Testing the sharing rule in a collective model of discrete labor supply with Spanish data

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Abstract

This paper estimates a collective model of discrete labor supply, using data from the Spanish Survey of Household Finances. The model allows identifying a sharing rule of household income. Then, it is used unique information for unemployed wives about intrahousehold transfers to estimate its accuracy. Results show that husbands' hours of work are conditional on wives' decisions, which mainly depend on non-labour income. Despite data availability, predicted sharing rules fit the data qualitatively well, and are mainly driven by wives' potential income. Husbands show low levels of altruism, and non-participation appears to be especially detrimental for wives with high potential income.

Keywords: Collective model; sharing rule; intrahousehold transfers; Spanish Survey of Household Finances
JEL codes: D13, J22

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I. Introduction

For the implementation of family policies, such as welfare programs, it is important to understand the effects on intrahousehold decisions. Several models have been proposed to analyze intrahousehold behaviors, one being the collective model (Chiappori, 1988, 1992). The main hypothesis of such models is Pareto efficiency, i.e., spouses cooperate to take advantage of marriage. See, for instance, Donni and Chiappori (2011), or Donni and Molina (2018). The efficiency hypothesis of collective models allows identifying the theoretical sharing rule that should be characterized by spouses' (unobserved) bargaining powers. However, surveys rarely include the required information to study the accuracy of these sharing rules. So far, only Lise and Yamada (2018) and Bargain et al. (2018) have addressed this issue, using consumption data for Japan and Bangladesh, respectively.

In that context, this paper exploits information about intrahousehold transfers from employed to unemployed spouses in the Spanish Survey of Household Finances to study the accuracy of sharing rules derived from a collective model of discrete labor supply. Results point to the validity of the collective model, as the rational collectivity is not rejected. Furthermore, the marginal relationships between sharing rules and explanatory variables are consistent with reported intrahousehold transfers.

II. The model

The empirical study is based on the collective model of discrete labor supply of Blundell et al. (2007), adapted to female discrete labor participation, and male hours of work.[1] Consider a household formed by a female *f*, and a male *m*, that reaches Pareto-efficient outcomes. Spouses have distinct egoistic utilities, $U_i = U_i\left(1 - h^i, c_i\right)$, $i = f, m$, where h^i represents labor supply and c_i private consumption. Define w_f as *f*'s labor income, w_m as *m*'s wage, and y as household non-labor income. The household then solves:

$$\max U_f + \mu U_m \tag{1}$$

[1] This choice is intended to maximize the information available (14.16% of husbands and 19.10% wives were unemployed in the original sample). Nevertheless, as shown in Table A1, the standard deviations of work hours are slightly larger for men than for women. Therefore, the assumption of a discrete female labor supply might not be accurate. Analogous main results for male discrete labor supply are shown in Table A3 in the Appendix.

$$s.t.\ C = w_f h^f + w_m h^m + y,$$

$$h^f \in \{0,1\}, 0 \le h^m \le 1.$$

$\mu = \mu(w_f, w_m, y)$ is the Pareto weight, characterizing spouses' bargaining power.

Assume that w_f represents potential earnings if *f* does not work, and that wives' decisions are parametrized as:

$$h^f = b_0 + b_1 w_f + b_2 \log w_m + b_3 y + b_4 z, \tag{2}$$

where z represents socio-demographics. Husbands' hours of work depend consequently on wives' decisions:

$$h^m = \begin{cases} A_0 + A_1 w_f + A_2 \log w_m + A_3 y + A_4 z, & \text{if } h^f = 1, \\ a_0 + a_1 w_f + a_2 \log w_m + a_3 y + a_4 z+, & \text{if } h^f = 0. \end{cases} \tag{3}$$

In that context, the problem is identified if and only if observed behaviors satisfy a series of restrictions (e.g., the rational collectivity). Under Equations (7) and (9), the rational collectivity is:

$$\frac{A_1 - a_1}{A_3 - a_3} = \frac{b_1}{b_3}, \quad \frac{A_2 - a_2}{A_3 - a_3} = \frac{b_2}{b_3}. \tag{4}$$

If the data satisfies (4), the sharing rule of household income, ϕ, can be identified up to an integration constant:[2]

$$\phi_{w_f} = \frac{a_1}{\left(\frac{A_1}{A_3} - \frac{a_1}{a_3}\right) a_3} \left(\frac{A_1}{A_3} - 1 - \frac{A_1}{A_3 F'}\right), \tag{5}$$

$$\phi_{w_m} = \frac{b_2}{\left(\frac{A_1}{A_3} - \frac{a_1}{a_3}\right) b_3} \left(\frac{A_1}{A_3} - 1 - \frac{a_1}{a_3 F'}\right),$$

$$\phi_y = \frac{1}{\frac{A_1}{A_3} - \frac{a_1}{a_3}} \left(\frac{A_1}{A_3} - 1 - \frac{a_1}{a_3 F'}\right).$$

