616	1939	1743	1770	1809	1649	1598

Notes: Specifications A, B and C are denoted in Section 3.3 and Expenditure 1 synthesis in Table 1. Mean estimates are based on robust linear regression and median estimates on basis of quantile regression.

Table A.2: Adequate Living Expenses estimates (in €) based on Expenditure 2 and various model specifications, for the years 2012 and 2017

2017 ALE thresholds

	Specification A (All households)		Specification B (Non Mortgage holders)		Specification B (Mortgage holders)		Specification C (Urban or semi-urban region)		Specification C (Agricultural region)	
Yearly	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
One adult	7180	6256	7100	6227	9888	8241	7327	6440	6661	5723
Two adults	13285	11922	12699	11150	15263	14635	13277	11884	11791	10178
Child multiplier	1942	2515	1892	2384	1820	2081	1890	2269	1224	1552
Extra Adult multiplier	1121	1842	1408	2029	183	839	1529	2093	1158	1606
Two Adults with two children	17168	16952	16484	15918	18902	18798	17058	16422	14240	13282
Monthly	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
One adult	598	521	592	519	824	687	611	537	555	477
Two adults	1107	993	1058	929	1272	1220	1106	990	983	848
Child multiplier	162	210	158	199	152	173	158	189	102	129
Extra Adult multiplier	93	154	117	169	15	70	127	174	97	134
Two Adults with two children	1431	1413	1374	1327	1575	1566	1421	1369	1187	1107

2012 ALE thresholds

	Specification A (All households)		Specification B (Non Mortgage holders)		Specification B (Mortgage holders)		Specification C (Urban or semi-urban region)		Specification C (Agricultural region)	
Yearly	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
One adult	7655	6082	7362	5896	12463	10841	7819	6416	7123	5314
Two adults	12921	11076	12482	10836	17255	15679	13247	11397	12514	10640
Child multiplier	3126	3884	2998	3475	2385	2105	3372	5871	2955	3340
Extra Adult multiplier	3117	3551	3000	3458	1891	2446	3651	3585	2338	2864
Two Adults with two children	19173	18845	18478	17785	22025	19889	19991	23138	18424	17319
Monthly	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
One adult	638	507	613	491	1039	903	652	535	594	443
Two adults	1077	923	1040	903	1438	1307	1104	950	1043	887
Child multiplier	261	324	250	290	199	175	281	489	246	278
Extra Adult multiplier	260	296	250	288	158	204	304	299	195	239
Two Adults with two children	1598	1570	1540	1482	1835	1657	1666	1928	1535	1443

Notes: Specifications A, B and C are denoted in Section 3.3 and Expenditure 2 synthesis in Table 1. Mean estimates are based on robust linear regression and median estimates on basis of quantile regression.

Table A.3: Adequate Living Expenses estimates (in €) based on Expenditure 3 and various model specifications, for the years 2012 and 2017

