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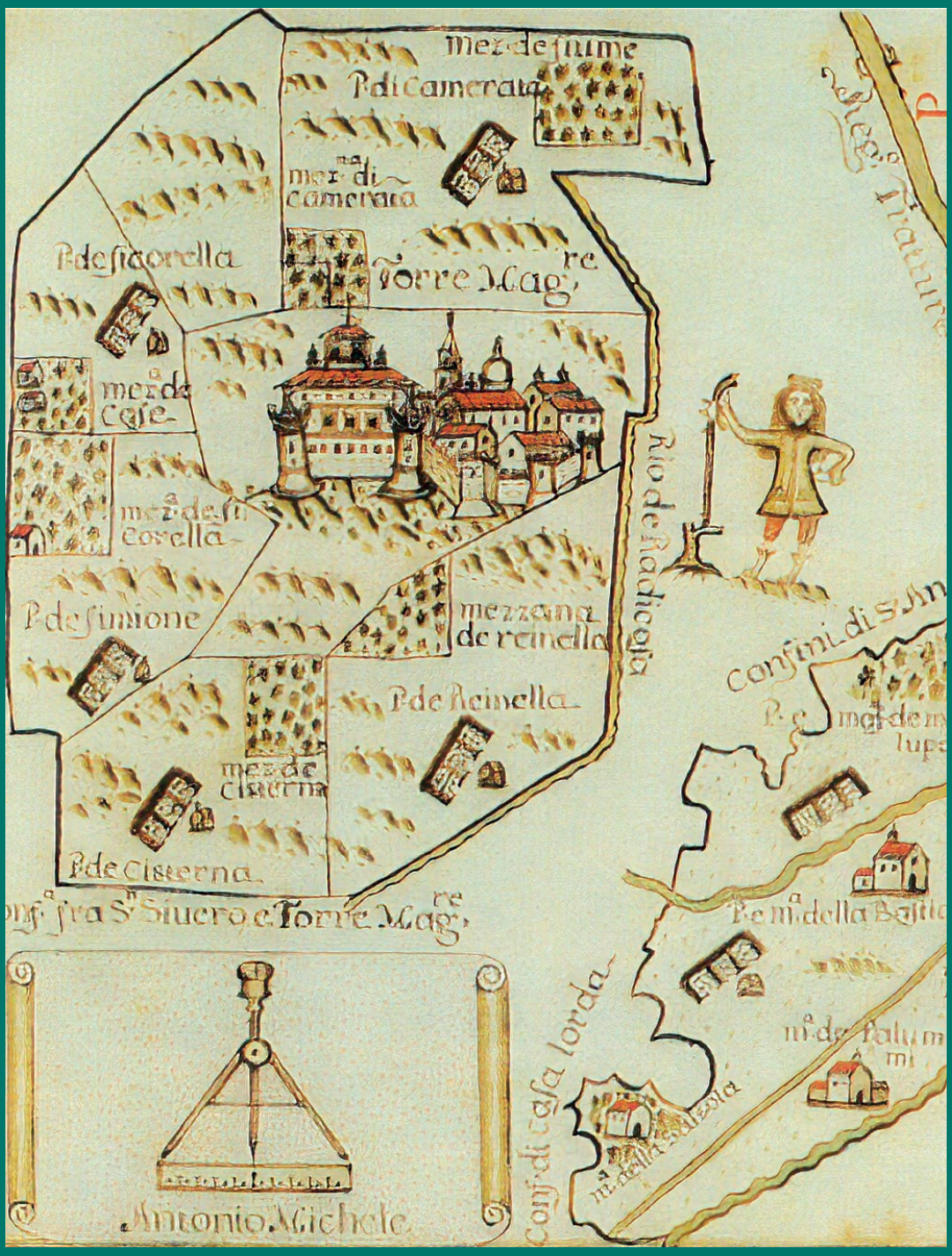

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Exploring farmland price determinants in Northern Italy using a spatial regression analysis

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Abstract. Using spatial regression models, we detect determinants of farmland's prices in a rural area located in the upper Treviso plain (Veneto region, Italy). Econometric analysis is based on a Spatial linear regression model able to account for spatial lags in the data. Estimates show which intrinsic and extrinsic characteristics have the greatest influence on price, and how buyers and sellers' profiles also matter on the price determination. Our application fosters spatial regression models in rural real estate market analysis and appraisal, and highlights that in the area under study the farmland's prices are significantly affected by factors that are rarely considered in the literature, such as sellers and buyers' profiles, the land use in the context where the sold plot is located matters, the hydraulic risk of the area and the presence of large infrastructures.

Keywords: rural real estate market analysis, farmland value, spatial lag of X (SLX) model, Treviso (Italy).
JEL codes: C21, Q15, R32.

1. INTRODUCTION

Theory and empirical analysis show that the price of farmland depends on numerous factors. Literature identifies at least three main group of drivers: 1) intrinsic land characteristics; 2) locational characteristics; 3) land planning and presence of easements (Devadoss and Manchu, 2007; De Noni et al., 2019; Tempesta et al., 2021). Soil fertility and, more in general, soil productivity, have a positive effect on prices (Bastian et al., 2002; Drescher et al., 2001; Faux and Perry, 1999; Kostov, 2009; Maddison, 2009; Perry and Robinson, 2001; Sardaro et al., 2018b; Sardaro et al., 2021; Troncoso et al., 2010; Tsoodle et al., 2006; Uematsu et al., 2013; Xu et al., 1993). Prices also increases when farmland is irrigated or has good drainage (Bastian et al., 2002; Kos-

tov, 2009; Ma and Swinton, 2011; Perry and Robison, 2001; Sardaro et al., 2020; Tsoodle et al., 2006), whereas slope of land implies a negative effect (Ervin and Mill, 1985; Hilal et al., 2016; Ma and Swinton, 2011; Sardaro et al., 2020; Sardaro et al., 2021; Tempesta et al., 2021). Distance from both urban areas and the road network reduce the price (Drescher et al., 2001; Khalid, 2015; King and Schreiner, 2004; Kostov, 2009; Ma and Swinton, 2011; Maddison, 2009; Sardaro et al., 2018a; Sardaro et al., 2020; Sardaro et al. 2021; Snyder et al., 2008; Tsoodle et al., 2006). Farmland's prices depend also on land use policy and urban growth (Abelairas-Etxebarria and Astorkiza, 2012; Delbecq et al., 2014; Guiling et al., 2009; Géniaux et al., 2011; Jaeger et al., 2012; Livanis et al., 2006; Ma and Swinton, 2012; Tempesta and Thiene, 1997). Urban growth raises expectations of land use change and land appreciation even in agricultural areas that are not directly affected by new urban settlements. As highlighted by Varian (2014, p. 206) in the assets with consumption returns market this will lead to an increase in the price of real estate.

Nevertheless, there are other aspects that can play a key role and that should be considered in the analysis of agricultural land price such as, for instance, the characteristics of buyers and sellers and the agents' expectations. These aspects have been detected sporadically (Colyer et al., 1978; Perry and Robinson, 2001; Tempesta et al., 2021; Tsoodle et al., 2006), despite it is clear that economic actors do not only consider current conditions of market, but also discount possible future changes in returns and values (Plantinga et al., 2002). Indeed, it can be assumed that the land market is largely motivated by expectations of an increase in land and property income. This is particularly true both when the purchase is motivated by agricultural purposes and when there are interests linked to possible changes in land use (Plantiga et al., 2002). In the case of expectations on possible changes of land use, motivations may be more articulated in some respects, but they can be traced back to: *i*) the presence of information asymmetries; *ii*) the different availability of capital to invest; and *iii*) the different propensity to risk and the different expected rent existing between buyers and sellers.

It follows that, at least on a theoretical level, in areas characterized by the coexistence of overlapping and interacting alternative land uses, it is difficult to assume that an equilibrium price trend can exist. Similar lands may in fact belong to different market segments, and such segmentation depends essentially on the characteristics of the potential buyers, and it is not entirely attributable to the objective characteristics of the property itself.

All these aspects show an evident spatial variability also in areas where different segments of market can coexist. Therefore, when analyzing the factors influencing land prices, it becomes particularly important to also consider the price spatial variability (Sekáč, et al., 2017; Sklenicka et al., 2013).

The purposes of this paper are manifold. Firstly, it aims at verifying what intrinsic land characteristics, locational features, urban planning decisions and structural constrains influence the value of agricultural land. Secondly, it aims at detecting the role in the price formation of variables related to the characteristics of buyers and sellers, such as for instance if the sale happened between relative or the corporate form of sellers and buyers. These aspects have never been studied in previous studies, despite they should be considered to verify if price formation is consistent with conditions and definition declared in the regulation (EU) n. 575/2013. This latter definition is, in fact, mandatory both for the assessment of the market value and the identification of comparables. Thirdly, the paper addresses the spatial dimension of data by testing the use of spatial models able to account for spatial lags in the data. Spatial regression models have never been used in Italy to analyze agricultural land market with the unique exception of De Noni et al. (2019). Here we account for spatial correlation using several models given that spatial correlation can affect the dependent variable, the independent variables, and/or the error terms (Manski, 1993). Across the different models suggested by the literature, the spatial lag of X (SLX) model seems to be particularly suitable for the purposes of this paper, for different reasons. As a first, according to Gibbons and Overman (2012), in comparison to other specifications, this model is not affected by identification problems. Moreover, in the SLX model direct and indirect effects do not require further calculations. Finally, effects might be different from one explanatory variable to another, and the spillover effects are local (Elhorst, 2017). Due to this flexibility, the SLX model is then a more attractive point of departure in an empirical study than other spatial regression specifications (Elhorst, 2014).

The area under study, located between Treviso and Montebelluna, is particularly suitable to achieve the aims of this analysis. In the past, also due to town planning policies, a widespread network of residential and productive settlements was formed. The possibility of use land for urban purposes is far from remote. The area falls within the 'Sport system of Asolo and Montebelluna' industrial district, and furthermore, given the nature of the subsoil, characterized by the high presence of gravel, there are numerous active and inactive quarries. Moreover, the territory has recently been crossed by

the Veneto Piedmont Motorway (Superstrada Pedemontana Veneta) and three motorway toll stations are located within it. In this regard, it can be assumed that the motorway, by improving the accessibility of the entire area, has favored the emergence of new urban rent phenomena that also affect agricultural areas.

2. MATERIALS AND METHOD

2.1 The area of study

The area falls in the municipalities of Povegliano, Paese, Vedelago, Volpago del Montello, Trevignano, Giavera del Montello and Montebelluna located in the upper Treviso plain (Veneto region, Italy) and has a surface of approximately 260 km^2 (see Figure 1).

Only flat lands have been considered for this analysis, excluding plots following in the hilly part of the municipalities of Montebelluna, Volpago del Montello and Giavera del Montello.

The area is characterized by a continental climate, with relatively harsh winters and hot, sultry summers. Annual temperatures are, on average, around 12°C and the annual average rainfall is just over 1,100 mm. Although rainfall shows normally a peak both in autumn and spring, only January and February have in general a monthly precipitation lesser than 75 mm.

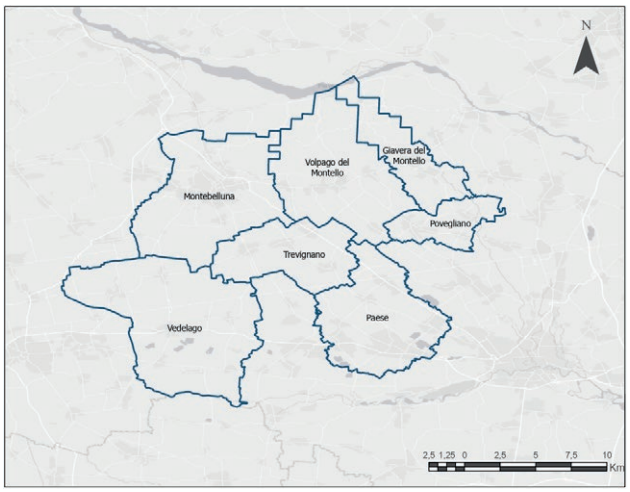

Figure 1. Area of study.

From a pedological point of view (see Figure 2), soils can be divided into two distinct categories (Regional Agency for Environmental Protection and Prevention of the Veneto - ARPAV, 2008), that are those with a prevalence of gravel and sand, and the ones that containing clays, silts and gravels. The former category of lands occupies mostly of the detected area. Such soils are characterized by high permeability and low fertility. The latter category, instead, occupies a narrow strip to the northern

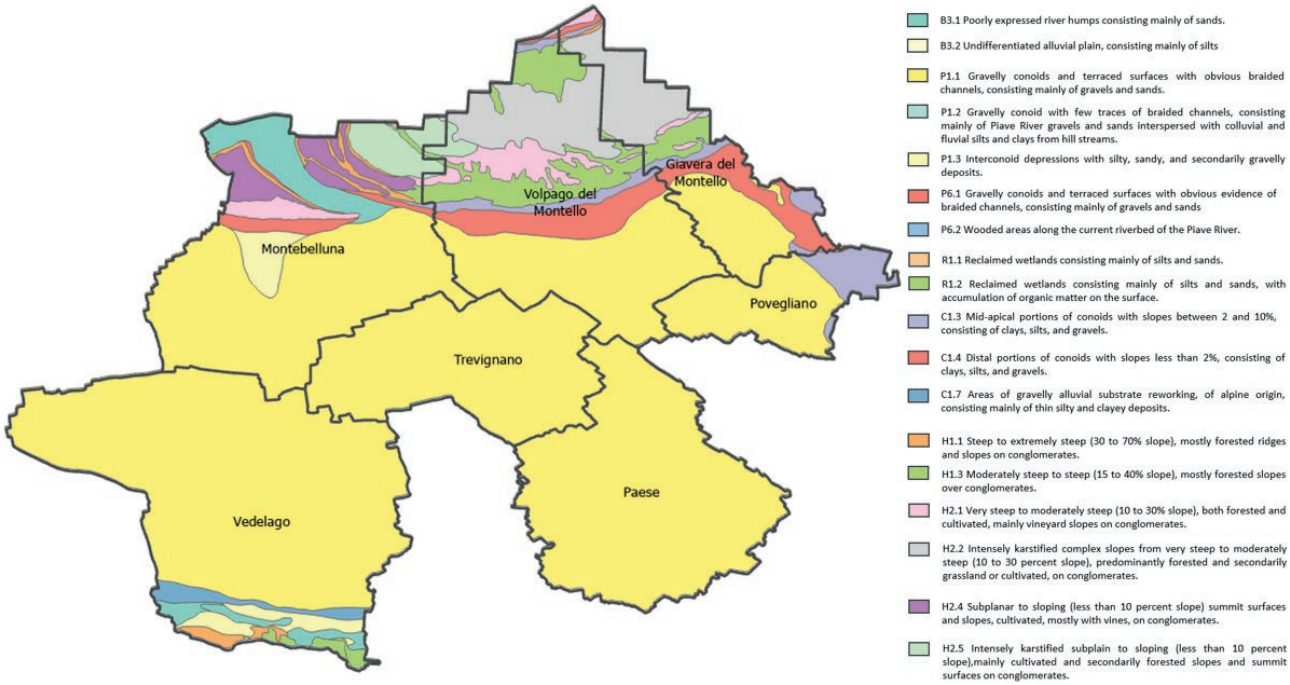

Figure 2. Soil typology distribution. Source: our elaborations on ARPAV data.

of the study area, located at the foot of the Montello hill. These soils are characterized by lower permeability and a greater capacity to store water. The whole territory is included in the irrigated area of the Piave Land Reclamation Consortium. In the past it was irrigated prevalently using the surface-flow method. Nowadays, a transformation project is underway in favor of a higher diffusion of pressurized irrigation systems that consume less water and make irrigation operations more flexible. Approximately two thirds of the study area is still irrigated by surface border (or flooding) system.

From an economic point of view, the area is characterized by a considerable diffusion of artisan and industrial activities and by a high spatial dispersion of both residential and productive areas. The municipalities of Montebelluna, Giavera del Montello, Volpago del Montello and Trevignano are part of the sportsystem di Asolo e Montebelluna industrial district. In the past, the municipalities of Vedelago and Ponzano Veneto were also part of the sports shoe and footwear district. According to data from the Provincial Territorial Plan, there are 109 industrial areas in the municipalities, 65% of which have a surface area of less than five hectares. The municipality of Montebelluna has a population of about 31,000 inhabitants and is an urban pole of regional relevance.

From an infrastructural point of view, the entire territory is crossed by a dense network of municipal, provincial, and state roads that make it easy to reach in a short time all the towns and the urban poles of Montebelluna, Treviso and Castelfranco. In 2023 the construction of Veneto Piedmont Motorway was completed. It crosses the territory of the analyzed municipalities in an east-west direction and provides a rapid connection between the entire territory and the main motorways of the Northern-Eastern Italy (A4, A31 and A27). In the territory under analysis there are three motorway toll stations. Finally, with reference to the possible effects on land values, the presence of an airport and widespread quarrying activities should be mentioned. The areas located near the military airport of Istrana are encumbered by an airport constraint that reduce sometimes drastically the possibility of building new houses or factories. Moreover, given the geological nature of the terrain, the entire territory was subject to intense excavation activity after World War II, so much so that, according to the data reported in the Provincial Territorial Plan, at the beginning of the 2000s, the active quarries occupied an area of 797 hectares and those no longer active 200 hectares.

2.2 Data collection

To test our research hypotheses, we collected data on 225 deeds of sale, which took place in the period 2017-2021. Data are related to soil plots located in places classified as agricultural zone by the municipal general urban plan (see Figure 3). All plots are characterized by the absence of buildings.

Deeds of sale were directly downloaded from SISTER, a web portal dedicated to professionals providing services by the Italian Land Registration System.

