

RURAL DEVELOPMENT AND LOCAL LABOUR MARKET: AN AGRICULTURAL HOUSEHOLD-DERIVED MODEL FOR ALLOCATION OF FAMILY FARM LABOUR IN SOUTHERN ITALY (1)

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1. INTRODUCTION

The reformation processes started in Italy during the last few years in order to reach the Maastricht Treaty Parameters together with some Rural Development Policies have also involved new regulations and marked controls on the labour market in general, and particularly for the agricultural sector. Since these changes will result in doubling the cost of labour (2) at farm level, they are going to particular influence the farms which utilise large amounts of labour, i.e. horticultural farms and the family farms, which its labour is at same time, resource and input for agricultural activity mainly situated in the southern part of Italy (Mezzogiorno). Therefore, the rural areas of the southern part of Italy are going to experience a dramatic shock that could involve

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(1) The Authors shared the general approach of the work, even though the responsibility of each paragraph is to be attributed as follows: Quaranta for the paragraphs 2, 4 and 5; and Marotta for paragraphs 1 and 3.

(2) During the last decade the agricultural sector has benefited from a particular law that reduced the cost of labour in terms of social security (paying only the 40% of the other sector), that benefit will disappear by the end of the next year. Furthermore, in order to receive any kind of support by any policy instruments, the farmers have to demonstrate that they apply all the regular contracts in hiring workers and someone has to control that. In other words both the new regulations impose the respect of the formal labour contracts by the farmers and workers that in the end means to have a total cost of labour twice as much as today.

ABSTRACT

The leading idea of this work is that the structural adjustment response to Rural Development Policy, especially provided by the EU, in areas such the Italian Mezzogiorno will depend not only on the technical characteristics of the farm but also on the socio-economic features of the farm family and from the local context (labour market). Agricultural household models (AHM), integrating a farm household's production and consumption decisions into a unified theoretical structure, provide a promising framework to model such circumstances. This study, by using a methodology derived from that setting, attempts to estimate some of the key relationships that may conditioning the application possibilities of the Rural Development policy in that and similarly areas. Because there are several reasons that strongly support the evidence of market divergences in the labour and some food markets that may severely influence the farmer's capacity to respond to new scenarios, such as the more integrated economy all over the world, price changes and other kind of shocks, a specific model is described and estimated. This model focus on the potential constraints (especially access to off-farm employment) that faces the agricultural household and their impact on the family's control variables, especially labour allocation.

Applying an empirical version of this model on some representative households with different structures available ant in three different southern Italy contexts, the study simulate the impact of Rural Development Policy mainly on family farm income and its composition, family labour allocation and farm land use. The results produce insights to develop and apply specific instruments of Agricultural and Economic Policy.

RÉSUMÉ

Ce travail repose sur le concept que la réponse à l'ajustement structurel de la Politique de Développement Rural, assuré par l'UE, en des zones comme le "Mezzogiorno d'Italia" dépendra non seulement des caractéristiques techniques de l'exploitation mais aussi des aspects socio-économiques de la famille de l'exploitant et du contexte local (marché du travail). Les modèles des ménages agricoles (Agricultural Household Models - AHM), qui intègrent les décisions sur la consommation et la production d'une famille paysanne, assurent un contexte prometteur pour modéliser ces conditions. Cette étude, en utilisant une méthodologie dérivée de cette approche, essaie d'estimer certaines relations clés qui pourraient conditionner les possibilités d'application de la politique de Développement Rural dans cette zone et en des zones similaires.

