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Focus on

Measuring individual levels of consumption: a challenge for economic theory and data collection

How do you measure individual levels of consumption? This deceptively simple question is one of the oldest and hardest in modern economic science. One of the purposes of consumer budget surveys is to measure the consumption of the population's households. These surveys cover a representative sample from which average consumption measures can be extrapolated for the individuals in the population. However, the individual consumption measures obtained from these surveys are individual in appearance only. These surveys in actual fact measure the total consumption of the household to which the individuals belong. "Individual" consumption is then obtained by dividing total consumption by the number of household members (per capita consumption). This *Focus* presents the strategies developed by economic science to estimate real individual consumption from total household consumption, and then describes an innovative survey mechanism that can be used for a more direct evaluation.

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On the impossibility of directly measuring individual consumption

Consumption per capita or per adult equivalent[1] can only provide a precise measure of individual consumption if consumer spending is equally distributed within the population's households. Yet nothing guarantees that this strong assumption always holds. It is more reasonable to refrain from making this assumption when households have more than one source of income, when members do not necessarily all have the same decision-making power, and in the case of non-nuclear households made up of extended family members, a case frequently observed in developing countries. In one of the first studies on this subject, Haddad and Kanbur (1990) take data on the Philippines to show that neglect of intra-household food consumption inequalities gives rise to a 30% to 40% underestimation of the levels of inequalities in well-being, such as they are measured by the ratio of calorie intake to calorie requirement in view of age, gender and, where relevant for women, pregnancy.

[1] Consumption per adult equivalent is obtained by dividing the household's consumption by the number of household members. This function factors in the economies of scale derived from the fact that some consumption is shared (e.g. housing-related expenditure) and that, depending on their age, members do not have the same level of consumption (in the case of food expenditure, in particular).

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The authors draw their conclusions from data taken from an original survey in which mothers were asked to note down the food intake of each family member over a day. Although such data are rare in practice, the fact that they only cover food consumption reduces their scope for use in understanding consumption inequalities. Moreover, asking respondents to recall food intake by household members can give rise to large measurement errors, which could go towards explaining the results obtained by the authors.

Measuring individual consumption levels directly is feasible in theory, but impossible in practice. For food, the only way of minimising measurement errors is for the quantities consumed by the household members to be systematically identified and weighed before consumption. In developed countries, households can be given scales to do so themselves. Yet this is an expensive arrangement and not really viable in developing countries where literacy and technical skills are low. Then there is the fact that food intake varies from day to day. It is therefore preferable to record quantities consumed over a number of days to limit the risks of error. This naturally has survey cost implications. Last but not least, the method clearly has limitations in countries where the custom is for everyone to share the same plate or pot (see Ferro-Luzzi, 2002, for a summary of the different methods). Measuring the individual consumption of the other goods and services acquired by the household raises other problems due, in particular, to the fact that many of them are public goods: water and electricity, for example, constitute a share of household consumption that is virtually impossible to divide up among the members.

Individual consumption can only be evaluated at the cost of various assumptions

Economic science has sought to get round these problems by using a theoretical modelling of household behaviour to estimate individual consumption from the observation of aggregate consumption. This implies the satisfaction of certain highly restrictive conditions as to what needs to be observed and as to the supposed behaviour of the household members.[2] In these models, called *collective* models, the first assumption is that the household chooses the level of consumption and leisure for each of its members with Pareto optimality. Given the household members' observed consumption and leisure, this means that there is no other distribution of consumption and leisure that all the household members would prefer. Secondly, there needs to be a way of observing the goods that each member alone consumes (called *exclusive* goods) or a means of identifying the amount of consumption of at least one good by each household member (termed *assignable* goods). Under these two conditions, information can be deduced as to how the resources are shared out, provided observations are made as to how consumption of the exclusive or assignable goods changes following a variation in the members' individual incomes or the household's total income. This observation can be used to evaluate, by extrapolation, how a given member's consumption varies according to his or her own income. However, this information is still not enough to determine each member's *level* of consumption. Other assumptions need to be added to do so.

[2] Seminal articles in this field are those by Chiappori (1988, 1992), Bourguignon and Chiappori (1992), and Browning *et al.* (1994). See Chiappori and Meghir (2014) for a recent review of the literature and Deaton (1997) for a discussion focusing on the context of developing countries.

One solution proposed by Lise and Seitz (2011), in a study of inequalities in couples without children in the United Kingdom, is to assume that if the wages of each member of the couple are identical, then they each have the same access to the household's resources. This assumption places an additional restriction on the relations between each member's wage and resources available for consumption. This enables the identification of the sharing rule, i.e. each member's level of consumption. Another solution is to assume that both members of the couple retain the same preferences when they are married as when they were single. The sharing rule can be identified here from the observation of the consumption of singles in addition to the consumption of married couples (Browning, Chiappori & Lewbel, 2013).

