Exploring Household Heterogeneities of the Deaton-Paxson Puzzle: Evidence for Argentina

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ABSTRACT

Theory predicts that economies of scale associated with the consumption of shared household public goods make larger families better off, given the same level of per capita expenditure or income. Public goods are relatively cheaper, while per capita expenditure on the private good will increase, as long as it is not easily substitutable, as in the case of food. However, Deaton and Paxson (1998) found exactly the opposite: food share declines with the number of heads, keeping household per capita expenditure constant. This paper aims to better understand the heterogeneities underlying the Deaton-Paxson paradox in food consumption, using data from the Argentinean Household Expenditure Survey (ENGH, Spanish acronym) for the period 2017/2018. We first differentiate the impact of an additional adult from an additional child on food demand, in families of different sizes. Second, we evaluate the relationship between food demand and household size on the distribution of income. Third, we explore potential associations beyond the conditional mean of food consumption. Because standard analysis focuses on average effects of family size on food demand, the existence of the paradox at the lower and upper end of the conditional food distribution remains unknown. Our evidence supports the findings of Deaton and Paxson (1998), and reveals important differences driving this food puzzle. Our results shed light on the crucial role of economies of scale in poor households.

Keywords: Engel law; economies of scale; household size; food consumption

JEL codes: D11, D12

1. Introduction

Theory predicts that economies of scale associated with the consumption of shared household public goods make larger families better off, given the same level of per capita expenditure or income. The argument goes as follows. If two adults get married, public goods are relatively cheaper. Then, the couple will benefit from shared consumption, lowering their per capita expenditure on public goods. As for the private goods, income and substitution effects operate in opposite directions. In the case of a private good that is not easily substitutable, with low own- and cross-price elasticities, the income effect will dominate. Then, per capita expenditure on the private good will increase. That is, the improvement in welfare from economies of scale translates into a higher per capita expenditure on private goods. Deaton and Paxson (1998) argue that food could be a reasonable example of a private good. Because food is a normal good, a larger household would spend more in per capita terms on food. This is especially true in poor countries, where there is limited opportunity for substituting away from food toward goods with greater economies of scale. However, they found exactly the opposite when analyzing cross-country data, for both developed and developing countries: food share declines with the number of heads, keeping household per capita expenditure constant. In addition, their findings suggest that the association between food consumption and household size is stronger in developing countries. This empirical regularity is also supported by historical estimates of household economies of scale for the United States (Logan, 2011).

Deaton and Paxson (1998) offer some insights into possible channels behind this puzzle, including direct economies of scale in food preparation and consumption, wastage, and intra-household inequality. Even though there is still no consensus on which channel may fully explain the paradox, the role of economies of scale seems to stand out (Abdulai, 2003; Gan and Vernon, 2003; Crossley and Lu, 2018; Gibson and Kim, 2018). Economies of scale may arise from a variety of sources, such as the 'publicness' of shared goods, the advantage of bulk discounts on purchasing in large families, and the increasing returns in household production of goods(Nelson, 1988). Because household economies of scale are crucial to the measurement and comparison of living standards, poverty, and the costs of children, the study of this food paradox lies at the center of welfare analysis.

This paper aims to better understand the heterogeneities underlying the Deaton-Paxson paradoxin food consumption for a middle-income country. We use data from the Argentinean Household Expenditure Survey (ENGH, Spanish acronym) for the period 2017/2018, to further characterize the puzzle. We use both parametric and non-parametric approaches to examine the relationship between food consumption and household size, conditional on per capita expenditure. We explore different sources of heterogeneity. First, we condition the analysis on the two most frequent household types (households of adults without children and households of two adults with and without children) to differentiate the impact of an additional adult and an additional child on food demand in families of different sizes, holding the per capita expenditure constant. Second, we evaluate the relationship between food consumption and household size on the (unconditional) distribution of income. And third, we explore potential associations between food demand and household size beyond the conditional mean, to fully characterize the paradox. To this end, we perform a quantile regression analysis, placing special focus on the tails of the food demand distribution. Distributional effects are important because focusing only on average marginal effects could give an incomplete picture of food consumption behavior when relevant differences are to be found at the lower or upper end of the conditional distribution.

Our evidence supports Deaton and Paxson's findings. Larger households are significantly associated with lower food share, keeping per capita expenditures and household composition constant. However, we find revealing heterogeneities driving this result. First, different effects are found according to family composition. When the number of adults doubles, the food share decreases, keeping per capita expenditure unchanged, while no association is found for households with more than three adults. In turn, an additional child in a family of two adults reduces the food share only in the case of the first or second child, and the marginal effect is larger for the second child. Second, larger effects are found for relatively poor families. If family size doubles, food share decreases by 3.7 percentage points in low-income families but only by 1.4 in high-income families, holding all else constant. On the other hand, the substitution of a young child for an adult reduces the food share in the high-income families, but leaves it unchanged in low-income families. Third, our evidence indicates that the relationship between food share and household size, holding per capita expenditure and family composition constant, is not homogenous across the conditional distribution of food consumption. We find larger and significant effects at the upper tail of the conditional distribution, that is for households with relatively higher food consumption, and reasonably lower income. However, no effect is found at the lower tail. Interestingly, the effect estimated at the mean level by standard regression analysis largely underestimates the effect for households at the upper end of the conditional distribution.

This paper contributes to further understanding the complexity behind the Deaton-Paxson food puzzle. While many empirical studies have tried to uncover factors explaining the paradox, we shed light on the potential heterogeneities driving the puzzle. As Deaton points out (1997), progress in measuring economies of scale depends on an understanding of the paradoxical relationship between food consumption and household size. In a departure from Deaton and Paxson's cross-country findings, we rely on within-country evidence that allows us to explore national differences in the puzzle across families, according to their composition, and food consumption and income levels. Because Argentina is classified as a middle-income country, the behavior of Argentinean households regarding expenditure on food is likely to be sufficiently general. By exploring the puzzle beyond marginal average effects, our evidence suggests that the paradox could be better characterized if heterogeneous effects throughout the conditional food distribution are accounted for.

The remainder of the paper is as follows. Section 2 describes the related literature. Section 3 presents the data, Section 4 describes our empirical strategy, and Section 5 reports the empirical results. Finally, Section 6 presents our conclusions.

2. Related Literature

2.1.A Basic Barten Model

Household economies of scale are traditionally measured by the Engel method or the Barten (1964)model. Deaton and Paxson (1998) rely on a simple version of the latter to derive the conditions under which food demand per person increases with household size in the presence of public goods. Model predictions indicate that economies of scale should cause the food share to increase with household size. If economies of scale can be attributed to the consumption of public goods, then larger families would have higher per capita consumption of private goods, such as food.

Deaton and Paxson's basic insight is the following. Suppose that a household is composed of n membersand consumes two groups of goods: a private (food) and a public good (housing). If $q_f$and q_h are the levels of household consumption of food and housing, respectively, and everything is shared equally, the household utility is given by $nv\left(\frac{q_f}{n}, q_h\right)$, while the household budget constraint in per capita terms is:

$$p_f\left(\frac{q_f}{n}\right) + \left(\frac{p_h}{n}\right) q_h = \frac{x}{n} \qquad (1)$$

When two one-person households join to form one two-person household, per capita outlay and the price of the private good do not change, but the price of the public good is reduced to one half, generating a positive income effect and a negative substitution effect on the demand for the private good. Then, if the private good is a necessity such as food, the substitution effect will be small, and its per capita consumption will rise.

To generalize the result, suppose now that a family consumes food (q_f) and non-food goods (q_h), and both are subject to some degree of scale economies. Then, the utility function is:

$$u = nv\left(\frac{q_f}{\phi_f(n)}, \frac{q_h}{\phi_{fh}(n)}\right) \qquad (2)$$

where ϕ_f and $\phi_h$are the scaling functions for food and non-food goods.Maximization of the utility function in(2) subject to the budget constraint in (1) yields the following food demand function per person:

$$\frac{q_f}{n} = \frac{\phi_f(n)}{n} g_f\left(\frac{x}{n}, \frac{p_f\phi_f(n)}{n}, \frac{p_h\phi_h(n)}{n}\right) \qquad (3)$$

where g_f is the demand function of food for the single-person household. By taking the log of Eq. (3) and differentiating with respect toln$n$, we can examine the relationship between household size and food demand. Then, per capita food consumption will increase with household size at constant per capita expenditure, if and only if the following condition holds:

$$\sigma_h(\epsilon_{fx} + \epsilon_{ff}) - \sigma_f(1 + \epsilon_{ff}) > 0$$

where σ_i is the commodity-specific economy of scale measure[1], with $\sigma_i = 1 - \frac{\partial \ln \phi_i(n)}{\partial \ln n}$, and $\epsilon_{ff}, \epsilon_{fx}$ are the own-price and income elasticities of food, respectively.