Specification A			Specification B					Specification C				
2017 ALE thresholds			**2017 ALE thresholds**					**2017 ALE thresholds**				
All households			**Non Mortgage holders**		**Mortgage holders**			**Urban or semi-urban region**			**Agricultural region**	
Yearly	Mean	Median	Yearly	Mean	Median	Mean	Median	Yearly	Mean	Median	Mean	Median
One adult	6853	6112	One adult	6826	6086	9299	8121	One adult	7013	6295	6327	5555
Two adults	12121	10981	Two adults	11897	10784	14417	13235	Two adults	12446	11344	11155	9876
Child multiplier	1904	2388	Child multiplier	1688	2246	2137	2315	Child multiplier	1744	2187	2472	2891
Extra Adult multiplier	1376	1917	Extra Adult multiplier	1591	2114	233	1475	Extra Adult multiplier	1665	2137	915	1553
Two Adults with two children	15928	15756	Two Adults with two children	15274	15276	18691	17864	Two Adults with two children	15934	15718	16098	15657
Monthly	Mean	Median	Monthly	Mean	Median	Mean	Median	Monthly	Mean	Median	Mean	Median
One adult	571	509	One adult	569	507	775	677	One adult	584	525	527	463
Two adults	1010	915	Two adults	991	899	1201	1103	Two adults	1037	945	930	823
Child multiplier	159	199	Child multiplier	141	187	178	193	Child multiplier	145	182	206	241
Extra Adult multiplier	115	160	Extra Adult multiplier	133	176	19	123	Extra Adult multiplier	139	178	76	129
Two Adults with two children	1327	1313	Two Adults with two children	1273	1273	1558	1489	Two Adults with two children	1328	1310	1342	1305
2012 ALE thresholds			**2012 ALE thresholds**					**2012 ALE thresholds**				
All households			**Non Mortgage holders**		**Mortgage holders**			**Urban or semi-urban region**			**Agricultural region**	
Yearly	Mean	Median	Yearly	Mean	Median	Mean	Median	Yearly	Mean	Median	Mean	Median
One adult	7337	5896	One adult	7166	5794	12055	11501	One adult	7636	6124	7046	5245
Two adults	12142	10906	Two adults	11859	10549	16219	15485	Two adults	12356	11271	11831	10353
Child multiplier	2955	3440	Child multiplier	2765	3358	2057	1696	Child multiplier	3147	4041	2685	3211
Extra Adult multiplier	2962	3294	Extra Adult multiplier	2828	3251	1909	2543	Extra Adult multiplier	3499	3983	2275	2556
Two Adults with two children	18052	17785	Two Adults with two children	17389	17266	20333	18878	Two Adults with two children	18650	19353	17200	16774
Monthly	Mean	Median	Monthly	Mean	Median	Mean	Median	Monthly	Mean	Median	Mean	Median
One adult	611	491	One adult	597	483	1005	958	One adult	636	510	587	437
Two adults	1012	909	Two adults	988	879	1352	1290	Two adults	1030	939	986	863
Child multiplier	246	287	Child multiplier	230	280	171	141	Child multiplier	262	337	224	268
Extra Adult multiplier	247	275	Extra Adult multiplier	236	271	159	212	Extra Adult multiplier	292	332	190	213
Two Adults with two children	1504	1482	Two Adults with two children	1449	1439	1694	1573	Two Adults with two children	1554	1613	1433	1398

Notes: Specifications A, B and C are denoted in Section 3.3 and Expenditure 3 synthesis in Table 1. Mean estimates are based on robust linear regression and median estimates on basis of quantile regression.

Table A.4: Adequate Living Expenses estimates (in €) based on Expenditure 4 and various model specifications, for the years 2012 and 2017

Specification A / B / C — 2017 ALE thresholds — Yearly

Yearly	Spec A All households Mean	Median	Spec B Non Mortgage holders Mean	Median	Spec B Mortgage holders Mean	Median	Spec C Urban or semi-urban region Mean	Median	Spec C Agricultural region Mean	Median
One adult	6094	5387	5917	5342	8195	7073	6020	5467	5732	5089
Two adults	10594	9748	7039	6895	8873	8585	11048	9966	9710	9152
Child multiplier	1878	2055	1604	1946	2178	2542	1666	2091	2093	2429
Extra Adult multiplier	1007	1385	1122	1553	269	603	1106	1710	866	1223
Two Adults with two children	14350	13859	10248	10787	13229	13669	14380	14148	13895	14009

2017 ALE thresholds — Monthly

Monthly	Spec A All households Mean	Median	Spec B Non Mortgage holders Mean	Median	Spec B Mortgage holders Mean	Median	Spec C Urban or semi-urban region Mean	Median	Spec C Agricultural region Mean	Median
One adult	508	449	493	445	683	589	502	456	478	424
Two adults	883	812	587	575	739	715	921	831	809	763
Child multiplier	156	171	134	162	182	212	139	174	174	202
Extra Adult multiplier	84	115	94	129	22	50	92	143	72	102
Two Adults with two children	1196	1155	854	899	1102	1139	1198	1179	1158	1167