We chose this primary source of data for many reasons. As a first, it gives us the possibility to directly collect for each selling data on the sold area and selling price. Moreover, the deed of sale reports information on the presence of various factors that may limit the ownership rights and, therefore, the market value of the lands, such as the presence of some easements (for example, methane pipeline or power line) and the proximity to airport runway clear zones. Furthermore, the deed of sale reports also key information on aspects related to the peculiarities of participants in the transaction that can influence the selling price, such as the legal status of the buyers and sellers (persons, partnerships and corporations), the presence of straight relatives between the parties, the position of the buyer in relation to the agricultural activity (professional farmer or active mainly in other activities), the municipality of residence (Cotteleer et al., 2008; Perry and Robinson, 2001; Tempesta et al., 2021).

However, there are many other intrinsic and extrinsic factors which can affect the price of agricultural land and that are not included among the information reported in the deed of sale. Some examples are the soils characteristics, the proximity to urban areas or to the main roads, areas under high-voltage overhead transmission line restrictions, and so on.

To account in the analysis also for these features, we followed the procedure proposed by Tempesta et al. (2021). Firstly, each land plot was georeferenced using cadastral data by consulting the WMS cadastral cartography based on the Web Map Service 1.3.0 standard, available in the Revenue Agency's Cadastral Cartographic Geoportal. This procedure allowed interfacing the cadastral data with Google Earth. Then, by means of placemarks, we identified location of the land on Google Earth and the geographical coordinates of its central point. Through Google Earth, we analysed the historical aerial images to learn the land use at the time of sale and to know the shape of the plots. Thus, by means of the shapefiles relating to various territorial themes available on the Geo-portal of the Veneto Region (https://idt2.regione.veneto.it), we derived data about the characteristics of each plot, such as the agronomic peculiarities of lands and their position with respect to the road network and urban and rural settlements. Finally, in the case of companies, for both sell-

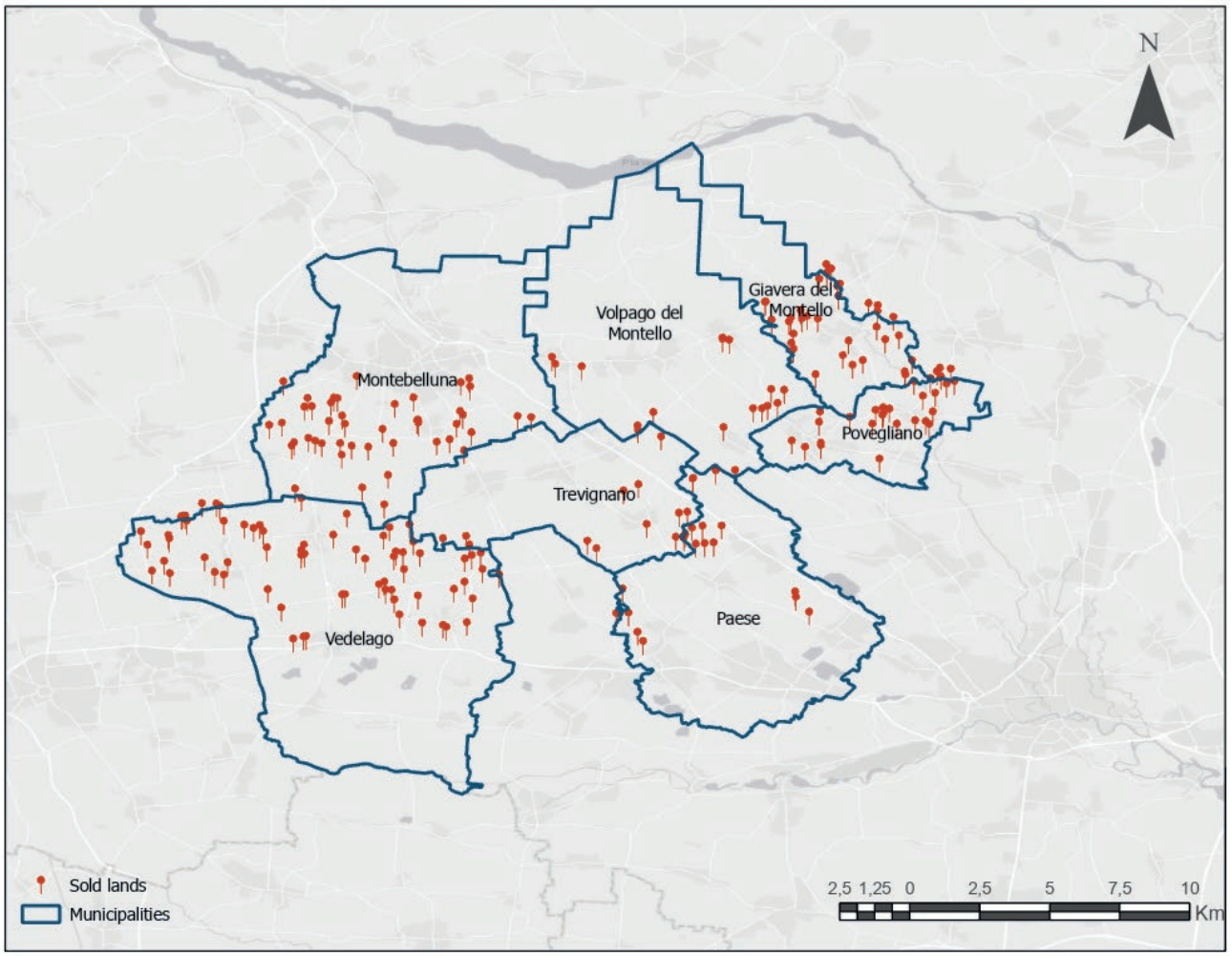

Figure 3. Sold farmlands localization.

ers and buyers, we collected information on the main business sector analysing their corporate website. Table 1 identifies data source for each intrinsic and extrinsic characteristic included in analysis. Figure 4 illustrates the spatial distribution of infrastructures.

2.3 Intrinsic characteristics of farmlands

Collected deeds of sale are related to a total surface equal to 250.40 ha, mostly consisting of arable land (84.4%) and vineyards (11.8%), while the presence of orchards and gardens (3.8%) is marginal. Orchards and gardens were often sold with other crops (especially arable crops). These combinations of land use represent the 8.1% of sales.

The sold plots have an average area of about 11,000 m^2, ranging from 100 m^2 to approx. 133,000 m^2. In the 87% of the sales, the surface area was less than 2 ha. Thus, the land market in the study area, predominantly, concerns small-sized plots.

Land plots are generally regular in shape (64.9%) and consist of a non-fragmented plot of land in almost all cases. The 72% of the sold lands is not encumbered by any easement. The most widespread is the power line easement (9.3%), followed by methane pipeline and aqueduct easements (8.4%). Much more widespread are road easements (30.7%) and those deriving from the presence of water bodies (27.6%). Despite less prevalent, airport (10.7%) and power line (9.3%) easements are particularly important due to the restrictions they impose on building and cultivation activities (Table 4).

Physical and agronomic characteristics of the sold lands reflect those of the study area (Table 2). Only for the 7.1% of the sales, the soil has a skeleton presence in the first 50 cm that is lesser than 5%, for the 74.2% of

Table 1. Data sources.

Variable	Source
Municipality in which the land is located	Deed of sale
Year in which the sale took place	Deed of sale
Sheet and cadastral parcel number	Deed of sale
Surface of the land	Deed of sale
Selling price	Deed of sale
Land sold with CAP entitlements	Deed of sale
Land leased at the time of purchase and sale	Deed of sale
Exercise of the right of first refusal	Deed of sale
Legal nature of buyers and sellers (natural person, partnership, corporation)	Deed of sale
Relationships between buyers and sellers	Deed of sale
Buyer professional agricultural entrepreneur or direct farmer	Deed of sale
Place of residence of buyers and sellers	Deed of sale
Presence and type of easement (passage, methane pipeline, hydraulic, power line)	Deed of sale
Presence of buffer strips (road, hydraulic, hydraulic pipeline, methane pipeline, airport or railway) indicated in the land use certificate	Deed of sale
Homogeneous Territorial Zone of belonging indicated in the certificate of urban destination	Deed of sale
Preliminary purchase and sale agreement registered with the Inland Revenue Office (preliminary real estate contract or preliminary sales agreement)	Deed of sale
Road network	Geo-portal of the Veneto Region
Regional hydrographic network	Geo-portal of the Veneto Region
Soil map	Geo-portal of the Veneto Region
Soil permeability map	Geo-portal of the Veneto Region
USDA Hydrologic Soil Group	Geo-portal of the Veneto Region
USDA soil classification	Geo-portal of the Veneto Region
Land capability classification	Geo-portal of the Veneto Region
Map of the texture and gravel within the first 50 cm of soil	Geo-portal of the Veneto Region
Land use map (2018)	Geo-portal of the Veneto Region
"Historical Centres" and "Minor Historical Centres" taken from the Atlas of the historical centres of the Veneto Region.	Geo-portal of the Veneto Region
Areas under hydrogeological restriction	Geo-portal of the Veneto Region
Other land use restrictions (road, railways, etc.)	Geo-portal of the Veneto Region
"First rank regional centres"; "Second rank intermediate urban centres"; "Third rank local urban centres"; "Local urban centres of the fourth rank" and "Local urban centres of the fifth rank"	Geo-portal of the Veneto Region
Companies main business sector	Corporate websites analysis

the sample it is between 5% and 15%; and for the rest of observations (18.7%) it is between 15% and 35%. It follows that a large proportion of the soils have a high permeability and belong to Class III of the Land Capability Classification. Thus, in these circumstances, only the presence of irrigation can allow the cultivation of arable lands. As already noted, the entire territory analyzed is served by an irrigation network that derives its water from the Piave River. The 38.2% of the analyzed land has a pressurized water distribution system, while in the rest of the surface the traditional method of surface border system is prevalently used.

2.4 Extrinsic characteristics of farmlands

Arable land is the most significant land use in the sold plots neighboring area within a radius of 250 m (75.3%) (Table 3). Built-up areas or areas affected by other urban uses (roads, car parks, urban parks, etc.) occupy, on average, 14.2% of the neighboring lands (e.g. neighboring area within a radius of 250 m). However, this percentage varies considerably and exceeds a percentage equal to 30% for the 17% of the land sold.

This reflects the situation of the entire upper Veneto plain, characterized by a significant urban sprawl. It follows that the distance from the main hamlets of the municipalities or from the municipal centre is generally rather lim-

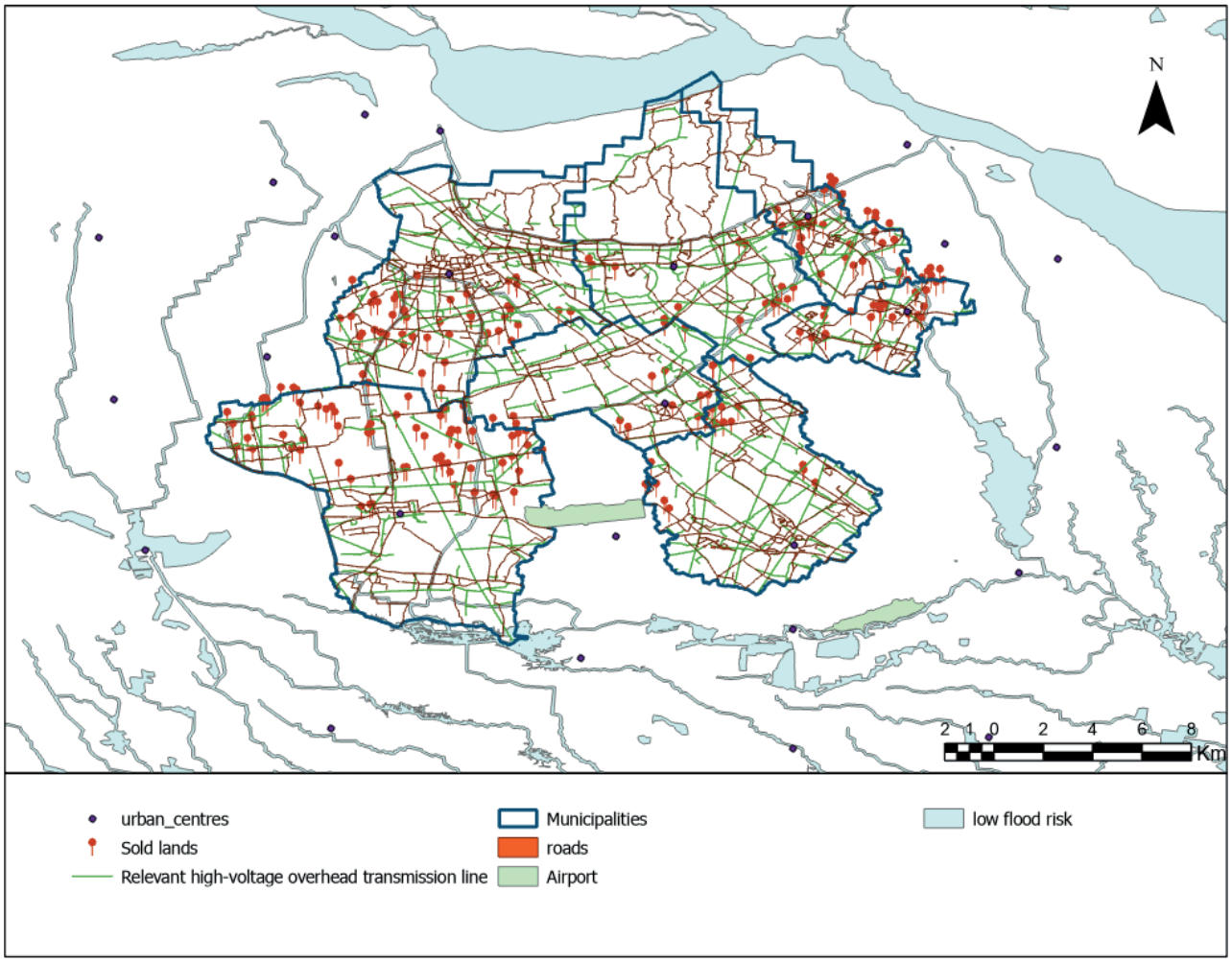

Figure 4. Infrastructural networks.

ited and not higher ad equals, respectively, 4 km and 8.4 km. All the sold lands are therefore easily accessible from the main hamlets. This is facilitated also by the presence of a capillary road network that makes it possible to reach in a short time all areas of the surveyed municipalities. On average, the distance to the nearest paved road is only 166 m and does not exceed 1,700 m. In addition, from the sold plots, it is also possible to reach in a short time the main road network consisting of provincial and regional roads. Infrastructural peculiarities of the area outline a potential future further development of the entire territory.

Quarrying activity is widespread throughout the analyzed area. This is also reflected in the sold land, which on average is about 1,700 m from an active or disused quarry. However, only 3.6% of the sold lands is less than 300 m away, and for this reason it can be assumed that quarries should not have had on the average a significant effect on price.

A final extrinsic factor that may affect the spread of urban rents is the recent construction of the Veneto Piedmont Motorway that presumably in the future will further increase the accessibility of a large part of the study area. The distance from the three motorway toll booths, which provide a quick connection to the national motorway network, is on average 3,889 m, ranging from a minimum of 413 m to a maximum of 8,459 m.

2.5 Features of buyers and sellers

The average market value of the sold plots per unit of surface is 8.46 €/m^2, a high amount given that the area includes prevalently lowlands with no specific productive vocation. However, prices per unit of surface are strongly variable, ranging from 2.37 €/m^2 to 24.80 €/m^2.

Table 2. Intrinsic characteristics of farmlands.

Variables	Type of variable	Mean	Standard Deviation	Min	Max
Surface (in m^2)	Continuous	11,127.840	14,380.301	116	139,458.000
Rented land (1 if yes)	Dummy	0.036	0.186	0.000	1.000
Plot shape (not regular) (1 if yes)	Dummy	0.351	0.478	0.000	1.000
Land shared in two or more plots (1 if yes)	Dummy	0.062	0.242	0.000	1.000
Absence of easement (1 if yes)	Dummy	0.720	0.450	0.000	1.000
Right of way easement (1 if yes)	Dummy	0.049	0.216	0.000	1.000
Gas pipeline easement (1 if yes)	Dummy	0.084	0.279	0.000	1.000
Waterline easement (1 if yes)	Dummy	0.084	0.279	0.000	1.000
High-voltage overhead transmission line easement (1 if yes)	Dummy	0.093	0.292	0.000	1.000
Pressurised irrigation system (1 if yes)	Dummy	0.382	0.487	0.000	1.000
No land use restriction (1 if yes)	Dummy	0.400	0.491	0.000	1.000
Road land-use restriction (1 if yes)	Dummy	0.307	0.462	0.000	1.000
Water body land-use restriction (1 if yes)	Dummy	0.276	0.448	0.000	1.000
Relevant high-voltage overhead transmission line land-use restriction (1 if yes)	Dummy	0.098	0.298	0.000	1.000
Gas pipeline land-use restriction (1 if yes)	Dummy	0.076	0.265	0.000	1.000
Airport zoning restriction (1 if yes)	Dummy	0.107	0.309	0.000	1.000
Gravel within the first 50 cm of soil: common (1 if yes)	Dummy	0.071	0.258	0.000	1.000
Gravel within the first 50 cm of soil: frequent (1 if yes)	Dummy	0.742	0.438	0.000	1.000
Gravel within the first 50 cm of soil: abundant (1 if yes)	Dummy	0.187	0.391	0.000	1.000
Soil texture: clay loam (1 if yes)	Dummy	0.080	0.272	0.000	1.000
Soil texture: other (1 if yes)	Dummy	0.920	0.272	0.000	1.000
Land Capability Classification: II class (1 if yes)	Dummy	0.116	0.320	0.000	1.000
Land Capability Classification: III class (1 if yes)	Dummy	0.884	0.320	0.000	1.000
Soil permeability: moderately low (1 if yes)	Dummy	0.080	0.272	0.000	1.000
Soil permeability: moderately high (1 if yes)	Dummy	0.920	0.272	0.000	1.000
Fraction of the plot's surface with vineyards	Continuous	0.067	0.250	0.000	1.000
Fraction of the plot's surface with arable crops	Continuous	0.853	0.346	0.000	1.000
Fraction of the plot's surface with orchards and gardens	Continuous	0.081	0.261	0.000	1.000

Only in a few cases, CAP entitlements have been transferred with the sale (5.8%). In 94.2% of the sales, the owners of the neighboring lands did not have the titles to apply for the right of first refusal.

