Nicola GALLUZZO

Association of Geographic and Economic Studies in Rural Areas, Rieti, Italy
asgear@libero.it

AN ASSESSMENT OF RURALITY IN ITALIAN FARMS AND IN THEIR SPECIALIZATION USING A QUANTITATIVE APPROACH

ABSTRACT

The Farm Accountancy Data Network (FADN) is a dataset able to investigate in depth the impact of the Common Agricultural Policy in a sample of farms. The core purpose of this research was to assess by a quantitative approach an estimation of rurality in Italian farms part of FADN dataset investigating also if the specialization of farms has impacted on the rurality. In fact, this quantitative approach has assessed the cause-effect relationships among different items and endogenous variables. The methodology has used a non-parametric approach such as the Partial Least Square Structural Equation Model (PLS-SEM) due to a small numerousness of farms in the sample and a not codified and consolidated methodology aimed at investigating the rurality. The sample has compared all Italian farms part of FADN dataset since 2006 to 2016, grouping also farms in 8 main clusters based on their own productive specialization. Findings have pointed out as the endogenous variables cost, financial subsidies allocated by the Common Agricultural Policy and the different endowment in crops or livestock have influenced on the rurality with significant unbalances in function of the specialization. Drawing the conclusions, the land endowment, payments and indirect subsidies disbursed by the European Union have acted directly on the level of rurality in all investigated Italian farms.

Key words: PLS-SEM, rural areas, Common Agricultural Policy, rural development.

JEL Classification: Q10, Q18, R11.

1. INTRODUCTION

Since the early 1960 there has been in Italy an intense decline in farms due to a significant permanent emigration from the countryside and very poor has been the generational turnover in rural territories (Galluzzo, 2018a; 2016a; 2016b). Recent outcomes in the Agricultural Census carried out by the Italian National Institute of Statistics (ISTAT) since 1960, also corroborated by the statistical data published by EUROSTAT, have pointed out a decrease of Italian farms and by contrast a growth in farm size in terms of utilized agricultural areas which in average is close to 8 hectares but it is under the average amount of the land capital assessed in all European countries which is equal to 14 hectares.

Italian rural fabric is characterized by different bottlenecks and negative aspects such as ageing people, poor land capital and a low level of investments in new technologies labour saving. In inner upland territories and in disadvantaged mountainous areas, these above-mentioned negative factors are the main constraints in the efficiency of farms with the consequence in fostering permanent emigration and in strengthening the socio-economic marginalization in rural territories. These latter territories are strictly dependent by exogenous financial subsidies allocated by the Common Agricultural Policy (CAP) in the framework of less favoured areas payments which have been able to mitigate the permanent out-emigration, increasing, both in Italy and in other new member states of the European Union, a positive generational turn-over in the countryside, also subsidized by the other measures and initiatives financed by the second pillar of the CAP (Galluzzo, 2016a; 2016b). Furthermore, the diversification in the frame of the multifunctionality strongly subsidized by the second pillar of the Common Agricultural Policy has been a milestone for Italian rural areas in the path of transition from a productivist model to a post-productivist paradigm (Van der Ploeg et al., 2002; Ilbery, 1998; Galluzzo 2015, 2016a; 2016b; 2018d). Because of this transition, the rurality has had a new strategic role in the European countryside and in reducing the socio-economic marginalization in rural territories which are sensitive to lots of exogenous drivers taking the advantage from a new governance towards rural areas based on a cohesive and endogenous rural development planning throughout a bottom-up approach (Woods, 2005; Galluzzo, 2015; 2016a).

The core purpose of this research was to assess by a quantitative approach an estimation of rurality in Italian farms part of Farm Accountancy Data Network (FADN) dataset since 2004 to 2016, investigating if the specialization of farms, in terms of main productive specialization, or rather the type of farming, has impacted on the rurality in all Italian regions. Furthermore, this quantitative approach has assessed the cause-effect relationships among different items and endogenous variables correlated to the index of rurality in all investigated typology of farming.