2012 ALE thresholds — Yearly

Yearly	Spec A All households Mean	Median	Spec B Non Mortgage holders Mean	Median	Spec B Mortgage holders Mean	Median	Spec C Urban or semi-urban region Mean	Median	Spec C Agricultural region Mean	Median
One adult	6448	5408	6296	5305	10270	8208	6514	5495	6347	5021
Two adults	10866	9832	8662	7964	12139	11420	11008	10291	10526	9352
Child multiplier	2648	3148	2540	2997	1896	2314	2822	3336	2510	2983
Extra Adult multiplier	2497	2718	2366	2659	2080	2185	3227	3237	1787	2286
Two Adults with two children	16161	16127	13741	13957	15930	16049	16652	16964	15546	15318

2012 ALE thresholds — Monthly

Monthly	Spec A All households Mean	Median	Spec B Non Mortgage holders Mean	Median	Spec B Mortgage holders Mean	Median	Spec C Urban or semi-urban region Mean	Median	Spec C Agricultural region Mean	Median
One adult	537	451	525	442	856	684	543	458	529	418
Two adults	906	819	722	664	1012	952	917	858	877	779
Child multiplier	221	262	212	250	158	193	235	278	209	249
Extra Adult multiplier	208	226	197	222	173	182	269	270	149	191
Two Adults with two children	1347	1344	1145	1163	1327	1337	1388	1414	1295	1277

Notes: Specifications A, B and C are denoted in Section 3.3 and Expenditure 4 synthesis in Table 1. Mean estimates are based on robust linear regression and median estimates on basis of quantile regression.

ANNEX B:

Regression results

Table B.1: Regression results based on Expenditure 1 and various model specifications, for the years 2012 and 2017

	2012 ALE estimates						2017 ALE estimates					
	Robust linear regression (mean)			Quantile reggression (median)			Robust linear regression (mean)			Quantile reggression (median)		
Specification A												
Variable	Coef.	Std. Err.	P>|t|	Coef.	Std. Err.	P>|t|	Coef.	Std. Err.	P>|t|	Coef.	Std. Err.	P>|t|
num_dep_children	3361.00	3.39	0.00	4157.04	6.78	0.00	2045.56	2.11	0.00	2447.28	2.39	0.00
dummy_twoplus_adults	5736.89	7.61	0.00	5441.16	21.01	0.00	6105.32	6.09	0.00	5665.92	9.10	0.00
num_add_adults	3550.47	4.80	0.00	3879.72	9.16	0.00	1415.38	3.08	0.00	2169.90	3.17	0.00
_cons	8179.93	6.32	0.00	6391.80	19.09	0.00	7771.37	4.71	0.00	6687.96	8.15	0.00
	R-squared = 0.175			Pseudo R-squared = 0.095			R-squared = 0.202			Pseudo R-squared =0.126		
Specification B												
Variable	Coef.	Std. Err.	P>|t|	Coef.	Std. Err.	P>|t|	Coef.	Std. Err.	P>|t|	Coef.	Std. Err.	P>|t|
num_dep_children	3103.77	3.49	0.00	3970.56	3.89	0.00	1982.99	2.46	0.00	2373.24	2.94	0.00
dummy_twoplus_adults	5543.20	7.56	0.00	5252.52	11.57	0.00	5855.67	6.23	0.00	5369.40	10.24	0.00
num_add_adults	3613.96	5.06	0.00	4004.88	5.32	0.00	1787.39	3.70	0.00	2468.64	3.83	0.00
dummy_mortgage	5383.86	30.31	0.00	4828.92	42.18	0.00	2784.17	31.88	0.00	2142.24	46.57	0.00
int_twoplus_adults_mortgage	-291.26	30.89	0.00	294.00	43.11	0.00	19.12	33.92	0.57	1564.73	48.28	0.00
int_num_dep_children_mortgage	-736.48	10.90	0.00	-1799.16	10.55	0.00	-72.74	4.71	0.00	-136.37	6.73	0.00
int_num_add_adults_mortgage	-1388.53	15.10	0.00	-884.40	12.98	0.00	-1643.06	6.30	0.00	-1467.62	9.08	0.00
_cons	7894.38	6.13	0.00	6195.84	10.41	0.00	7683.84	4.70	0.00	6625.08	9.09	0.00
	R-squared = 0.192			Pseudo R-squared = 0.101			R-squared =0.213			Pseudo R-squared =0.131		
Specification C												
Variable	Coef.	Std. Err.	P>|t|	Coef.	Std. Err.	P>|t|	Coef.	Std. Err.	P>|t|	Coef.	Std. Err.	P>|t|
num_dep_children	3482.82	4.60	0.00	4335.72	2.E-12	0.00	2012.61	2.51	0.00	2396.35	2.46	0.00
dummy_twoplus_adults	5776.23	9.67	0.00	6109.32	6.E-12	0.00	6196.38	7.24	0.00	5947.68	9.03	0.00
num_add_adults	4167.86	6.35	0.00	4347.12	3.E-12	0.00	2006.28	3.80	0.00	2450.28	3.75	0.00
dummy_agr	-1054.53	12.78	0.00	-1119.24	9.E-12	0.00	-807.74	9.96	0.00	-803.76	17.59	0.00
int_twoplus_adults_agr	226.24	15.34	0.00	-476.88	1.E-11	0.00	-641.29	12.55	0.00	-1212.96	19.44	0.00
int_num_dep_children_agr	-310.74	6.60	0.00	-470.22	3.E-12	0.00	162.79	4.69	0.00	616.65	4.69	0.00
int_num_add_adults_agr	-1352.49	9.52	0.00	-816.24	4.E-12	0.00	-673.06	6.31	0.00	-591.00	5.69	0.00
_cons	8498.90	7.78	0.00	6932.28	6.E-12	0.00	7945.17	5.50	0.00	6855.24	8.04	0.00
	R-squared = 0.181			Pseudo R-squared = 0.101			R-squared =0.212			Pseudo R-squared = 0.131		