[2] F' is a (positive) solution of $(F')^2 \left(\frac{b_3}{b_1}\frac{a_1}{a_3} - \frac{b_3}{b_1}\frac{a_1}{a_3}\frac{A_1}{A_3} - 1 + \frac{A_1}{A_3}\right) + F' \left(1 - \frac{a_1}{a_3} + 2\frac{b_3}{b_1}\frac{a_1}{a_3}\frac{A_1}{A_3} - \frac{b_3}{b_1}\frac{A_1}{A_3} - \frac{A_1}{A_3}\right) + \left(\frac{a_1}{a_3} - \frac{b_3}{b_1}\frac{a_1}{a_3}\frac{A_1}{A_3}\right) = 0.$

III. Data

I use the Survey of Household Finances (SHF) from years 2002-2014. The SHF is carried out every three years by the Bank of Spain and includes interviews at the family and individual level. I restrict the sample to spouses between 18 and 65 years, where the husband is employed, and the wife is either employed or not. Restrictions leave 4,170 households, 84.22% of which are characterized by both spouses working.

The following variables are used: age, education, marital status, the number of children, monthly earnings, weekly hours of work, hourly wages, and household non-labor income (household monthly expenses minus labor incomes). The SHF allows to define transfers from working to unemployed spouses. 101 of 658 unemployed wives report positive transfers but, as surveys rarely include direct information about intrahousehold processes (Bargain et al., 2018), it is worth examining these transfers. Table A1 in the Appendix shows main descriptive statistics.

Predicted w_f, w_m, and y are defined to deal with potential endogeneity. The following Heckman models are estimated:

$$w_f = \alpha_0 + \alpha_1 edu_f + \alpha_2 P^2(age_f) + \alpha_4 z + \epsilon_f, \quad (6)$$

$$\log w_m = \beta_0 + \beta_1 edu_m + \beta_2 P^2(age_m) + \beta_4 z + \epsilon_m,$$

based on a human capital approach (Chiappori and Meghir, 2015). Non-labor income is instrumented as:

$$y = \theta_0 + \theta_1 edu_f + \theta_2 edu_m + \theta_3 P(age_m, age_f) + \theta_4 g(\mu) + \theta_7 z + \epsilon, \quad (7)$$

where μ represents household income from assets and dividends. All models include occupation and year fixed effects. Estimates are shown in Table A2 in the Appendix.

IV. Results

Labor supply estimates are shown in Table 1. Column (1) shows that, on average, labor participation among wives is negatively determined by household income. On the other hand, wives' (husbands') earnings show a small, positive (negative) and non-significant correlation.

Columns (2) and (3) show estimates for husbands whose wives work and do not work, respectively. Working wives' earnings are negatively correlated to husbands' hours of work. However, non-working wives' potential income is not significant. Analogously, husbands' wages are negative and significantly correlated with their labor supply only if the wife does not work. Finally, non-labor income shows a negative, small and significant correlation with husbands' hours of work.

(Table 1 about here)

Estimates do not reject the rational collectivity (p = 0.894, 0.431). Then, I can identify the sharing rule as:

$$\phi = K - 0.023w_f + 49.04 \log w_m + 0.112y. \quad (8)$$

Thus, an increase in wives' potential earnings has a small and negative effect on their share of income. Oppositely, a 1% increase in husband's wages (24.0 more Euros per month) is correlated with 4.9 Euros transferred to the wife; and from each extra Euro of non-labor income, 0.11 are assigned to wives. These results suggest moderate levels of altruism among husbands.

The mean difference between sharing rules and reported transfers is 117.95 Euros, which is non-null based on a t test (p = 0.018). Furthermore, (8) is estimated using information about transfers in Column (4) of Table 1. Despite the existence of quantitative differences, results suggest that the sign of the derivatives of the sharing rule are accurate qualitatively.

V. Conclusions

This paper estimates a collective model of (discrete) labor supply using the Spanish Survey of Household Finances to study the accuracy of sharing rules. Results show that, despite the existence of quantitative differences, sharing rules are qualitatively robust to data. That provides evidence in favor of collective models.

The analysis has certain limitations. First, the data is cross-sectional. Second, sample restrictions may lead to selection bias. Finally, the information regarding transfers is limited to a reduced subsample.

Disclosure statement

No potential conflict of interest was reported by the author.

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Table 1. Collective model estimates

VARIABLES	Wives' labor participation	Husbands' hours of work	
		Wife works	Wife not works
	(1)	(2)	(3)
Wife earnings	0.000	-0.003***	0.001
	(0.000)	(0.001)	(0.001)
Husband log-wage	-0.226	-1.928	-6.007***
	(0.439)	(1.511)	(1.107)
Non-labor income	-0.001***	-0.002***	-0.002**
	(0.000)	(0.001)	(0.001)
Secondary (non-comp.) ed. (w)	0.211	-	-
	(0.148)		
University ed. (w)	0.088	-	-
	(0.296)		
Secondary (non-comp.) ed. (h)	-	-1.011**	0.413
		(0.482)	(0.889)
University ed.(h)	-	-2.065**	-2.275
		(0.966)	(1.825)
Age (w)	-0.003	-	-
	(0.010)		
Age (h)	-	-0.024	-0.056
		(0.038)	(0.053)
Married couple	0.296	-1.067	-5.194***
	(0.181)	(0.946)	(1.628)
N. children ≤ 6 years	0.112	0.093	1.856**
	(0.099)	(0.284)	(0.795)
N. children older	0.090	0.297	0.894
	(0.089)	(0.249)	(0.734)
Constant	1.016	48.526***	58.063***
	(0.679)	(2.103)	(3.118)
Year F.E.	Yes	Yes	Yes
Observations	4,170	3,512	658