2. STATE OF KNOWLEDGE

In the literature, some studies since the early 1970s have argued the pivotal role in using a quantitative approach as proposed by Kendall in 1975 in assessing the rurality by a specific quantitative index. Lots of studies and researches have used different quantitative approaches to define a concept of rurality such as population, distance from the main urban centers and unemployed people (Woods, 2005; Halfacree, 1993; 1995; Jones, 1995); these guidelines have been a fundamental tool in the process of defining the rurality not only in Italy but in other European countries as well (Van Dam et al., 2002; Woods, 2005; Halfacree, 1993; 1995; Jones, 1995; Galluzzo, 2016a; 2018a; 2018b; Heley and Jones, 2012).

By contrast, other authors have estimated in a quantitative approach an index of rurality throughout a quantitative methodology using a correlation analysis which has set up a Local Indicator of Spatial Association (LISA) that has assessed in a perspective of spatial association the rurality index (Galluzzo 2018a; 2018b; 2018c; Li et al., 2015; Cloke, 1977; Kendall, 1975; Lehtonen & Tykkyläinen, 2010; Griffith, 2003).

In general, many authors have investigated the role of farm typology and specialization of farming in increasing the level of technical efficiency using different quantitative approaches (Galluzzo 2015a; 2015b; 2016a; 2016b; 2016c; 2017; Bojnec & Latruffe, 2008; Latruffe et al., 2017) corroborating a positive role of farm size and decoupled payments in getting better the efficiency of farms (Ahearn et al., 2005; Bojnec and Latruffe, 2013; Galluzzo, 2013; Hadley, 2006; Kazukauskas et al., 2013; Kazukauskas et al. 2014; Rizov et al., 2013; Mary, 2013; Minviel & Latruffe, 2017).

Furthermore, there are not studies aimed at investigating in depth if farm specialization has been a pivotal pillar able to act and to influence the rurality using a quantitative approach aimed at defining an index of rurality (Cloke, 1977; Cloke & Edwards, 1986; Galluzzo, 2016a; 2016b; 2016c; Finco et al., 2005; Galluzzo, 2018a; 2018b; 2018c). In 1977, Cloke proposed a first definition of rural index which has been a new approach in the framework of an innovative quantitative method in investigating rural areas and in defining a concept of rural and rurality addressing the attention of scholars and stakeholders towards different development strategies in a holistic and cohesive perspective of rural development (Cloke, 1977; Banister, 1980; Harrington & O'Donoghue, 1998).

The main purpose of an index of rurality is to define a model able to asses which socio-economic variables have had an effect on the development patterns in rural areas; furthermore, a quantitative index is able to suggest the optimal allocations of financial resources considering in the planning process which socio-economic variables are involved in reducing the socio-economic marginalization in rural areas (Galluzzo, 2018a; 2018b; 2018c; 2018d).

A comparison between different studies carried out in several European countries underlined the strategic role of quantitative methodologies in elaborating the index of rurality corroborating the role of a quantitative approach in estimating the rurality index (Prieto-Lara & Ocaña-Riola, 2010; Cloke, 1977; Ocaña-Riola & Sánchez-Cantalejo, 2005; Cloke & Edwards, 1986; Galluzzo, 2016a; 2016b; 2016c; Finco et al., 2005). Drawing some conclusions on the literature review, there is not a complete definition of an index of rurality able to analyze the impact of financial subsidies allocated by national and European authorities in the first and second pillar of the Common Agricultural Policy (CAP) and other socio-economic variables correlated to the rural context involved in the path of rural development and on the rurality in the countryside.

3. MATERIAL AND METHOD

The source of data was represented by the findings detected in a sample of farms and published in the annual survey European Farm Accountancy Data Network (FADN), which is a sample analysis carried out by the European Union in order to assess the impact of the Common Agricultural Policy towards some European farms (Galluzzo, 2018c). The main purpose of this study has been addressed to assess by a quantitative approach the cause-effect relationships in a small sample of Italian farms from 2004 to 2016 belonging to the Farm Accountancy Data Network (FADN) grouping the enterprises in function of their own productive specialization in terms of typology of farming. This study has grouped farms in function of their type of farming stratified in 8 clusters, as proposed by the European Union in the Council Regulation 79 published in 1965 and particularly by the Council Regulation 1242 published in 2008 such as: field crops, wine, horticulture, granivores, milk, mixed farms, other grazing livestock and other permanent crops.