Notes: Specifications A, B and C are denoted in Section 3.3 and Expenditure 1 synthesis in Table 1.

Table B.2: Regression results based on Expenditure 2 and various model specifications, for the years 2012 and 2017

Specification A

Variable	2012 ALE estimates						2017 ALE estimates					
	Robust linear regression (mean)			Quantile reggression (median)			Robust linear regression (mean)			Quantile reggression (median)		
	Coef.	Std. Err.	P>|t|	Coef.	Std. Err.	P>|t|	Coef.	Std. Err.	P>|t|	Coef.	Std. Err.	P>|t|
num_dep_children	3126.38	3.08	0.00	3884.38	0.66	0.00	1941.65	1.99	0.00	2515.04	1.51	0.00
dummy_twoplus_adults	5265.99	7.01	0.00	4993.58	2.04	0.00	5792.00	5.47	0.00	5116.72	5.76	0.00
num_add_adults	3117.32	4.33	0.00	3550.88	0.89	0.00	1120.74	2.88	0.00	1842.28	2.01	0.00
_cons	7654.61	5.82	0.00	6082.34	1.86	0.00	7179.60	4.19	0.00	6255.60	5.16	0.00
	R-squared = 0.175			Pseudo R-squared = 0.096			R-squared = 0.205			Pseudo R-squared =0.120		