As observed, Barten's model predicts that per capita food demand will increase when family size increases, holding constant per capita expenditure if the income effect dominates the substitution effect. That is, if the food income elasticity for food is high and the price elasticity is low in absolute value, given that $\sigma_f = 0$ and$\sigma_h = 1$. This condition is likely to hold in the case of developing countries, because the food share is high and food is a necessity, so it has limited substitutes, and behaves as a private good.

2.1. Possible Explanations for the Puzzle

Despite theoretical predictions, Deaton and Paxson (1998) found exactly the opposite when analyzing cross-country data: food share declines with the number of heads, keeping household per capita expenditure constant. Because the evidence holds for both developed and developing countries (United States, Great Britain, France, Taiwan, Thailand, Pakistan, and South Africa), their findings suggest the existence of an empirical regularity. Further, the association between food consumption and household size is stronger in poorer countries, where substitution should be at its lowest.

Even though Deaton and Paxson (1998)identify possible channels behind paradoxical results (direct economies of scale in food preparation and consumption, wastage, and intra-household inequality), one strand of the literature has made a significant effort to test different possible hypotheses. Horowitz (2002) and Gan and Vernon(2003) show that extending the two-goods theoretical model would be consistent with the empirical evidence. In addition, Gan and Vernon (2003) examine two alternative empirical models, one with food and a more public good (housing), and another one with food and a more private good (transportation). In the first case, the food share decreases with family size, and in the second case the food share increases with household size, as predicted by the Barten model. These authors also suggest that economies of scale in food preparation time may be a key factor in understanding the puzzle. However, in a response, Deaton and Paxson (2003) note that Gan and Vernon (2003) provide an unclear description of the puzzle and that their findings do not address the central paradox. At the same time, they extend the theoretical framework to incorporate more goods, proving the validity of the model.

Another channel explored is measurement error in the recall of food expenditures (Gibson, 2002; Gibson and Kim, 2007, Gibson et al., 2015; Brzozowski et al., 2017). It could be that larger families have more difficulty remembering in detail all food expenditures, leading to under-reporting. Then, measurement errors may cause a negative bias in the relationship between household size and food demand. However, because results are mixed, the argument

[1]If $\sigma_i = 0$, i is a private good and if $\sigma_i = 1 i$ is a public good.

may only partially contribute to an explanation of the puzzle. Perali (2008) examines the relationship between food consumption and family size separately from economies of scale, and finds that the Engel curve expressed in equivalent income shifts to the right when family size increases, as the theory predicts. Abdulai (2003) finds no evidence to suggest that the endogeneity of male and female hours of work in the labor force can explain the puzzle.

According to the evidence, economies of scale in food preparation may be key to an explanation. Studies in this line suggest that the effects of direct economies of scale dominate those generated by public goods (Abdulai, 2003; Gibson and Kim, 2018). More recently, Crossley and Lu (2018) incorporate home production to the model and argue that heterogeneity in the time cost of food preparation may resolve the puzzle. Using Canadian expenditure and time data, they find that the food baskets of larger households are significantly shifted away from prepared and ready-to-eat foods and towards foods requiring preparation time. However, Logan (2011) produces comparable historical estimates of household economies of scale for the US, but find that changes in economies of scale over time do not resolve the empirical puzzle.

Despite several attempts at an explanation, it is still not clear which channel may fully resolve the question. We now take a closer look at the heterogeneities underlying the Deaton-Paxson paradox in food consumption, for a middle-income country.

3. Data

Household data comes from the National Household Expenditure Survey (ENGH, Spanish acronym) for the period 2017/2018, conducted by the National Institute of Statistics and Census (INDEC) of Argentina. The survey is a cross-sectional, urban and nationally representative survey reporting comprehensive information on household expenditures at a low level of disaggregation. The survey is carried out over four consecutive trimesters. Expenditure data is collected using recall methods, based on the nature of purchased items. Daily expenditures, such as food and beverages, have a recall period of seven days prior to the interview. All expenditures are expressed on a monthly basis. The data records detailed information on housing conditions as well as individual data on socio-demographic characteristics and labor status.

Food expenditure includes household expenditures on food, beverages, and meals away from home. Total expenditure is defined as the sum of all household expenditures on durable and non-durable goods, following Deaton and Paxson (1998). To deal with outliers, we exclude families with more than 7 members (0.06% of observations), families with expenditures higher than 8 standard deviations from the mean of each aggregated category (1.3% of observations), and families with extreme values of income (2.8% of observations). Our final sample amounts to 14,534observations, of which 8,218 are families composed of only adults, while 6,316 have children. In this study, children are defined as individuals aged below 18 years old and adults are members aged above 17 years old.

Table 1 reports descriptive statistics of the variables used in the empirical strategy. Households allocate, on average, 35% of total expenditure to food. The most frequent kinds of household are those composed of adults without children (22.5% of households have only one adult, 22.9% two adults and 15.6% more than two adults) and of two adults with children (11.4% of households have two adults and 1 child, 11.7% two adults and two children and 6.9%two adults and more than two children). Families have, on average, 2 adults and 2.7 members, and 43.45% of those families have, on average, 1.8 children. Families are mainly located in the Buenos Aires, Pampeana, and Northeast regions. Heads of household are 50.55 years old, on average, and 29.5% of them have elementary education, 40.1%have secondary education, and 30.4% have higher education (either completed or not).

[Table 1 about here]

4. Empirical Strategy

We explore different sources of heterogeneity in the Deaton-Paxson paradox using the Argentinean data. We use both non-parametric and parametric approaches to examine the relationship between food consumption and household size, conditional on per capita expenditure.

Non-parametric estimations of the Engel curves provide an interesting starting point from which to explore the relationship between the demand for food and household size. We estimate non-parametric Engel curves using a local lineal estimator and consider different family sizes to analyze the extent of the puzzle. Intuition indicates that, for the puzzle to be present, we would need to observe a decrease in the share of food for an increasing number of members, at the same level of per capita expenditure. Then, food Engel curves for larger families would lie below the Engel curve for smaller families, given their per capita expenditure.

Even though non-parametric estimations provide a first approximation of the paradox, these estimates do not allow us to account for differences across households that may affect food expenditures, and are correlated with household size. To this end, we estimate a parametric regression, closely following the specification of Deaton and Paxson (1998):

$$w_f = \alpha + \beta\, ln\left(\frac{x}{n}\right) + \gamma \ln n + \sum_{k=1}^{K-1} \eta_k \frac{n_k}{n} + \xi\, \boldsymbol{V} + u \qquad (1)$$

where w_f is the household food share, x is total household expenditure, n is family size, and n_k/n is the ratio of k age categories of household members (0-5, 6-11, 12-17, 18-64, and over 65 years old) to household size. These variables are meant to distinguish between the impact of household size n and the composition of the family represented by the ratios n_k/n. The vector $\boldsymbol{V}$includes additional control variables: regional indicators (Buenos Aires, Pampeana, Northeast, Northwest, Cuyo, and Patagonia), trimester indicators, and the fraction of adults who work, to account for the behavior of consumers away from home. Further, we include the gender, age and educational level (primary, secondary, or higher education) of the head of the household, following Crossley and Lu (2018). Descriptive statistics of all variables are reported in Table 1.

The parameter βin the estimation of Eq. (1) reflects Engel's Law for food, and is expected to be negative, while the coefficient of interest γcaptures the relationship between household size and household food demand, holding all other relevant variables constant. According to Deaton and Paxson's findings for several countries, the sign of this parameter is negative – contradicting the predictions of the theory.

