

# Household labor supply: What kind of data can tell us how many decision makers there are?

Arie Kapteyn

*CentER and Department of Econometrics, Tilburg University, 5000 LE Tilburg, the Netherlands*

Peter Kooreman

*Wageningen Agricultural University, 6700 AD Wageningen, the Netherlands*

## 1. Introduction

Although in empirical work the neoclassical assumption of the household as a homogeneous decision making unit is still predominant, there appears to be an increasing interest in models of household labor supply based on game theoretic notions. Examples are Ashworth and Ulph (1981), Bjorn and Vuong (1984, 1985), Brown and Chuang (1981), Brown and Manser (1978), Horney and McElroy (1988), McElroy and Horney (1981), McElroy (1990), Schultz (1990), Thomas (1990). Quite a few of these papers also attempt to test the assumption of one decision maker against the more general bargaining framework. Typically, these take the form of tests for certain restrictions on the data that should hold if the neoclassical model were valid, and which need not hold in the game theoretic framework. Chiappori (1988b) argues that a truly valid test of a bargaining model should leave from the notion that observed data are the result from some cooperative game being played by the household members, without specifying the solution concept. He then goes on to argue that the restrictions placed on the data by such an assumption are quite mild indeed. In a separate paper Chiappori (1988a) derives restrictions on observed labor supply functions based on this notion. However, his main result is based on rather special assumptions.

In this note we put the various results in perspective. Our basic obser-

vation is that the neoclassical model and the cooperative game theoretic model are empirically indistinguishable as long as one only uses data on household nonlabor income and household consumption and wages and hours worked by family members. In terms of the neoclassical model, a game theoretic approach provides an argument for the occurrence of prices in the household utility function. But this argument does not distinguish it empirically from any other consideration that would imply price dependent preferences. All this is not to say that game theory does not improve our understanding of household decision making, or that neoclassical models are fundamentally equivalent to cooperative game theoretic models, but rather that on the basis of the type of data typically available for empirical research, the two kinds of models cannot be distinguished. If one wants to gain solid empirical ground, then one has to collect more specific data on each of the players in the household game. In other words, not only the theorist has to stop treating the household as a homogeneous unit, the data collector has to do the same.

In section 2 we will set out the general framework and discuss the analysis of Chiappori (1988a). Among other things, we will argue that his results depend entirely on special assumptions about household members' preferences, so that the conditions derived cannot be said to set game theoretic models aside from neoclassical ones. In section 3 we then go on to review some of the other models and tests proposed in the literature. Some tests have been conducted in the same framework, and others have exploited additional information, like the composition of nonlabor income. It will be our basic tenet that for a truly powerful test of the game theoretic model one needs extra information. Hence, we also speculate about the kind of information that might be collected for this purpose.

## 2. The framework

We only consider households with two players, called the husband and wife. They both have well behaved utility functions with their own leisure and consumption and their spouse's leisure and consumption as arguments. Our notation pretty much follows Chiappori's [Chiappori (1988a)]. Thus we write:

$$U^i = U^i(L^i, Z^i, L^j, Z^j), \quad i = 1, 2; j = 1, 2, j \neq i, \quad (2.1)$$

where  $i$  refers to either the husband ( $i=1$ ) or the wife ( $i=2$ ),  $L^i$  is the  $i$ th spouse's leisure,  $Z^i$  is the  $i$ th spouse's consumption. Household consumption is equal to  $C := Z^1 + Z^2$ . The budget constraint is:

$$C \leq y + w_1 l^1 + w_2 l^2, \quad (2.2)$$

where  $l^i$  is the labor supply of the  $i$ th spouse:  $l^i := T - L^i$ , where  $T$  is total

time endowment of an individual;  $y$  is nonlabor income of the household;  $w_i$  are wage rates,  $i = 1, 2$ .

The notion of a cooperative game imposes the condition that any solution should satisfy Pareto optimality. This in turn implies that the outcome can be written as the solution of the following maximization problem:

$$\begin{aligned} \max_{L^1, Z^1, L^2, Z^2} \quad & W\{U^1(L^1, Z^1, L^2, Z^2), U^2(L^1, Z^1, L^2, Z^2) | w_1, w_2, y\}, \quad (2.3) \\ \text{s.t.} \quad & (2.2); \end{aligned}$$

for some 'social welfare function'  $W$ . Considering (2.3) we may make a number of observations. First of all, without further restrictions there is no way in which this problem can be distinguished from one in which a household utility function with arguments  $L^i, Z^i$  is maximized. Secondly, the social welfare function is allowed to depend on prices (wages) and income since the bargaining strength of the spouses may depend on it. This introduces price dependent preferences, as in Pollak (1977). Thirdly, the commodities  $Z^1$  and  $Z^2$  have identical prices, so that  $C$  is a perfect aggregate. As a result of these considerations, the maximization problem (2.2) is equivalent to a problem of the following kind:

$$\begin{aligned} \max_{L^1, L^2, C} \quad & \bar{W}(L^1, L^2, C) | w_1, w_2, y\}, \quad (2.4) \\ \text{s.t.} \quad & (2.2). \end{aligned}$$

Clearly, the appearance of prices and income in (2.4) is the only thing that distinguishes it from a standard neoclassical household utility function. If no further specific assumptions are made regarding the way prices and income enter the utility function then basically all neoclassical conditions go out of the window, as was shown by Pollak (1977). It is not surprising therefore that Chiappori (1988a) is not able to obtain any parametric restrictions on demand functions in this general case.

Within the framework (2.4) any further specialization of assumptions can both be interpreted in terms of a game theoretic approach and in terms of the neoclassical model. Hence there does not appear to be any fundamental difference in empirical implications that would allow us to discriminate between both paradigms.