The non-parametric approach called Partial Least Square Structural Equation Modeling (PLS-SEM) fitted well to the aim of the analysis using the software Smart PLS 3 in order to estimate the cause effect relationships among variables in the PLS-SEM (Ringle et al., 2015). The PLS-SEM is fairly adequate for our targets because it fits well to the specific features of the analysis and the sample of observation such as: a scarcity of theoretical models in literature able to corroborate other specified theoretical hypothesis which can be contextualized in other study areas (Hair et al., 2017; 2016; Tenenhaus et al., 2004; Galluzzo, 2018a; 2018b; 2018c). According to these authors, a modest dimension of the farm sample investigated in the Italian FADN dataset made by less than 3,000 units of investigation is adequate to use the Partial Least Square Structural Equation Modeling.

The Structural Equation Modelling describes the causality among latent variables by an iterative methodology aims at estimating the internal and external correlations and values in all investigated latent variables (Hair et al., 2017; 2016; Tenenhaus et al., 2004, Wong, 2013; Vinzi et al., 2010; Galluzzo, 2018a; 2018b; 2018c; Monecke & Leisch, 2012). Furthermore, the non-parametric model PLS-SEM needs some non-restrictive assumptions compared to the Covariance Based Structural Equation Modelling (CB-SEM) which by contrast has in literature a well-defined and consolidated field of application, *a priori* assumptions, a theoretical framework, some constraints in the model and other basic theoretical assumptions as well (Hair et al., 2016) as defined in other subjects of investigation as psychology and sociology which have a parametric strictly theoretical frame of study (Galluzzo, 2018c; 2018d). In Table 1 are described all the endogenous and exogenous variables assessed in the model and the items used in the PLS-SEM made by all Italian farms belonging to the FADN dataset.

Table 1

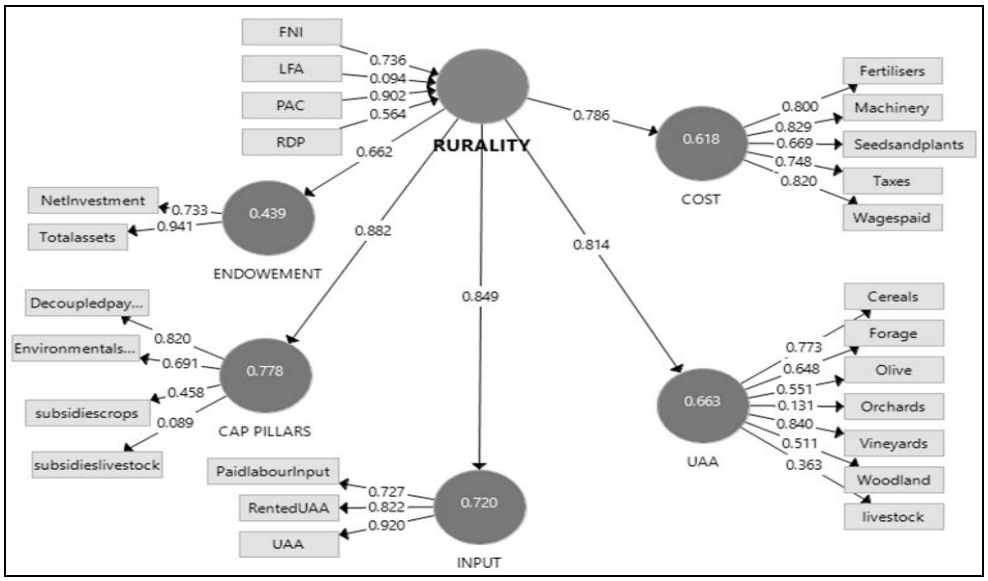
Main exogenous, endogenous variables and items used in the Partial Least Square Structural Equation Modelling in all Italian farms part of FADN dataset