Eq. (1) is estimated by Ordinary Least Squares (OLS) and Instrumental Variable (IV) methods. As in any demand analysis, there is a potential endogeneity problem associated with the expenditure variable. Because the budget shares and per capita expenditures are constructed from the same expenditure information, the residuals in Eq. (1), which represent measurement or recall errors or unobserved preferences, are very likely to be correlated with per capita expenditures. Then, estimates would be biased. To avoid this problem, we follow the tradition of demand system and Engel curve estimation by instrumenting the log of per capita expenditures with the log of per capita income (e.g. Deaton and Paxson, 1998;Perali, 2008; Cherchye et al., 2012;Brzozowskiet al., 2019; Tommasi, 2019;Betti et al., 2020). Income is a good instrument because it is strongly correlated with expenditure but is reported independently in the survey.[2] All subsequent estimations reported are instrumental variable estimates.[3]

The empirical model is estimated for the two most frequent household types; (a) households of adults without children (8,218 households); and (b) households of two adults with and without children (7,683 households).Estimations of the model on these sub-samples allow us to differentiate the impact on food demand of an additional adult from an additional child, holding the per capita expenditure constant.

To better understand the existence of the paradox across income levels, we evaluate the relationship between food demand and household size on the (unconditional) distribution of income. We estimate Eq. (1) separately for each quintile of the per capita income distribution. The theory predicts a larger positive effect of household size on food consumption in low-income scenarios at constant levels of per capita expenditure, because the income elasticity of food is higher, and the price elasticity is relatively low, and because food is probably close to subsistence levels for poor families. Then, for larger families, the increase in welfare from economies of scale should translate into an increase in food consumption. However, Deaton and Paxson (1998) found exactly the opposite; in the poorest households there is evidence of a larger negative association between family size and food consumption.

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[2] Other works use wealth indices to instrument for total expenditure as Dunbar et al. (2013). However, a careful analysis for the case of Argentina reveals that income is a stronger instrument for this data (Echeverria et al., 2019).

[3]In our application the IV method is adequate given the linearity involved in the estimation.

Estimations of Eq. (1) by OLS and IV methods allow us to obtain marginal average effects. However, potential associations between food demand and household size, beyond the conditional mean of the food share, remains unknown. We explore this source of heterogeneity and characterize this relationship at different points of the conditional distribution, placing special focus on the tails using quantile regression analysis.[4] We estimate Eq. (1) by quantile regression on the full sample of households and obtain conditional marginal effects of family size on food consumption, considering quantiles $\tau \epsilon \{10, 15, 40, 60, 85\ 90\}$. In these estimations, an instrumental variable approach is also undertaken. In addition, we estimate the quantile regression separately on both sub-samples considered (adults without children, and two adults with and without children) in order to capture if the impact of an additional adult and an additional child on food demand differs in the tails of the conditional distribution of food consumption. Distributional effects are important because focusing only on average marginal effects could give an incomplete picture of food behavior if important differences were to be found at the lower or upper end of the conditional distribution.

5. Results

In this section, we first estimate non-parametric Engel curves to determine whether there is preliminary evidence of the existence of the Deaton-Paxson paradox, and we then perform a parametric regression analysis. We report our results for the full sample of households and for the two most frequent household types, households of adults (without children) and households of two adults with and without children.

Figure 1 shows local lineal regression estimates of the Engel curve for food that summarizes the relationship between the food share and the per capita expenditure for households of different household sizes and adult-child composition. Panel (A) depicts the non-parametric Engel curve for the full sample of households, differentiating the curves by household size. The solid curve sets the reference household and the dash curves represent households with increasing numbers of members. As expected, food consumption declines with per capita expenditure, as predicted by Engel's Law for each household size. We observe evidence of the Deaton-Paxson puzzle, because there is a downward shift of the Engel curves when family size increases. For a given level of per capita expenditure, larger households generally have a lower food share and therefore a lower per capita food expenditure. However, the evidence seems not to be straightforward in the tails of the distribution, where curves cross. Panel (B) reports Engel curves for households with different numbers of adults (without children) and Panel (C) for households with two adults with and without children. Engel curves by household type enables us to analyze food consumption, separating those household size increases driven by an additional adult (keeping fixed the number of children) or by an additional child (keeping fixed the number of adults). Thus, curves do not reflect differences

[4] Prior evidence of heterogeneous effects in Engel curve estimations for Argentina motivates the use of quantile regressions (Pizzolito, 2007).

in needs between adults and children. In Panel (B), we observe that an additional adult decreases the food share at constant per capita expenditure only when we move from households of one adult to households of two adults. However, Engel curves for two, three, and more than three adults overlap. In Panel (C) there is a downward shift of the Engel curve for households of two adults and one child and two children, although the fixed cost of having the first child is larger. However, there is an upward shift when having a third child, or more. In addition, it is worth noting that in Panels (B) and (C) there is a crossing of the tails, making it difficult to assess and support the existence of the paradox without further evidence. This suggests that marginal effects computed on the conditional mean of the food share distribution, as standard regression analysis computes, may not be enough to fully characterize the paradox.

[Figure 1 about here]

We now report estimates of a parametric regression of the food share on household size and per capita expenditure, to account for differences across households that may affect food expenditures and are correlated with household size. For example, Engel curves in Figure 1 do not control for the adult-child ratio, however, we wish to separate the effect of household size from the effect of household composition.

Table 1 shows the OLS and IV estimates of Eq. (1) without controls (Columns (1) and (3)) and with controls (Columns (2) and (4)). The negative signs of the per capita expenditure coefficients reflect Engel's Law for food. The negative sign of the family size coefficients contradicts the theory predictions of food as a private good in the Barten model, while supporting Deaton-Paxson's evidence of a paradox. Larger household size is significantly associated with a lower food share, keeping per capita expenditures and household composition constant. In particular, a 100% increase in household size leads to a reduction in food share of 1.5 percentage points by OLS estimates, and of 3.3percentage points by IV estimates. All following regression coefficients shownin this Section are estimated by IV method, and full estimated parameters of each regression reported are presented in Appendix A.

[Table 2 about here]

We now wish to distinguish the marginal effect of an additional adult from an additional child. For this purpose, we estimate Eq. (1) for the two household types previously considered, and report the results in Table 3. Panel (A) shows the change in the food share when a family of adults gets larger because of an additional adult, while Panel (B) shows the change in the food share when a family of two adults gets larger because of an additional child, holding all other variables constant. Results in Panel (A) indicate that if the number of adults were to double, the food share decreases by 3.3 percentage points, keeping per capita expenditure unchanged. However, no association is found for households with more than three adults. Results in Panel (B) suggest that an additional child in a family of two adults reduces the food share only in the case of the first or second child, and the marginal effect is larger for the second child.

[Table 3 about here]

Additionally, Deaton and Paxson (1998) found that, contrary to the theory, the negative association between the demand for food and household size at constant per capita expenditure is greater in poor countries. At the same time, their cross-country comparisons suggest that the substitution of a young child for an adult reduces the food share in the richer countries but leaves it unchanged or increases it in the poorer countries.

Table 4 reports regression coefficients of family size and the ratio of the youngest child group (0-5 and 6-11)[5] by quintiles, to evaluate whether these effects differ over the full (unconditional) range of per capita income. Results within country are in line with Deaton and Paxson's findings. On the one hand, when family size doubles, food shares decrease by 3.7 percentage points in low-income families, but only by 1.4 in high-income families, holding all else constant. Then, our evidence indicates that the negative association is greater at the bottom of the (unconditional) distribution of income. On the other hand, the substitution of a young child for an adult reduces the food share in high-income families, but leaves it unchanged in low-income families.

[Table 4 about here]

We further explore the Deaton-Paxson paradox on different points of the conditional distribution of food consumption, placing special focus on the tails. Table 5 reports quantile regression coefficients of family size, considering quantiles $\tau \epsilon \{10, 15, 40, 60, 85\ 90\}$ for the full sample of households. Note that the lower (upper) end of the conditional distribution corresponds to lower (higher) values of food share, and reasonably to higher (lower) income families, according to Engel's Law. Figure A.1 in Appendix A depicts the quantile estimates of the Engel curves for all families and shows sound evidence of heterogeneous effects of the per capita expenditure on food consumption across the conditional distribution.