### 2.1. Separability

Chiappori (1988a) pays a fair amount of attention to household preferences of the following form:

$$W = W\{U^1(L^1, Z^1), U^2(L^2, Z^2) | w_1, w_2, y\}. \quad (2.5)$$

The point about this specification is not so much that agents would be 'egoistic' [it does not preclude caring, see Chiappori (1991b)], but rather that consumption and leisure of both spouses are weakly separable. Assuming maximization of this function s.t. the budget constraint (2.2), Chiappori derives a set of restrictions that must be satisfied by household labor supply functions. The restrictions do not overlap with Slutsky conditions due to the appearance of prices and income in the utility function. If in (2.5) we remove the dependence on prices, then stronger conditions can be derived directly from the familiar separability conditions [e.g., Deaton and Muellbauer (1980)]. These conditions are equivalent with Chiappori's conditions plus Slutsky symmetry for the observable demands. [See Chiappori (1991b).]<sup>1</sup>

Although his analysis is quite ingenious, it is hard to believe a priori that leisure or consumption of spouses would be separable. For instance, they might want to have a meal together every now and then. And of course, if we give up the separability assumption, we are back in the situation where no restrictions on observable behavior remain.

### 3. Some other tests

McElroy and Horney (1981) extend the framework considered so far by also distinguishing a fifth good, which is a pure public good. They assume a cooperative Nash solution throughout, and derive comparative statics. In the model, threatpoints play an important role. The threatpoints are defined by the utility of not living in the household (the 'outside option'). This (indirect) utility is a function of a spouse's own wage rate and nonlabor income, and the prices of the pure public good and the private good. Generally, the outside option is not observed in the data. In that case, as observed by Chiappori (1988b) and (1991), not many testable restrictions remain. Actually, this is then used to discriminate between the neoclassical and the Nash model because the neoclassical model is the more restrictive one. Hence McElroy and Horney end up with the usual tests for neoclassical restrictions.

In response to Chiappori (1988b), McElroy (1990) reconsiders the implications of the McElroy and Horney model. One of her observations is that the nonlabor incomes of the spouses enter the labor supply functions separately under the cooperative game assumption, but not under the neoclassical assumption. In the latter case only the sum of nonlabor incomes enters. Unfortunately, however, nonlabor incomes of spouses are usually not

<sup>1</sup>The proof is given in an earlier version of this paper.

observed and even hard to define. Horney and McElroy (1988) construct measures of nonlabor income for husband and wife partly on the basis of direct observations and partly by regression based imputation. Transfer income is one of the components of nonlabor income in their definition. For various reasons such a measure forms a shaky basis for a test of the bargaining model. Transfers are often means tested and hence nonlabor income defined this way depends on hours worked, which introduces endogeneity. Secondly, transfers are also often conditioned on family composition and hence will probably change if spouses separate. As a result of this, transfer income is not a good indication of the 'outside option'. Thus one should not put much weight on a test using this definition of nonlabor income. For completeness we mention that the tests performed by the authors do not appear to be able to discriminate between the competing paradigms. Brown and Manser (1978) exploit a similar framework within the context of the Rotterdam system. Also their measures of nonlabor income are far from flawless however; basically means of social groups for single women were imputed to married women of the same social group. It seems that by such a procedure the imputed values will pick up variation in labor supply behavior across social groups, more than anything else. Despite these qualifications, the idea of using extra information to test the game theoretic model agrees with our observation that without such information tests are basically useless.

Schultz (1990) employs Thai data on households, in which various forms of unearned income (transfer income and property income) have been recorded. His test also amounts to a test on the equality of the coefficients of the unearned income of both spouses in their labor supply equations. He rejects equality. He takes this as evidence against the neoclassical model but is careful not to accept the bargaining model as a consequence.

Lundberg (1988) considers a linear simultaneous model of male and female hours with wages, family nonlabor income, own wage, the spouse's earnings as explanatory variables. Among other things, she employs this framework to discriminate between the neoclassical model and the bargaining model. Apart from the fact that her specification of the neoclassical alternative is unnecessarily restrictive (spouse's wages do not enter directly into the labor supply equations), the test between the bargaining model and the neoclassical model once again amounts to a test for the validity of the neoclassical restrictions.

Altogether, these papers base the tests for a bargaining vis-à-vis a neoclassical model on the fact that the neoclassical model is the most restrictive of the two, and hence all tests eventually amount to a test of neoclassical restrictions.

#### **4. Concluding remarks**

We go along with Chiappori's claim that at the present stage Pareto

optimality is about the only tenable assumption of household bargaining models. At the same time this makes them empirically indistinguishable from neoclassical models, possibly with price dependent preferences.

What kind of data would help in discriminating between the neoclassical and the bargaining model? Clearly, one needs to know more about the players' preferences. One kind of information to be used may be responses to subjective questions. In Kooreman and Kapteyn (1990) we have used subjective data about desired labor supply as a means to elicit the spouses' preferences. That exercise was quite limited however, as the survey on which the analysis was based, had not been designed with the bargaining application in mind. To elicit preferences, the subjective questions should elicit the utility functions of both spouses. This can be done by asking for the dictatorial points of both spouses. In other words, which allocation would each spouse consider to be optimal? For instance, both partners may be asked how many hours they would like to work at their present after tax wage rate but also how many hours they would like their spouse to work at his or her after tax wage rate. By also observing the actual allocation (i.e. the number of hours actually worked) we can shed light on the solution concept of the game.<sup>2</sup>

<sup>2</sup>We have actually prepared a short questionnaire along these lines. The questionnaire is available upon request from the first author.

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