Note: Robust standard errors in parentheses. Estimates include sample weights. *** Significant at the 1%, ** significant at the 5%, * significant at the 10%.

Appendix A: Additional tables

Table A1. Summary statistics

	Wives		Husbands	
INDIVIDUAL VARIABLES	Mean	S.D.	Mean	S.D.
Labor participation	0.842	0.365	-	-
Hours of work per week†	29.728	15.613	41.838	8.451
Monthly income†	1605.5	1244.7	2320.6	2504.7
Monthly transfer††	624.67	486.96	-	-
Hourly wage			13.401	15.924

	Household	
FAMILY VARIABLES	Mean	S.D.
Monthly non-labor income	-2219.9	2801.9
N. Families	4,170	

Note: Statistics include sample weights. †Sample restricted to employed wives. ††Sample restricted to unemployed wives reporting non-null values.

Table A2. First stage estimates

VARIABLES	Wives' earnings		Husbands' wages		Non-labor income
	Main eq. (1)	Selection eq. (2)	Main eq. (3)	Selection eq. (4)	(5)
Secondary (non-comp.) ed. (w)	64.700**	-	-	-	-128.376**
	(29.274)				(59.637)
University ed. (w)	466.984***	-	-	-	-333.457**
	(55.638)				(141.078)
Secondary (non-comp.) ed. (h)	-	-	0.110***	-	-82.051
			(0.016)		(63.939)
University ed. (h)	-	-	0.309***	-	-498.362***
			(0.024)		(147.648)
Age (w)	36.656***	-	-	-	15.210
	(11.989)				(33.893)
Age sq. (w)	-31.241*	-	-	-	-26.763
	(16.479)				(48.010)
Age (h)	-	-	0.009	-	-62.546*
			(0.006)		(37.468)
Age sq. (h)	-	-	-0.002	-	98.462**
			(0.008)		(45.919)
Married couple	-	0.181***	-	0.329***	-300.181***
		(0.060)		(0.063)	(82.052)
N. children ≤ 6 years	-	-0.019	-	-0.007	139.324**
		(0.027)		(0.031)	(63.403)
N. children older	-	0.071***	-	0.003	127.962***
		(0.025)		(0.027)	(48.889)
Main house: owned	110.491***	-	0.121***	-	-74.448
	(39.496)		(0.019)		(142.616)
N. other houses	67.773***	-	0.029***	-	-307.372***
	(9.897)		(0.008)		(101.908)
N. vehicles	26.367	-	0.057***	-	35.862
	(31.054)		(0.013)		(65.946)
Monthly income from assets	-	-	-	-	0.695***
					(0.243)
Monthly income from assets sq.	-	-	-	-	0.041**
					(0.019)
Positive assets	-	-	-	-	-404.859***
					(67.881)
Positive assets*					
Monthly income from assets	-	-	-	-	-1.353***
					(0.520)
Monthly income from assets sq.	-	-	-	-	-0.041**
					(0.019)
Constant	867.688***	0.696***	1.937***	0.812***	-1,492**
	(240.453)	(0.057)	(0.118)	(0.059)	(624.469)
Inverse Mills ratio	-9.769	-	-0.068	-	-
	(36.192)		(0.044)		
Occupation F.E.	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes	Yes
Observations	4,856	4,856	4,856	4,856	4,853

Note: Robust standard errors in parentheses. Estimates include sample weights. *** Significant at the 1%, ** significant at the 5%, * significant at the 10%.

Table A3. Collective model estimates – discrete male labor supply

VARIABLES	Husbands' labor participation (1)	Wives' hours of work		Estimated Sharing rule (4)
		Husband works (2)	Husband does not work (3)	
Husband earnings	-0.000	-0.001	-0.000	-0.160
	(0.000)	(0.000)	(0.001)	(0.161)
Wife log-wage	0.735*	5.659***	-7.561***	372.182***
	(0.439)	(1.326)	(2.039)	(112.428)
Non-labor income	-0.000***	-0.000	-0.004***	-0.213**
	(0.000)	(0.001)	(0.001)	(0.101)
Constant	1.862***	30.613***	49.162***	-
	(0.621)	(2.014)	(4.295)	
Socio-demographics	Yes	Yes	Yes	No
Observations	3,943	3,512	431	36

Note: Robust standard errors in parentheses. Estimates include sample weights. *** Significant at the 1%, ** significant at the 5%, * significant at the 10%.