Variables	**Description**
RURALITY	Index of rurality
ENDOWEMENT	Investments and assets in farm
CAP PILLARS	Financial subsidies allocated by the Common Agricultural Policy
INPUT	Input used in the production in farm
UAA	Utilized agricultural areas and livestock in farm
COST	Direct costs correlated to the production in farm
Items	**Description**
FNI	Farm net income
LFA	Less favoured areas subsidies
PAC	Total financial subsidies allocated by the first pillar of the CAP
RDP	Total financial subsidies disbursed by the second pillar of the CAP
Net investment	Net investments in farms
Total asset	Total fixed assets in farms
Decoupled	Decoupled payments allocated by the first pillar of the CAP
Environment	Payments for the environment disbursed by the first pillar of the CAP
Subsidie scrops	Subsidies allocated by the first pillar of the CAP to crops
Subsidies livestock	Subsidies allocated by the first pillar of the CAP to animals
Labour_input	Input correlated to labour capital
Rented_UAA	Rented usable agricultural areas
UAA	Utilized agricultural areas owned by farmers
Cereals	Area cultivated with cereals
Forage	Area cultivated with forage
Olive	Olive area cultivated
Orchards	Hectares with other permanent crops
Vegetables	Vegetables areas
Vineyards	Vine areas
Woodland	Surface with wood
Livestock	Animal in farms
Wagespaid	Wages paid
Taxes	Taxes paid by farmers
Fertiliser	Cost of fertilizer
Machinery	Cost of machinery used in farms
Seedsandpl	Cost for seeds and plants

Furthermore, the Partial Last Square Structural Equation Modelling is specifically adequate to estimate a modest sample size of investigation units because of there are not well-defined model specifications aimed at maximizing the difference to the variance (Hair et al., 2017; 2016; Tenenhaus et al., 2004; Wong, 2013; Galluzzo, 2018a; 2018b; 2018c; Monecke & Leisch, 2012).

4. RESULTS AND DISCUSSIONS

Findings in the index of rurality assessed by the Partial Least Square Structural Equation Modelling (PLS-SEM) in farms specialized in field crops have pointed out that the exogenous variable RURALITY has been directly influenced by the items farm net income and total financial subsidies allocated by the Common Agricultural Policy; on the contrary, an indirect cause-effect relationship has been assessed between the item subsidies disbursed by the Rural Development Program and the exogenous variable index of rurality (Fig. 1).



Source: Calculations using data from http://ec.europa.eu/agriculture/rica/database/database_en.cfm

Figure 1. Main PLS-SEM results in field crop investigated in all Italian farms since 2004 to 2016.

The cluster of farms in the FADN dataset classified as field crops has pointed out that the items decoupled payments, environmental subsidies and subsidies on crops have had a direct and more intense effect on CAP PILLARS endogenous variable. No effects have had the subsidies on livestock on the endogenous variable CAP PILLARS. The endogenous variables INPUT and CAP PILLARS have had a direct impact on the variable index of rurality expressed as RURALITY able to explain respectively more than 0.77 and 0.72 of the variance in each investigated model.

Italian farms specialized in granivores, such as poultry and pigs, have pointed out that the endogenous variables INPUT, CAP PILLARS and UAA have had a positive and direct influence on RURALITY; focusing the attention on this endogenous variable the items forage and cereals have had a direct and positive impact on the endogenous variable UAA, explaining more than 60% of the variance

in the model (Fig. 2). The RURALITY variable has been influenced by the items total financial subsidies allocated by the Common Agricultural Policy and farm net income; by contrast, the items Less Favored Areas payments and financial supports disbursed in the framework of the rural development, or rather the second pillar of the CAP, have had and indirect link to the rurality index.

