

A Collective Model of the Household Enterprise

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The model is general, in the sense that:

- **It represents the household as a collection of individuals each of whom characterized by specific preferences.**



“Collective”

- **It describes household as involved both in production, in a family owned business, and in consumption. It is not specific to the farm-households but describes all households involved in any sort of entrepreneurial activity.**



“Family/firm”



- **It embraces both rural and urban households in relation to the location of both the household and the entrepreneurial activity.**
- **When family owned business are not undertaken, then the household sells labor either to the job market or to the household. The general model of a “family/farm” reduces to a “family” engaged in home production.**
- **It can be applied in distributional analysis for other developed and developing countries.**



Research project:

1. Estimation of a micro-econometric model specified within the collective theory of the household (Menon and Perali 2004).
2. Construction of a “family/firm” programming model, in GAMS, that exactly reproduces the underlying econometric model. The farm-household programming model is calibrated using the estimated elasticities of the econometric model and the household social accounting matrix.
3. Perform of comparative static analysis.

Aim: *To understand the welfare consequences of economic and family policies, both at the household and individual level.*



The collective approach to household behavior

(Chiappori 1988,1997; Apps and Rees 1997)

- **Individualism :**

Household as a group of individuals each of whom characterized by own preferences. Household has a welfare function that is a weighted sum of individuals' private utility functions. The Pareto weight is a function of wages and non labor income.

- **Pareto efficiency :**

The outcome of the decision process is Pareto efficient. Namely, the optimal consumption-leisure bundles are such that it is not possible increase the individual's welfare without decrease the welfare of the other household member.



The model

ASSUMPTIONS:

1. Egoistic utility functions
2. Household is engaged in the production of both marketable (*household products-firm technology*) and non-marketable goods (*home products-domestic technology*).
3. Goods, that cannot be sold in the market, are consumed within the household.
4. Constant return to scale for domestic technology (Identifying property: the shadow price of home products is derived by Shepard's lemma applied to the cost function).
5. Separability of production and consumption family decisions.



The production-consumption model: the centralized representation of the household behavior

$$\begin{aligned} & \text{Max } \left\{ U^1(x_z^1, z_x, l^1; d) \mid U^2(x_z^2, z_x, l^2; d) \geq u_2 \right\} \quad \text{or} \\ & \text{Max } \left\{ \mu U^1(x_z^1, z_x, l^1; d) + (1-\mu)U^2(x_z^2, z_x, l^2; d) \right\} \end{aligned}$$

subject to:

1. Household budget constraint :
$$\sum_i^{1,2} \sum_{n=1}^N p_{x_z^n}^n x_{z_n}^i + \sum_i^{1,2} \sum_{k=1}^V p_{x_{zz}^k}^k x_{zz_k}^i \leq \sum_i^{1,2} w_i^o o_i + \pi_M + \sum_{i=1}^2 y_i = Y$$

2. Time constraint:
$$l_i = \bar{T} - o_i - h_i - f_i, \quad i = 1, 2$$

3. Domestic technology constraint:
$$z_x = g(x_{zz}^i, h_i; d_h)$$

4. Firm technology constraint:
$$q = q(F, f_i; d_f)$$

5. Non-negativity constraint:
$$x_{z_n}^i \leq x; x_{zz_k}^i \leq x; x \geq 0; l_i \geq 0; f_i \geq 0; h_i \geq 0; z_x \geq 0; y_i \geq 0; Y \geq 0$$

The production-consumption model: the decentralized representation of the household behavior

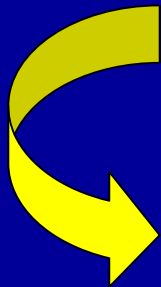
Production side of the household economy

$$\max_{f^i, h^i, F, x_{zz}} \left(pq - \sum_{i=1}^2 w_i f_i - \sum_{j=1}^J r_j F_j \right) + \left(p_{z_x} z_x - \sum_{i=1}^2 w_i h_i - \sum_{k=1}^V p_{x_{zz}}^k x_{zz_k} \right)$$

$$s.t.: \quad q = q(F, f_i; d_f)$$

$$z_x = g(x_{zz}, h_i; d_h)$$

The individual consumption model: **sharing rule interpretation**



$$\max_{x_z^i, z_x^i, l^i} U^i(x_z^i, z_x^i, l^i; d)$$

$$s.t.: \quad \sum_{j=1}^N p_{x_z} x_{z_j}^i + \sum_{k=1}^V p_{z_{z_k}} x_{z_{z_k}}^i \leq w_i^o o_i + \varphi_i(w_1, w_2, y_1, y_2) = Y_i$$

$$l_i = \bar{T} - o_i - h_i - f_i$$



Data

ISMEA Survey on socio-economic characteristics of Italian Rural Households conducted in 1995.

The questionnaire has been designed on the basis of the behavioral model presented.

ISMEA data merges four survey types:

- Expenditure survey
- Stylized time use survey
- Farm accounting survey
- Income survey



Data – Social Accounting Matrix (SAM)

Two farm-household types: “Professional” and “Less Professional”

Professional farm-household: medium and large farm-households

Less Professional farm-household: limited resources, pension, residential and small farm households

Outputs: crop, beef, milk, and fruit, olives and grapes (They are sold in the market)

Input: hired labor, chemicals, materials, capital stock, land, and family labor

Agents: husband and wife

Consumption goods: food, cloth, leisure, domestic good, and other market goods



The farm-household programming model

It exactly reproduces the micro-econometric model estimated in Menon and Perali (2004).