Specification B

Variable	2012 ALE estimates						2017 ALE estimates					
	Robust linear regression (mean)			Quantile reggression (median)			Robust linear regression (mean)			Quantile reggression (median)		
	Coef.	Std. Err.	P>|t|	Coef.	Std. Err.	P>|t|	Coef.	Std. Err.	P>|t|	Coef.	Std. Err.	P>|t|
num_dep_children	2998.29	3.24	0.00	3474.54	4.06	0.00	1892.42	2.33	0.00	2383.98	2.13	0.00
dummy_twoplus_adults	5120.27	7.01	0.00	4940.16	12.07	0.00	5598.23	5.61	0.00	4923.36	7.43	0.00
num_add_adults	2999.74	4.45	0.00	3458.34	5.55	0.00	1408.25	3.47	0.00	2029.08	2.78	0.00
dummy_mortgage	5101.12	28.10	0.00	4945.32	44.00	0.00	2787.59	30.32	0.00	2013.84	33.79	0.00
int_twoplus_adults_mortgage	-328.13	28.66	0.00	-102.12	44.98	0.02	-223.71	32.06	0.00	1471.44	35.03	0.00
int_num_dep_children_mortgage	-613.30	10.13	0.00	-1369.62	11.00	0.00	-72.76	4.50	0.00	-302.94	4.89	0.00
int_num_add_adults_mortgage	-1108.59	14.10	0.00	-1012.50	13.54	0.00	-1225.42	6.04	0.00	-1189.80	6.59	0.00
_cons	7361.59	5.70	0.00	5895.60	10.86	0.00	7100.43	4.18	0.00	6226.80	6.60	0.00
	R-squared = 0.193			Pseudo R-squared = 0.102			R-squared = 0.214			Pseudo R-squared = 0.128		

Specification C

Variable	2012 ALE estimates						2017 ALE estimates					
	Robust linear regression (mean)			Quantile reggression (median)			Robust linear regression (mean)			Quantile reggression (median)		
	Coef.	Std. Err.	P>|t|	Coef.	Std. Err.	P>|t|	Coef.	Std. Err.	P>|t|	Coef.	Std. Err.	P>|t|
num_dep_children	3371.99	4.32	0.00	5870.58	132.45	0.00	1890.34	2.33	0.00	2269.02	3.12	0.00
dummy_twoplus_adults	5428.16	8.88	0.00	4981.08	384.77	0.00	5949.93	6.50	0.00	5444.15	11.45	0.00
num_add_adults	3650.55	5.84	0.00	3584.88	181.50	0.00	1529.16	3.47	0.00	2093.28	4.76	0.00
dummy_agr	-696.48	11.99	0.00	-1101.96	570.60	0.05	-666.22	8.83	0.00	-716.76	22.31	0.00
int_twoplus_adults_agr	-37.02	14.33	0.01	344.88	625.14	0.58	-819.57	11.29	0.00	-989.51	24.66	0.00
int_num_dep_children_agr	-416.67	6.12	0.00	-2530.86	196.09	0.00	220.50	4.51	0.00	656.82	5.95	0.00
int_num_add_adults_agr	-1312.20	8.52	0.00	-720.48	263.71	0.01	-371.16	5.94	0.00	-487.02	7.22	0.00
_cons	7819.10	7.04	0.00	6415.80	345.77	0.00	7327.29	4.89	0.00	6440.04	10.20	0.00
	R-squared = 0.183			Pseudo R-squared = 0.102			R-squared =0.213			Pseudo R-squared = 0.127		

Notes: Specifications A, B and C are denoted in Section 3.3 and Expenditure 2 synthesis in Table 1.

Table B.3: Regression results based on Expenditure 3 and various model specifications, for the years 2012 and 2017

Specification A

	2012 ALE estimates						2017 ALE estimates					
	Robust linear regression (mean)			Quantile reggression (median)			Robust linear regression (mean)			Quantile reggression (median)		
Variable	Coef.	Std. Err.	P>|t|	Coef.	Std. Err.	P>|t|	Coef.	Std. Err.	P>|t|	Coef.	Std. Err.	P>|t|
num_dep_children	2954.71	2.70	0.00	3439.62	2.00	0.00	1903.83	1.96	0.00	2387.52	1.71	0.00
dummy_twoplus_adults	4805.50	6.18	0.00	5010.00	6.19	0.00	5267.84	4.94	0.00	4869.24	6.53	0.00
num_add_adults	2961.53	3.61	0.00	3294.36	2.69	0.00	1375.69	2.60	0.00	1917.24	2.28	0.00
_cons	7336.75	5.15	0.00	5895.60	5.62	0.00	6852.74	3.81	0.00	6111.72	5.85	0.00
	R-squared = 0.199			Pseudo R-squared = 0.106			R-squared =0.233			Pseudo R-squared =0.134		