Estimates in Table 5 indicate that the relationship between food share and household size, holding per capita expenditure and family composition constant, is not homogenous across the conditional distribution of food consumption. We find larger and significant effects in the upper tail of the distribution, while no effect is found in the lower tail.[6] Interestingly, the effect estimated at the mean level (Table 2) largely underestimates the effect for households at the upper end of the distribution, that is, households with relatively higher food consumption.

[Table 5 about here]

Figure 2 shows quantile regression estimates of Engel curves for food for all households considering the lower and upper tail of the conditional distribution of food consumption ($\tau \epsilon \{10, 90\}$).In the upper tail, an increase in household size is related to a lower food share, keeping per capita expenditure constant. However, in the lower tail, Engel Curves for different

[5] To compare the effect of a child with the effect of an adult, we estimate Eq. (1) using adults (individuals over 17 years old) as the omitted category of groups of members.

[6] Marginal effects of family size for the different quantiles are significantly different from each other.

household sizes practically overlap. This evidence suggests that the paradox could be better characterized when heterogeneous effects throughout the conditional distribution are accounted for.

[Figure 2 about here]

Table 6 reports quantile regression parameters by household type, focusing on the tails of the conditional distribution. Panel (A) includes households of adults without children, and Panel (B) households of two adults with and without children. Similar results are found for an increasing number of adults; the association between food share and family size is significant only at the upper end of the distribution, indicating that heterogeneous effects do exist. However, no effect is found for an additional child in a family of two adults, regardless of the relative position of families in the conditional distribution of food consumption.

[Table 6 about here]

6. Conclusions

This paper takes a closer look at the Deaton-Paxson paradox to better understand the heterogeneities underlying the food puzzle for a middle-income country. We use data from the Argentinean Household Expenditure Survey (ENGH, Spanish acronym) for the period 2017/2018, to explore the presence of within-country features of the puzzle. We use non-parametric and parametric approaches to explore different sources of heterogeneity in the relationship between food consumption and household size, conditional on per capita expenditure.

Our evidence reveals interesting heterogeneities driving Deaton and Paxson's findings. First, different effects are found, according to family composition. When the number of adults doubles, the food share decreases, keeping per capita expenditure unchanged, while no association is found for households with more than three adults. In turn, an additional child in a family of two adults reduces the food share only in the case of the first or second child, and the marginal effect is larger for the second child. Second, larger effects are found for relatively poor families. When family size doubles, food shares decrease by 3.7 percentage points in low-income families but only by 1.4 in high-income families, holding all else constant. Then, our evidence indicates that the negative association is greater at the bottom of the (unconditional) distribution of income. On the other hand, the substitution of a young child for an adult reduces the food share in the high-income families, but leaves it unchanged in low-income families. Finally, our evidence indicates that the relationship between food share and household size, holding per capita expenditure and family composition constant, is not homogenous across the conditional distribution of food consumption.

The design of social policies requires the consideration not only of heterogeneities in family types but also in degree of economies of scale when particular attention is placed on reversing the vulnerable situation of low-income families. Accounting for economies of scale and family composition is crucial in determining the income needed by different families to reach a given standard of living, as well as to establish the amount of benefit transfers made to poor households. This study shows significant differences in the puzzle across families according to their composition, but also according to their food demand behavior and income level. If one admits that economies of scale are at the center of the puzzle, our evidence of significant effects in the upper tail of the conditional distribution of food, which are-in turn-larger than average level effects, helps to uncover the crucial role of economies of scale in low-income households. Since Argentina is classified as a middle-income country, the behavior of Argentinean households regarding expenditure on food is likely to be sufficiently general. Our results suggest that special focus should be placed on measuring the extent of economies of scale in the poorest families.

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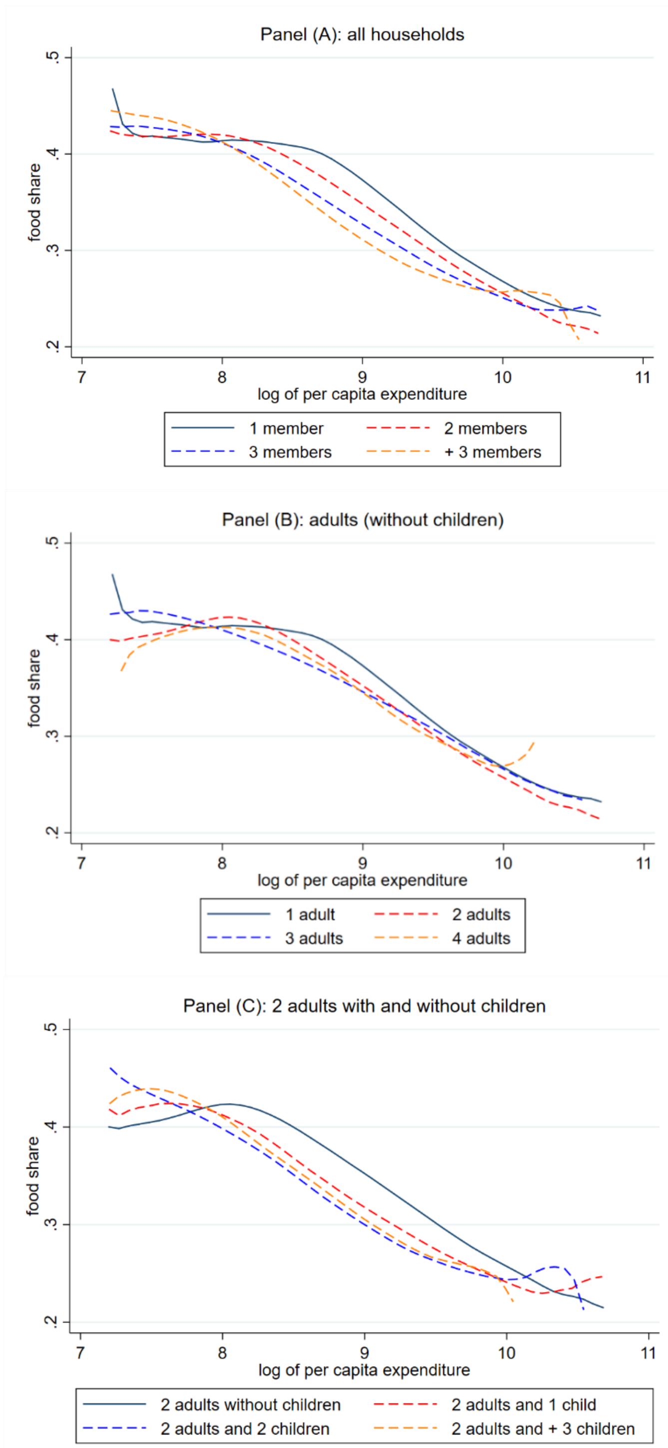
Tables and Figures

Table 1. Descriptive Statistics

Variables	**Mean**	**Std. Dev.**
Expenditures		
food share	0.35	0.15
log of per capita expenditure	8.85	0.73
log of per capita income	9.09	0.80
Types of Households		
1 adult	22.5%	-
2 adults	22.9%	-
3 adults	7.3%	-
more than 3 adults	3.8%	-
2 adults with 1 child	11.4%	-
2 adults with 2 children	11.7%	-
2 adults with more than 2 children	6.9%	-
Household Composition		
household size	2.76	1.42
number of adults	1.96	0.84
proportion of families with children	43.45	-
number of children	1.85	0.92
ratio of members of 0-5 years old to household size	0.12	0.17
ratio of members of 6-11 years old to household size	0.18	0.18
ratio of members of 12-17 years old to household size	0.16	0.18
ratio of members of 18-64 years old to household size	0.61	0.35
ratio of members of >65 years old to household size	0.19	0.37
Socio-demographic variables		
Buenos Aires region	18.9%	-
Pampeana region	26.1%	-
Northeast region	20.7%	-
Northwest region	11.8%	-
Cuyo region	9.3%	-
Patagonia region	13.1%	-
trimester 1	23.5%	-
trimester 2	25.4%	-
trimester 3	25.8%	-
trimester 4	25.3%	-
age of the household head	50.55	16.35
if the household head is male	58.29	-
number of working adults	0.91	0.22
if the household head has elementary education	29.5%	-
if the household head has secondary education	40.1%	-
N	14,534	

Figure 1. Non-parametric Engel Curves for Food



Note: Local linear regression estimates of Engel curves for food and different household sizes. Panel (A): full sample of households.Panel (B): households without children (only adults). Panel (C): households with 2 adults with and without children.