Quasi-calibration: The model is calibrated on the estimated elasticities and on the household social accounting matrix for each farm-household type.



The need for calibration is reduced to a minimum limited to the calibration of the intercepts of demand and production equations to match the levels of the household SAMs



Advantages of this method

A researcher can pool the statistical power of the econometric micro-simulation models with the mathematical precision of a programming tool capable of implementing corner solutions at the individual level.

For the sake of policy simulations, the programming approach enjoys more flexibility, namely it is sufficient to apply simple modifications to the structure of the model without the need of re-estimating the underlying econometric model.

The farm-household programming model plays the role of a policy lab which simulates the micro impact of the macro policy changes under several assumptions about the market functioning and degree of openness.



Modeling labor market failures

The econometric analysis (Menon and Perali 2004) revealed a failure in the labor market: *on-farm wage and market wage assume different values.*

Professional farm-type: on-farm wage is greater than off-farm wage

$$wage_{on} > wage_{off}$$

Less professional farm-type: market wage is greater than on-farm wage

$$wage_{off} > wage_{on}$$

We model labor market failure as a *Mixed Complementarity Problem* (MCP)



Complementarity condition for the on-farm labor supply:

$$H_i * (\text{wage_on} - \text{wage_off}_i) = 0 \quad i = \text{wife, husband}$$



Individual's i market labor supply

- **Professional farm-households:**

$$\text{wage_on} > \text{wage_off}_i \quad \rightarrow \quad H_i = 0$$

$$\text{wage_on} \leq \text{wage_off}_i \quad \rightarrow \quad H_i > 0 \quad \text{and} \quad \textit{lower bound for household labor supply}$$

- **Less professional farm-households:**

$$\text{wage_off}_i > \text{wage_on} \quad \rightarrow \quad H_i > 0 \quad \text{and} \quad \textit{lower bound for household labor supply}$$

$$\text{wage_off}_i \leq \text{wage_on} \quad \rightarrow \quad H_i = 0$$



Simulation results for “Professional” Farm-Household

1. Increase of marginal labor productivity :

	<i>Base</i>		<i>Simulation</i>	
	Husband	Wife	Husband	Wife
Sharing rule	0.459	0.541	0.459	0.541
On farm wage	6.371	6.371	6.412 (0.64%)	6.412 (0.64%)
Market wage	5.801	5.801	5.801	5.801
Leisure	159.406	198.073	160.347 (0.59%)	199.328 (0.63%)
Domestic labor supply	83.713	129.140	84.561 (1.01%)	130.449 (1.01%)
Market labor supply	4.450	13.327	0 (-100%)	0 (-100%)
Household labor supply	172.431	79.459	175.092 (1.54%)	90.224 (13.55%)



Simulation results for “Professional” Farm-Household

2. Increase of market wage :

	<i>Base</i>		<i>Simulation</i>	
	Husband	Wife	Husband	Wife
Sharing rule	0.459	0.541	0.459	0.541
On farm wage	6.371	6.371	6.371	6.371
Market wage	5.801	5.801	6.962 (20%)	6.962 (20%)
Leisure	159.406	198.073	161.715 (1.45%)	201.152 (1.55%)
Domestic labor supply	83.713	129.140	85.798 (2.43%)	132.355 (2.43%)
Market labor supply	4.450	13.327	90.665 (1937.54%)	53.057 (298.12%)
Household labor supply	172.431	79.459	81.823 (-52.55%)	33.435 (-57.91%)



Simulation results for “Less Professional” Farm-Household

1. Increase of wife’s bargaining power :

	<i>Base</i>		<i>Simulation</i>	
	Husband	Wife	Husband	Wife
Sharing rule	0.477	0.523	0.475	0.525
On farm wage	2.839	2.839	2.839	2.839
Market wage	7.459	7.459	7.459	7.459
Leisure	190.196	220.651	199.962 (5.14 %)	243.814 (10.50 %)
Domestic labor supply	84.599	109.796	94.862 (12.13 %)	123.117 (12.13 %)
Market labor supply	25.942	19.136	65.544 (152.65 %)	17.861 (-6.66 %)
Household labor supply	119.263	70.417	59.632 (-50.00%)	35.208 (-50.00%)



Simulation results for “Less Professional” Farm-Household

2. Decrease of wife’s bargaining power :

	<i>Base</i>		<i>Simulation</i>	
	Husband	Wife	Husband	Wife
Sharing rule	0.477	0.541	0.490	0.510
On farm wage	2.839	2.839	2.839	2.839
Market wage	7.459	7.459	7.459	7.459
Leisure	190.196	220.651	221.557 (16.49%)	220.384 (-0.12%)
Domestic labor supply	84.599	109.796	103.298 (22.10%)	134.065 (22.10%)
Market labor supply	25.942	19.136	35.514 (36.89%)	30.343 (58.56%)
Household labor supply	119.263	70.417	59.632 (-50.00%)	35.208 (-50.00%)



Conclusions

At the micro-level, most policy changes are likely to induce internal reallocations of income and of other resources, such as time, that affect individual well-being.

- This application seeks to understand the welfare consequences of policy changes both at the household and individual level by describing the households' behavioral response to the policy changes.
- The collective approach permits deducing the welfare levels of individual household members thus making it possible to account for gender and inter generational differences in the evaluation of policy impacts and individual responses to policy.