Specification B

	2012 ALE estimates						2017 ALE estimates					
	Robust linear regression (mean)			Quantile reggression (median)			Robust linear regression (mean)			Quantile reggression (median)		
Variable	Coef.	Std. Err.	P>|t|	Coef.	Std. Err.	P>|t|	Coef.	Std. Err.	P>|t|	Coef.	Std. Err.	P>|t|
num_dep_children	2765.10	2.85	0.00	3358.26	3.69	0.00	1688.39	2.17	0.00	2245.88	1.90	0.00
dummy_twoplus_adults	4693.42	6.29	0.00	4755.12	10.97	0.00	5071.31	5.01	0.00	4697.36	6.61	0.00
num_add_adults	2828.32	3.76	0.00	3251.04	5.04	0.00	1591.35	3.01	0.00	2114.44	2.47	0.00
dummy_mortgage	4889.69	25.73	0.00	5707.08	39.99	0.00	2473.42	27.58	0.00	2035.08	30.06	0.00
int_twoplus_adults_mortgage	-530.24	26.20	0.00	-771.48	40.88	0.00	46.11	29.15	0.11	415.77	31.16	0.00
int_num_dep_children_mortgage	-707.74	9.15	0.00	-1661.82	10.00	0.00	449.01	4.69	0.00	68.63	4.35	0.00
int_num_add_adults_mortgage	-919.20	12.67	0.00	-708.12	12.31	0.00	-1358.11	5.48	0.00	-639.08	5.86	0.00
_cons	7165.76	5.19	0.00	5794.08	9.87	0.00	6825.77	3.79	0.00	6086.40	5.87	0.00
	R-squared = 0.211			Pseudo R-squared = 0.116			R-squared = 0.256			Pseudo R-squared = 0.139		

Specification C

	2012 ALE estimates						2017 ALE estimates					
	Robust linear regression (mean)			Quantile reggression (median)			Robust linear regression (mean)			Quantile reggression (median)		
Variable	Coef.	Std. Err.	P>|t|	Coef.	Std. Err.	P>|t|	Coef.	Std. Err.	P>|t|	Coef.	Std. Err.	P>|t|
num_dep_children	3147.04	3.68	0.00	4041.12	0.28	0.00	1743.69	2.25	0.00	2186.94	2.17	0.00
dummy_twoplus_adults	4719.97	7.78	0.00	5146.92	0.81	0.00	5433.23	5.82	0.00	5048.88	7.97	0.00
num_add_adults	3499.35	4.88	0.00	3982.68	0.39	0.00	1665.07	3.08	0.00	2136.60	3.31	0.00
dummy_agr	-589.69	11.06	0.00	-879.00	1.21	0.00	-686.07	7.98	0.00	-740.16	15.52	0.00
int_twoplus_adults_agr	65.05	12.96	0.00	-39.36	1.32	0.00	-605.06	10.17	0.00	-728.04	17.15	0.00
int_num_dep_children_agr	-462.40	5.27	0.00	-830.58	0.41	0.00	727.97	4.44	0.00	703.83	4.14	0.00
int_num_add_adults_agr	-1224.47	7.08	0.00	-1426.92	0.56	0.00	-750.25	5.15	0.00	-584.07	5.02	0.00
_cons	7635.74	6.32	0.00	6124.32	0.73	0.00	7012.96	4.41	0.00	6295.08	7.10	0.00
	R-squared = 0.204			Pseudo R-squared = 0.115			R-squared = 0.249			Pseudo R-squared = 0.138		

Notes: Specifications A, B and C are denoted in Section 3.3 and Expenditure 3 synthesis in Table 1.