Table 2. The Deaton-Paxson Paradox(all households)

	OLS		IV	
	(1)	**(2)**	**(3)**	**(4)**
log of family size	-0.026***	-0.015***	-0.043***	-0.033***
	(0.002)	(0.003)	(0.003)	(0.004)
log of per capita exp.	-0.084***	-0.070***	-0.114***	-0.111***
	(0.002)	(0.002)	(0.003)	(0.004)
Controls	No	Yes	No	Yes
R-squared	0.148	0.189	0.131	0.165
N	14,534			

Note: Dependent variable: food share. Estimations for the full sample of households. Columns (1) and (2) correspond to OLS estimation without and with controls, respectively. Columns (3) and (4) correspond to a two-stage least squares estimation (IV) without and with controls, respectively. We instrument the log of per capita expenditure with the log of per capita income, following Deaton and Paxson (1998). Control variables: the ratio of household members who fall in different age groups (0-5; 6-11; 12-17; 18-64; +65) to household size, the fraction of working adults, regional and trimester indicators, and the age, gender, and education level of the household head. Full set of estimates are reported in Table A.1 of Appendix A. Standard errors in parenthesis. ***p<0.01, **p<0.05, *p<0.1.

Table 3. The Deaton-Paxson Paradox by Household Types

Panel (A): Increasing number of adults (without children)				
	All adults	1 or 2 adults	2 or 3 adults	+ 3 adults
log of family size	-0.033***	-0.032***	-0.037***	0.006
	(0.004)	(0.006)	(0.013)	(0.022)
log of per capita exp.	-0.102***	-0.101***	-0.105***	-0.107***
	(0.005)	(0.006)	(0.007)	(0.013)
R-squared	0.157	0.166	0.135	0.096
N	8,218	6,600	4,389	1,601
Panel (B): Increasing number of children (2 adults)				
	2 adults with or without children	2 adults with 0 or 1 child	2 adults with 1 or 2 children	2 adults with + 2 children
log of family size	0.016	-0.033*	-0.067***	-0.073
	(0.033)	(0.017)	(0.018)	(0.238)
log of per capita exp.	-0.118***	-0.114***	-0.123***	-0.123***
	(0.005)	(0.006)	(0.008)	(0.010)
R-squared	0.158	0.150	0.175	0.185
N		4,988	3,360	2,695

Note: Dependent variable: food share. Two-stage least squares estimation with controls. We instrument the log of per capita expenditure with the log of per capita income, following Deaton and Paxson (1998). Estimations reported in Panel (A) include all households without children. Control variables for estimations in Panel (A): the ratio of household members who fall in the age groups of 18-64 and +65 to household size, the fraction of working adults, regional and trimester indicators, and the age, gender, and education level of the household head. Estimations reported in Panel (B) include all households with 2 adults with and without children. Control variables for estimations in Panel (B): the ratio of household members who fall in different age groups (0-5; 6-11; 12-17; 18-64; +65) to household size, the fraction of working adults, regional and trimester indicators, and the age, gender, and education level of the household head. Full set of estimates are reported in Table A.2 of Appendix A. Standard errors in parenthesis. ***p<0.01, **p<0.05, *p<0.1.

Table 4. Regression Coefficients of Family Size and the Ratio of Young Children to Household Size by Income Quintiles (all households)

	By Income Quintiles				
	Q1	**Q2**	**Q3**	**Q4**	**Q5**
log of family size	-0.037***	-0.020	-0.034***	-0.029*	-0.014**
	(0.014)	(0.016)	(0.013)	(0.015)	(0.007)
log of per capita exp.	-0.104***	-0.104**	-0.104***	-0.095***	-0.076***
	(0.027)	(0.041)	(0.031)	(0.036)	(0.014)
ratio of 0-5 to hh size	-0.025	-0.095***	-0.068**	-0.068***	-0.048*
	(0.026)	(0.024)	(0.028)	(0.026)	(0.029)
ratio of 6-11 to hh size	0.021	-0.059***	-0.055**	-0.039*	-0.057**
	(0.021)	(0.021)	(0.023)	(0.022)	(0.024)
R-squared	0.093	0.100	0.104	0.103	0.106
N	2,801	2,929	2,901	3,043	2,860

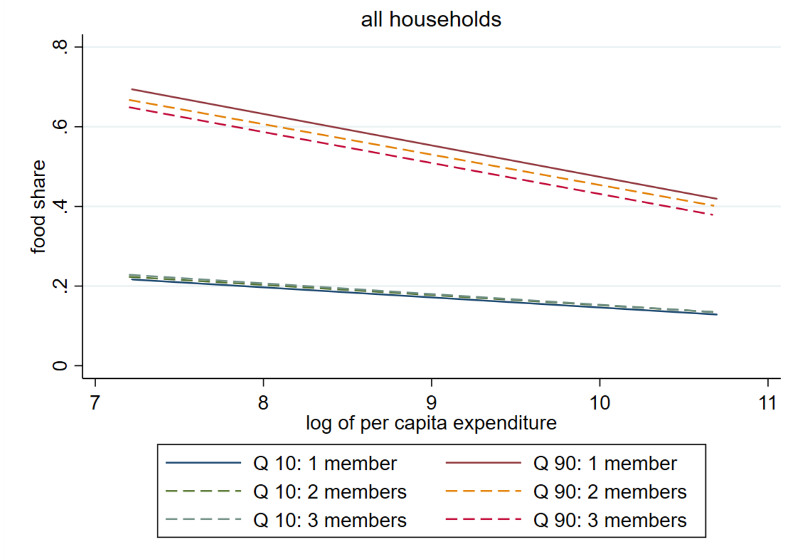
Note: Dependent variable: food share. Estimations for the full sample of households by quintiles of the per capita income distribution. Two-stage least squares estimation with controls. We instrument the log of per capita expenditure with the log of per capita income, following Deaton and Paxson (1998). Estimations for the full sample of households and by quintiles of the per capita income distribution. Control variables: the fraction of working adults, regional and trimester indicators, and the age, gender, and education level of the household head. Full set of estimates are reported in Table A.3 of Appendix A. Standard errors in parenthesis. ***p<0.01, **p<0.05, *p<0.1.

Table 5. The Deaton-Paxson Paradox Beyond the Conditional Mean (all households)

	Q10	**Q15**	**Q40**	**Q60**	**Q85**	**Q90**
log of family size	-0.002	-0.006	-0.018***	-0.036***	-0.064***	-0.080***
	(0.005)	(0.004)	(0.005)	(0.006)	(0.006)	(0.007)
log of per capita exp.	-0.048***	-0.060***	-0.099***	-0.126***	-0.161***	-0.176***
	(0.005)	(0.005)	(0.006)	(0.006)	(0.007)	(0.007)
Pseudo R-squared	0.0499	0.0607	0.0881	0.1051	0.1129	0.1142
N	14,534					

Note: Dependent variable: food share. Estimations for the full sample of households. Quantile regression with two-stage least squares estimation with controls. We instrument the log of per capita expenditure with the log of per capita income, following Deaton and Paxson (1998). Control variables: the fraction of working adults, regional and trimester indicators, and the age, gender, and education level of the household head. Full set of estimates are reported in Table A.4 of Appendix A. Standard errors in parenthesis. ***p<0.01, **p<0.05, *p<0.1.

Figure 2. The Deaton-Paxson Paradox Beyond the Conditional Mean ($\tau \epsilon \{10, 90\}$)



Note: Quantile regression estimates of Engel curves for food for all households, for quantiles 10 and 90 of the conditional distribution of food consumption.