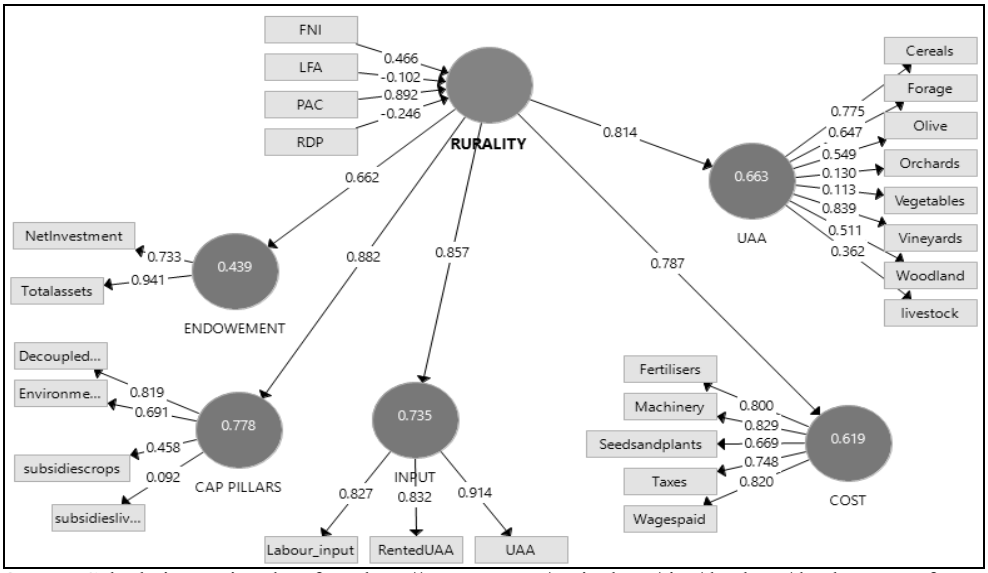


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Figure 2. Main results in granivores specialized enterprises investigated in all Italian farms since 2004 to 2016.

Farm specialized in dairy production part of the FADN dataset have pointed out during the time of investigation 2004–2016 the direct and positive impact of the endogenous variables INPUT and CAP PILLARS towards the RURALITY able to explain in each endogenous variable more than 70% of the variance even if the item subsidies towards animals does not seem to have any effects on the CAP PILLARS endogenous variable (Fig. 3). Addressing the attention on the endogenous variable UAA, the items livestock and surface cultivated in cereals and in forage have had a significant impact on it.

Figure 4 showed that in mixed farms the endogenous variable ENDOWEMENT has had the lowest level of R^2 and by contrast the endogenous variables CAP PILLARS and INPUT have had the highest values of explained variance. The items correlated to the endogenous variable UAA have had different impacts in mixed farms; still, the items wages paid, cost in fertilizer and machinery have had the highest levels of incidence on the endogenous variable COST. Summing up, the total amount of financial subsidies allocated by the Common Agricultural Policy have had in association to the item farm net income the most significant cause-effect impact to the index of rurality in mixed farms over the time of investigation.

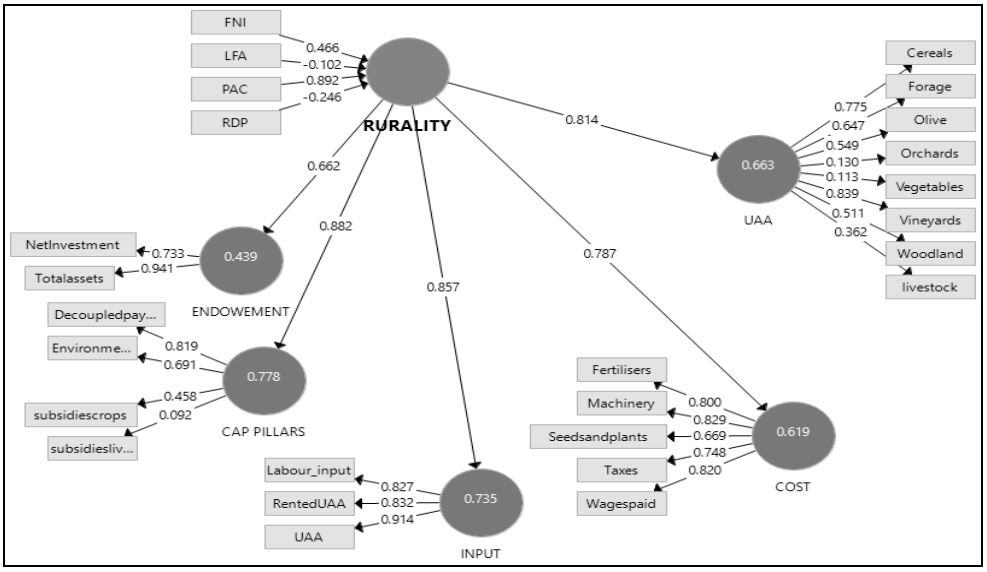

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Figure 3. Main results in dairy farms investigated in all Italian enterprises part of FADN dataset since 2004 to 2016.