Can this literature be applied to the context of developing countries? One key problem, aside from the constraints on the observability of assignable and exclusive goods and the assumption of Pareto optimality, is that the theoretical restrictions that enable the sharing rule to be identified apply to two-person households. They cannot be used to reconstitute individual consumption when there are more than two household members. One way of overcoming the problem is to consider categories of individuals in those households with more than two members. For example, Subramanian and Deaton (1991) divide the household into adult and child members and examine how the consumption of adult goods (alcohol, cigarettes, etc.) varies when the household grows following a birth. Given constant income, the increase in household size can lead the adults to reduce their own share in the consumption. An examination of differences in the adjustment of expenditure on adult goods by newborn gender reveals whether the households discriminate by sex. The findings of the study of data on the Indian State of Maharashtra collected in the early 1980s prove rather surprising: no discrimination is observed against female children. These results were confirmed later by Subramanian (1994) for other Indian states, and then by Ahmad and Morduch (1993) for Bangladesh, Deaton (1997, page 240) for Pakistan, and Rudd (1993) for Taiwan. None of these studies finds evidence of positive discrimination in favour of male children in intra-household resource allocation, in situations where there are many reasons to suspect the contrary. The contrast between these results and what can be observed elsewhere, supporting the reality of discrimination against girls, could be explained by the fact that although food and other everyday consumer goods may well normally be allocated equitably within the studied populations' households, there is a possibility that not all the household members are treated the same way in times of crisis created by a household income shock. In any case, only the variation in resources allotted to adults and children is identified. The level of these resources remains unknown. It is therefore impossible to calculate inequality indicators.

More recently, Dunbar, Lewbel and Pendakur (2012) have explored another avenue. Like Subramanian and Deaton, they separate the household into categories of members, but this time into three groups: men, women and children.[3] Household consumption is still assumed to

[3] The children are not divided by gender. This is not a compulsory restriction and nothing in principle rules out having a fourth category. In this modelling, the number of categories depends on the possibility of observing at least one good whose consumption can be assigned to each category or the existence of exclusive goods. In other words, if an observation can be made of goods consumed solely by male children and others solely by female children, there is nothing to prevent the differentiation of the children by gender.

be Pareto-optimal and the consumption of at least one assignable good or exclusive goods per category still needs to be observed in order to identify the consumption of each category of member. However, the authors show that the consumption of each category of member can be evaluated by imposing additional assumptions as to the nature of the household members' preferences and, more specifically, the shape of the Engels curves, i.e. the relationship between consumption and the level of the members' resources. This modelling is used to estimate the poverty of men, women and children separately in Malawi and analyse the influence of household characteristics. They conclude that failure to consider intra-household inequalities results in child poverty being largely underestimated.

The work by Dunbar, Lewbel and Pendakur represents an advance in the understanding and invention of methods to open the household black box and estimate household members' individual consumption, particularly their most vulnerable members: the children. However, aside from the theoretical assumptions on which this advance is based, the proposed method's scope is limited by what needs to be observed to be able to conduct the estimation. The authors identify individual consumption from the observation of spending on clothing for each category of member. The assumption made is therefore that clothes are assignable goods. This strategy presents a number of problems. Firstly, the clothes must not be able to be transferred from one person to another and especially not between member categories (the dress bought by the mother must at no moment be worn by her daughter). Secondly, consumption of the clothing is equated with the outlay made to purchase it. This implicitly assumes that clothes are not durables, bringing more than one year of satisfaction to their owner.[4] Thirdly, the purchase of clothes by one household member cannot have an indirect effect on the well-being of another member. In other words, each member must be indifferent to the clothes worn by the other members. These are strong conditions and meeting them is obviously far from guaranteed, but their validity can be statistically evaluated.

Even assuming that assignable and exclusive goods can be identified and their consumption observed, the strategy proposed by Dunbar, Lewel and Pendakur – and by the literature on collective models in general – is not applicable to all contexts. In West Africa, where extended households are more the rule than the exception and where polygamy is frequent,[5] the estimation of women and children's average consumption, albeit a definite advance over current practice, is unlikely to return an accurate measure of inequalities within households. In polygamous families, in particular, there is nothing to say that all women, and consequently all children, have access to the same level of resources. Women may have their own resources from their work and the household head may not necessarily make up the difference. Furthermore, a woman may be married to her husband for different reasons: the marriage may have been arranged by the husband's parents, may be a marriage for love or may even be a levirate marriage based on the custom whereby a deceased man's younger brother marries his widowed sister-in-law to prevent her from being left alone. In these circumstances, the possibility that the nature of the marital union may have an impact on the wives' share and

[4] One year is the period over which consumption is generally measured.
[5] In Senegal in the mid-2000s, for example, 23% of married men and 36% of married women were in a polygamous relationship.

consequently their children's share of resources cannot reasonably be ruled out. Yet inequalities between women and between children cannot be captured by the modelling proposed by the collective models. The problem here is that although surveys might be able to report on purchases of clothes for children in general, they cannot identify which children receive the clothes. The questionnaires have to be altered to take into account the non-nuclear structure of the households.