Table 6. The Deaton-Paxson Paradox Beyond the Conditional Mean by Household Type

Panel A: all adults (without children)				
	Q10	**Q15**	**Q85**	**Q90**
log of family size	0.003	-0.006	-0.066***	-0.074***
	(0.005)	(0.005)	(0.009)	(0.008)
log of per capita exp.	-0.032***	-0.047***	-0.152***	-0.157***
	(0.005)	(0.005)	(0.010)	(0.010)
Pseudo R-squared	0.0401	0.0494	0.1055	0.1077
N		8,218		

Panel B: 2 adults with and without children				
	Q10	**Q15**	**Q85**	**Q90**
log of family size	0.007	0.015	0.055	0.061
	(0.044)	(0.048)	(0.053)	(0.053)
log of per capita exp.	-0.058***	-0.067***	-0.167***	-0.178***
	(0.007)	(0.007)	(0.009)	(0.010)
Pseudo R-squared	0.0457	0.0534	0.1171	0.1217
N		7,683		

Note: Dependent variable: food share. Quantile regression with two-stage least squares estimation with controls. We instrument the log of per capita expenditure with the log of per capita income, following Deaton and Paxson (1998). Estimations reported in Panel (A) include all households without children. Control variables for estimations in Panel A: the ratio of household members who fall in the age groups of 18-64 and +65 to household size, the fraction of working adults, regional and trimester indicators, and the age, gender, and education level of the household head. Estimations reported in Panel (B) include all households with 2 adults with and without children. Control variables for estimations in Panel B: the ratio of household members who fall in different age groups (0-5; 6-11; 12-17; 18-64; +65) to household size, the fraction of working adults, regional and trimester indicators, and the age, gender, and education level of the household head. Full set of estimates are reported in Table A.5 of Appendix A. Standard errors in parenthesis. ***p<0.01, **p<0.05, *p<0.1.

Appendix A

Table A.1. Full Set of Estimates of Table 2

	OLS	IV
log of per capita expenditure	-0.070***	-0.111***
	(0.002)	(0.004)
log of family size	-0.015***	-0.033***
	(0.003)	(0.004)
ratio of 0-5 to household size	-0.040***	-0.059***
	(0.011)	(0.012)
ratio of 6-11 to household size	-0.011	-0.027***
	(0.009)	(0.010)
ratio of 12-17 to household size	0.004	-0.008
	(0.010)	(0.010)
ratio of +65 to household size	-0.005	-0.009*
	(0.005)	(0.005)
Pampeana region	-0.021***	-0.024***
	(0.003)	(0.003)
Northeast region	0.032***	0.017***
	(0.004)	(0.004)
Northwest region	0.007	-0.014***
	(0.004)	(0.005)
Cuyo region	-0.022***	-0.032***
	(0.004)	(0.005)
Patagonia region	-0.040***	-0.044***
	(0.004)	(0.004)
trimester 2	-0.001	-0.000
	(0.003)	(0.003)
trimester 3	-0.004	0.000
	(0.003)	(0.003)
trimester 4	0.006*	0.012***
	(0.003)	(0.003)
age of the household head	0.000***	0.000***
	(0.000)	(0.000)
gender of the household head	-0.004*	-0.009***
	(0.002)	(0.002)
number of working adults	0.000	0.006
	(0.005)	(0.005)
if the head has elementary educ.	0.040***	0.014***
	(0.003)	(0.004)
if the head has secondary educ.	0.016***	0.001
	(0.003)	(0.003)
Constant	0.959***	1.355***
	(0.023)	(0.039)
R-squared	0.189	0.165
N	14,534	

Note: Dependent variable: food share. Estimations for the full sample of households. We instrument the log of per capita expenditure with the log of per capita income, following Deaton and Paxson (1998). Standard errors in parenthesis. ***p<0.01, **p<0.05, *p<0.1.

Table A.2. Full Set of Estimates of Table 3 (Panel A)

	All adults	**1, 2 adults**	**2, 3 adults**	**+3 adults**
log of per capita expenditure	-0.102***	-0.101***	-0.105***	-0.107***
	(0.005)	(0.006)	(0.007)	(0.013)
log of family size	-0.033***	-0.032***	-0.037***	0.006
	(0.004)	(0.006)	(0.013)	(0.022)
ratio of +65 to household size	-0.013**	-0.013**	0.005	-0.014
	(0.006)	(0.006)	(0.008)	(0.023)
Pampeana region	-0.023***	-0.022***	-0.023***	-0.028**
	(0.004)	(0.005)	(0.006)	(0.011)
Northeast region	0.016***	0.019***	0.010	-0.000
	(0.005)	(0.006)	(0.007)	(0.011)
Northwest region	-0.004	0.003	-0.010	-0.034**
	(0.006)	(0.008)	(0.009)	(0.014)
Cuyo region	-0.028***	-0.027***	-0.025***	-0.036***
	(0.006)	(0.007)	(0.008)	(0.013)
Patagonia region	-0.038***	-0.033***	-0.036***	-0.065***
	(0.005)	(0.006)	(0.008)	(0.014)
trimester 2	-0.000	0.002	0.002	-0.009
	(0.004)	(0.005)	(0.006)	(0.010)
trimester 3	-0.004	-0.000	-0.007	-0.020**
	(0.004)	(0.005)	(0.006)	(0.010)
trimester 4	0.010**	0.013***	0.006	-0.002
	(0.004)	(0.005)	(0.006)	(0.010)
age of the household head	0.001***	0.001***	0.000*	0.001
	(0.000)	(0.000)	(0.000)	(0.001)
gender of the household head	-0.012***	-0.014***	0.002	-0.006
	(0.003)	(0.003)	(0.004)	(0.008)
number of working adults	0.002	-0.000	-0.002	0.007
	(0.010)	(0.013)	(0.011)	(0.017)
if the head has elementary educ.	0.014***	0.017***	-0.002	-0.003
	(0.005)	(0.006)	(0.007)	(0.012)
if the head has secondary educ.	0.004	0.007*	-0.004	-0.012
	(0.004)	(0.004)	(0.006)	(0.010)
Constant	1.269***	1.256***	1.307***	1.292***
	(0.051)	(0.057)	(0.072)	(0.134)
R-squared	0.157	0.166	0.135	0.096
N	8,218	6,600	4,389	1,601

Note: Dependent variable: food share. Estimations for all households without children. Two-stage least squares estimation with controls. We instrument the log of per capita expenditure with the log of per capita income, following Deaton and Paxson (1998). Standard errors in parenthesis. ***p<0.01, **p<0.05, *p<0.1.

Table A.2. (Cont). Full Set of Estimates of Table 3 (Panel B)

	2 adults with or without children	**2 adults with 0 or 1 child**	**2 adults with 1 or 2 children**	**2 adults with + 2 children**
log of per capita expenditure	-0.118***	-0.114***	-0.123***	-0.123***
	(0.005)	(0.006)	(0.008)	(0.010)
log of family size	0.016	-0.033*	-0.067***	-0.073
	(0.033)	(0.017)	(0.018)	(0.238)
ratio of 0-5 to household size	-0.147***	-0.079***	-0.054***	0.092
	(0.049)	(0.025)	(0.019)	(0.568)
ratio of 6-11 to household size	-0.108**	-0.032	-0.017	0.134
	(0.050)	(0.026)	(0.017)	(0.568)
ratio of 12-17 to household size	-0.086*	-	-	0.151
	(0.050)	-	-	(0.568)
ratio of +65 to household size	0.005	0.004	-0.156**	0.213
	(0.007)	(0.008)	(0.079)	(0.180)
Pampeana region	-0.021***	-0.020***	-0.021***	-0.022***
	(0.005)	(0.006)	(0.007)	(0.008)
Northeast region	0.017***	0.015**	0.018**	0.019**
	(0.005)	(0.007)	(0.008)	(0.009)
Northwest region	-0.019***	-0.013*	-0.028***	-0.030***
	(0.006)	(0.008)	(0.009)	(0.011)
Cuyo region	-0.029***	-0.027***	-0.033***	-0.033***
	(0.006)	(0.008)	(0.009)	(0.010)
Patagonia region	-0.040***	-0.039***	-0.049***	-0.041***
	(0.005)	(0.007)	(0.008)	(0.009)
trimester 2	-0.004	0.002	-0.012**	-0.016**
	(0.004)	(0.005)	(0.006)	(0.007)
trimester 3	-0.001	-0.001	-0.006	-0.001
	(0.004)	(0.005)	(0.006)	(0.007)
trimester 4	0.010**	0.011*	0.003	0.007
	(0.004)	(0.006)	(0.006)	(0.007)
age of the household head	0.000	0.000	0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
gender of the household head	-0.001	-0.000	-0.011**	-0.005
	(0.003)	(0.004)	(0.005)	(0.006)
number of working adults	0.011	0.008	0.018*	0.014
	(0.007)	(0.010)	(0.009)	(0.010)
if the head has elem. educ.	0.005	0.001	0.010	0.012
	(0.005)	(0.007)	(0.008)	(0.009)
if the head has secondary educ.	-0.006	-0.000	-0.010*	-0.017**
	(0.004)	(0.005)	(0.006)	(0.007)
Constant	1.390***	1.381***	1.514***	1.471***
	(0.058)	(0.066)	(0.080)	(0.113)
R-squared	0.158	0.150	0.175	0.185
N	7,683	4,988	3,360	2,695