En appliquant une version similaire de ce modèle à des familles représentatives avec différentes structures disponibles et en trois différents contextes italiens, l'étude simule l'impact de la Politique du Développement Rural surtout sur le revenu de la famille paysanne et sa composition, l'allocation du travail familial et l'utilisation des terres de l'exploitation. Ces résultats fournissent des informations pour développer et appliquer des instruments spécifiques de Politique Economique et Agricole.

the economy as a whole. The objective of this paper is to propose an empirical model to evaluate the effects of labour policies on family income and the allocation of family labour on family farms that operate in the rural areas of southern Italy. In substance, this empirical model reproduces the mechanism of family income maximisation that evolves around the family's decision's regarding the allocation of available family labour to different jobs inside the family farm (productive activity, house work, etc.) or outside.

2. METHODOLOGY

2.1 Theoretical model

Taking into consideration the various pieces of theoretic analysis consolidated in literature, the variables that determine the allocation of family labour can be schematically illustrated as follows:

A) External factors:

A1. *The segmentation and the dynamics of the local labour market.* The connection between territorial socio-economics and the supply of family labour which has been particularly emphasised by the various studies on sociology

and territorial economics was also verified by empirical analysis (Corsi, 1991; De Benedictis, 1995) that pointed out a direct relationship between territorial socio-economics and the supply of family labour. The segmentation of local labour markets, their internal dynamics, salary levels and job entry conditions to the various seg-

ments influence the supply of family labour, summing up the external labour opportunities these factors "encourage/discourage" family members to participate at the local labour market (Barbero-Marotta, 1987). The segmentation and the dynamics of farm labour markets are also important aspects.

A2. *Farm price levels and dynamics.* The profitability of farm employment as well as farm activity intensity and family labour allocation depend on farm price levels (products and factors).

B) Internal factors:

B1. *Family socio-cultural and demographic characteristics.* Many studies carried out in the 1980's put the accent on the role played by internal factors well on family labour supply and its allocation to different jobs in different segments of the local market inside or outside the family farm well knowing the importance of territorial socio-economics (Reyneri, 1987; Accornero and Carmignani, 1986; Saraceno, 1988; Bagnasco, 1988; Barbero and Marotta, 1990). Family socio-cultural and demographic characteristics trigger a segmentation of the supply family labour that determines the job allocation, interacting with the articulation and dynamics of local labour demand (Mantino 1995).

B2. *Family resources.* In concomitance with the raise of schooling of younger family members, family resources have been assuming an important role. In fact, the financial availability and social status of the family are important because:

— on the one hand, they represent a fundamental economical support for the young components giving them the possibility to participate at the labour market selection and they lengthen the research time for the desired job;

— on the other, they guarantee social and economic relationships that can be depicted as a reduction in job entry costs to desired jobs.

At farm level, farm activity resources assume great importance, as do, production scales - prices and technology, and therefore job reward are obviously a reference point in job allocation.

Both internal and external factors have been emphasised by different researches that have explored the causal relations between the family and the labour market. The recent theoretical contributions have all been oriented towards considering the mechanism of allocating the supply of family labour as the result of the interaction of all the variables mentioned above, those that act on the demand as well as those that influence the demand and the resources.

The proposed empirical model takes into account these interactions. It combines the basic philosophy of the models i.e., Household with those at the base of territorial analysis ones, trying to overcome the problems linked to both the estimation of family usefulness and consequent labour supply obtained as the opposite of

free time (Quaranta, 1994). It differs from both models, because it considers in detail the decisions on the allocation of time on either farm activity or non farm activity of the rural family members, and the allocation of time between income producing activity and spare time is not made explicit (*). The model beside including the internal family characteristics it also includes the equipment used in the farm activity (productive activity).