Table B.4: Regression results based on Expenditure 4 and various model specifications, for the years 2012 and 2017

	2012 ALE estimates						2017 ALE estimates					
	Robust linear regression (mean)			Quantile reggression (median)			Robust linear regression (mean)			Quantile reggression (median)		
Specification A												
Variable	Coef.	Std. Err.	P>|t|	Coef.	Std. Err.	P>|t|	Coef.	Std. Err.	P>|t|	Coef.	Std. Err.	P>|t|
num_dep_children	2647.66	2.33	0.00	3147.54	0.55	0.00	1877.66	1.59	0.00	2055.42	2.25	0.00
dummy_twoplus_adults	4417.55	5.31	0.00	4424.16	1.71	0.00	4500.68	3.88	0.00	4361.16	8.59	0.00
num_add_adults	2496.75	3.09	0.00	2717.94	0.74	0.00	1007.16	2.05	0.00	1384.74	2.99	0.00
_cons	6448.48	4.39	0.00	5408.04	1.55	0.00	6093.73	3.05	0.00	5386.92	7.70	0.00
	R-squared = 0.213			Pseudo R-squared = 0.117			R-squared = 0.269			Pseudo R-squared =0.142		
Specification B												
Variable	Coef.	Std. Err.	P>|t|	Coef.	Std. Err.	P>|t|	Coef.	Std. Err.	P>|t|	Coef.	Std. Err.	P>|t|
num_dep_children	2539.60	2.47	0.00	2996.64	3.50	0.00	1604.29	1.84	0.00	1945.80	1.84	0.00
dummy_twoplus_adults	4331.55	5.42	0.00	4289.76	10.42	0.00	4603.03	4.32	0.00	4212.24	6.40	0.00
num_add_adults	2365.97	3.18	0.00	2658.84	4.79	0.00	1122.36	2.40	0.00	1553.04	2.39	0.00
dummy_mortgage	3974.30	21.59	0.00	2903.40	38.00	0.00	2278.85	24.17	0.00	1731.00	29.10	0.00
int_twoplus_adults_mortgage	-497.71	22.00	0.00	553.20	38.84	0.00	-444.46	25.55	0.00	-40.80	30.17	0.18
int_num_dep_children_mortgage	-644.00	7.69	0.00	-682.20	9.50	0.00	573.73	3.89	0.00	596.10	4.21	0.00
int_num_add_adults_mortgage	-285.78	10.71	0.00	-473.64	11.69	0.00	-853.38	4.27	0.00	-949.74	5.68	0.00
_cons	6296.10	4.43	0.00	5304.84	9.38	0.00	5916.57	3.25	0.00	5341.92	5.68	0.00
	R-squared = 0.227			Pseudo R-squared = 0.124			R-squared = 0.285			Pseudo R-squared = 0.151		
Specification C												
Variable	Coef.	Std. Err.	P>|t|	Coef.	Std. Err.	P>|t|	Coef.	Std. Err.	P>|t|	Coef.	Std. Err.	P>|t|
num_dep_children	2821.75	3.13	0.00	3336.36	3.46	0.00	1665.77	1.97	0.00	2090.76	2.01	0.00
dummy_twoplus_adults	4494.70	6.42	0.00	4796.04	10.03	0.00	5028.54	5.01	0.00	4499.05	7.36	0.00
num_add_adults	3226.54	4.28	0.00	3237.12	4.76	0.00	1106.43	2.44	0.00	1710.18	3.06	0.00
dummy_agr	-166.12	9.42	0.00	-473.52	14.89	0.00	-288.12	7.10	0.00	-378.48	14.34	0.00
int_twoplus_adults_agr	-316.30	11.06	0.00	-465.24	16.31	0.00	-1050.09	8.90	0.00	-821.95	15.85	0.00
int_num_dep_children_agr	-311.69	4.53	0.00	-353.16	5.12	0.00	426.80	3.57	0.00	337.98	3.83	0.00
int_num_add_adults_agr	-1439.35	5.98	0.00	-950.64	6.87	0.00	-240.19	4.24	0.00	-487.44	4.64	0.00
_cons	6513.53	5.16	0.00	5494.80	9.01	0.00	6019.95	3.77	0.00	5467.32	6.56	0.00
	R-squared = 0.227			Pseudo R-squared = 0.125			R-squared = 0.267			Pseudo R-squared = 0.148		

Notes: Specifications A, B and C are denoted in Section 3.3 and Expenditure 4 synthesis in Table 1.

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