The sale between relatives can be considered quite widespread since it concerns 10.7% of the acts surveyed.

Sale happened among relatives in the 11% of the cases. The practice of depositing the preliminary deed of sale with the revenue agency seems to be very limited (7.1%), probably because the negotiation very often involves people residing in the same municipality, between whom there is a mutual trust on the outcome of the bargaining.

There are significant differences between sellers and buyers in terms of both legal characteristics of the companies and place of residence of the contracting parties. Table 4 shows that the average number of sellers involved in each sale is considerably higher than that of buyers (1.84 vs.1.16). Moreover, in the case of sellers, only in the 48.9% of cases, owners reside in the same municipality where the land is located. This percentage rises to 71.6% among buyers, implying that in the area, at least on the demand side, the market has a strongly local dimension.

Difference between buyers and sellers emerges more clearly when their corporate form is considered (see Figure 5). The 92% of the sellers are natural persons. This percentage is considerably lower among buyers (62.7%). For the latter, both partnership (25.8%) and corporation (11.6%) are much more numerous.

The importance of corporations in the agricultural land market is even greater when the purchased area and the amount spent to purchase land are analyzed: corporations acquired 54% of the land sold and spent 58% of the sums invested in the purchase of land (Tables 5-8). Furthermore, the average area, the average price and the

Table 3. Extrinsic characteristics of farmlands.

Variables	Type of variable	Mean	Standard Deviation	Min	Max
Fraction of surface with vineyards in the radius of 250 m	Continuous	0.044	0.081	0.000	1.000
Fraction of surface with arable crops in the radius of 250 m	Continuous	0.753	0.159	0.300	1.000
Fraction of surface with woods and hedgerows in the radius of 250 m	Continuous	0.014	0.030	0.000	0.250
Fraction of surface with orchards in the radius of 250 m	Continuous	0.016	0.037	0.000	0.300
Fraction of surface with scattered urban settlements in the radius of 250 m	Continuous	0.031	0.040	0.000	0.250
Fraction of surface with urban areas in the radius of 250 m	Continuous	0.081	0.100	0.000	0.450
Fraction of surface with other land use (road, car parks, etc.) in the radius of 250 m	Continuous	0.061	0.078	0.000	0.450
Distance from the nearest asphalted road (in m)	Continuous	166.400	278.100	0.000	1,700.000
Distance from the nearest provincial or state road (in m)	Continuous	653.400	597.700	0.000	2,700.000
Distance from urban centres (in m)	Continuous	1,177.200	848.700	0.000	4,000.000
Distance from municipality centres (in m)	Continuous	3,039.900	2,243.600	200.000	8,400.000
Distance from industrial areas (in m)	Continuous	2,451.600	1,358.900	100.000	6,000.000
Distance from the nearest quarry of gravel (in m)	Continuous	1,730.100	1,091.200	0.000	8,500.000
Distance from the Veneto Piedmont Motorway (in m)	Continuous	2,643.800	1,990.900	0.000	8,400.000
Distance from the nearest exit of the Veneto Piedmont Motorway (in m)	Continuous	3,889.000	1967.500	413.000	8,459.000
Fraction of the territory with low flood risk within a radius of 500 m	Continuous	2.022	3.302	0.000	14.000
Municipality of Montebelluna (1 if yes)	Dummy	0.188	0.391	0.000	1.0000

Table 4. Features of buyers and sellers.

Variables	Type of variable	Mean	Standard Deviation	Min	Max
Selling price (in €)	Continuous	95,485.860	133,236.578	850.000	1,255,164.000
Price per unit of surface (in €/m^2)	Continuous	8.460	3.037	2.370	24.840
Transfer of CAP entitlements (1 if yes)	Dummy	0.058	0.234	0.000	1.000
Pre-emption right absent (1 if yes)	Dummy	0.942	0.237	0.000	1.000
The seller is a natural person (1 if yes)	Dummy	0.916	0.314	0.000	1.000
The seller is a partnership (1 if yes)	Dummy	0.018	0.127	0.000	1.000
The seller is a corporation (1 if yes)	Dummy	0.067	0.256	0.000	1.000
The buyer is a natural person (1 if yes)	Dummy	0.627	0.483	0.000	1.000
The buyer is a partnership (1 if yes)	Dummy	0.258	0.442	0.000	1.000
The buyer is a corporation (1 if yes)	Dummy	0.120	0.311	0.000	1.000
Sellers all reside in the same municipality where the sold land is located	Dummy	0.489	0.501	0.000	1.000
At least one seller resides in a municipality adjoining the municipality where the sold land is located (1 if yes)	Dummy	0.276	0.445	0.000	1.000
At least one seller resides in a municipality not adjoining the municipality where the sold land is located (1 if yes)	Dummy	0.236	0.437	0.000	1.000
Buyers all reside in the same municipality where the sold land is located (1 if yes)	Dummy	0.716	0.453	0.000	1.000
At least one buyer resides in a municipality adjoining the municipality where the sold land is located (1 if yes)	Dummy	0.178	0.393	0.000	1.000
At least one buyer resides in a municipality not adjoining the municipality where the sold land is located (1 if yes)	Dummy	0.107	0.297	0.000	1.000
Buyer is a Professional Agricultural Entrepreneur (PAE) (1 if yes)	Dummy	0.547	0.497	0.000	1.000
Sale between relatives (1 if yes)	Dummy	0.107	0.304	0.000	1.000
Preliminary contract of sale was registered to the Italian Revenue Agency (1 if yes)	Dummy	0.071	0.237	0.000	1.000
Sellers involved in each sale (n.)	Continuous	1.840	1.934	1.000	17.000
Buyers involved in each sale (n.)	Continuous	1.164	0.379	1.000	3.000

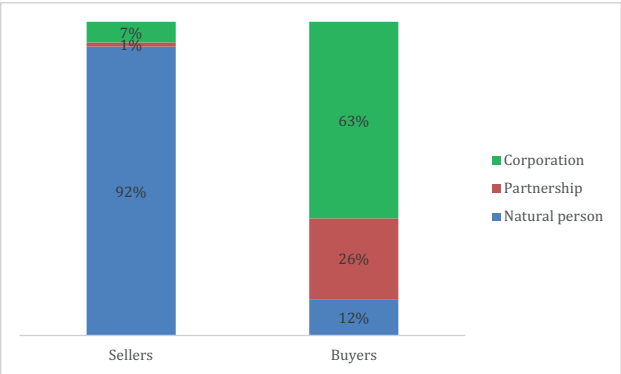

Figure 6. Corporate form of sellers and buyers.

average price per unit of surface are significantly higher in the case of land purchased by companies than in the case of land purchased by individuals (Tables 6-8). Finally, in the 54% of sales, the buyer is a Professional Agricultural Entrepreneur (PAE). Their role in the land market is much more significant since they purchased 72% of the total land sold and spent 75% of its value. The average purchased area and the average expenditure incurred by PAEs is significantly higher than that of other buyers (Table 9) while the unit price is not statistically different, with 95% probability.

In Table 9 the average purchased area, the average selling price and the average price per unit of surface are shown by groups of purchasers according to the type of company and whether or not they have the status of professional farmer or direct cultivator. In general, professional entrepreneurs tended to pay a higher price than non-professional entrepreneurs.

Collected data through the corporate website produce interesting insights on the development of the land market in the study area. Despite the limited number of observations, both on the side of the demand and the supply, the identification of the activity field suggests a changing in comparison to the past on the parties interested in acquiring land. The crisis in the construction market has led many companies engaged in the gravel quarries to sell their owned agricultural land. On the other hand, probably due to the effect of the construction of the Veneto Piedmont Highway, the presence of industrial and real estate companies on demand side of the agricultural land market is higher in comparison to the supply side. Thus, the amount of land owned by companies operating in non-agricultural sectors has increased.

2.6 Econometric model

Econometric analysis is based on spatially lagged X (SLX) model (Elhorst, 2010; Elhorst, 2014; Elhorst and Halleck Vega, 2017; Kopczewska, 2020).

The model is a "constrained" Manski model (Manski, 1993) through which it is possible to account for spa-

Table 5. Selling surfaces for different corporate form of sellers and buyers.

	Sellers				Buyers			
	Sold surface (in ha)	%	Mean	Standard deviation	Purchased surface (in ha)	%	Mean	Standard deviation
Natural person	2,057,236	82.2	9,938.30	11,088.10	1,151,841	46.0	8,169.10	7,759.90
Partnership	63,248	2.5	21,082.70	13,097.30	901,826	36.0	15,548.70	16,856.10
Corporation	383,279	15.3	25,551.90	34,785.90	450,096	18.0	173,11.40	27,080.60
Total	2,503,763	100.0	11127.8	14,380.30	2,503,763	100.0	11,127.80	14,380.30

Table 6. Prices for different corporate form of sellers and buyers.

	Sellers				Buyers			
	Sold price (in €)	%	Mean	Standard deviation	Purchased price (in €)	%	Mean	Standard deviation
Natural person	17,798,875	82.8	85,984.90	105,398.90	8,979,987	41.8	63,687.90	68,722.60
Partnership	687,703	3.2	229,234.30	203,309.20	8,019,685	37.3	138,270.40	149,984.70
Corporation	2,997,741	14.0	199,849.40	312,776.80	4,484,647	20.9	172,486.40	255,352.50
Total	21,484,319	100.0	95,485.90	133,236.60	21,484,319	100.0	95,485.90	133,236.60

Table 9. Corporations by field of activity.

Field of activity	Sellers		Buyers	
	n.	%	n.	%
Agriculture	6	40.0	9	34.6
Marketing of agricultural products	2	13.3	0	0.0
Quarry	5	33.3	0	0.0
Industry	2	13.3	12	46.2
Real estate companies	0	0.0	5	19.2
Total	15	100.0	26	100.0

Table 7. Prices per unit of surface for different corporate form of sellers and buyers.

	Sellers		Buyers	
	Sold price per unit of surface (in €/m²)	Standard deviation	Purchased price per unit of surface (in €/m²)	Standard deviation
Natural person	8.53	3.11	7.85	2.14
Partnership	9.56	3.51	8.98	3.44
Corporation	7.28	1.22	10.66	4.72
Total	8.46	3.04	8.46	3.04

Table 8. Surfaces, prices and unit prices paid by professional and non-professional farmers.

	n.	%	Surfaces (in ha)		Price (in €)		Price per unit of surface in (€/m²)	
			Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
Natural person not PAE	80	35.6	5,652.9	4,430.6	42,936.9	35,043.3	7.91	2.07
Natural person and PAE	61	27.1	11,469.0	9,754.2	90,902.3	89,865.6	7.77	2.23
Partnership not PAE	6	2.7	7,830.5	7,221.3	51,205.7	48,996.9	7.59	3.23
Partnership and PAE	52	23.1	16,439.3	17,453.5	148,316.4	154,634.6	9.14	3.46
No corporation	17	7.6	10,541.5	8,818.7	91,503.8	67,670.8	9.93	4.75
Corporation and PAE	9	4.0	30,098.9	43,068.0	325,453.6	392,869.9	12.04	4.61
Total not PAE	103	45.8	6,568.5	574.3	51,238.7	4,567.9	8.22	0.28
Total APE	122	54.2	14,908.8	1,613.1	132,178.6	15,044.0	8.66	0.29
Total	225	100.0	11,127.8	14,380.3	95,485.9	133,236.6	8.46	3.04

Note: PAE - Professional Agricultural Entrepreneur.

tial spillover effects across the units in the sample. The SLX model is specified as:

$$y = \alpha i_N + X\beta + W_x X\theta + \varepsilon \quad (1)$$

where:

- y represents an $N \times 1$ vector consisting of one observation on the dependent variable for every unit in the sample ($i = 1, \ldots, N$);
- i_N is an $N \times 1$ vector of ones associated with the constant term parameter α;
- X denotes an $N \times K$ matrix of explanatory variables associated with the $K \times 1$ parameter vector β;
- $\varepsilon = (\varepsilon_1, \varepsilon_2, \ldots \varepsilon_N)$ is a vector of independently and identically distributed disturbance terms with zero mean and variance σ^2 which represents the idiosyncratic error term;
- W is an $N \times N$ nonnegative matrix describing the spatial arrangement of the units in the sample;
- θ is the spatial parameter.

WXθ figures out the spatial interaction effects. Since W is $N \times N$ and X is $N \times K$, the WX matrix of spatial lags is also $N \times K$. Consequently, the vector of response parameters θ is order $K \times 1$ (just like β). The spatial spillover effects of this model coincide with the parameter estimates θ of the WX variables, while direct effects coincide with the parameter estimates β of the X variables. The sum of direct and spillover effects is the total effect.

The weight matrix W is exogenously determined and can cause specification problems (Florax and Rey, 1995). Literature suggests the use of different criterion to represent spatial correlation across units, such as the contiguity or the inverse distance ones. Moreover, the matrix can be symmetric or asymmetric (Kopczewska, 2020). We tested the use of different weight matrices (e.g. Queen matrix assuming first and second order of correlation, Root matrix, Euclidean inverse distance matrix and k-nearest matrices, with k ranging from 4 to 6) and we adopted different normalization rules (e.g. none, spectral, min-max and row's sum) to identify the best matrix specification that was, according to our expectations, the one based on an inverse Euclidean distance with spectral normalization.

Furthermore, to be sure that the assumed model specification is the one that better fit our data, we also estimated other spatial models based on one or two spatial effects, assuming significant lags also for the dependent variable and the error terms. To identify the best spatial models, we followed the top-down approach (Elhorst, 2010; Floch and Le Saout, 2018) according to the starting point for the estimation process is the estimate of the Manski model, that account for all the type of spatial lags. Given the insignificance of parameters related to the spatial autocorrelation of the dependent variable and of the error term, the SLX specification resulted to be the model that better fit the data.

When θ = 0, the SLX model reduces to a standard linear regression model. To verify that the SLX model shows better performance than the standard linear regression, we used both "diffuse" and "focused" tests, such as the Moran's I test, the Wald test (or asymptotic t-test) and the Likelihood Ratio (LR) test. The Moran's I test is based on the rejection of the null hypothesis the assume the absence of spatial autocorrelation. The alternative hypothesis assumes the presence of spatial autocorrelation, but not specified what form or process and for this reason the test is considered "diffuse". The other ones, instead, are Maximum Likelihood Based Tests and reject the null hypothesis against a fully specified alternative model that, in this case, is the SLX spatial autoregressive model. Consequently, they are "focused" tests.

Table 10. List of independent variables included into the SLX model.

Indipendent variables	Direct effect	Spillover effect
Arable crops in the radius of 250 m	✓	✓
Woods and hedgerows in the radius of 250 m	✓	✓
Distance from urban centres	✓	✓
Soil permeability: moderately low	✓	✓
Partnership: PAE*	✓	
Corporation: PAE*	✓	
Corporation: no PAE*	✓	
Sellers residing in the same municipality where the land sold is located	✓	
Airport zoning restriction	✓	✓
Plot sold in 2020 or 2021	✓	
Distance from the nearest toll booths of the Veneto Piedmont Motorway	✓	✓
Relevant high-voltage overhead transmission line land-use restriction	✓	✓
Municipality of Montebelluna	✓	
Territory with low flood risk within a radius of 500 m	✓	✓
Sale between relatives	✓	

Note: PAE - Professional Agricultural Entrepreneur.

Specifically, Wald test is based on value of the spatial parameter(s) estimate while LR test is based on difference in data-fitting. The SLX model has been estimated by means of the Generalized Spatial Two-Stage Least-Squares (GS2LS) estimator, that assures consistent estimates both in the cases of IID or heteroskedastic residuals (Drukker et al., 2013). Econometric analyses were done using STATA 17.0. Some matrices were generated also using GEODA 1.18.

Table 10 reports the list of the independent variables included into the model and identified those for which a significant spatial component was assumed. As it concerns the dependent variable, we used the logarithm of the price per unit of surface (€/m^2) (Bourassa et al., 2005; Tsutsumi et al., 2011).

3. RESULTS

Table 11 shows the coefficients estimates for the OLS and SLX models. Apparently, models seem to produce very similar results. The R-square and pseudo R-square values are similar. Even if we take the mean of the absolute percentage deviation between the observed and estimated value (Mean Percentage Absolute Deviation) (Tempesta et al., 2021) as an index of the models' goodness of fit for estimation purposes, we obtain quite simi-

lar values (17.63 for the OLS model and 17.85 for the SLX model). The Mean Absolute Deviation between observed and estimated values for both models is 1.49 €/m^2.

Statistical tests (Likelihood-ratio test and Wald test of spatial terms) conducted to identify the best model specification suggest the use of the SLX model. Coefficient estimates for this model's specification in comparison to the OLS one assures an improving of the level of significance for all the variables, with the exception of "Relevant high-voltage overhead transmission line land-use restriction". Variables are always significant with at least 95% of probability.

As it concerns the intrinsic characteristics of the sold plots, results suggest that land with low permeability are more expensive than land with higher permeability (the coefficient estimate equals to 0.1429), probably due to the lower expenses for irrigation and soil tillage as well as the better agronomic characteristics of these soils and their higher productivity. Airport zoning restriction and relevant high-voltage overhead transmission line land-use restriction show both a negative effect on the price per unit of surface. Airport and power line easements have little relevance from a strictly agricultural point of view and instead have a strong negative impact on the building susceptibility of soils. The buffer strips of high-voltage power lines under Italian law are de facto unbuildable. Even in the case of airports there are strong limitations on building possibilities that vary according to the distance from the airports. In this regard, however, it must be considered that in both cases, the real impact of the resulting constraints both on agricultural activity and, to a greater extent, on building susceptibility, can be affected by numerous specific factors that are difficult to fully consider. For example, airport constraints are of a different nature and can change depending on the distance from the airport and the position with respect to take-off and landing lines.