2.2 Empirical Model

The proposed empirical model is formulated in terms of mathematical programming (MP) and reproduces the mechanism of family income maximisation according to the theoretical scheme illustrated in the previous paragraph. Indicating *gross income* (*) with RI_n (before the remuneration of family labour including the cost of salaries) of the activity n the model can be defined as follows:

$$(1) \text{Max} \sum_{n=1}^N RI_n g_n - \sum_{p=1}^P \sum_{q=1}^Q w_q LSA_{pq} + \sum_{p=1}^P \sum_{c=1}^C \sum_{s=1}^S w_{cs} LFA_{scp}$$

subject to:

$$(2) \sum_{n=1}^N a_n g_n \leq b$$

$$(3) \sum_{q=1}^Q \sum_{p=1}^P \sum_{n=1}^N LA_{npq} g_n + \sum_{p=1}^P \sum_{c=1}^C \sum_{s=1}^S LFA_{scp} \leq \sum_{p=1}^P \sum_{c=1}^C \sum_{q=1}^Q DLF_{cpq} + \sum_{p=1}^P \sum_{q=1}^Q LSA_{pq}$$

$$(4) MLFA_{cps} = \begin{cases} 0 & s = 1, \dots, k \\ 1 & \end{cases}$$

$$(5) MLFA \geq 0 \quad s = k + 1, \dots, S$$

$$(6) g_n \geq 0$$

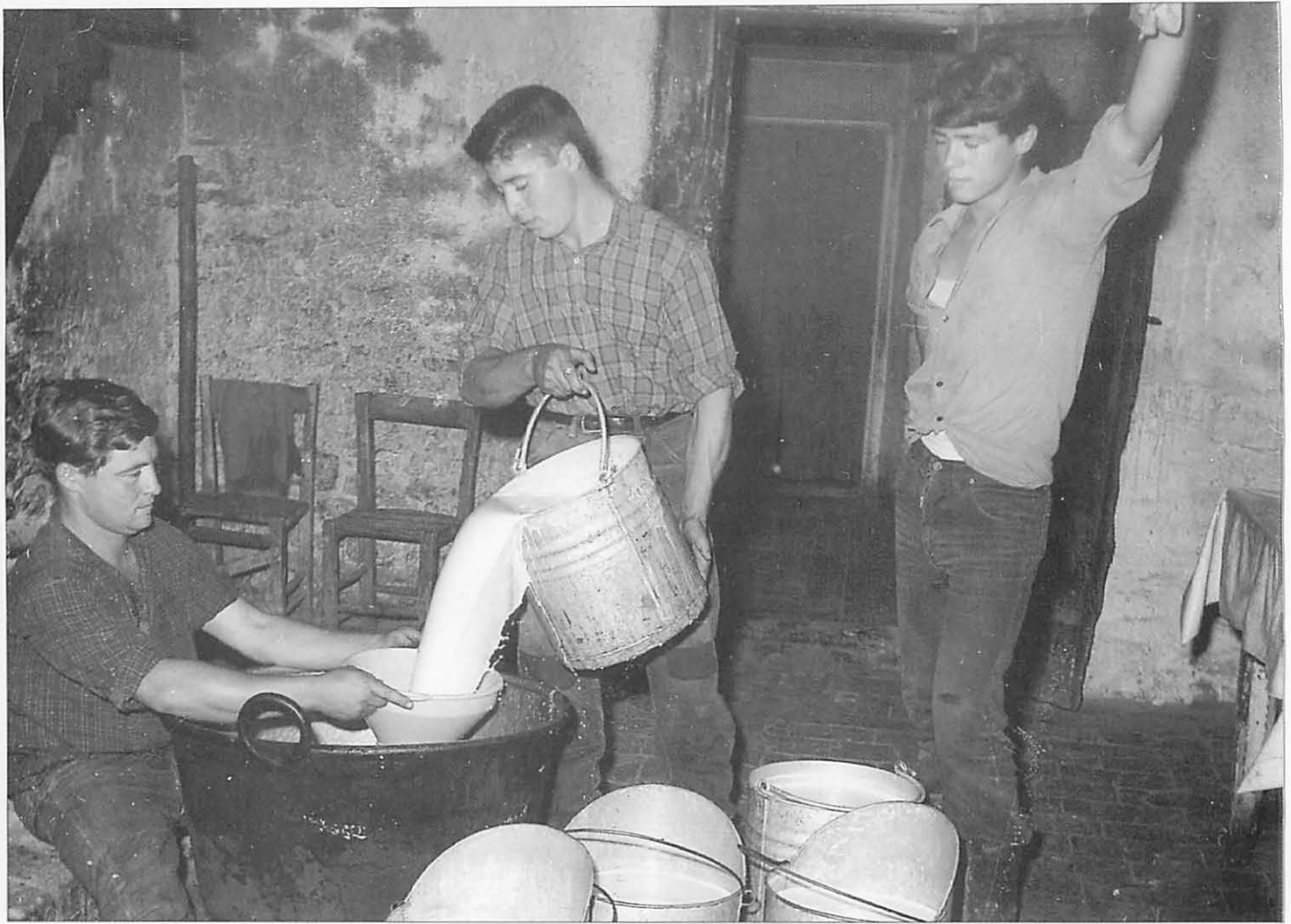
(*) There are different reasons for this point of view, since there is a clear sensation that the allocation of time between labour and spare time is less important, in relation to family farm performance and possible development than the allocation of labour between the farm and outside. Furthermore, as Nakajima (1986) pointed out that as long as part of the family labour is sold on the market, the allocation between farm and outside can be checked without knowing nothing on the usefulness function, and this has advantages in terms of analytical simplicity. However, it is possible to understand an increasing evaluation of spare time when income of any kind increases. In fact, considering spare time as goods of intensive time it can be acquired at the cost of refusing the income that could be earned during the time used as leisure. Supposing that this is equally divided among the family members, the result is that their capacity of producing income is not changed in proportion, and this does not modify the decisions of allocating time among the different productive activities.