Note: Dependent variable: food share. Estimations for all households with 2 adults with and without children. Two-stage least squares estimation with controls. We instrument the log of per capita expenditure with the log of per capita income, following Deaton and Paxson (1998). Standard errors in parenthesis. ***p<0.01, **p<0.05, *p<0.1.

Table A.3. Full Set of Estimates of Table 4

	Q1	Q2	Q3	Q4	Q5
log of per capita exp.	-0.104***	-0.104**	-0.104***	-0.095***	-0.076***
	(0.027)	(0.041)	(0.031)	(0.036)	(0.014)
log of family size	-0.037***	-0.020	-0.034***	-0.029*	-0.014**
	(0.014)	(0.016)	(0.013)	(0.015)	(0.007)
ratio of 0-5 to hh size	-0.025	-0.095***	-0.068**	-0.068***	-0.048*
	(0.026)	(0.024)	(0.028)	(0.026)	(0.029)
ratio of 6-11 to hh size	0.021	-0.059***	-0.055**	-0.039*	-0.057**
	(0.021)	(0.021)	(0.023)	(0.022)	(0.024)
ratio of 12-17 to hh size	0.013	-0.016	-0.008	-0.017	-0.036
	(0.022)	(0.022)	(0.024)	(0.024)	(0.026)
Pampeana region	-0.019*	-0.019**	-0.023***	-0.031***	-0.011*
	(0.010)	(0.009)	(0.008)	(0.008)	(0.006)
Northeast region	0.046***	0.027***	0.023**	-0.009	-0.001
	(0.009)	(0.010)	(0.009)	(0.012)	(0.008)
Northwest region	-0.001	-0.006	-0.012	-0.021	0.008
	(0.012)	(0.013)	(0.014)	(0.019)	(0.013)
Cuyo region	-0.027**	-0.037***	-0.017	-0.036***	-0.020**
	(0.012)	(0.010)	(0.010)	(0.011)	(0.010)
Patagonia region	-0.051***	-0.053***	-0.026**	-0.050***	-0.027***
	(0.013)	(0.011)	(0.011)	(0.012)	(0.007)
trimester 2	-0.006	0.003	0.002	0.004	-0.007
	(0.008)	(0.007)	(0.007)	(0.007)	(0.006)
trimester 3	0.001	-0.004	0.000	0.002	-0.006
	(0.008)	(0.007)	(0.007)	(0.007)	(0.006)
trimester 4	0.011	0.016**	0.012	0.009	0.003
	(0.008)	(0.007)	(0.008)	(0.008)	(0.006)
age of the head	0.000	0.000	0.001**	0.001**	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
gender of the head	-0.008	-0.007	-0.013**	-0.005	-0.010**
	(0.006)	(0.006)	(0.005)	(0.005)	(0.004)
number of working adults	-0.019*	0.033***	-0.005	0.015	-0.016
	(0.011)	(0.012)	(0.013)	(0.014)	(0.016)
if elementary educ.	0.034***	0.029**	0.013	0.005	0.008
	(0.011)	(0.014)	(0.012)	(0.014)	(0.010)
if secondary educ.	0.017*	0.008	0.001	-0.001	0.006
	(0.009)	(0.010)	(0.008)	(0.008)	(0.006)
Constant	1.304***	1.252***	1.299***	1.190***	1.036***
	(0.248)	(0.381)	(0.300)	(0.357)	(0.145)
R-squared	0.093	0.100	0.104	0.103	0.106
N	2,801	2,929	2,901	3,043	2,860

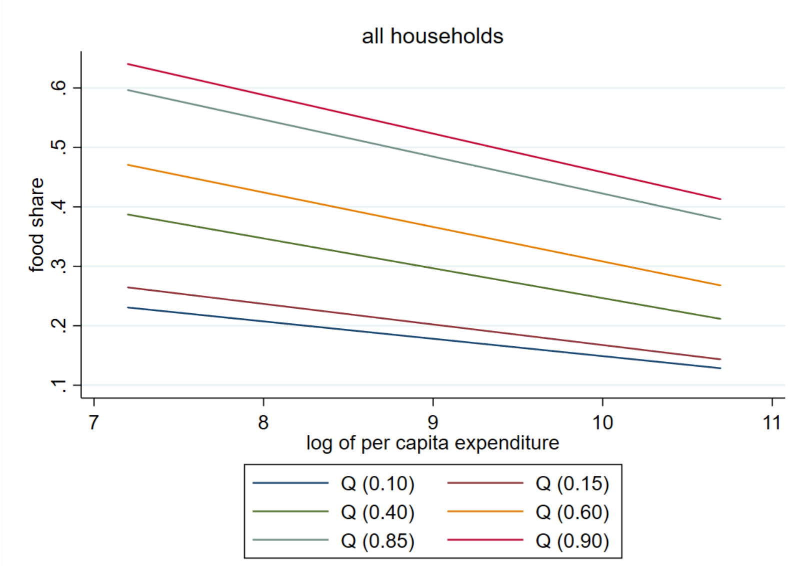
Note: Dependent variable: food share. Estimations for the full sample of households and by quintiles of the per capita income distribution. Two-stage least squares estimation with controls. We instrument the log of per capita expenditure with the log of per capita income, following Deaton and Paxson (1998). Standard errors in parenthesis. ***p<0.01, **p<0.05, *p<0.1.