Extrinsic factors correlated in a statistically significant way to the unit price are exclusively territorial characteristics. When a piece of land is located in an exclusively agricultural context where there are only arable crops or other woody crops (e.g. hedges and woods) within a 250 m radius, the price drops significantly (-27.6% for arable crops and -73.5% for woody crops). This result can depend on multiple factors, including the spread in the zone of quarries, landfills and other non-productive uses, despite the proximity to active quarries, per se, does not resulted to have a statistically significant effect on prices.

The low hydraulic risk of the area surrounding the sold land also has a positive effect on prices: as the percentage of the area occupied by areas that are poorly subject to flooding increases, the price of land can also rise significantly. In this regard, however, it should be noted that this percentage never exceeds 14% among the land surveyed.

In the municipality of Montebelluna, which as observed constitutes an urban pole of regional importance, agricultural land prices are higher (+19.1%). This is a phenomenon already found in other studies in the Veneto region with reference to rural buildings, which generally reflects the urban rent phenomena typical of the region's real estate market (Tempesta, 2011). However, urban rents in the survey area do not depend only on the main urban pole, since smaller towns are also able to create a not-negligible rent. A piece of land located two kilometers away from population centres is worth 10% less than a piece of land bordering them. This phenomenon can certainly be traced back to Veneto's urban planning practice, which has generally endowed all the main settlements in a municipality with urban expansion and production areas. In fact, the municipality has always been the main actor in regional urban planning policies.

Further, results demonstrate that the realization of a large infrastructure project can lead to a non-negligible redistribution of land rent in the territory. The proximity to the tollbooths of the Veneto Piedmont Motorway increases the value of agricultural land in a non-negligible way. According to the model shown in Table 11, an agricultural land located five kilometers from one of the three toll booths in the investigated territory is worth 9.5% less than one located close to them.

Moreover, the model estimate suggests that over the two-year period 2020-2021, land prices fell by 9%. This result suggests a sharp drop in agricultural land values of the area during the Covid 19 pandemic that does not seem to be motivated by internal difficulties in the primary sector, but rather by the general slowdown in the economy and real estate investments.

A third group of factors influencing the sales price and considered into the analysis concerns the characteristics of buyers and sellers. A first result about these aspects is that if the contractors are relatives, the unit price is 19% lower. This is a somewhat obvious fact but, following the recommendations of the International Valuation Standards, it should always be taken into account when comparables are chosen in the appraisal.

Less obvious and, for some aspects, more difficult to interpret, is the effect on the price per unit of surface of the other characteristics of the contracting parties. As for the sellers, if they all reside in the municipality where the sold land is located, then the price is 8.6% higher. This probably stems from the fact that, in many cases, the sellers reside in other municipalities, sometimes far from the

Table 11. OLS and SLX estimates.

Variable		OLS (ML estimator)		SLX (GS2SLS estimator)	
		Coefficient	Standard error	Coefficient	Standard error
Arable crops in the radius of 250 m (fraction)	β_1	-0.2774 *	0.1422	-0.3223 **	0.1371
Woods and hedgerows in the radius of 250 m (fraction)	β_2	-1.3452 **	0.5608	-1.3283 **	0.5493
Distance from urban centres (in m)	β_3	-0.0001 ***	0.0000	-0.0001 ***	0.0000
Soil permeability: moderately low	β_4	0.1545 **	0.0701	0.1429 **	0.0682
Partnership: PAE (1 if yes)	β_5	0.1341 ***	0.0418	0.1389 ****	0.0396
Corporation: PAE (1 if yes)	β_6	0.3652 ****	0.0557	0.3594 ****	0.0595
Corporation: no PAE (1 if yes)	β_7	0.2375 ****	0.0551	0.2259 ****	0.0561
Sellers residing in the same municipality where the land sold is located (1 if yes)	β_8	0.0832 ***	0.0305	0.0827 ***	0.0304
Airport zoning restriction (1 if yes)	β_9	-0.1933 ***	0.0620	-0.1963 ****	0.0560
Plot sold in 2020 or 2021 (1 if yes)	β_{10}	-0.0990 ***	0.0332	-0.0940 **	0.0371
Distance from the nearest exit of the Veneto Piedmont Motorway	β_{11}	-0.00002 *	0.00001	-0.00002 **	0.00001
Relevant high-voltage overhead transmission line land-use restriction	β_{12}	-0.1385 ***	0.0453	-0.1071 **	0.0437
Municipality of Montebelluna (1 if yes)	β_{13}	0.1791 ****	0.0488	0.1745 ****	0.0497
Territory with low flood risk within a radius of 500 m (in %)	β_{14}	0.0132 **	0.0051	0.0120 **	0.0050
Sale between relatives (1 if yes)	β_{15}	-0.2036 ***	0.0704	-0.2102 ***	0.0668
Constant	β_0	2.3621 ****	0.1079	2.4117 ****	0.1334
Arable crops in the radius of 250 m (fraction)	θ_1			-0.3199 **	0.1543
Woods and hedgerows in the radius of 250 m (fraction)	θ_2			9.3278 **	4.1222
Distance from urban centres (in m)	θ_3			0.0001	0.0001
Soil permeability: moderately low	θ_4			1.1174 **	0.5206
Territory with low flood risk within a radius of 500 m (in %)	θ_5			-0.0682 **	0.0342
R^2/pseudo R^2		0.4833		0.5081	
Likelihood-ratio test[(a)]				10.99*	
Wald test of spatial terms				15.72***	

(a) The test compares OLS and the SLX model's results estimated using the same (ML) estimator. The null hypothesis assumes that OLS (constrained) model is nested into SLX.
(b) The test verify that all the spatial parameters are statistically different from zero. This test is referred to the estimates obtained using the GS2SLS estimator.
* p<0.10; ** p<0.05; *** p<0.01; **** p<0.001.

one where the land is located. If a large number of sellers have received the land as an inheritance and have no interest in cultivating it, it is plausible that there is a tendency to sell the land even at a lower price in order to have an immediate monetary return.

The model's results also point out that when the purchasers are corporations, the price is higher than in the situation where the purchasers are natural persons. In the case of corporations, which under current law are to be considered professional agricultural entrepreneurs, the average price paid is 43.2% higher, and if they are not professional agricultural entrepreneurs, it is 25.3% higher. Even in the case of partnerships established by professional agricultural entrepreneurs or direct farmers, the price is significantly higher (14.9%). A first possible explanation for what emerged is the tendency of partnerships and corporations to be more productive and, therefore, they show a higher willing to pay. This is particularly true when the price paid is particularly high in the case of professional enterprises. A second reason could be connected to the fact that direct farmers and professional farmers pay registration fees in a fixed amount and not proportional to the declared value. They would have no incentive to declare a lower amount than actually paid in order to reduce the taxes to be paid to the State. Concerning corporations, 65.4% were found to be active in industry or real estate. In these cases, it can be assumed that the higher price paid is in some way to be traced back to the expectations of land use change triggered by the construction of the Veneto Piedmont Motorway.

Figure 6 shows the value of the direct and the spillover effects, in percentage, respect the total effect on the

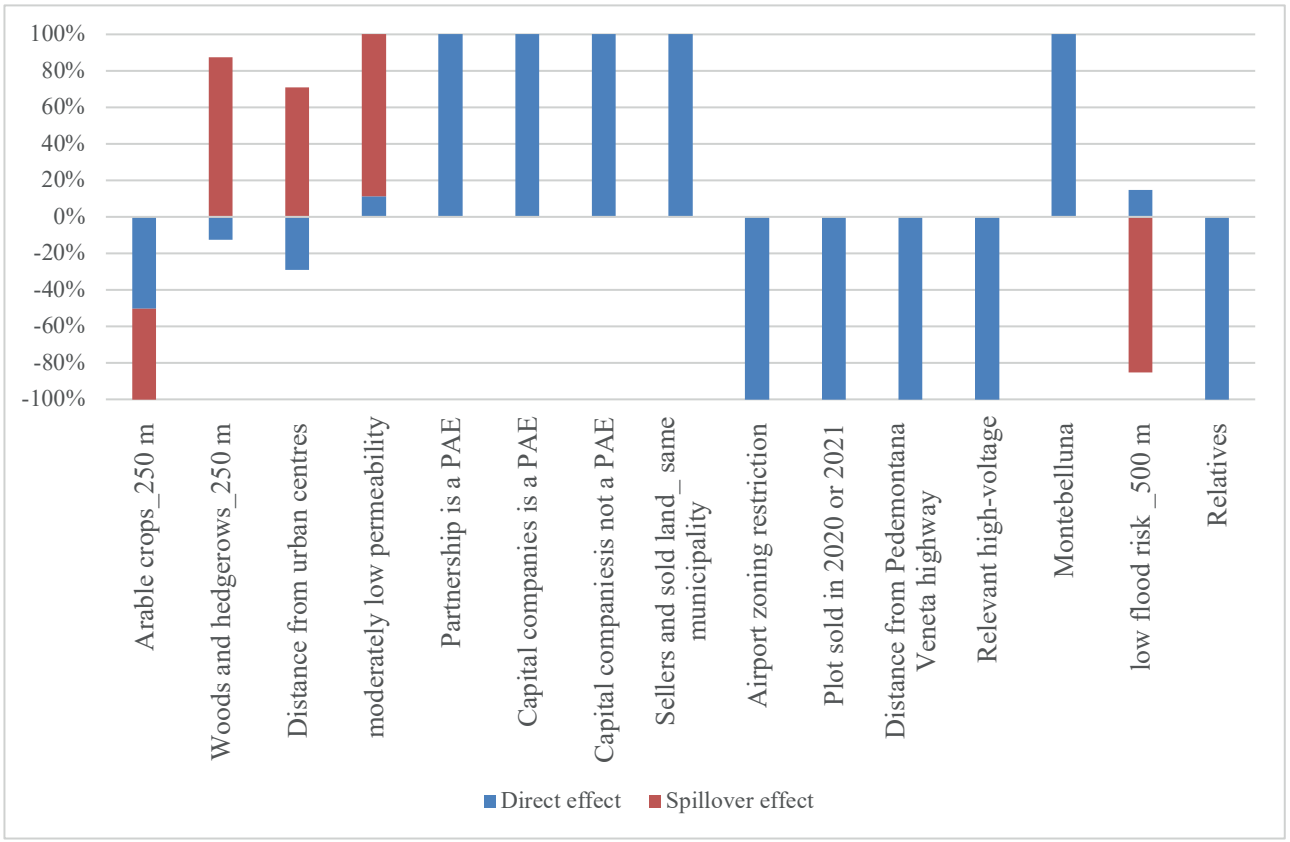

Figure 6. Direct and indirect effects in percentage of the total effect. Note: PAE - Professional Agricultural Entrepreneur.

price per unit of surface. Focusing on the variables for which we assumed a significance spatial Durbin effect, direct and the spillover effects are concord in the estimated sign only for the variables named "Arable crops in the radius of 250 m" and "Soil permeability: moderately low", for which the indirect effect represents, respectively, the 50% and the 89% of the total effect on the price per unit of surface. In all the other cases, signs are opposed and the percentage value of the spillover effect on the total one is very high, ranging between the 117% (for the variable named "Woods and hedgerows in the radius of 250 m") and the 169% for the variable named "Distance from urban centres".

4. CONCLUSION

This study aims at verifying what intrinsic aspects, locational features, characteristics of buyers and sellers, urban planning and structural constrains influence the value of farmland in some municipalities located in the upper Treviso plain (Veneto, Italy). The main novelty of this study is the use of a spatial model able to treat spatial lags in the data and to account for both direct and indirect (or spillover) effects.

Results confirm empirical evidence already produced by similar studies, especially as it concerns the significance of some intrinsic characteristics, such as the soil permeability, the distance for the urban centres and the presence of easements (e.g. airport zoning restriction and relevant high-voltage overhead transmission line land-use restriction). However, additional information arises regarding what characteristics of buyers and sellers influencing sale prices. According to expectations, if the contractors are relatives, the unit price is 19% lower, while if sellers reside in the municipality where the sold land is located, then the price is 8.6% higher. Moreover, also the corporate form of sellers and buyers matters, implying significant variations both in offered and asked prices. Such results are crucial, especially given the increasing diffusion in the use of valuation standards that identify defined profiles of market operators that, unlikely, often do not coincide with real buyers and sellers. Appraisers should consider how the price changes according to sellers and buyers profiles during the comparables searching phase. This stage in the valuation process is made par-

ticularly complicated by the rigidities of the Italian (but not only) rural real estate market, where sales are occasional. Knowing the effect of buyer and seller characteristics on the farmland price is useful to set up factor able to correct prices in the successive analysis.

Further important indications arise by the inclusion in the model of territorial characteristics as determinants on the farmland price. In particular, the land use in the context where the sold plot is located matters, as well as the hydraulic risk of the area and the presence of large infrastructures. Few territorial variables are spatially autocorrelated and this imply the possibility to differentiate the direct from the spillover effect. Estimates suggest that in few cases the spillover effect enhances the direct effect showing the same sign (e.g. fraction of arable crops in the radius of 250 m and soil permeability). The majority of the autocorrelated regressors (fraction of woods and hedgerows in the radius of 250 m, distance from urban centres and percentage of territory with low flood risk within a radius of 500 m), instead, present an indirect effect that is opposite and heavily higher in magnitude than the direct one. This knowledge is crucial to have a more comprehensive understanding of the complex interactions among various factors affecting farmland values.

The main limit of this analysis relates prevalently to territorial data that are available at defined scales, often not suitable for local spatial analyses. However, despite this limitation, the study produces empirical evidence useful for making informed investments and rural market analysis. Understanding the market features allows for identifying opportunities for potential appreciation and to assess the risk associated with the investments. Farmers and agricultural firms, in addition, need to evaluate the cost and benefits of acquiring new farmland or expanding their existing operations. Knowledge of farmland price determinants indicates suitable locations and makes informed decisions about resource allocation. Results of this study are useful also for policy makers and planners in making decisions about land use and development policies. They can identify areas with higher agricultural importance and implement regulations and environmental conservation efforts that protect farmlands from unsustainable farming practices, urbanization or non-agricultural uses.

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The Mortgage Lending Value (MLV): proposal for a new calculation procedure

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Abstract. The mortgage lending value (MLV) is a type of value different from the market value (MV). The MLV appraisal is normally required in loans secured by real estate (collateral) context. In Italy, this appraisal is often made in percentage terms or with subjective criteria that do not consider the reference principles also defined by the valuation standards. This paper, starting from the analysis of the German procedure to appraise the MLV, which is the first country to introduce the concept of a security value in the context of property valuations, aims to propose a more precise procedure than the German one by adopting calculation methodologies typical of the income approach which are based on the principles derived from the definition of mortgage lending value and from market trends. The case is made that the proposed methodology and calculation procedure provide a more objective method to appraise the MLV compared to the current ones, in accordance with both national and international valuation standards, and that it represents a useful tool in the professional field.

Keywords: market value, mortgage lending value, market income, income approach, international valuation standards.
JEL codes: G21, D46, R31.

1. INTRODUCTION

Banks and financial institutions are faced with the possibility that adverse events could lead to significant losses every day. This situation is known as "prudential risk". Financial regulation and supervision are important tools for ensuring that financial institutions manage prudential risk in a way that keeps the overall financial system stable. In this regard, central banks, and supervisory agencies, conduct a meticulous surveillance of financial institutions to ensure that they effectively manage prudential risk. This supervision includes keeping rules and regulations, such as Basel standards, which set minimum capital requirements that banks must meet to manage

risk. In this regard, the European Court of Auditors (ECA, 2023) recently wrote a document known as: *Special report 12/2023: EU supervision of banks' credit risk – The ECB stepped up its efforts, but more is needed to increase assurance that credit risk is properly managed and covered*, in which stated that the credit risk assessments conducted by the European Central Bank are of high quality; however, it is observed that banking supervision fails effectively to utilize the available tools to ensure sound management and coverage of such risk.

The assessment of the collateral value is one of the tools for prudential risk management by financial institutions. Financial regulators closely monitor this issue to ensure that financial institutions are properly managing the prudential risk associated with collateral assets. Following the Basel agreements on the regulation of the banking system, European legislation has addressed the problem of mortgage guarantees and the associated risks of Non-Performing Loans (NPLs) in the event of debtor insolvency, starting from the indications contained in European Parliament Directive n. 2006/48/EC of 14 June 2006 subsequently replaced by 2013/36/EU.

In this context, it is imperative to address the issue of accurate appraisal of real estate for loan provision and the corresponding quantification of risks, with the objective of overseeing the soundness of credit institutions. The main European bodies responsible for the standards reworking in the field of property assessments to meet the stated needs, have had to consider the dictates expressed by European legislation on real estate valuations aimed at granting credit by integrating them into their doctrinal corpus and framing them in accordance with the principles of valuation and standard valuation methodologies already consolidated. The integration process seeks to advance the concept of mortgage lending value (MLV), which is a distinct value from the market value but closely tied to it. This value is determined specifically when appraising a property for the purpose of using it as collateral for a mortgage loan. The Italian Banking Association (IBA) has studied the subject thoroughly by publishing in 2011 appropriate guidelines with the objective of appraising real estate for the purposes of providing security for credit exposures. In addition, the Italian Unification Authority (UNI) has taken steps to address this matter by establishing a working group. The purpose of this group was to develop a standard and methodology for quantifying the mortgage lending value. However, the group has not yet fully completed this task.

The mortgage lending value (MLV) is not a term universally understood or accepted and a codified and shared methodology to calculate it is still not available, thereby leaving a delicate issue to the competence and individual responsibility of the professional called to perform the calculation. The primary aim of MLV is to determine a value that is sustainable and suitable for evaluating whether a property can serve as secure collateral for a mortgage in the long term.

This paper, starting from the analysis of the MLV calculation method adopted in Germany, which was one of the first country to introduce the concept of a security value in the context of property valuations, tries to provide a solution to this problem proposing a more precise method than the German one by adopting calculation methodologies typical of the income approach.