(*) $RI_n = P_n Q_n - \sum_{j=1}^J q_j V_{nj}$
where:

P_n represents the price of the product nmo;

Q_n represents the quantity of the product nmo

V_{nj} represents input jmo except in the job, asked for the unitary activation of process njmo. This definition of Gross Income arises from the objectives of the present paper postulating the possibility of comparing the income of farm activity with that coming from other sources.



Indicating respectively with «C», «P», «S», «Q» and «N» the number of family components, the number of temporary periods (months or decades, according to the availability of data), the number of employment sectors or types of contracts (part or full time), the number of different work qualifications (unskilled or skilled) and the number of activity that can be activated in the farm; the *decisional variables* of the model are:

G_n, levels of the single farm activity;

LSA, the need of farm salary work of Q qualification during period P;

LFA, jobs outside the farm of the family component C, during the period P, of qualification Q in the sector S. In other words, the matrix LFA reproduces the mechanism of interaction between the segmentation of the demand of labour at local level (observed and/or simulated) and the supply of external labour of each family component in function to their individual characteristics (age, sex, qualification, schooling, etc.)

The *parameters* of the model are:

a_n, technical coefficient relative to soil resource (this coefficient assumes a unitary value) ⁽⁵⁾;

b, soil type available (dry or irrigate soil);

LA, technical coefficients of the work asked for the farm activity N having Q qualification during the period P;

DLF, total family labour available during the period P to be allocated into the different job possibilities inside and out of the farm.

MLFA, type of employment (type of contract) for the jobs outside the farm of the component C, during the period P^{mo} and in the sector S. **MLFA** implements an dichotomous stratagem in the model resolution that consents to take into consideration contract types, determining the structures of the vectors **w_q**, salary rate of the job in the farm of quality Q;

w, market salary for outside jobs of component C in sector S.