Table A.4. Full Set of Estimates of Table 5

	Q10	Q15	Q40	Q60	Q85	Q90
log of per capita exp.	-0.048***	-0.060***	-0.099***	-0.126***	-0.161***	-0.176***
	(0.005)	(0.005)	(0.006)	(0.006)	(0.007)	(0.007)
log of family size	-0.002	-0.006	-0.018***	-0.036***	-0.064***	-0.080***
	(0.005)	(0.004)	(0.005)	(0.006)	(0.006)	(0.007)
ratio of 0-5 to hh size	-0.037***	-0.035***	-0.066***	-0.057***	-0.089***	-0.085***
	(0.013)	(0.014)	(0.012)	(0.015)	(0.018)	(0.023)
ratio of 6-11 to hh size	-0.030***	-0.036***	-0.040***	-0.029**	-0.033	-0.002
	(0.009)	(0.012)	(0.011)	(0.013)	(0.020)	(0.019)
ratio of 12-17 to hh size	0.003	0.006	-0.017	-0.006	-0.013	-0.018
	(0.010)	(0.010)	(0.013)	(0.014)	(0.019)	(0.019)
ratio of +65 to hh size	-0.009	-0.010*	-0.004	-0.012	-0.005	-0.015
	(0.006)	(0.006)	(0.007)	(0.008)	(0.009)	(0.010)
Pampeana region	-0.016***	-0.020***	-0.024***	-0.029***	-0.029***	-0.032***
	(0.003)	(0.004)	(0.005)	(0.005)	(0.006)	(0.006)
Northeast region	0.018***	0.018***	0.022***	0.016***	0.007	0.006
	(0.005)	(0.004)	(0.005)	(0.006)	(0.007)	(0.008)
Northwest region	-0.005	-0.008	-0.004	-0.017**	-0.031***	-0.033***
	(0.006)	(0.006)	(0.007)	(0.007)	(0.009)	(0.009)
Cuyo region	-0.022***	-0.024***	-0.029***	-0.032***	-0.044***	-0.053***
	(0.005)	(0.005)	(0.006)	(0.006)	(0.008)	(0.009)
Patagonia region	-0.034***	-0.041***	-0.051***	-0.054***	-0.039***	-0.038***
	(0.004)	(0.004)	(0.005)	(0.005)	(0.007)	(0.008)
trimester 2	0.002	0.005	0.008*	-0.003	-0.010	-0.014**
	(0.003)	(0.004)	(0.004)	(0.005)	(0.007)	(0.006)
trimester 3	0.005	0.008**	0.006	-0.000	-0.009	-0.014**
	(0.004)	(0.004)	(0.004)	(0.005)	(0.007)	(0.006)
trimester 4	0.013***	0.017***	0.020***	0.012**	0.005	0.001
	(0.003)	(0.003)	(0.004)	(0.005)	(0.007)	(0.007)
age of the head	0.000	0.000	0.000**	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
gender of the head	-0.004	-0.006**	-0.010***	-0.008**	-0.008*	-0.010**
	(0.003)	(0.003)	(0.003)	(0.004)	(0.005)	(0.005)
number of working adults	-0.002	0.006	0.002	0.012	0.001	-0.001
	(0.006)	(0.007)	(0.008)	(0.008)	(0.011)	(0.011)
if elementary educ.	0.020***	0.021***	0.019***	0.017***	0.007	0.000
	(0.004)	(0.005)	(0.005)	(0.006)	(0.008)	(0.007)
if secondary educ.	0.006*	0.005	0.001	-0.001	-0.008	-0.009*
	(0.003)	(0.003)	(0.004)	(0.004)	(0.006)	(0.005)
Constant	0.609***	0.739***	1.195***	1.506***	1.983***	2.163***
	(0.051)	(0.048)	(0.057)	(0.061)	(0.073)	(0.074)
Pseudo R-squared	0.0499	0.0607	0.0881	0.1051	0.1129	0.1142
N			14,534			

Note: Dependent variable: food share. Estimations for the full sample of households. Quantile regression with two-stage least squares estimation with controls. We instrument the log of per capita expenditure with the log of per capita income, following Deaton and Paxson (1998).Standard errors in parenthesis. ***p<0.01, **p<0.05, *p<0.1.

Figure A.1. Quantile Regression Estimates of the Engel Curve for Food



Note: Quantile regression estimates of Engel curves for food for all households.

Table A.5. Full Set of Estimates of Table 6 (Panel A)

	Q10	Q15	Q85	Q90
log of per capita exp.	-0.032***	-0.047***	-0.152***	-0.157***
	(0.005)	(0.005)	(0.010)	(0.010)
log of family size	0.003	-0.006	-0.066***	-0.074***
	(0.005)	(0.005)	(0.009)	(0.008)
ratio of +65 to hh size	-0.013*	-0.013*	-0.016	-0.021**
	(0.007)	(0.007)	(0.010)	(0.010)
Pampeana region	-0.015***	-0.017***	-0.026***	-0.028***
	(0.005)	(0.005)	(0.007)	(0.009)
Northeast region	0.013**	0.014**	0.009	0.013
	(0.006)	(0.006)	(0.008)	(0.010)
Northwest region	-0.002	-0.002	-0.015	-0.008
	(0.008)	(0.008)	(0.011)	(0.013)
Cuyo region	-0.021***	-0.023***	-0.037***	-0.041***
	(0.006)	(0.007)	(0.009)	(0.012)
Patagonia region	-0.027***	-0.033***	-0.034***	-0.029**
	(0.005)	(0.005)	(0.010)	(0.011)
trimester 2	0.001	0.005	-0.017*	-0.022***
	(0.005)	(0.005)	(0.009)	(0.008)
trimester 3	0.002	0.004	-0.019**	-0.028***
	(0.004)	(0.005)	(0.008)	(0.008)
trimester 4	0.008*	0.015***	-0.002	-0.008
	(0.005)	(0.005)	(0.008)	(0.009)
age of the head	0.000**	0.000**	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
gender of the head	-0.003	-0.007**	-0.012**	-0.009
	(0.003)	(0.003)	(0.005)	(0.006)
number of working adults	0.002	-0.002	0.006	-0.006
	(0.011)	(0.011)	(0.018)	(0.020)
if elementary educ.	0.020***	0.023***	0.006	0.007
	(0.006)	(0.006)	(0.010)	(0.009)
if secondary educ.	0.005	0.011**	-0.000	-0.000
	(0.004)	(0.004)	(0.008)	(0.007)
Constant	0.443***	0.612***	1.880***	1.964***
	(0.052)	(0.054)	(0.103)	(0.102)
Pseudo R-squared	0.0401	0.0494	0.1055	0.1077
N		8,218		

Note: Dependent variable: food share. Estimations for all households without children. Quantile regression with two-stage least squares estimation with controls. We instrument the log of per capita expenditure with the log of per capita income, following Deaton and Paxson (1998).Standard errors in parenthesis. ***p<0.01, **p<0.05, *p<0.1.

Table A.5 (Cont.). Full Set of Estimates of Table 6 (Panel B)

	Q10	Q15	Q85	Q90
log of per capita exp.	-0.058***	-0.067***	-0.167***	-0.178***
	(0.007)	(0.007)	(0.009)	(0.010)
log of family size	0.007	0.015	0.055	0.061
	(0.044)	(0.048)	(0.053)	(0.053)
ratio of 0-5 to hh size	-0.073	-0.081	-0.286***	-0.326***
	(0.063)	(0.066)	(0.081)	(0.086)
ratio of 6-11 to hh size	-0.056	-0.076	-0.208**	-0.241***
	(0.067)	(0.070)	(0.087)	(0.087)
ratio of 12-17 to hh size	-0.024	-0.038	-0.190**	-0.231***
	(0.067)	(0.072)	(0.083)	(0.080)
ratio of +65 to hh size	-0.002	-0.006	0.010	0.008
	(0.008)	(0.010)	(0.014)	(0.016)
Pampeana region	-0.006	-0.009	-0.033***	-0.039***
	(0.005)	(0.006)	(0.008)	(0.008)
Northeast region	0.016**	0.017***	0.018*	0.011
	(0.007)	(0.007)	(0.009)	(0.010)
Northwest region	-0.003	-0.008	-0.040***	-0.047***
	(0.007)	(0.008)	(0.012)	(0.012)
Cuyo region	-0.015**	-0.017**	-0.044***	-0.048***
	(0.007)	(0.008)	(0.011)	(0.013)
Patagonia region	-0.032***	-0.039***	-0.031***	-0.032***
	(0.006)	(0.006)	(0.010)	(0.010)
trimester 2	-0.002	0.002	-0.008	-0.008
	(0.005)	(0.006)	(0.009)	(0.008)
trimester 3	0.005	0.007	-0.008	-0.013
	(0.005)	(0.005)	(0.008)	(0.009)
trimester 4	0.015***	0.016***	0.002	-0.007
	(0.005)	(0.006)	(0.008)	(0.009)
age of the head	-0.0001	-0.0001	0.0001	-0.0001
	(0.000)	(0.000)	(0.000)	(0.000)
gender of the head	0.002	-0.001	0.002	-0.002
	(0.004)	(0.004)	(0.006)	(0.006)
number of working adults	0.0001	0.011	0.0001	0.010
	(0.009)	(0.009)	(0.014)	(0.012)
if elementary educ.	0.005	0.012	-0.013	-0.014
	(0.008)	(0.008)	(0.010)	(0.010)
if secondary educ.	-0.004	-0.005	-0.022***	-0.019***
	(0.005)	(0.005)	(0.007)	(0.007)
Constant	0.701***	0.794***	1.977***	2.126***
	(0.075)	(0.076)	(0.101)	(0.110)
Pseudo R-squared	0.0457	0.0534	0.1171	0.1217
N	7,683			

Note: Dependent variable: food share. Estimations for all households with 2 adults with and without children. Quantile regression with two-stage least squares estimation with controls. We instrument the log of per capita expenditure with the log of per capita income, following Deaton and Paxson (1998).Standard errors in parenthesis. ***p<0.01, **p<0.05, *p<0.1.