This paper consists of four sections. In Section 2, a literature review on the subject and the legislative and institutional state of the art is provided. In Section 3, the differences between market value (MV) and mortgage lending value (MLV), together with their notable definitions, are illustrated. Section 4 describes the materials and methods employed in this study. In particular, in Section 4.1, we deliver the procedure structure used in Germany to appraise the MLV in the banking sector, highlighting the principles on which it is based. In Section 4.2, a proposal for a new calculation procedure, based on the German one, is presented and a small practical example is considered. Finally, in Section 5, we present the conclusions drawn from the study.

2. LITERATURE REVIEW

Mortgage valuation is a topic widely discussed in German literature mostly. In particular, Rossler and Langner (2004), Ross and Brachmann (2005), and Sommer and Kroll (2005) have dealt with this topic extensively. Contents and approaches to MV methods are very similar in these publications with national applicability. The study of Adolf (2005) and Metzner (2005) only marginally covers this research area. More specific studies aiming to analyse the MLV were conducted by Werth (1998), Ruchardt (2001), Stocker (2004), and Kierig (2006).

In the Anglo-American journals about property valuation and lending there are several studies regarding MLV (Adair and Hutchison, 2005; Crosby and French, 1999; Joslin; 2005; Serret and Trello, 2004; White and Turner, 1999).

Among other issues, matters related to the valuation quality, the macroeconomic impact, or the exertion of influence of banks on the valuation results are also dealt with, as in Bretten and Wyatt (2001), Crosby et al. (2004), Pitschke (2004), Bienert (2005), and Ciuna et al. (2016). Often, these studies are particularly interesting and relevant within the boundaries of the countries considered.

On a macroeconomic level, in 1994, Renaud worked on questions concerning real estate cycles, property risk, credit crunch, and cause and effect chains within the real estate industry (1995). The findings of Ropeter (1998), Maier (1999), Wüstefeld (2000), and Pfnür and Armonat (2001) related to property risk identification and assessment are of great interest, particularly for German real estate markets. The results of studies made by PriceWaterhouse-Coopers (PWC, 2004), as well as Tsatsaronis & Zhu (2004) or Milleker (2005), concerning the determinants of real estate prices are also significant. Otherwise, the works of Poppensieker (1997) and Jorion (2000) are focussed on risk assessment in general. French and Gabrielli (2006) define risk as the measure of the difference between actual and expected outcomes of the analysis, whereas uncertainty concerns the lack of knowledge and poor or imperfect information about the inputs required in the model. Ferreira et al. (2014) employ an AHP-based methodology in the credit-scoring system employed by one of the major banks in Portugal. Their objective is to propose a methodological framework to adjust trade-offs among the criteria considered and provide decision makers with a more transparent mortgage risk evaluation system. A few years later, the same authors analyse the results from the application of the AHP, Delphi Method, and Measuring Attractiveness by a Categorical Based Evaluation Technique (MACBETH) during the trade-off readjustments operations during the credit risk were obtained (Ferreira et al., 2016). As for the risk, Locurcio et al. (2021) identify a synthetic risk index through the participatory process, in order to support the restructuring debt operations to benefit smaller banks and small and medium-sized enterprises (SME), by analysing the real estate credit risk.

With reference to aspects of mortgage lending from a bank's point of view and the interaction of European mortgage markets especially, mention must be made of the works of Rode (1993), Rüchard et al. (1993), Steffan and Scholz (1993), Süchting (1995), Rüchard (2001), Paschedag (2002), Low et al. (2003). Gondring and Lorenz (2001) affirm that the MLV must be conceived as an independent value which is not identical to the market value. In this regard, Benvenuti (2013) proposes a calculation criterion for the MLV determination that originates from the financial method application (direct capitalization) by adopting a capitalization rate calculated by means of the debt coverage ratio (DCR). A more recent study by Tajani and Morano (2018) proposes and tests an innovative methodology for assessing MLV, trying to improve and rationalize the appraisal of the percentage reduction to be applied to the market value. Salvo et al. (2022) propose an appraisal model to determine the mortgage lending value in particular cases, such as when the existing buildings provide income during their useful life. In this study some of the indexes introduced are completely original with respect to the current referenced literature.

Generally, international studies show that the relationship between the MV and how the MLV should be calculated is still unclear (Bienert and Brunauer, 2007). European legislation, following the Basel agreements on the regulation of the banking system, on several occasions has addressed the problem of mortgage guarantees and the associated risks of non-performing banks in the event of debtor insolvency, starting from the indications contained in the EU Directive 2006/48/EC (2006) of the European Parliament and Council of 14 June 2006. As a result, the main European organizations responsible for drawing up standards for property valuation had to take account the principles and concepts set forth in European legislation on property valuation, integrating them into their doctrinal corpus and framing them in accordance with the principles of the estimative doctrine and the standard methodologies of evaluation already consolidated.

The European Parliament defines the guidelines to which the international standards adhere: the "White Book" of the IVSC (International Valuation Standard Council), the "Blue Book" of the EVS (European Valuation Standards) of TEGoVA (The European Group of Valuers' Associations) and the Appraisal and Valuation Manual known as "Red Book" of the RICS (Royal Institution of Chartered Surveyors).

The European Mortgage Federation (EMF) states that the MLV cannot be grouped with other valuation approaches based on MV that are taken on a given date; the MLV is estimated to verify if a mortgaged property provides sufficient guarantee to secure a loan over a long period and thus reflects the long-term value of a property.

TEGoVA is the first institution to adopt this definition and integrate it with the EVS. In its European Valuation Standards, TEGoVA defines the MLV as a valuation basis other than MV. This concept is reproduced even in the most recent edition of the 2020 European Valuation Standards (TEGOVA, 2020). The European Banking Authority (EBA) has identified the need to apply the MLV and reach a harmonization of rigorous criteria for the respective valuation (EBA, 2015).

3. MORTGAGE LENDING VALUE (MLV) VS MARKET VALUE (MV)

There are significant differences between the market value (MV) and the mortgage lending value (MLV).

The MLV is defined by the European Valuation Standard (TEGOVA, 2020) as follows: *"The value of immovable property as determined by a prudent assessment of the future marketability of the property taking into account long-term sustainable aspects of the property, the normal and local market conditions, the current use and alternative appropriate uses of the property"*. The above definition is incorporated into Capital Requirements Regulation (EU) No. 575/2013, art. 4 (74).

The International Valuation Standard Council (IVSC) defines the MLV as a non-market value basis in the International Valuation Standards (IVS), highlighting that the MLV *"is a value concept used for property lending purposes, based on the sustainable aspects of the property and restricting the assessment of property value to the permanent economic characteristics of the property and the revenue that any tenant could produce by proper management"* [2]. With this value, they refer to market risks (present market conditions, market cycles, market volatility, stability, liquidity, demographic trend, attractiveness of regional markets, etc.), location risks (suitability of the location for investment, revenues and increases in values, infrastructure, micro-trend of the local economy, etc.), construction-related property risks (physical quality of the property, maintenance requirements, reconstruction costs, etc.), risks related to the tenants and leases, fiscal risks (current tax situation, potential positive or negative changes, etc.), and legal risks (ownership, planning permission, subside, etc.).

The MV definition, also incorporated into Capital Requirements Regulation (EU) No. 575/2013, art. 4 (76), is defined as follows: *"The estimated amount for which the property should exchange on the date of valuation between a willing buyer and a willing seller in an arm's-length transaction after proper marketing wherein the parties had each acted knowledgeably, prudently and without compulsion"*. This definition is quite similar to that one given by EVS and IVS.

The most substantial and principal difference between MLV and MV is that the first is intended to be a property value assessment for a long period of time and theoretically obtainable in a sale at any moment during the loan period; instead, the MV is an assessment at a given moment in time (specific valuation date). The MLV is lower than the market value because it does not consider the market fluctuations and settles down to the minimum value that the property may take throughout the terms of a mortgage (Figure 1).

The appraisal of the MLV is crucial for banks to be able to take decisions on the granting of loans and allows to establish if a mortgaged property is able to offer sufficient collateral to cover a long-term loan. On

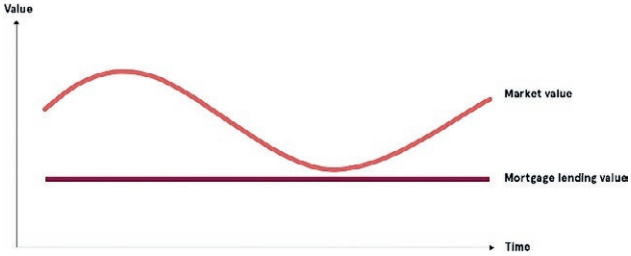

Figure 1. MLV and MV graphs through time.

the basis of this, the appraiser has to seek a value that is safe for the bank over an appropriate period of time. To pursue this goal, it is necessary to consider some fundamental elements such as the future marketability of the property in the long term. It should focus on the property characteristics that have a high degree of sustainability through time, such as the location, the quality of the construction and the context in which it is inserted. The appraiser will have to calculate rental income based on past and present long-term market trends.

Essentially, the MLV appraisal implies the methodological problem of its quantitative measure since it is a risk analysis even before an appraisal judgment; for this reason, it can be classified as a Non-Market-Value.

The methodological procedures used to appraisal the MLV, whether the calculation is performed independently or is derived from the market value, must always consider the following considerations:

- The MLV is a type of value that needs to be determined considering long-term sustainable characteristics of the property and the normal and local market conditions;
- The definition of the mortgage lending value also introduces a notion that can be described as a mitigation of market trends, rents, and capitalisation rates. The sustainability of the mortgage lending value may require adjustments to the actual income of the property, to the discount or capitalisation rate and to the costs of managing the property;
- The MLV cannot be determined through a straightforward percentage reduction of the market value;
- The assumptions used for the appraisal of the MLV must derive from a thorough knowledge of the historical development of the property market and from a critical examination of current conditions and trends, especially in terms of risk;
- The MLV appraisal cannot be based on tabular real estate prices and list prices of companies and brokers;
- In the MLV appraisal, the evaluator must make explicit reference in the valuation report to any guidelines issued by the Bank.

4. MATERIALS AND METHODS

4.1 German method to appraise the MLV

In this paragraph, the MLV calculation methodology used by the German Pfandbrief Banks is presented: this represents the starting point for the definition of the procedure proposed in this paper.

The German procedure is based on the following general principles:

- To determine the mortgage lending value, the future marketability of the property is to be taken as a basis within the scope of a prudent valuation, by considering long-term sustainable characteristics of the property, the normal and local market conditions, the current use, and alternative appropriate uses of the property.
- The determination of sustainable characteristics of the property and their influence on the valuation requires a long-term view of market conditions.
- The period under consideration shall be specified and its appropriateness comprehensibly explained.

Below, we state the key steps of the German procedure:

Step 1: *Determination of the annual gross income of the property*
The determination of the annual gross income of the property takes into account only the income that the property is capable of yielding to any owner on a sustained basis assuming proper management and permissible use. Following this statement, the monthly unit income considered to appraise the MLV is lower than that one used to appraise the market value of a property. The gross income of the property is derived by multiplying the surface area of the property with the monthly unit income, and then multiplying that result by twelve months.

Step 2: *Determination of the net income of the property*
The net income of the property is determined by subtracting the usual operating expenses, which are typically the responsibility of the landlord, from the annual gross income. To accomplish this, factors such as management costs, maintenance expenses, rental income risk, any additional expenses not covered by shared costs, and property-specific modernization risks need to be considered.
Management costs encompass several expenses, including:

- The costs associated with personnel and equipment required for property management.
- Expenses related to accounting, payment transactions, and year-end financial statements.
- Costs incurred for lease agreement administration and handling of damage cases or insurance claims.

Maintenance costs are costs that have to be incurred as a result of wear and tear, age, and weather to preserve the use of the building for its intended use during its useful life. These costs comprise ongoing maintenance and regular repairs of the building, but not its renovation.
Rental income risk is the risk of a reduction of income due to irrecoverable rent arrears or vacant rental space. This risk also encompasses expenses related to legal action for rent collection, lease agreement termination, or eviction.
Running costs are the costs that are incurred on an ongoing basis as a result of ownership of the property or of the designated use of the property as well as of the building and other installations for the purpose specified.
Modernization risks are the costs for the necessary adjustments needed in addition to the maintenance costs to preserve the marketability and to safeguard the basic rent level on a permanent basis. They are to be shown as a percentage of the reconstruction costs.

Step 3: *Calculation of the income of the built area*
The income of the built area is calculated starting from the knowledge of the market value of the land. This value, appraised by multiplying the land surface with its unit price, is then multiplied with the capitalization rate to obtain the income of the built area. The capitalization rate is derived considering a *"sustainable valuation"* in accordance with the general principles stated at the beginning of this paragraph that have to be followed to appraise the MLV. For this reason, the capitalization rate normally used to appraise the market value, in a specific market and for a specific property, is *"softened"*.

Step 4: *Determination of the net income of the building*
The net income of the building is obtained from the net income of the entire property (as calculated in **Step 2**) by subtracting the income of the built area (a**s** calculated in **Step 3**).

Step 5: *Appraisal of the building market value capitalizing the net income with the use of a multiplier* PV_{factor}
The building market value is appraised capitalizing the net income of the building (as calculated in **Step 4**) with the use of a multiplier PV_{factor} based on the remaining useful life of the building and on the capitalization rate. The multiplier PV_{factor} is calculated as:

$$PV_{factor} = \frac{1-(1+r)^{-s}}{r} \quad (1)$$

where s is the remaining useful life and r is the capitalization rate.

The *remaining useful life* represents the period in which the building can still be operated economically assuming proper maintenance and operation. The remaining useful economic life can be appraised for the specific property on the basis of the expected duration the property's assured economic usability.

The *capitalization rate* corresponds to the assumed interest rate at which the sustained net income of a property, achievable in future, is discounted over the period of its assumed payment on the basis of a prudent assessment and based on experience. It must be derived from the relevant regional long-term and use-specific market developments. Different types of use must be considered separately in each case. We specify that the capitalization rate used in **Step 5** is the same rate used in **Step 3**.

Step 6: *Appraisal of the property value*

The last step of the German procedure to appraise the MLV consists in the sum of the building market value (calculated into **Step 5**) and the built area market value. The amount calculated represents the MLV.

In Figure 2, we report a figure in that summarizes the German procedure to appraise the MLV described.

4.2 Methodological structure of the proposed model

The proposed model to appraise the mortgage lending value (MLV) retraces the steps of the German procedure seen in the previous paragraph but which presents substantial reviews concerning the capitalization rate.

The reviews are the following:

1. To appraise the income of the built area and the market value of the building two different capitalization rates are used: a land capitalization rate r_L and a building capitalization rate r_B. This modification comes from the knowledge that the investments concerning the land and the building are substantially different. The land capitalization rate r_L has to reflect a lower investment risk and an unlimited duration compared to the building capitalization rate r_B; on the other hand, the building capitalization rate r_B has to reflect an increased investment risk, a medium to long duration, a potential depreciation, and higher operating costs than the land capitalization rate r_L (Simonotti, 2019).
2. It is considered incorrect *"to soften"* the capitalization rate used in the appraisal procedure of the MLV. Because of the inverse proportionality between value and capitalization rate, by lowering the latter we would obtain a higher market value and so the

Income Value Method - Market Value

Rental Income		
1,779 sq.ft. x $18.50 per sq.ft. x 12 months = rental income per year		$394,938
Equivalent Yield	7.00%	
Multiplier	14.29 PV factor into perpetuity	
394,938 x 14.3 = Income Value		5,643,664
Less: additional purchase costs @ 5.75%		324,511
		5,319,153
Market Value (rounded)		**$5,320,000**

Income Value Method - Mortgage Lending Value

Annual Gross Income based on the incoming rent		
1,779 sq.ft. x **$17.00** per sq.ft. x 12 months = rental income per year		$362,916
Less operating costs (individual evidence)		
Administration	1.0%	
Rick of rent loss	3.0%	
Maintenance / Revitalization	5.0%	
Total	9.0%	
Minimum estimate	**15.0%**	
Less: Ttl. Exp. based on minimum estimate		**54,437**
Total annual net income		308,479
Less: income attributable to the land **950,000** x **6.50%** =		
Net income attributable to the land only		**61,750**
Building income		246,729
Present Value of Building calculation		
Remaining Economic Life	60 years	
Property capitalization rate	**6.50%**	
Multiplier (PV factor)	**15.03**	
Present Value of Building		3,709,063
Plus Land Value		**950,000**
Total Property Value		4,659,063
Less: additional purchase costs @ 5.75%		267,896
		4,391,166
Mortgage Lending Value (rounded)		**$4,390,000**

Figure 2. Summary of the German procedure to appraise the MLV (Source: Verband Deutscher Pfandbriefbanken).

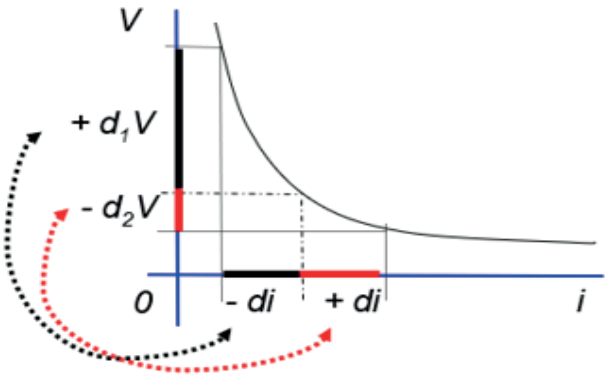

Figure 3. The relation between the market value and the capitalization rate.

rate reduction does not lead to a sustainable value. This represents a contradiction because we know that normally the MLV has to be lower than the MV. The relation between the market value and the capitalization rate is represented in Figure 3.

In order to appraise the MLV, the proposed procedure, is based, on the one hand, on the principles of the income approach appraisal methods and, on the other hand, on the same principles on which the German procedure is based. The latter derive from the definition of mortgage lending value and the market trends. The application of these principles leads to the *"mitigation"* of the input market data involved in the procedure such as the annual net income of the property, the land capitalization rate i_L and the building capitalization rate i_B; the mitigation of the two capitalization rates consists, in the light of what was explained at the beginning of the paragraph, in an increase of the same rates in order to smooth the market value. These operations of mitigation come from the recognition that the mortgage lending value has to focus on the long-term value sustainability in order to provide adequate collaterals for the credit granting. For these reasons, it is necessary to consider the smoothing of the market trends, namely, of the incomes and the rates.