The model formulated in the equations 1-6 reflects the theoretic scheme described in the previous paragraph. In fact, the objective of rural families function (equation 1) maximises the total family income given by the sum

⁽⁵⁾ The only fixed resource considered in this model is the soil, nevertheless a eventual differentiation of this resource can be accounted for: it would become a vector.

of the income produced by farm activities

$$\sum_{n=1}^N RI_n g_n - \sum_{p=1}^P \sum_{q=1}^Q w_q LSA_{pq}$$

and by the income coming from jobs outside the farm

$$\sum_{p=1}^P \sum_{c=1}^C \sum_{s=1}^S w_{cs} LFA_{scp}$$

Equation 2 expresses the constraint of the scale connected to the farm's resources, excluding family labour. The equations 3-5, that represent the peculiarity of this model, notwithstanding the innovative element with respect to the usual MP models used in literature for similar aims, describe the allocation of family labour in function to the internal characteristics of the family (DLF_{cqp}), local labour market characteristics (LFA_{cpqs}) and the internal needs of the farm $LA_{npq} g_n$. The equations 4 and 5 express the eventual rigidity of contracts and/or local labour market institutes: in particular equation 4 identifies those sectors in which jobs are regulated by full time contracts (generally office work), so that the single family component either accedes to this segment with a full time job (1) or one does not accede at all (0); instead, equation 5 takes into account those sectors and/or those contracts that permit part-time work, on a seasonal or daily basis.

This model consents to identify optimal family labour opportunity criteria on short and medium term scale (however excluding the long term option of renting the terrain) (6). In fact, in calculating farm activity RI, relative to the crop and breeding productive processes and costs relative to fixed capital (soil, working capital) only the interests on the latter are to be considered (short period point of view). Nevertheless, the possibility of increasing the activation level of the processes that involve more than one production cycle (breeding, arbo-real crops) above the actual levels in the farm with the consequent increase of the fixed specific factors (medium period point of view) with the explicit consideration of the relative amounts of costs.

3. STUDY AREAS

In order to apply the proposed model four representative family-farms have been chosen (7) in two typical homogenous areas within the so called Italian Mezzo-

(6) The possibility to hire worker allows the by fact the farmers to manage the farms without any direct hand work.

(7) A specific inquiry has been done by direct collection of data on a random sample of family-farms. After a statistically treatment by using principal component analysis and cluster analysis, two representative family-farm systems in each areas have been selected.

(8) The areas of the Mezzogiorno where the inquiry has been conducted were originally three. Since the third one had a middle results situation, we only reported the results of the extreme areas where we could derive much of the conclusion shared by the middle area.

Table 1 Non marginal area.

	Present situation	Expected situation	% var.
Cap 1			
Dry land (ha)			
Irrigated land (ha)	10	10	
Family components (age 16-55)	5	5	
% Intensive crops	89	65	
Objective function value (Lit)	223.000.000	204.000.000	-9
Available labor (hours)	9.080	9.080	0
Off farm labor in agriculture (hours)	1.568	1.568	0
Off farm labor in other sectors (hours)	2.898	4.347	50
Farm labor (hours)	1.513	2.401	59
Unemployed labor (hours)	3.101	1.644	-47
Hired labor (hours)	3.298	1.561	-53
Income labor/hours (Lit)	108.857	50.970	-53
Income labor/cropping area (Lit)	16.470.000	12.238.000	-26
Cap 2			
Dry land (ha)			
Irrigated land (ha)	16	16	
Family components (age 16-55)	3	3	
% Intensive crops	91	68	
Objective function value (Lit)	271.000.000	242.000.000	-11
Available labor (hours)	6.810	6.810	
Off farm labor in agriculture (hours)	1.536	1.392	-9
Off farm labor in other sectors (hours)		1.449	
Farm labor (hours)	2.116	2.972	40
Unemployed labor (hours)	3.158	997	-68
Hired labor (hours)	5.601	3.683	-34
Income labor/hours (Lit)	123.861	67.083	-46
Income labor/cropping area (Lit)	16.380.625	12.460.625	-24