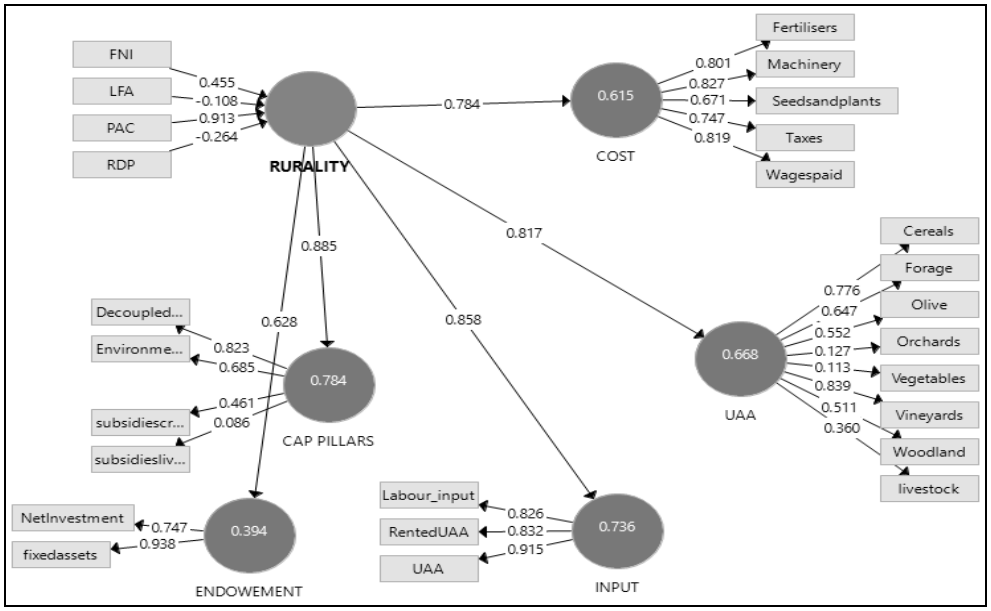

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Figure 4. Main results in mixed farms part of FADN dataset since 2004 to 2016.

The index of rurality in all Italian farms part of the Farm Accountancy Data Network dataset specialized in horticulture has had direct links to the endogenous variables CAP PILLARS and INPUT both able to explain more than 70% of the variance (Fig. 5). Positive has been the role of items farm net income and financial subsidies allocated by the CAP towards the index of rurality expressed as RURALITY. Addressing the attention to the endogenous variable INPUT the item size of farms in terms of land capital (UAA) and labor input have had the most important impact.

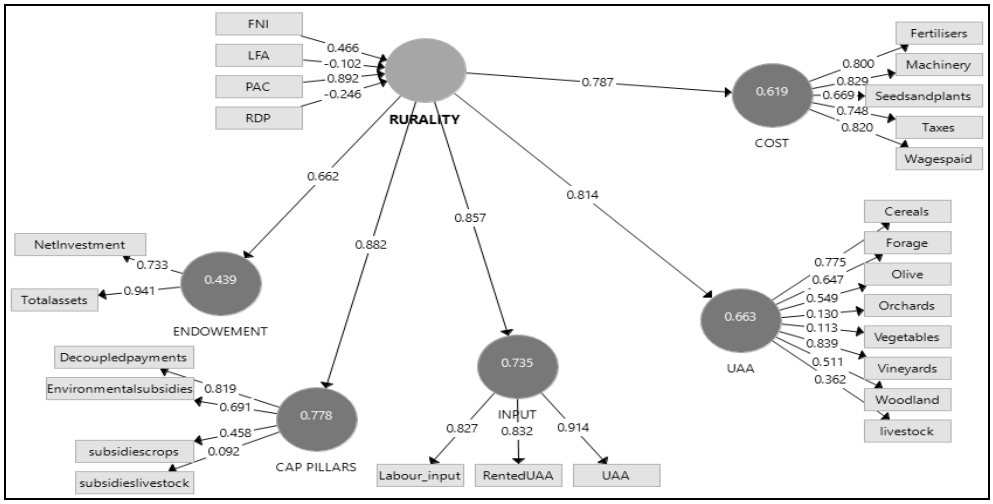

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Figure 5. Main results in horticulture specialized farms part of FADN dataset since 2004 to 2016.