An innovative survey mechanism

The Poverty and Family Structure (PFS) survey conducted in Senegal in 2006-2007 and then in 2010-2012 is an exception from this point of view. As the survey's name suggests, its purpose was to collect data to explicitly factor in the complex structure of Senegalese households to the analysis of poverty (see De Vreyer et al., 2008, for a detailed description). Applying a practice similar to that already used in censuses conducted by the National Statistics and Demographics Agency of Senegal prior to the 2003 census, "cells" were identified within the households to measure consumption inequalities among household members, among other things. Each cell is made up of one adult and the individuals dependent on that adult. In a polygamous family, then, each woman and her children form a separate cell and the household head forms a separate cell. Any nephews, nieces, fostered children, parents and so on living in the household form a separate cell if they are accompanied by dependents. Otherwise, they belong to the cell of the person on whom they depend. The questionnaire is designed in such a way as to separate out common household consumption from each cell's specific consumption by interviewing both the household head and the head of each cell.

This mechanism cannot measure individual levels of consumption, but it does represent an advance compared with the usual surveys as it can be used to evaluate inequalities among the household cells' levels of consumption. When processed, these data reveal the extent and nature of the inequalities within Senegalese households. In a study in progress with Sylvie Lambert (De Vreyer & Lambert, 2017) using data from the first wave, I show that intra-household inequality as measured by the cells' per capita consumption differentials represents 16% of total inequalities in Senegal, and that over 12% of the poor live in households perceived as non-poor when their level of consumption per adult equivalent is evaluated without considering internal inequalities. The study also shows that interviewing several people in extended households gives rise to a serious re-evaluation of their consumption. The usual practice of asking solely the household head to report on all the members' consumption makes for substantial omissions due simply to the fact that the household head cannot observe everyone's consumption. This is increasingly true the more complex the household structure and the higher the number of their sources of income. Consequently, the level of inter-household inequalities in Senegal appears to be largely underestimated by the surveys usually conducted. The data from the PFS survey return a Gini coefficient evaluation of 0.56, much higher than the value of 0.40 in 2011 given by the World Bank's World Development Indicators, for example.

The second wave of PFS survey data tracked all the individuals identified in Senegal in the first period and interviewed them again along with their entire host household. The panel dimension, combined with the particular way in which the consumption data were collected, provides the possibility to precisely analyse the determinants and outcomes of individual trajectories over an average period of 4.5 years and answer as yet relatively unexplored questions. With Björn Nilsson, I take the data from the two survey waves to examine the effectiveness of offsetting mechanisms potentially at work in households to protect members who suffer a negative shock (De Vreyer & Nilsson, 2017). The shock chosen to identify the mechanism's effectiveness is the death of a cell head. The findings show that, within the households, not all the children suffer the same negative repercussions: only those who belong to the deceased person's cell are affected. They go to school less frequently, the boys have a higher probability of working and the girls are more likely to be fostered outside the household. These findings therefore confirm the intuition that inequality in levels of consumption among household members is just one aspect among others in the measurement of inequalities and that coping processes in times of crisis are another.

Conclusion

The measurement of individual consumption from consumer budget surveys is restricted to taking average consumption per capita or per adult equivalent in the household to evaluate the consumption of the individuals comprising the household. This practice overlooks consumption inequalities within the households. Collective models of household behaviour developed since the early 1990s elucidate the conditions under which individual consumption can be reconstituted from the household's total consumption in the case of couples without children, provided the consumption of exclusive or assignable goods can be observed. The approach recently proposed by Dunbar, Lewbel and Pendakur (2012), under household behaviour assumptions, has opened up the household black box a little more with the evaluation of household members' individual consumption, including their most vulnerable members: the children. However, the approach has limitations in terms of its applicability to the consumption behaviour of the extended households frequently found in Sub-Saharan Africa. First of all, the validity of the household behaviour assumptions used to identify individual consumption is questionable. In view of their restrictive nature, it is actually highly improbable that they would hold in general. Is then this assumed behaviour, which does not reflect reality, an acceptable approximation? There is no answer to this empirical question for the time being. Secondly, this theoretical framework cannot be applied to extended households without altering the survey questionnaires to explicitly take account of their complex structure. The Poverty and Family Structure survey conducted in Senegal has taken a first step in this direction, but the tool could definitely be improved. Thought could be given, for example, to applying collective model reasoning to the cells identified in the extended households. Yet this assumes further improving data collection to better identify exclusive and assignable goods, and the question remains as to the validity of the underlying theoretical assumptions.

In any case, what the experiment in Senegal with the Poverty and Family Structure survey shows is that survey questionnaires designed to measure consumption in nuclear families in

developed countries need to be seriously adapted to measure the same thing in Southern countries. One questionnaire model cannot fit all situations. The distribution of resources within households depends on their structure and their socioeconomic and cultural environment. Ignoring this and acting "as if" the household head were an omniscient demiurge watching over the equality of treatment among the members is likely to result in some serious errors.

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