giorno (southern and poorest part of the country) (8). *Non marginal area.* The first area is located in the plain near the Adriatic sea and covers 2.628 square Kms with about 350.000 people living the area. Even though it shows one of the lower ratios among the Mezzogiorno, more than 15% of employees are occupied in the agricultural sector, while the largest portion works in services, a typical development pattern. The last Agricultural Census (1990) recognises more than 22.000 farms which conduct around 210.000 hectares of cropping area. The average size (around 10 hectares) is almost double with respect to the Italian average, even though they also show the same concentration phenomenon typical, of the Mezzogiorno where the 10% of the farms manage 2/3 of the cropping area. As a result of large investments made in previous years, most of the agricultural land is irrigated which has allowed many farms to make great modifications in their cropping systems, now oriented towards horticulture and tree cultivation. An other important peculiarity of this fairly rich area is the distribution by age of the agricultural sector workers. Indeed, in contrast with the Mezzogiorno average, here the young classes are well represented and enlarging their weight, while the older have declined their relative importance during the last decade. The existing labour market conditions for both the agricultural sector and the other sectors are interesting, even though quite fragile. The high agricultural labour demand has been

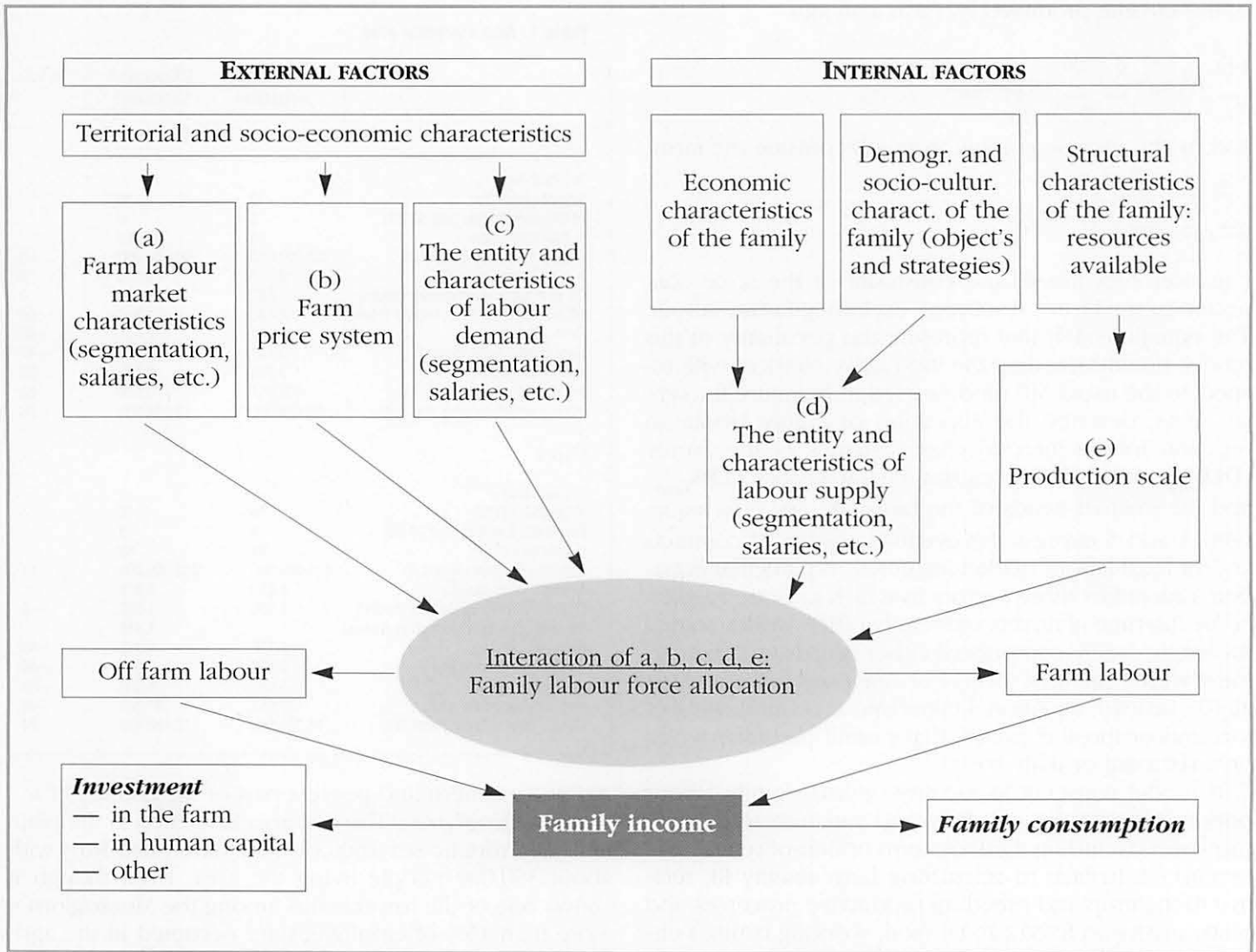


Figure 1 - A theoretical scheme on the allocation of the labour force in farm families.

so far satisfied, also by a large presence of summer immigrant workers -mainly coming from northern Africa, that have mitigated the tension on the salary level.

The two representative family farms selected in this area have 10 and 16 hectares of irrigated land respectively. The two families managing these farms have 3 and 5 components in labour age respectively. They are statistically representative of the agricultural practices performed in the area. Other than in terms of size, they are different in terms of family member characteristics. As it will be shown this is going to play a very important role in terms of performances and economic results.

Marginal area. The second area is a typical marginal and internal area within the poorest part of the Mezzogiorno. The main physical aspect is the existence of a flat central part, crossed by a river, surrounded by a crown of hills and mountains, in this sense, it is less ho-