In wine specialized Italian farms the endogenous variable CAP PILLARS has stressed the highest amount of R^2 with a significant cause-effect impact towards the endogenous variable ENDOWEMENT (Fig. 6); the items decoupled payments and environmental subsidies have had the most significant impact towards the CAP PILLARS endogenous variable; furthermore, positive and very high have been the items net investments and total assets towards the land capital endowment in Italian wine farms.

Comparing both the Italian farms grouped in other grazing and other crops clusters have been very similar in the endogenous variables CAP PILLARS, INPUT and UAA pointing out the positive role of the items land endowment, level of inputs and financial subsidies allocated by the European Union throughout the Common Agricultural Policy payments in the framework of decoupled and environmental subsidies (Figs. 7, 8). Very interesting have been the items directly correlated to the index of rurality (RURALITY) in farms classified as other crops which have had a positive impact with the exception of the item RDP hence, these

farms typically located in disadvantaged rural areas have had a positive and direct impact as a consequence of an increase of direct payment to them (Fig. 8).

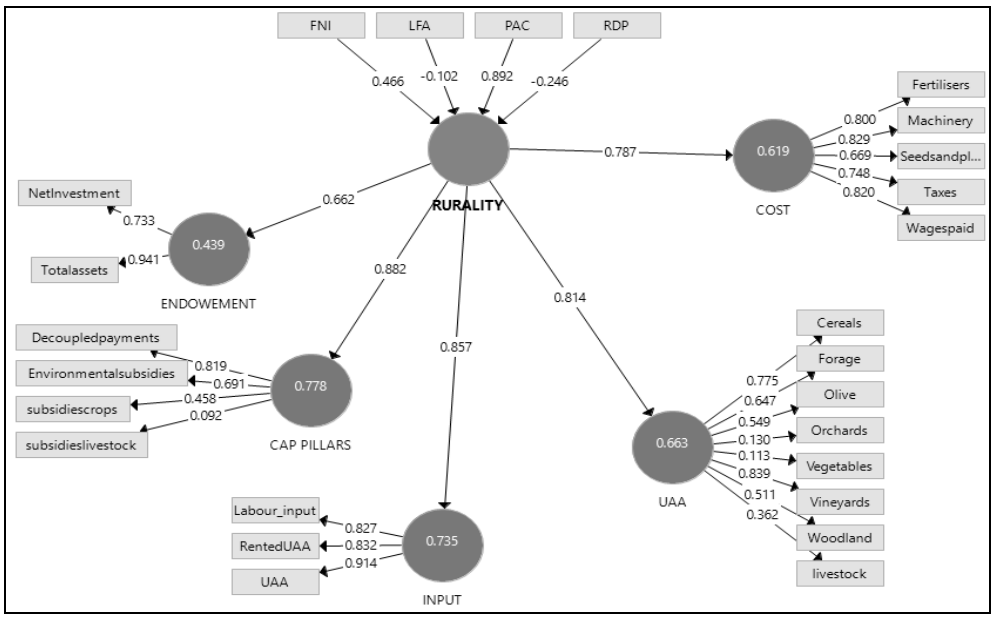

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Figure 6. Main results in wine farms part of FADN dataset since 2004 to 2016.

