Individual welfare analysis for collective households ☆

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ABSTRACT

We propose novel tools for the analysis of individual welfare on the basis of aggregate household demand behavior. The method assumes a collective model of household consumption with the public and private nature of goods specified by the empirical analyst. A main distinguishing feature of our approach is that it builds on a revealed preference characterization of the collective model that is intrinsically nonparametric. We show how to identify individual money metric welfare indices from observed household demand, along with the intrahousehold sharing rule and the individuals' willingness-to-pay for public consumption (i.e. Lindahl prices). The method is easy to use in practice and yields informative empirical results, which we demonstrate through both a simulation exercise and an empirical application to labor supply data drawn from the Panel Study of Income Dynamics.

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1. Introduction

The analysis of individual welfare is at the core of the applied welfare literature given its relevance for a large variety of policy-relevant empirical questions. For example, when assessing inequality in a society, one of the basic objects of interest is the consumption level of individuals. If the within-household distribution of resources is highly unbalanced, inequality between individuals will be very different from inequality between aggregate households. In a similar spirit, it is individuals who have utilities and not households. This pleads for using measures of *individual* welfare when empirically evaluating the impact of policy reforms, such as tax reforms.

The empirical analysis of individual welfare raises two important challenges. Firstly, at the empirical level, the analyst usually only observes the aggregate household expenditures. The within-household sharing of resources is typically not observed.[4] Secondly, at the conceptual level, an important issue relates to the fact that households are intrinsically characterized by public consumption,

[4] In the past few years, more attention is given to the gathering of information on the consumption of individuals inside households (see, for example, Browning and Goertz, 2012 and Cherchye et al., 2012). Datasets with such information are still not widespread, though.

which simultaneously benefits the different household members. The question remains how to evaluate this public consumption in the context of individual welfare analysis.

This paper presents a novel empirical method for the analysis of individual welfare that addresses both challenges. It is based on observed aggregate household consumption behavior, and it effectively accounts for intrahousehold public consumption in the evaluation of individual welfare.

1.1. Collective household consumption

We take as a starting point that the collective model of Apps and Rees (1988) and Chiappori (1988, 1992) provides a well-suited conceptual framework for dealing with these questions.[5] The attractive feature of this model is that it explicitly recognizes that households are not unitary decision making units, but consist of multiple decision makers with own rational preferences. Observed household consumption is regarded as the outcome of a within-household interaction process. The model (only) assumes that this process leads to Pareto-efficient intrahousehold allocations. Such a non-unitary approach to modeling households' consumption behavior is particularly relevant for the analysis of individual welfare, as it naturally allows us to account for the possibility of an unequal distribution of resources and welfare within households. See, for example, Chiappori and Meghir (2014) and Chiappori (2016) for extensive argumentation.

A main distinguishing feature of our method is that it builds on a revealed preference characterization of the collective model that is intrinsically nonparametric (in the tradition of Afriat, 1967, Diewert, 1973 and Varian, 1982). The method does not require an explicit parametric/functional specification of the intrahousehold decision process (e.g. individual preferences). This is particularly attractive from a conceptual point of view. From an empirical perspective, one potential disadvantage of this robust methodology is that the welfare-economic concepts will not be "point" identified but "set" identified (yielding lower and upper bounds on the individual welfare measures, as we explain in Sections 3 and 4). However, if the identified sets are tight (i.e. sharp upper and lower bounds), the practical relevance of this issue is low. Moreover, if the nonparametrically identified sets turn out to be wide, then this basically demonstrates that any more specific welfare-economic conclusion obtained from a parametric analysis is likely to depend heavily on the (nonverifiable) functional structure that is imposed.