mogeneous than the previous one. According to the last Census data, people living in the area are around 33.000 units, however the figure of people really living in the zone is much lower because of temporary migration workers, a very common pattern to the Mezzogiorno. The ratio of active population registered by the Census was 38%, but only 29% employed. The distribution of employed workers according to the sector of activity shows a very high percentage in agriculture (31%). In this area, in contrast with the previous one, the share of female and old people working in the agricultural sector is higher than in the other sectors. This has been due to the characteristic demand of labour in agriculture that is mainly oriented to marginal workers. The last agricultural Census recognises about 5.000 farms in the area, farming around 45.000 hectares of typically dry cropping area. Even worse is the distribution of the land: half of the farms manage less than 2 hectares. The

non agricultural local labour markets are practically stagnant, with very few opportunities, and even the possibility of working in the agricultural sector has to be found outside the area, about an hour drive.

The two representative family farms belonging to this area well represent the kinds of agriculture performed in many marginal areas of the Mezzogiorno. In fact, one of them manages 10 hectares of irrigated land while the other works on 12 hectares of dry land. Taking advantage of the water availability and of the good environment, the first family farm is involved in the production of high quality products, well accepted by the market, which have also the recognition of the EU (Reg. 2081/92). The other family, with 3 components as the previous one, manages a dry land farm with livestock and cereal production, much less oriented to market inputs and outputs as well as the labour market.

4. RESULTS

Tables 1 and 2 show the results of the model estimation: the first column reports the results at the existing conditions, the second one refers to the full application of the new policy instruments. Furthermore, **table 2** shows a third column with the results of the model that simulates a change in the local demand of labour coming from an application of a rural development policy which increase the opportunity to find job outside the agricultural sector.

Non marginal area. Looking at the results shown in table 1, we can see the huge negative effect of the new implemented policy instruments on both family income and profitability of the employed resources. The new equilibrium of the two representative family-farms seems to be determined by:

- a change in the agricultural activity performed, with an abandonment of the horticulture (because intensive labour) towards a more labour extensive production;
- a reallocation of family work towards a larger amount on the farm resulting in substitution of hired work.

Both the family-farms share these results, but since they differ in resource availability, the pattern is the same and the intensity is different.