The MLV appraisal method requires in-depth knowledge of the real estate market historical development, especially in terms of risk.

The first step of the MLV procedure consists in the appraisal of the market value MV and the annual net market income MI_N of the property. According to traditional real estate appraisal methods, the market value of a built property can ideally be decomposed into the sum of the land market value (without buildings) and the building market value (Simonotti, 2019; Salvo et al., 2021). Thus, in analytical terms, MV can be expressed as:

$$MV = MV_L + MV_B \tag{2}$$

where MV is the property market value, calculated by adding the land value MV_L to the building value MV_B. This relationship sets a clear separation between the land property and the building property that ideally are supposed to provide separate incomes.

The incidence of the built area c_L is the ratio of the land market value to the property market value:

$$c_L = \frac{MV_L}{MV} \tag{3}$$

According to Equation (3), we can rewrite (2) as follows:

$$MV = c_L \cdot MV + (1 - c_L) \cdot MV \tag{4}$$

Given the annual unit share of the building depreciation q and the building value MV_B, we can calculate the annual share of the building depreciation D_B in this way:

$$D_B = MV_B \cdot q = (1 - c_L) \cdot MV \cdot q \tag{5}$$

The annual unit share of depreciation q is considered constant during the economic life of the residential building and can be obtained as follows:

$$q = \frac{1}{n} \tag{6}$$

where n represents the economic duration of the building. This amount depends on the specific building type of the considered property.

According to the definition of mortgage lending value, the quantity MI_N has to be *mitigated* to consider the smoothing of the market trends. This correction is obtained using a specific coefficient α, determined after having analysed the specific market and the associated risks. The aforementioned coefficient is determined based on reasonable assumption that derives from practitioner's expertise. Once the mitigation coefficient α has been applied to the annual net market income MI_N, we define the annual net market income prudentially adjusted as $MI^{\star}_N = \alpha MI_N$.

By analogy with Equation (2), the annual net market income of the property, namely $MI^{\star}_N$, can be also expressed into the sum of the market income $MI^{\star}_L$ of the built area and the market income $MI^{\star}_B$ of the building:

$$MI^{\star}_N = MI^{\star}_L + MI^{\star}_B \tag{7}$$

The annual net market income of the property is obtained by subtracting the operating expenses – nor-

mally to be covered by the landlord - from the annual gross income. The individual cost items are management costs, maintenance costs, loss of rental income risk, and any other running costs not covered by allocable shares in costs. The costs include a modernization risk specific to the property type. The operating expenses of the property would include expenses for legal and accounting services, insurance, janitorial, supplies, taxes, utilities, etc. They also include principal and interest payments on loans, capital expenditures, and depreciation. According to the Regulation on the Determination of the MLV of Properties in accordance with § 16 pars. 1 and 2 of the Pfandbrief Act, the minimum amount of a deduction of operating expenses must equal at least 15 percent of the gross income (Werth, 2001; Rüchardt, 2001; Stöcker, 2004; Kierig, 2006).

The market income $MI^{\star}$ of the property net of the annual share of the building depreciation D_B is equal to[1]:

$$MI^{\star} = MI^{\star}_N - D_B \tag{8}$$

The market income $MI^{\star}_L$ of the built area is calculated from the market income $MI^{\star}$ of the property on the basis of the incidence of the built area c_L as follows:

$$MI^{\star}_L = c_L \cdot MI^{\star} = c_L \cdot (MI^{\star}_N - D_B) \tag{9}$$

and the market income $MI^{\star}_B$ of the building is obtained by subtracting the market income $MI^{\star}_L$ of the built area from the annual net market income $MI^{\star}$ of the property this way:

$$MI^{\star}_B = MI^{\star}_N - MI^{\star}_L = MI^{\star}_N - c_L \cdot (MI^{\star}_N - D_B) \tag{10}$$

Given the quantities MV_L, $MI^{\star}_L$, MV_B and $MI^{\star}_B$, the land capitalization rate r_L and the building capitalization rate r_B are equal to:

$$r_L = \frac{MI^{*}_L}{MV_L} \tag{11}$$

$$r_B = \frac{MI^{*}_B}{MV_B} \tag{12}$$

We use an additional value β to prudentially increase the capitalization rate of the building and consequently to mitigate the market value of the property. The additional value β, as the coefficient α, is determined based on reasonable assumption that derives from practitioner's expertise. We define $r^{\star}_B = \beta + r_B$.

It is necessary to clarify that the land capitalization rate r_L, in most cases, has not to be increased because its economic value is more sustainable than the building one during the time. The land, in fact, is not subject to the process of progressive loss of economic value caused by physical deterioration and functional obsolescence. If there are some external influences that can affect the land value, we could consider a specific additional value, to be applied to the capitalization rate of the built area, that takes into account these circumstances and so the depreciation due to external obsolescence.

Considering a remaining useful life of the building equal to s years, we can transform the building capitalization rate $r^{\star}_B$ into *GRM* (Gross Rent Multiplier) form:

$$GRM = \frac{1-(1+r^{*}_B)^{-s}}{r^{*}_B} \tag{13}$$

where the remaining useful life of the building are appraised by the professional in relation to the type and to the state of maintenance of the property and considering the years of depreciation.

Finally, the calculation of *MLV* may therefore be rendered as follows:

$$MLV = \frac{MI^{*}_L}{r_L} + MI^{*}_B \cdot GRM \tag{14}$$

This expression formulates the possibility of calculating the MLV by referring to the capitalization rates and the market incomes, adequately mitigated in accordance with the national and international common definitions of MLV, and so, by adopting calculation methodologies typical of the income approach.

To clarify the proposed method to appraise the MLV, we have considered a small example starting from the data collected in Table 1 that represent the input data of the procedure. The example illustrates the MLV appraisal of a residential property.

As described hereinafter, we report the application of the procedure, step by step.

1. *Decomposition of the property market value into the sum of the land market value and the building market value. This process involves the using of the incidence of the built area (c_L).*

$$MV = 0.20 \cdot 200{,}000.00 + (1 - 0.20) \cdot 200{,}000.00 \text{ €} \tag{15}$$

$$MV_L = 0.20 \cdot 200{,}000.00 = 40{,}000.00 \text{ €} \tag{16}$$

$$MV_B = (1 - 0.20) \cdot 200{,}000.00 = 160{,}000.00 \text{ €} \tag{17}$$

[1] The annual share of the building depreciation D_B affects only the built property' part related to the building. To calculate the market income $MI^{\star}_L$ of the built area, it is necessary to separate the annual share of the building depreciation from the annual net market income $MI^{\star}_N$ of the entire property.

Table 1. Input data of the procedure to appraise the MLV.

Data type	Amount
Market value of the property (*MV*)*	200,000.00 €
Annual net market income of the property (*MI*)*	12,000.00 €/*year*
Incidence of the built area (c_L)	0.20
Economic life of the building (n)	100 *years*
Mitigation coefficient (α) *It has to be applied to the annual income of the property*	0.05
Additional value (β) *It has to be added to the building capitalization rate*	0.01

*If these data are not known, it is possible to derive them using the classical procedures in literature.

2. *Determination of the annual share of the building depreciation D_B.*

$$D_B = 160{,}000.00 \cdot 0.01 = 1{,}600.00 \text{ €/year} \quad (18)$$

In Equation (18), the amount 0.01, namely the annual unit share of depreciation q, is obtained knowing that the economic life of the residential building considered n is equal to 100 years.

3. Mitigation of the annual net market income of the property MI_N using the mitigation coefficient (α). The annual net market income prudentially adjusted MI^*_N is obtained as:

$$MI^*_N = 0.05 \cdot 12{,}000.00 = 11{,}400.00 \text{ €/year} \quad (19)$$

4. *Determination of the market income MI* of the property net of the amount D_B.*

$$MI^* = 11{,}400.00 - 1{,}600.00 = 9{,}800.00 \text{ €/year} \quad (20)$$

5. *Determination of the market income MI^*_L of the built area.*

$$MI^*_L = 0.20 \cdot 9{,}800.00 = 1{,}960.00 \text{ €/year} \quad (21)$$

6. *Determination of the market income MI^*_B of the building.*

$$MI^*_B = 11{,}400.00 - 1{,}960.00 = 9{,}440.00 \text{ €/year} \quad (22)$$

7. *Calculation of the land capitalization rate r_L and the building capitalization rate r_B.*

$$r_L = \frac{1{,}960.00}{40{,}000.00} = 0.049 \quad (23)$$

$$r_B = \frac{9{,}440.00}{160{,}000.00} = 0.059 \quad (24)$$

8. *Increase of the building capitalization rate r_B, obtaining the r^*_B, with the use of the additional value β.*

$$r^*_B = 0.01 + 0.059 = 0.069 \quad (25)$$

9. *Transformation of the building capitalization rate r^*_B into GRM (in this example it is considered that the remaining useful life of the building is equal to 60 years).*

$$GRM = \frac{1-(1+0.069)^{-60}}{0.069} = 14.23 \quad (26)$$

10. *Calculation of MLV.*

$$MLV = \frac{1{,}960.00}{0.049} + 9{,}440.00 \cdot 14.23 = 174{,}314.00 \text{ €} \quad (27)$$

5. CONCLUSIONS

The mortgage lending value is a key element of property valuation for lending purposes. It is based on the long-term, sustainable features of the property being mortgaged and excludes speculative elements and fluctuations in value tied to changes in the economy. In Italy, particularly in the professional context, the appraisal of this type of value is often made in percentage terms or with subjective criteria that do not take into consideration the referenced principles also defined by the valuation standards. In the academic field, instead, the procedures developed for the MLV appraisal are often laborious and difficult to apply in professional practice. This study aims to overcome these difficulties, proposing a procedure to appraise the MLV that is easy to apply and reflects the valuation standards. The German procedure to appraise the MLV distinguishes itself for its easy application. It takes due account of the subdivision of the property into its components, the land, and the building and, in applying the income capitalization method; it realistically considers the residual maturity of the building's structure instead of an unlimited period as is the case for the land. The procedure proposed in this paper starts from the German model but takes a step forward by considering two different capitalization rates, a land capitalization rate r_L and a building capitalization rate r_B. By doing so, the procedure recognizes that the investments concerning the land and the building are substantially different in consideration of the different risks associated with each of them, respectively.

Future insights of this work, in order to make strong the proposed procedure, could concern the development

of a methodology useful to calculate the mitigation coefficient α and the additional value β. This goal could be pursued, collecting data from different market areas, and using it in an econometric model.

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Analysis of the initial steps of the Market Comparison Approach (MCA) for its application to agricultural land: parameters of the market segment and real estate data

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Abstract. In the current Italian real estate market, estimates of the market value of rural properties are carried out by appraisers mainly using the single-parameter comparison procedure and, less frequently, the income capitalization method. To overcome problems of appraiser subjectivity and other issues related to these methods, and to gradually comply with real estate appraisal standards, this research paper aims to develop and validate a scientifically rigorous method. This article carries out a first attempt to apply the mixed approach based on the integration of Market Comparison Approach (MCA) and General Assessment System (GAS) to agricultural land, currently used only in the field of urban real estate appraisal. The study focuses on the first steps of this valuation procedure: choice of the parameters which characterise the market segment and identification of the land characteristics to be included in the procedure. These two steps are preparatory to the following phase concerning the estimate of marginal prices, which represents the core of the whole valuation procedure.

Keywords: valuation standards, market-oriented method, land values, land prices, real estate appraisal.
JEL codes: C81, O18, Q1, R3.

1. INTRODUCTION

The 17 Sustainable development goals set by the European Union with Agenda 2030 include goal 2, which aims to end hunger, achieve food security, and promote sustainable agriculture that helps maintain the planet's ecosystem and contrasts the growing phenomenon of soil degradation and desertification; additionally, it aims to assure secure and equal access to land for all.

Until recently, the agricultural sector has seen little interest from those responsible for property appraisals. This is because the land market has a

marginal economic importance compared to urban real estate, which is more closely linked to the financial and investment sectors.

The land market is characterized by a particular good, soil, which has a limited and extremely rigid supply that has been exacerbated by its drastic consumption during the last few decades due to the land transition from agricultural to non-agricultural uses, and finally by land abandonment and movement of investments elsewhere.

However, it seems that a reversal in this trend may be underway, shown by increasing interest from analysts stimulated by greater public interest towards environmental sustainability and land consumption (Munafò, 2021).

An analysis of the land market requires transparent data collected with scientific rigor. However, up until now, precise information is still lacking on agricultural land trading activities (Festa et al., 2021).

Thus, there seems to be an unmet need on one side to have easily available sales databases and on the other to be equipped with a valuation tool complying with real estate appraisal standards in order to provide reliable estimates.

Today in Italy, the unreliability of land appraisal results is mainly due to the fact that information is obtained in a market that is scarcely active and rather opaque, making it difficult to implement market-oriented estimates and almost impossible to conduct large-scale valuations (e.g. Mass Appraisals). To overcome these obstacles, estimates are often based on the personal knowledge of the appraiser rather than on recorded and traceable data, thus becoming true "expertise" (Ciuna et al., 2014; Ciuna et al., 2015; Simonotti, 2003).

Up until now, the scientific community has concentrated its attention on urban real estate markets, and has refined tools and methodologies both for the measurement and data collection phase as well as for the valuation phase itself.

Thus, the introduction of these more advanced market-oriented procedures into the agricultural land market sector should be favoured, where the most used method in professional practice is still the single parameter comparative procedure.

The whole valuation discipline, especially that belonging to the Italian school (Brizi, 1946; Medici, 1972; Michieli, 1993), in dealing with the monoparametric appraisal procedure, makes a distinction between comparative estimates based on technical (or physical) parameters and those ones based on economic parameters.

Within the first category, the parameter that is most commonly cited in the literature and used in professional practice is the surface, a parameter that is easy to quantify because it can be detected with a very high degree of precision, depending on the measurement tool adopted.

Among those ones with economic parameters (gross saleable production, net product, landlord income, rent) the rent is the element most taken into consideration both by the literature and by the category of real estate appraisers in the field of agricultural land.

Within the first category, the estimates can be easily applied only when the goods have a high degree of homogeneity ("deep analogy" condition). Therefore, according to the appraisal theory, this parameter is difficult to use with land properties as the market value of this category of assets is attributable to a large variety of intrinsic and extrinsic characteristics and is not exclusively correlated to their surface area. The use of this parameter is therefore possible only if there is a high degree of homogeneity between the land being valued and the similar used for comparison, a situation which rarely occurs in the actual market.

In the case of economic parameters, the rent is applicable only following the occurrence of the two conditions illustrated below. The first one is that it must be determined by the effective interaction between land market demand and supply (pursuant to article 45 of Law no. 203 of May, 3rd, 1982) and the second condition is that land management of the specific market segment must ordinarily be rent-based.

This appraisal procedure may be strongly influenced by discretionary decisions made by the appraiser, who has the delicate task of identifying comparable properties that are similar in everything except the parameter chosen as the discriminant under a condition of "deep analogy" (Simonotti, 2002).

The absence of such a condition leads to a sample selection that is not consistent with the methodological assumptions of the valuation procedure. The distortion of the resulting appraisal valuation can be attributed to a lack of consideration of certain characteristics that significantly contribute to the market price but are operationally difficult to quantify, as well as to the low activity of the agricultural land market that does not easily allow for the identification of bought and sold properties that are only dissimilar from the one being appraised in a single characteristic.

Based on the situation discussed above, it seems evident that a procedure is needed that is multiparametric but also parsimonious, such as the Market Comparison Approach (MCA), which can make systematic adjustments of detected prices. These price corrections make it possible to: a) not have to identify comparable goods

that fit the "deep analogy" conditions; b) to decode otherwise omitted variables influencing market price into economic terms.

Currently, applications of MCA in the literature exclusively regard urban real estate markets (Simonotti et al., 2016; Simonotti, 2003; 2006; 2011; 2019) and to the authors' knowledge the only attempt to implement the MCA for agricultural land is that of Berloco (2012), who proposes using MCA as an instrument that can assure accurate and robust valuations of agricultural land, even in the presence of a land market that is notoriously stagnant and opaque.

First, Berloco (2012) emphasises the importance of carefully identifying the market segment to be studied due to the extreme complexity of agricultural holdings. The collection of property data comes next, which should be carried out by using ad hoc survey forms. In the absence of a set of universally shared agricultural land property characteristics, the Author presents a wide variety to stimulate a discussion with appraisal professionals to identify the current "best practices" that can be used as the foundations for agricultural property appraisal standards [1]. To this end, he proposes an illustrative case-study where an integrated MCA-General Assessment System (GAS) is applied to an agricultural property producing cereal and forage crops.

Besides, MCA and GAS in relation to agricultural land can be found in Italian Property Valuation Standard (Tecnoborsa, 2005; 2018) and in Simonotti (2011). The latter proposes three examples of application of the MCA and the GAS for educational purposes; the former, aims to provide professionals with the guidelines for the appraisal of agricultural assets and to indicate their operative field. Therefore, the Code mentions MCA and GAS, among others, in the more general context of the Market Approach Method for the evaluation of agricultural land.

In the light of the above, there is the actual risk that professional estimates are carried out on the basis of real estate characteristics just described and not developed from the methodological point of view.

The GAS is a mathematical procedure based on comparison. By starting with two or more properties with one or more characteristics that are usually qualitative, this process makes it possible to determine the marginal prices of said characteristics and the value of the subject through matrix calculus techniques (Simonotti, 2011). It can be used both autonomously and in combination with the MCA when the marginal prices of qualitative characteristics need to be estimated. Since its resolution requires the use of matrix calculus, its main limitation is that the number of comparables must be equal to the number of qualitative characteristics involved plus one.