1.2. Individual welfare analysis

We focus on a collective model with public and private consumption, in which the private and public nature of commodities is specified by the empirical analyst. This resembles the set-up of Chiappori and Ekeland (2009), who showed identifiability of all welfare-relevant aspects of this model under the exclusion restriction that, for each member, there exists at least one good that is not consumed by this member. Particularly, these authors showed that, if there are two exclusive goods and only public goods (i.e., no non-exclusive private goods), then the structural components of the model (including the individual utilities, individual prices and sharing rule) are completely identified. However, the strategy that we propose in the current paper in principle also admits non-exclusive private goods. Furthermore, we follow a nonparametric revealed preference approach, whereas Chiappori and Ekeland adopted a so-called differential approach. Our identification strategy yields robust nonparametric bounds instead of point estimates of the sharing rule and the MMWI.

We start from the revealed preference characterization of the collective model by Cherchye et al. (2011), and we develop a method that can provide the empirical tools for analyzing the individual welfare questions described above. First, we show how to identify the intrahousehold *sharing rule*, which defines the within-household distribution of resources.[6] Next, we build on this sharing rule identification to subsequently identify the individuals' *money metric welfare indices*, which define the income that individuals need to be equally well off (in utility terms) as a single as in their current households. Chiappori and Meghir (2014) particularly advocated the use of these indices for individual welfare analysis based on the collective model in the presence of public goods.

As we will explain, both the sharing rule and the money metric welfare indices form special cases of the general concept of money metric utility, which is defined as the minimum amount of money at reference prices that an individual needs to attain a given welfare level. The difference lies in the reference prices that are used. While the sharing rule evaluates the expenditures on public goods at shadow (i.e. Lindahl) prices, money metric welfare indices evaluate these expenditures at market prices. Chiappori and Meghir (2014) argue that money metric welfare indices are especially well-suited for (intra-individual) welfare comparisons, because they quantify welfare changes at constant prices for the given individuals. Variation in the sharing rule, by contrast, reflects not only changes in true welfare but also changes in the shadow prices, which are strongly context-dependent. For instance, these shadow prices will generally depend on the individual's current partner, and are subject to change when the individual becomes single or enters a new relationship. Therefore, the sharing rule is appropriate for intra-individual welfare comparisons only insofar as the individual's environment remains the same (e.g. to compute individual poverty rates). Money metric welfare indices, on the other hand, are robust to a change of environment and, in such a case, can capture the actual individual welfare changes more consistently (e.g. to compute the individual compensation that is needed to be equally well off after divorce as in the current marriage). This motivates our attempt to set identify not only the sharing rule but also money metric welfare indices.

We will demonstrate the practical usefulness of our identification tools by means of a simulation exercise, as well as through an empirical application to data drawn from the Panel Study of Income Dynamics (PSID). Our simulation exercise will illustrate the collective consumption mechanics underlying our identification method. Next, our empirical application is the first one that uses nonparametric revealed preference techniques to implement the collective money metric welfare concept advocated by Chiappori and Meghir (2014) for observational household consumption data. Through various exercises, we will show that our method allows for an informative empirical analysis. It has substantial empirical bite, despite its nonparametric orientation. For example, our results for the money metric welfare index enable us to quantify the households' economic gains through public consumption (i.e. scale economies), and to assess the effects of household income and relative wages on the intrahousehold (money metric) welfare distribution. In addition,

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[5] The collective model has become the workhorse model in the family economics literature. It has been proven to be a viable alternative to the unitary model that is deficient when used in a context of multiperson decision making. See, for example, Fortin and Lacroix (1997), Browning and Chiappori (1998), Chiappori et al. (2002), and Attanazio and Lechene (2014) for empirical evidence based on a parametric specification of household demand, and Cherchye and Vermeulen (2008) and Cherchye et al. (2009, 2011) for nonparametric evidence based on the revealed preference characterization of the collective consumption model.

[6] The sharing rule takes a central position in empirical applications of collective consumption models. See, for example, Browning et al. (1994), Chiappori et al. (2002), Blundell et al. (2005), Lewbel and Pendakur (2008), Bourguignon et al. (2009), Couprie et al. (2010), Lise and Seitz (2011), Bargain and Donni (2012), Cherchye et al. (2012), Browning et al. (2013) and Dunbar et al. (2013) for various applications of the collective consumption model that make use of the sharing rule concept.