# A collective labor supply model with complementarities in leisure: Identification and estimation by means of panel data

Pierre-Carl Michaud [a,b,c,1], Frederic Vermeulen [d,*,2]

[a] University of Quebec at Montreal (UQAM), Canada
[b] CIRPEE, Canada
[c] RAND, United States
[d] Netspar, CentER, Tilburg University, P.O. Box 90153, NL-5000 LE Tilburg, The Netherlands

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## ABSTRACT

We present a novel identification strategy for a collective labor supply model that allows for complementarities in leisure (i.e., individuals may enjoy leisure more in company of their spouse). Individual preferences and the Pareto weights (which capture the intra-household bargaining process) are identified by making use of panel data with couples and individuals who became a widow(er) in the observation period, along with the assumption that an individual's preferences can only change in a particular manner after the spouse's death. The change in preferences comes from changes in observable variables that can be controlled for (like mental health) and from the loss of the possibility to jointly enjoy leisure after the couple's dissolution. We apply the model to American households coming from the first nine waves of the Health and Retirement Study (1992–2008) and show that complementarities in leisure are indeed important when modeling spouses' labor supply choices.

## 1. Introduction

A burgeoning literature in microeconomics is that on intra-household decision-making models. The emergence of this field can at least be partly attributed to a growing discomfort with the standard unitary model, which assumes that a household behaves as a single decision maker, irrespective of the number of individuals in the household. One major problem with the unitary approach is that there is much empirical evidence that does not fit multi-person household data very well. Slutsky symmetry and negativity are usually rejected when confronted with consumption or labor supply data (see Fortin and Lacroix, 1997; Browning and Chiappori, 1998; Vermeulen, 2005; Cherchye and Vermeulen, 2008; Cherchye et al., 2009, for some recent

examples). Evidence suggests that intra-household bargaining aspects within multi-person households cannot be ignored in general.

One particularly attractive model within the broad literature on intra-household decision-making is the so-called collective model (Chiappori, 1988). This model starts from the basic assumption that a multi-person household is formed by individuals with their own rational preferences, while these individuals are engaged in a bargaining process that results in Pareto-efficient intra-household allocations. Interestingly enough, the collective model entails theoretical implications that seem more difficult to reject when tested on multi-person household data (see Browning and Chiappori, 1998; Chiappori et al., 2002; Vermeulen, 2005; Cherchye and Vermeulen, 2008; Cherchye et al., 2009).

Closely related to the testability of demand or labor supply models is the issue of identification: can we recover the underlying structural model from observed behavior?[3] This is crucial from a normative point of view. Welfare analyses based on a model that is observationally equivalent to another model that is normatively different

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* Corresponding author. Tel.: +31 13 466 3234.
E-mail addresses: michaud.pierre-carl@uqam.ca (P.-C. Michaud), frederic.vermeulen@uvt.nl (F. Vermeulen).

[3] One could argue that we should use 'identifiability' instead of 'identification'. See Chiappori and Ekeland (2009) for a discussion.

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would be quite unreliable. The unitary model is very clear on identification: it is well known that a unique preference ordering can be recovered from observed demand or labor supply that satisfies the standard unitary restrictions. The identification question is more complex in collective models. The question here is whether spouses' preferences and the intra-household bargaining process can be identified from couples' observed consumption or labor supply alone. Chiappori (1988) showed that if preferences are egoistic or of the Beckerian caring type, then a so-called sharing rule (which summarizes how household means are allocated to the household members) can be identified up to a constant, whereas individual preferences can be identified up to a translation, by means of couples' observed labor supply. Similar identification results with public goods inside the household, non-participation and/or taxation can be found in Donni (2003), Blundell et al. (2005), and Blundell et al. (2007).

Although convenient, the widely used assumption of egoistic or caring preferences is rather restrictive. Both types of preferences imply that an individual's marginal rate of substitution between own leisure and consumption remains unaffected by his or her spouse's labor supply. As soon as other preference structures are considered, alternative (but related) assumptions must be introduced to obtain identification. For example, Chiappori and Ekeland (2009) demonstrated that if all commodities are publicly consumed, then it generally suffices to have one exclusive commodity per household member for identification.