A didactic example of the application of this method to agricultural land can be traced in a quite old study by Simonotti (1985), where the author deals with it from a theoretical point of view while making in the closing part of the paper a mere exemplification concerning an agricultural piece of land.

However, no further developments have followed this pioneering study in investigating appraisal methodologies for agricultural properties.

The objective of the present study is to obtain estimates that are rigorous in terms of both property data collection and valuation analysis, even under the condition of a scarcely active market[2].

This study discusses the following first two steps of the research that has been carried out so far:

1. Choice of parameters to implement the segmentation of the agricultural land market (market segmentation data collection form);
2. Identification of the characteristics to be included in the procedure determining the relative marginal prices (property data collection form).

2. CHOICE OF PARAMETERS TO IMPLEMENT THE SEGMENTATION OF THE AGRICULTURAL LAND MARKET (*MARKET SEGMENTATION DATA COLLECTION FORM*)

Like the urban real estate market, the agricultural land market is also divided into segments that can be identified through a process of segmentation.

The parameters that characterize a segment show both how each segment differs from the others and also identifies unifying properties with common technical and economic parameters (Simonotti, 2011).

Furthermore, as defined by Simonotti (2011), the market segment is the basic unit of economic and estimative analysis for the real estate market that cannot be further divided.

In Simonotti (2011), as regards the definition of the market segment, some parameters are already reported

[1] To the best of our knowledge, the second edition of Tecnoborsa (2005) already included a chapter exclusively addressing agricultural properties in its third edition of the *Codice delle Valutazioni Immobiliari* (Real Estate Valuation Code).

[2] Recently Festa et al. (2021) and Povellato (2022) reported data on bought and sold surface areas. Using ISTAT calculations based on annual surveys of notary activities, they estimated the approximate annual percentage of agricultural and forest land that is bought and sold in Italy to be about 1% of the total agriculture and forest surface area.

such as: Description; Location; Type of contract; Destination; Real Estate Typology; Size; Characteristics of supply and demand; Market form; Price level.

In Italian Property Valuation Standard (Tecnoborsa, 2018), there is just a list of parameters (location; form of contract; agricultural production destination; type of land investments and other fixed endowments; size; characteristics of supply and demand; market regime; price level) which define the market segment of an agricultural company (page 234).

In this regard, a new market segment survey form has been developed to carry out this first phase. It is based on the already tested and widely used survey form for urban real estate valuation proposed by Simonotti (2011) and reported in Tecnoborsa (2018), within which the parameters that characterize a given market segment are contained. For these parameters to be translated into economic-estimative indicators, they must be measured and recorded, as suggested by Simonotti (2011).

Below, potential parameters that characterize rural property market segments are discussed.

The *type of contract* indicates a sale, rental, or other relationship (donation, exchange, "rent to buy", etc.).

Location refers to the geographic and economic position (presence of infrastructure, public services, etc.) of an immovable property, taking into consideration the *General Regulatory Plan* (Piano Regolatore Generale, PRG, in Italian), which is an urban planning instrument that classifies land areas based on their construction potential and eventual planning and protection restrictions.

Current use indicates whether the land making up a certain segment is used for agricultural production or for other uses[3]. The type of use (agricultural or not agricultural) serves as a discriminant to determine if additional parameters characterizing the market segment apply. Indeed, if the current use of a property is "agricultural", then the following additional parameters should be considered:

- The *altitude range* indicating the altitude, in terms of meters above sea level (MASL) of the considered area. For this purpose, a classification into "agricultural regions" is used, i.e., portions of land made up of "groups of municipalities according to rules of homogeneous territorial continuity in relation to certain natural and agricultural characteristics and, subsequently, aggregated by altimetric zone"[4] (ISTAT, 1958). According to this classification, the following altimetric zones will be identified for the practical definition of the market segment: internal mountains and coastal mountains; internal hills and coastal hills; lowlands.
- The *climate data* relating to average annual temperature and precipitation values and their distribution are essential as they guide crop choices. Furthermore, living in the era of climate change, these values can be subject to varying fluctuations over the short term. Thus, satellite-based remote sensing tools such as the Climatic Research Unit Gridded Time Series v. 4.06 (CRU TS) (Harris et al., 2020) can be helpful since they provide a continuous monitoring of data made available through open access platforms such as Google Earth;
- The *size class* refers to the order of magnitude, expressed in hectares (ha), of the rural property that characterizes a given segment for a certain type of contract. The various size classes could go hand in hand with the Utilized Agricultural Area (UAA) (or *Superficie Agricola Utilizzata*, SAU, in Italian) classes adopted by ISTAT (2012) for data collection for the General Agriculture Census. In this way, appraisers could have a reference point to compare with his or her own knowledge of the market. Following this reasoning, the dimensional classes could be ≤ 0.99 ha, from 1.00 to 1.99 ha, from 2.00 to 4.99 ha, from 5.00 to 9.99 ha, from 10.00 to 19.99 ha, from 20.00 to 49.99 ha and ≥ 50.00 ha;
- *characteristics* refer to all the rural characteristics to be considered within the procedure that potentially contribute to the formation of each given segment and therefore positively or negatively influence the market;
- *supply and demand agents* describe the kinds of figures operating in the market and the motivations that drive them to act. The principal actors within the rural land market can be classified as physical or legal persons. The first group generally include those involved in the agricultural sector as professional farmers, direct cultivators, and field workers or non-agricultural workers for whom farming is a hobby and not an income source. The physical persons category also includes private individuals who operate in the rural land market for investment purposes. The legal persons category includes corpora-

[3] Given the complexity of the subject, this first exploration only considers cases where the land is used for purely agricultural purposes (including the uncultivated land at the service of the productive agricultural area, called tare) and momentarily excludes land used for other purposes.

[4] Translated into English by authors. Original text: "gruppi di comuni secondo regole di continuità territoriale omogenee in relazione a determinate caratteristiche naturali ed agrarie e, successivamente, aggregati per zona altimetrica".

tions, cooperatives, public entities, and the Church;
- the *market form* is established based on the degree of competition between supply and demand for a property belonging to a given segment. The rural land market can be defined as "imperfect" because of the varying nature and behaviour of the agents that locally influence the supply and demand of land, and the relative high transaction cost involved. This is proven by the fact that there are actually many different markets for land, both in terms of time and space as well as in relation to its alternative uses. In this sense, the Italian rural land market takes on a bilateral oligopoly (Antonietti, 1976; Magri, 1985, Bazzani, 1987; Grillenzoni and Grittani, 1994; Schimmenti et al., 2013);
- the *market ratios*, which are mainly used for the calculation of marginal prices/rents of characteristics per surface area in the context of the urban real estate market. In this moment, it is not possible to say which agricultural land characteristics are actually connected, nor to describe the possible ways of determining their value. The eventual detection of these relationships will depend on how the calculation of the marginal prices of certain characteristics will be developed;
- the *indicative price* regards the sales price, the rent, etc. The trend of increasing, decreasing or steady prices and the number of sales in a given time frame (market cycles) characterize individual market segments;
- the *attachments* are generally satellite images or urban planning documents (*Piano Regolatore Generale*, PRG), that refer to the geographic location of the identified market segment.

In Figure 1 a scheme of market segmentation parameters is reported.

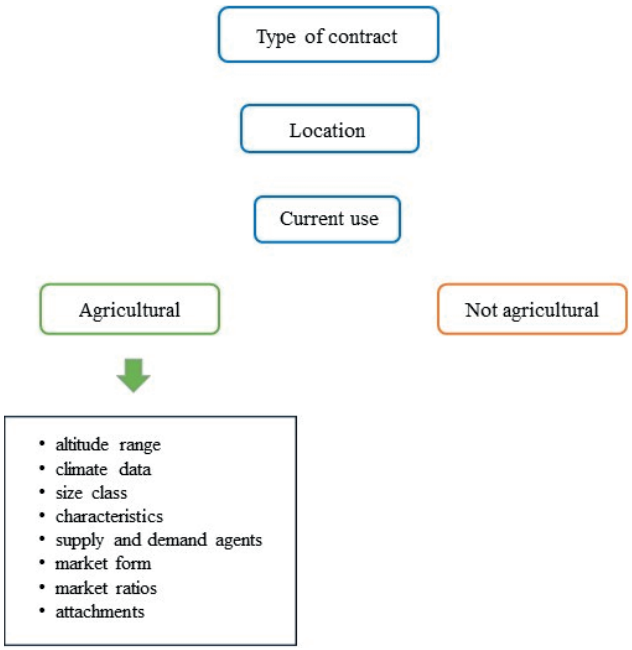

Figure 1. Parameters for the identification of agricultural land market segments.

3. IDENTIFICATION OF THE CHARACTERISTICS NEEDED FOR MARGINAL PRICES DETERMINATION

The fundamental contribution made by this line of research is the determination of marginal prices for all the characteristics that potentially influence the value of agricultural land, including those that are intrinsic and extrinsic, qualitative and quantitative.

Thus, first it is necessary to identify all these characteristics, analyse their advantages and disadvantages, eventual correlations or interactions with other characteristics and choose the most functional ways to express them, establishing nomenclature, measurement scales and economic criteria. For qualitative characteristics, the marginal price is estimated using the GAS.

Already Grillenzoni and Grittani (1994, p. 412) and Gallerani et al. (2011, p. 28) in their textbooks and, more recently, Tecnoborsa (2018, p. 235) provide a list of the main characteristics which are most likely to affect the market price of a land asset.

The characteristics listed and described in this study take the cue from the relevant white and grey literature on the topic.

The first characteristic, of extrinsic nature, is the *date*, which refers to the moment in which the sales contract is stipulated for comparable properties. The estimate of its marginal price is for the purpose of the adjustment of the comparables' prices to the moment of appraisal. A discrete cardinal scale is used, with months as the measurement unit (Simonotti, 2011). The marginal price can be calculated in a similar way to urban real estate estimates, i.e., through the monthly change rate of the considered market segments (Simonotti, 2011) or for a similar market segment (Tecnoborsa, 2018; Simonotti, 2019). This variation rate is finally multiplied by the comparable market price.

However, despite there being an analogy with the urban real estate market in terms of the formula to be applied for calculating the marginal price, it may be necessary to change the time frame considered for the selection of comparables given the different level of the rural land market's activity compared to that of urban real estate.

The *surface area* is an intrinsic characteristic, its measurement scale is cardinal and refers to the Utilized Agricultural Area (UAA) and Uncultivated Land Area (Tare). According to the definition of the Italian *Network of Agricultural Accounting Information* (Rete di Informazione Contabile Agricola, RICA, in Italian), the UAA represents the surface area used for agricultural production and thus occupied by agricultural crops. According to RICA, in Italian *tare* are those land areas that are not directly used for production but are in any case necessary for farming, such as areas occupied by buildings, country roads, or any other non-agricultural use. The urban real estate method for calculating marginal prices was also thought to be the best choice in this case. Thus, the UAA is the main surface area, and the *tare* may be considered as the secondary surfaces. The marginal price would then be the lowest[5] of the average prices calculated by the ratio between the total price of the comparable properties and the *commercial surface area*[6] (Equation 1). The market ratio of tare refers to the ratio between the marginal prices of tare and UAA and its value is likely to be obtained directly through official and unofficial market sources (i.e., estate agents, consultants, ecc.) or by means of data inferred from notarial deeds.

$$\bar{p} = \frac{P}{UAA + TARE * \pi} \quad (1)$$

In (1) $\bar{p}$ is the average price (€/m^2 or €/ha); P is the market price paid for comparable land (€); UAA is the utilized agricultural area (ha or m^2); $TARE$ is the unproductive land according to the definition cited above (ha or m^2); π is the market ratio of the uncultivated surface area.

Regarding the $TARE$, the marginal price (p_{TARE}) can be determined as the product of the UAA's marginal price (p_{TARE}) and the relative market ratio (π_{TARE}) (Equation 2).

$$p_{TARE} = p_{UAA} \times \pi_{TARE} \quad (2)$$

The *crop type* indicates the crop (herbaceous or orchard) present in the subject and in the comparables with reference to the moment of valuation for the former and at the time of sale for comparables. For herbaceous crops[7] no other details are necessary. For orchard crops, the tree variety should be recorded, as well as the planting distance (between the rows and within the rows) to know the planting density (i.e., the number of trees per hectare), pruning shape (i.e., the form used to manage the vegetative growth of a tree for both technical and economic ends), the age of the orchard to identify what stage of the production cycle the orchard in question is in: planting and establishment, growth and maturity, peak production, decline (Gallerani et al., 2011; pages 67-68-74-75). This intrinsic characteristic due to its nature is to be expressed in a nominal scale, by distinguishing as a first step among herbaceous crops and orchards and if necessary, by describing the cultivated plant species and varieties.

Regarding the economic criteria, the cost value and the capitalization value are believed to be the best choices to determine the marginal prices of the crop types, especially in the case of tree orchards.

The first of the two economic criteria mentioned above – the cost value – can always be used to estimate the value of the topsoil of a tree crop land. Regardless of the specific context, it is always possible to proceed with the preparation of a metric estimate (Computo Metrico Estimativo in Italian, CME) - current or referring to a certain year (by consulting the Regional Agricultural Price Lists or carrying out any analyses of unit prices) - based on technical nature (use of factors and means of production) and economic nature (average unit prices by type of intervention), in order to arrive at the total cost of planting a specialized topsoil. In this way, the planting cost would correspond to the marginal price for the transition from the value of bare land (e.g. arable land) to that of land containing a given tree crop plantation. In summary, it would be the amount of money necessary for the transition from the market value of arable land to that of tree crop land.

The second economic criterion that is proposed here is the capitalization value, applicable to the estimate of equal in age tree crop lands that are renewed on themselves at the end of the economic cycle of the crop in progress. The mechanism by which the quantification of the marginal price for the type of crop is reached is the determination of the difference between the estimated value in an intermediate year (V_m) of the economic cycle and that of bare land (V_0). However, this criterion is excessively complicated having in mind the objective of using it in a "thrifty" estimating procedure, as it would be necessary to carry out a double estimate by

[5] As for the MCA used for urban real estate appraisal, the choice to use the lower of the average unit prices of comparable properties is due to the difficulty in determining the relationship between the average price and the marginal price trend. There may not be enough real estate transactions to create a curve of the average and marginal prices based on the total market prices to compare to the traded areas.

[6] The term "commercial", taken from the urban real estate sector, simply means that the different weight of productive and unproductive areas is directly considered in terms of economic value - at least for agricultural production.

[7] Herbaceous crops can be cereals, leguminous plants, vegetable crops, forage crops, etc.

capitalization, first applied to the bare land, then to the land considered already planted with trees, for the sole purpose of gathering the variation in the total price of a land property after the change in land use from arable to orchard or vice versa.

The *exposition* represents the capacity of the land to receive sunlight, in relation to its orientation in respect to the four cardinal points and the potential presence of mountains, or to be influenced by negative phenomena that exclude the possibility of cultivation, such as exposure to wind (EXEO, 2023). The angle of incidence of sun rays on the earth's surface influences the microclimate in terms of humidity and temperature. Obviously, the best definition of exposition depends on the cultivated crop. Furthermore, since this is an intrinsic qualitative characteristic, its measurement scale could be ordinal – with points attributed in terms of preferences (1 poor, 2 medium, 3 excellent) – or dichotomous – i.e., in relation to the type of crop grown on the subject, the comparable and whether the same subject receives an optimal sun exposition (presence = 1/ absence = 0). In both cases the relative marginal price could be determined with the GAS.

The *land improvements* regard investments made to construct immovable goods that aim to improve the land's productivity and attractiveness. These improvements entail both an increase of income as well as the value of the property where they are built since they become an integral part of the land's capital (Medici, 1972; Michieli, 1993). The following is included in the category of land improvements:

- the rural buildings that contribute to farming, such as the farmer's home, barns to shelter animals, to store machinery and equipment and agricultural products;
- hydraulic improvements are interventions to regulate excess water on farmland caused by precipitation and/or runoff phenomena. Excess water inflows/outflows can severely damage crops, causing water stagnation on flat lads (killing plants via root asphyxiation, nutrient leaching, soil structure destruction, etc.) and of erosion on sloping lands (topsoil removal, i.e. the soil layer with the highest level of biological activity and of organic substances, causing a consequent reduction of the soil's infiltration and thus water retention capacity). Furthermore, the construction of drainage infrastructure, channels, terracing, etc. can help mitigate these phenomena, which would permanently compromise the fertility of agricultural soil;
- the farm's wells, artificial lakes and water supply from irrigation consortia as sources of irrigation water;
- irrigation systems, which transform a farm from a dry system to an irrigated one. In this way, the farmer can establish the times and methods of irrigation/ other interventions to better satisfy the water needs of crops;
- internal roads within the farm facilitate the movement of people and agricultural machinery without affecting the area where crops are grown (i.e., the UAA);
- fencing provides security for the farmer, who needs to protect his or her land from possible damage caused by the intrusion of animals or people.

This characteristic is cardinal and its unit of measurement depends on the nature of the land improvement (linear, square or cubic metre) since the characteristic is manifold.

The most appropriate economic criterion for the marginal price of land improvements is the cost value, depreciated according to the age, state of maintenance and economic life of the built structure involved.

The *layout* represents the shape of the land parcel. This parameter is important because it can determine whether production limits or advantages are present in terms of the agricultural surface area suitable for farming. If the parcel is rectangular or square, it can be defined as regular; instead, if its geometric shape diverges from the above-mentioned ones, it is defined as irregular (EXEO, 2023). Thus, this intrinsic characteristic lends itself to being expressed as a dichotomous variable in terms of absence/presence of regularity and the relative marginal price is estimated through the GAS.

The *degree of consolidation and fragmentation* tells us if the cadastral units that make up the entire real estate property are connected or split into two or more parts. The more fragmented (i.e., the number of parts) the property is, the more difficult it is for the landowner to manage it. It is an extrinsic qualitative characteristic which can be expressed on an ordinal scale according to the number of parts the property is composed of, and its marginal price can be quantified using the GAS.