Marginal area. The family-farm with water available to irrigation that have also benefited by a quality production policy, shows the worst results both in terms of family income and profitability of resources employed on the farm. The allocation of family labour among the different work opportunity remain stable. This is mainly due to the very high profitability of the quality products grown on the farm. The dry farm system, instead shows a fairly large improvements in family income, because the cropping activity of the farm does not need to employ hire workers, while the surplus of the family labour is sold on the market (typically agricultural sector of the nearby plain) at a higher wage (*). Simulating

Table 2 Simulation for the marginal area.

	Present situation	Expeted situation	% var.	modified scenario	% var.
agri1					
Dry land (ha)					
Irrigated land (ha)	10	10		10	
Family components (age 16-55)	3	3		3	
% Intensive crops	90	90		98	
Objective function value (Lit)	278.000.00	222.000.000	-20	252.000.00	14
Available labor (hours)	8.310	8.310		8.310	
Off farm labor in agriculture (hours)	536	536		144	-
73					
Off farm labor in other sectors (hours)				4.347	
Farm labor (hours)	7.337	7.337		3.005	-59
Unemployed labor (hours)	437	437		814	86
Hired labor (hours)	7.023	7.023		7.335	4
Income labor/hours (Lit)	37.525	29.344	-22	83.082	183
Income labor/cropping area (Lit)	27.532.000	21.530.000	-22	24.966.000	16
Agri2					
Dry land (ha)	12	12		12	
Irrigated land (ha)					
Family components (age 16-55)	3	3		3	
% Intensive crops	0	0		0	
Objective function value (Lit)	64.000.000	72.000.000	13	77.000.000	7
Available labor (hours)	6.177	6.177		6.177	
Off farm labor in agriculture (hours)	1.112	1.120	1	704	-37
Off farm labor in other sectors (hours)				1.449	
Farm labor (hours)					
Unemployed labor (hours)	4.126	4.105	-1	2.776	-32
Hired labor (hours)	939	952	1	1.248	31
Income labor/hours (Lit)	13.866	13.829	-0	15.382	11
Income labor/cropping area (Lit)	4.767.500	4.730.833	-1	3.500.833	-26

the impact of a new effective rural development policy that improves the local labour market conditions in terms of demand, we can see in the third column of **table 2** a significant increase in family income, demonstrating that the profitability of the farm activity is still much lower than the other sector even in the case of a very profitable production and they always are less competitive in terms of labour allocation.

5. CONCLUSION

The results of the model application open important questions on the role of the agricultural sector and on the effects of some policy instruments apparently not directed towards the primary sector. In the irrigated

(*) It is just the case to mention that this kind of results are a peculiarity of the model used. The traditional model looks at the farm and family as two different entities cannot capture this important effect of labour costs changes.

plain areas the new policies we have evaluated seem to be very critical for the horticultural activity that have played and still play a very important role in the Mezzogiorno economy. Furthermore, without deterioration in terms of profitability, as these regulations produce, these productions could be susceptible to have a big increase in demand due to the reaffirmation of the superiority of the Mediterranean diet. The substitution of these productions with the more extensive ones (cereals and fodder crops), as the optimisation model proposed, is in strong contrast with the present market situation for those productions (and even with the new Common Agricultural Policy). Consequently, the solutions obtained from the model estimation seem to be virtually more than real in terms of practicability making the family-farm conditions even worse without any policy instruments capable to compensate the negative effects of that important labour market regulations. An example is given by the policy implemented to recognise the quality and typicality (Reg. EC 2081/92). The crisis of the sector induced by the considered regulation seems to be better overcome when the local general economic conditions are able to contribute towards the creation of jobs. This can be obtained by a good rural development policy. In this case the reallocation of family labour force among the agricultural and non agricultural activities mitigates the effects of any external shocks expected from the restructuring processes that Italy has experienced in this recent years. ●

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