In this paper, we present a collective labor supply model with complementarities in leisure and where a Hicksian consumption good is publicly consumed. We propose a novel approach to obtain identification. The identification strategy is built upon the assumption that an individual's preferences can only change in a particular manner after the dissolution of the couple. The change in preferences comes from changes in observable variables that can be controlled for and from the loss of the possibility to jointly enjoy leisure after the couple's dissolution. To pursue our identification strategy, we need longitudinal data where we observe labor supply choices of individuals who are observed as member of a couple and as a single (that is, after the household's dissolution). Preference parameters capturing the individual trade-off between consumption and leisure are identified by means of singles' observed labor supply choices, while the change in preferences due to marriage, along with parameters capturing the intra-household bargaining process are identified through observed labor supply choices of individuals in couples. Intuitively, our collective labor supply model can be identified due to the fact that we also make use of labor supply responses of singles. Since there is, by definition, only one decision maker in such households, the unitary model can be directly applied to singles and it is completely identified if its restrictions are satisfied. [4]

We apply our model to a sample of older couples that were drawn from the first nine waves of the Health and Retirement Study (HRS). An important characteristic of our data set is that we select all couples that eventually dissolve during the covered period because one of the spouses becomes a widow(er). The channels through which the death of a spouse has an impact on the survivor's preferences are assumed to be shocks in observable variables like (mental) health, and the loss of the possibility to jointly enjoy leisure. Of course, we also take account of changes in economic resources following the death of one partner.

The illustration of our identification strategy to the HRS is interesting in its own right. However, it is also important from a policy point of view. For example, there is considerable evidence that retirement decisions of spouses are coordinated. Indeed, the tendency of husbands and wives to retire together, or very shortly after each other, is well documented (see, e.g., Blau, 1998; Gustman and Steinmeier, 2000; Maestas, 2001; Michaud, 2005; see Hamermesh,

2002 for a similar observation in non-elderly couples' labor supply). Complementarities in spouses' leisure are a likely explanation for such retirement patterns and we show that these are important to capture joint retirement.

The rest of the paper is structured as follows. In Section 2, we present a collective labor supply model with complementarities in leisure and show how individual preferences and the Pareto weights (which capture the intra-household bargaining process) can be recovered by means of our identification strategy. Section 3 describes the empirical model. The data and empirical results are discussed in Section 4. Section 5 concludes.

## 2. Collective labor supply with complementarities in leisure

We focus on households that consist of two individuals $m$ and $f$. Let $h^j$, $l^j$ and $l_{max}$ ($j = m,f$) denote individual $j$'s labor supply, leisure and time endowment, such that $h^j = l_{max} - l^j$. Wages are denoted by $w^m$ and $w^f$, while the household's non-labor income is given by $y$. There is only one Hicksian commodity with a price that is normalized to one. Consumption of this good is denoted by $c$. The household's budget constraint is thus equal to[5]

$$c \leq w^m h^m + w^f h^f + y. \tag{1}$$

We assume that preferences of each member allow for complementarities in leisure and that the Hicksian commodity is publicly consumed. Preferences of individual $j$ ($j = m,f$) may depend on a vector of individual characteristics $\mathbf{z}^j$ and are represented by the direct utility function:

$$v^j\left(l^m, l^f, c; \mathbf{z}^j\right), \tag{2}$$

which is continuously differentiable, concave and increasing in $l^j$ and $c$.

Both members are involved in a bargaining process that, together with individual preferences, determines how the household's full income is allocated to leisure and consumption. Following Chiappori (1988), we assume that this decision process leads to Pareto-efficient outcomes. Observed allocations are thus assumed to be a solution to the following program:

$$\max_{l^m, l^f, c} \mu v^m\left(l^m, l^f, c; \mathbf{z}^m\right) + (1-\mu)v^f\left(l^m, l^f, c; \mathbf{z}^f\right) \tag{3}$$

subject to

$$c \leq w^m\left(l_{max} - l^m\right) + w^f\left(l_{max} - l^f\right) + y.$$

As is clear from Eq. (3), male and female utilities are weighted by respectively $\mu$ and $(1-\mu)$. Typically, these Pareto weights depend on the individuals' wages and the household's non-labor income. Moreover, Pareto weights may also depend on so-called 'distribution factors', which influence individuals' bargaining positions but do not affect their preferences nor the household's budget set (see Chiappori et al., 2002). As a consequence, we have $\mu = \mu(\mathbf{p})$, where $\mathbf{p}$ is a vector of, say, 'bargaining factors' containing wages, other budget set characteristics and distribution factors. If $\mu(\mathbf{p})$ is increasing in $w^m$, for example, then the husband's bargaining position improves, following an increase in his wage. This implies that he will be able to claim a higher utility than before, which is produced by an intra-household allocation that is more favorable to the husband. It must be stressed that the dependence of the aforementioned household utility

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