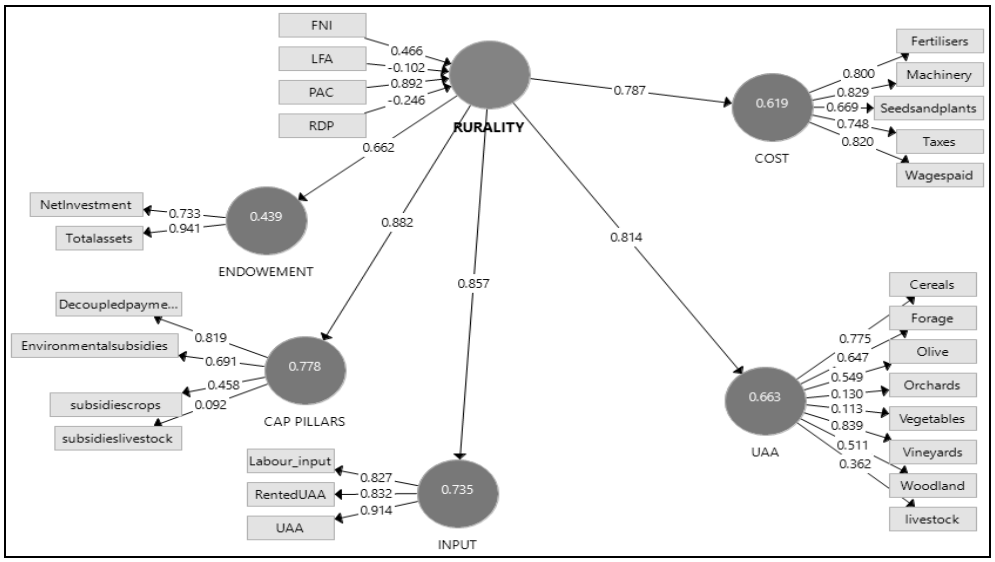

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Figure 7. Main results in other grazing farms part of FADN dataset since 2004 to 2016.

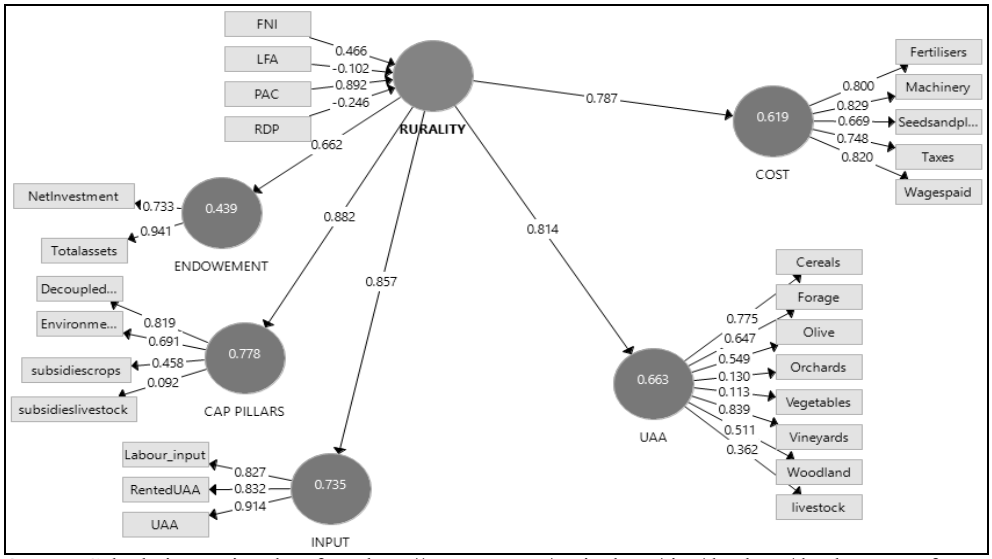

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Figure 8. Main results in other crops farms part of FADN dataset since 2004 to 2016.

5. CONCLUSIONS

The items size of farms, in terms of land endowment, farm net income and the total amount of financial subsidies allocated by the European Union have had a positive and significative impact on the rurality index corroborating as there are significant quantitative relationships among all investigated variables.

A modest size of farms in terms of Usable Agricultural Areas, in farms grouped in the cluster horticulture farms has underlined a positive impact of the land endowment to the variable index of rurality; in the same time, research's findings have underlined in high specialized farms with a high intense capital a significant increase of farm net income.

Drawing some conclusions, it is important in small farms located in stayed behind rural areas to subsidize farmers by indirect payments allocated by the Rural Development Program able to generate a buffer tool for investments in the framework of socio-economic development in rural areas at risk of socio-economic marginalization. Summing up, it is pivotal bearing in mind as in many not high specialized farms the less favoured payments have had a direct impact towards the index of rurality in Italian farms part of the Farm Accountancy Data Network.

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