The presence of *planning and protection restrictions* on the property, identifiable through the urban zoning certification *(*known as Certificato di Destinazione Urbanistica, CDU, in Italian), which entail a depreciating factor on the property. From a legal point of view, these can be grouped into three large categories: building restrictions; building codes and land use regulations.

The first are enforced by laws governing the entire category of properties that are recognized as worthy of protection because they possess public good qualities. These include hydrological restrictions, forest restrictions and environmental restrictions. Building codes are

enforced on a property so that it does not compromise the ability of another property to serve public interests. These include access and buffer requirements (regarding roads, cemeteries, public land, railroads, electric lines, aqueducts, methane pipelines, airports, public maritime property, public waters, etc.). Finally, land use regulations include the limits imposed by the territory governance plan (Piano di Governo del Territorio, PGT, an Italian regional planning instrument), which governs land transformations, building density, urban attractiveness and even the use-destinations of private properties involved in expropriations.

Regardless of restriction type, they all partially or entirely limit an owner's potential to develop land. The more restrictions exist on a property, the less attractive it will be to the market. This extrinsic characteristic can be expressed by a dichotomous scale (presence/ absence of restriction) and its marginal price quantified using the GAS.

The *type of access to the property* is an intrinsic characteristic and indicates ease of access. In fact, a property can be accessed by public roads (such as highways, principal and secondary extra-urban roads and local roads in order of importance) or be interlocked, i.e. surrounded by other properties without the possibility of being accessed from a public road. By law, the owners of interlocked properties have easement rights, and the owners of neighbouring plots must grant them passage. However, clearly access through an easement is not the same as direct access from a public road. This is a qualitative characteristic measured through a dichotomous scale (0 = interlocked land; 1 = land with front-road access) and the procedure for identifying its marginal price is the GAS.

Furthermore, the *distance from the public road network* is important for all properties that are accessed through private inter-property roads, which is considered equal to the sometimes-winding route that must be taken to access these properties. These roads are often unpaved, and difficult or impossible to travel on with cars or farm vehicles. This extrinsic variable can be expressed on an ordinal scale according to the distance and the upkeep condition of the roads involved and the marginal price can be estimated with the GAS.

One of the most important characteristics of rural land, especially in market segments where the buyer is a farmer, direct grower or field worker, is *soil fertility*[8].

In fact, characteristics directly connected to land productivity are of particular interest to an agricultural buyer, who shows a willingness to pay during negotiations that is directly proportional to the property's expected profitability (Grillenzoni and Grittani, 1994; Grittani, 1994).

Fertility is perhaps the most relevant intrinsic characteristic of land, yet it is also the most complex and articulated because it is divided amongst three components: physical fertility, chemical fertility and biological fertility.

The first is related to soil structure and grain size. The second is connected to soil's cation exchange capacity, electrical conductivity and pH. Finally, biological fertility is linked to the presence of organic matter and to the activity of beneficial microorganisms in the surface layer of the soil, which in turn influence the other two previously mentioned components of fertility.

Thus, overall soil fertility is the product of these three components. In turn, each one is also influenced by various endogenous factors, including anthropic activity.

Thus, the overall valuation of fertility is quite complex and cannot be carried out in a synthetic way by professional appraisers without the support of the costly laboratory analyses necessary to measure the different indicators involved.

In addition, some intrinsic characteristics of soil (slope, rockiness, stoniness, etc.) influence soil fertility. A separate assessment of such characteristics could result in an over-estimation of the fertility marginal price due to their conjoint influence on a land property's market value.

A solution to the above problem might be to separately analyse the characteristics which mainly contribute to the overall level of soil fertility. Despite the existence of several intrinsic characteristics affecting soil fertility, at this very early stage of the research it seems appropriate to describe only those ones reported by Costantini (2006), based on the Land Capability Classification System[9].

Stoniness and *rockiness* characteristics influence soil properties and consequentially farm management. In general terms, areas with a strong presence of these factors are difficult to work mechanically, require frequent irrigation, and repeated fertilizing.

Stoniness indicates the presence of stones (classified as gravel, pebbles, stones, and boulders according to

[8] Here we report as an example one of the numerous definitions of soil fertility present in the field literature (Violante, 2013): "It defines the ability of the soil, used for agronomic purposes, to allow abundant plant production. More precisely, fertility is expressed by the maximum yield that can be obtained from a soil cultivated with the plant species most suitable for the climatic conditions of a specific environment. Therefore, the propensity to produce is not a function of the only characteristics of the soil but represents the productive potential of a complex pedoclimatic system".

[9] The Land Capability Classification System was established in 1961 in the United States of America by the Department of Agriculture's Soil Conservation Service.

their size) on and below the soil surface that can impede farming activities. The following classes regarding surface stoniness are proposed:

- not stony: absence or almost absence (up to 3% of the UAA) of stones on the surface, for which no intervention is necessary;
- slightly stony: when up to 15% of the UAA is covered with stones;
- moderately stony: when up to 50% of the UAA is covered with stones;
- very stony: presence of stones for over 50% of the UAA.

Thus, the measurement scale is ordinal and the economic criteria to be used is the cost value. The marginal price can be determined based on the cost of the stone clearing necessary for a property to move up one category.

Rockiness indicates the presence of bedrock near the soil surface, or of rocky outcrops above the surface. The following classes indicate the different percentage frequencies of rockiness present in an area:

- non-rocky: absence or near absence (up to 2% of UAA) of rocks;
- slightly rocky: when up to 10% of UAA is covered by rocks;
- moderately rocky: when up to 25% of UAA is covered by rocks;
- very rocky: when up to 50% of UAA is covered by rocks;
- extremely rocky: presence of rocks for over 50% of UAA.

Unlike stoniness, rockiness indicates actual layers of rocks on the ground that are difficult if not impossible to remove. For this reason, it is appropriate to consider it as a surface subtracted from agricultural production and therefore to be included in the unproductive surface area present on the land. Thus, this characteristic is included in the MCA as a non-productive area and its marginal price is calculated by referring to the Equation 2 described at the beginning of this section.

Slope, intended as the relationship between the difference in elevation and the distance between two known points, can significantly affect agricultural productivity and management costs.

The steeper the slope, the more difficult farming will be. Furthermore, slope directly affects soil fertility due to erosion. Erosion is a naturally occurring phenomenon where soil surface particles are detached and transported by precipitation, which can significantly reduce soil fertility. The rate of erosion is positively correlated with the slope: the greater the slope, the more intense the erosion will be, with consequent negative repercussions for the soil productivity.

The following four distinct slope classes are proposed:

- flat: up to 13%;
- gentle slope: up to 20%;
- moderate slope: up to 35%;
- steep slope: up to 60%.

Land with a grade of over 60% and up to 90% is defined as excessively steep, and a slope over 90% is defined as precipitous. Such high slope values preclude any kind of cultivation and so land or portions of land with these features can be classified as unproductive areas. Thus, for *slope,* an ordinal measurement scale is used.

However, like fertility, slope is a complex characteristic due to the various collateral effects it causes, such as impeding mechanized farming operations, and causing hydrogeological instability, i.e., landslide risk. For these reasons, an economic criterion to calculate the marginal price of slope is not easily definable and it will be identified in a further development of the study.

Praedial servitudes, are easement rights where one property (the servient tenement) must bear a property burden favouring another property (the dominant tenement) belonging to a different owner (Art. 1027 c.c.).

According to the Italian Civil Code, they can be instated voluntarily with an *inter vivos* act (with a contract) or a *mortis causa* act (with a will). The acts must be put in writing by law otherwise they are null and void.

The legislation automatically provides for a small number of easements (right of way easements, aqueduct easements, power line easements, irrigation easements) in the absence of explicit agreements between parties, which can be established coactively, through a judicial ruling or through an administrative act from the public administration.

In both cases (with or without a contract), the property owner of the dominant tenement must pay an indemnity in favour of the owner of the servient tenement, which is indispensable for the holder of the servitude to start exercising his or her right.

A property bearing a servitude burden is less attractive to the market than one that is free of encumbrances, as for all economic burdens.

Servitude burdens on properties are usually indicated in notary deeds of sale, even if the description is rarely precise enough to allow an appraiser to assess its importance in economic terms. In the map sheets the presence of servitudes could be found.

A dichotomic scale is used to express this extrinsic characteristic (0 = presence, 1 = absence), while the quantification of the marginal price is based on the monetary sum (the indemnity) due the owner of the servient tenement to compensate for the burden imposed

on the property. If this should be impossible to determine, even though it remains a dichotomous characteristic, its marginal price should be calculated with the aid of the GAS.

Usufruct is a real right to enjoy another owner's property, which is regulated by the Italian Civil Code (art. 978-1020).

The two legal subjects involved in the institution of usufruct are:

- the legal owner loses property rights, while remaining formally the owner of the asset;
- the usufructuary holds the rights to enjoy the "fruits" of the property, i.e., to benefit from the property and use it as if he or she were the owner, with the exception that the usufructuary cannot change its economic destination.

Usufructuary rights can last up to a maximum of 30 years for legal persons and for the natural life of physical persons.

The presence of usufruct is transcribed in both the cadastral register and in the deed of sale, specifying the parties involved (usufructuary and legal owner).

The same right can also be transferred. Rural properties with the burden of total or partial usufruct are less attractive to the market since the buyer cannot use the asset until the usufruct expires (potentially until the death of the usufructuary).

As for the characteristics preceding it, the usufruct is an extrinsic one, is measured with a dichotomic scale (0 = presence, 1 = absence) and the economic criterion used to quantify its marginal price is the discounting of the future income annuities that have still to be gained by the usufructuary for the residual period of the usufruct.

In case of a "life-long" usufruct contract, the number of residual years can be quantified through the statistical data produced by ISTAT and freely accessible from the ISTAT website. They provide the life expectancy of an individual in a certain territorial area by age and gender. These data correspond to the second quartile of a statistical sample, in other words to the median of the distribution curve.

The annual income of an usufructuary can be approximately traced back to the Land Benefit, which represents the reward due to the landowner, that is the price paid for the use of real estate capital. The average annual income of the land owner can be obtained following two methodological procedures. The first one is based on the annual farm balance by which Land Benefit is quantified by subtracting all the farming cost items (various expenses, wages, salaries, taxes, interests on agricultural capital and maintenance, insurance and depreciation quotas) from the Saleable Gross Product (SGP).

Alternatively, the adjustment for the presence of a life-long usufruct right might take place by applying the coefficients of the usufruct right used by law for tax purposes. These coefficients allow to derive the value of bare ownership (that is, the property subject to usufruct) by subtracting the monetary value of the usufruct right, as obtained above, from the observed sale price of land.

One of the most important financial characteristics to be included in the collection of agricultural land real estate data is the presence of an *ongoing loan or mortgage*, which constitutes an additional financial burden in its sale.

This situation is always described in particular detail in the notary deed, thus appraisers should not have any difficulties quantifying this important monetary sum.

The economic criterion used to assess the marginal price of this extrinsic characteristic is the discounting, i.e., accumulating all the remaining future loan or mortgage payments to the present moment of appraisal by applying a commercial interest rate. In other terms, the economic criterion to be adopted is to discount all the remaining loan instalments at the time of the valuation and then to subtract their present value from the estimated land market value.

In this case, the marginal price will differ from comparable to comparable, depending on single instalment amounts, the number of remaining payments and the applied interest rate.

Regarding *property tax*[10], in Italy, the Unified Municipal Tax (Imposta Municipale Unica, IMU) is applied to all real estates, and therefore in this specific study on agricultural properties. Nevertheless, to date the latter are exempted[11] when they are situated in minor islands (Law No. 448/2001) or in mountain or hill areas (Legislative Decree No. 504/1992). The characteristic is extrinsic and can be expressed through a dichotomic scale (1-present; 0-absent). Its marginal price has a negative sign and is calculated by the discounted present value of the unlimited annual tax fees saved by the landowner in case of IMU exemption.

Entitlements connected to European grants for farmers must also be considered. These entitlements represent the right to obtain monetary aid to cultivate a given area

[10] As to tax benefits, the new 2023 Italian finance law (L. 197/2022) states that registration and mortgage taxes for professional farmers and direct cultivators holding small farm and mountain properties are to be paid at a fixed rate (200 euros) and a cadastral tax equivalent to 1% of the land's sale price. Agricultural cooperatives that directly manage land receive the same benefits. Although tax benefits might affect land purchase propensity by the above-listed categories, they have not been included among the characteristics since they are not directly linked to the value of land capital but to the typologies of buyers.

[11] Stability Law 2016 – Law No. 208/2015.

of land. In addition to receiving these incentives, a farmer can obtain entitlements by buying them. Since they are an object of transfer, it would be possible to retrace the price paid for them using notarial deeds and to use it to appropriately adjust the purchase price of the land upwards or downwards.

The National Strategic Plan of the Common Agricultural Policy (CAP) has stated that entitlements will be abolished starting from 2028 and that in the meanwhile their values will be gradually lowered. Therefore, they are not considered in the present study.

EU income support represents the amount of money granted to farmers through the CAP. These economic supports are allocated in relation to the crops and to the cultivation area. The scale of measurement of this extrinsic characteristic is cardinal. The marginal price can be calculated by discounting the future grants based on the of National Strategic Plan period (2023-2027).

Distance to population centres or product processing/commercialization centres is an important characteristic that strongly influences a property's attractiveness to market agents. The traveling time from the closest population centre and/or processing/commercialization centre of the farm's products can, in fact, significantly influence a property owner's management costs. Furthermore, a potential buyer usually pays just as much attention to the property's location compared to population and processing/commercialization centres as to other aspects.

A cardinal scale in kilometres seems the best way to measure this extrinsic characteristic. The economic criterion for the quantification of the marginal price is that of the cost value. The marginal price is linked to the unit cost of the fuel necessary to cover a kilometre of distance between the reference population centre and the rural property. Assuming an average fuel consumption and a given standard fuel price, the marginal price is obtained by multiplying the two factors. Due to the nature of the characteristic, its marginal price is negative since there is a proportionally inverse relationship between market value and distance.

For the sake of clarity, we are going to describe all the steps from the determination of the marginal price to the quantification of the price delta related to the characteristic within the evaluation table.

The marginal price is obtained by multiplying the kilometre consumption by the unit price of the fuel (petrol or diesel) and is expressed in €/Km. In order to obtain the price adjustment, the round-trip distance travelled daily between the land property and the nearest inhabited centre (subject minus the comparable one) is firstly multiplied by 365 (in order to pass from daily to annual distance) and then the result is to be divided by an adequate commercial rate to capitalize the annual figure.

Alternatively, its marginal price could be calculated as the relationship between the opportunity cost and the possible income the property owner waives by traveling to and from the centre. As per the previous calculations, appropriate adjustments need to be made in the valuation table and the obtained result needs to be capitalized to a single moment in time with a given commercial rate.

The main information concerning the characteristics dealt with in this section are summarized in table 1, reported below.

4. DISCUSSION AND FIRST REMARKS

This paper has described an initial attempt to utilize the mixed approach MCA and GAS for the agricultural land assessment, dealing in particular with the choice of the market segment parameters and with the identification of the relevant land characteristics. Therefore, it serves an exploratory purpose, providing an initial overview of the potential for further methodological developments.

Such a research need arises since in the literature there are just documents reporting a list of land characteristics (Tecnoborsa, 2018) and some illustrative efforts for educational/professional goals (Simonotti, 2011) or for a scientific purpose (Berloco, 2012).

It is believed that this line of investigation could produce a breakthrough in terms of both scientific research and professional practice. Not only would it provide a more transparent and objective method for appraising land through the development of a modified MCA, but it would standardize parameters and features of real estate, create a database of land prices, as well as a database of the marginal price of land features.

Should this research continue to be developed, it would contribute to increasing the knowledge of freelance appraisers and to diversifying appraisal methodologies, with market-oriented methods currently limited to just the single parameter procedure. Thus, appraisers could have a practical land appraisal tool based on scientific principles and not on subjective judgements.

This would significantly help appraisers to overcome the known difficulties they encounter when valuing land, which are principally caused by the land market's low level of activity and its opacity. These drawbacks strongly impact on the search of sales deeds and on the identification of comparables characterized by an adequate level of homogeneity.

Table 1. Characteristics analysed for the inclusion in the MCA procedure.

Characteristics	Nature (intrinsic or extrinsic)	Type (quantitative or qualitative)	Measurement scale (dichotomic, cardinal, ordinal, nominal)	Economic criterion or procedure
Date of sale	Extrinsic	Quantitative	Cardinal	-
Surface area	Intrinsic	Quantitative	Cardinal	Market value
Tare	Intrinsic	Quantitative	Cardinal	Market value
Crop type	Intrinsic	Qualitative	Nominal	Cost and capitalization value
Exposition	Intrinsic	Qualitative	Ordinal or dichotomic	GAS
Land improvements	Intrinsic	Quantitative	Cardinal	Cost value
Layout	Intrinsic	Qualitative	Dichotomic	GAS
Degree of consolidation and fragmentation	Extrinsic	Qualitative	Ordinal	GAS
Planning and protection restrictions	Extrinsic	Qualitative	Dichotomic	GAS
Type of access to the property	Extrinsic	Qualitative	Dichotomic	GAS
Distance from the public road network	Extrinsic	Quantitative	Cardinal	GAS
Stoniness	Intrinsic	Quantitative	Ordinal	Cost value
Rockiness	Intrinsic	Quantitative	Ordinal	Cost value
Slope	Intrinsic	Quantitative	Ordinal	Not defined
Praedial servitudes	Extrinsic	Qualitative	Dichotomic	Benefit calculated in compliance with the normative in force
Usufruct	Extrinsic	Qualitative	Dichotomic	Discounting
Ongoing loan or mortgage	Extrinsic	Quantitative	Dichotomic	Discounting
Property Tax	Extrinsic	Quantitative	Dichotomic	Discounting
Entitlements	Extrinsic	Quantitative	-	Not applicable
EU income support	Extrinsic	Quantitative	Cardinal	Discounting
Distance to population centres or product processing/ commercialization centres	Extrinsic	Quantitative	Cardinal	Capitalization of a cost value

The greatest limit to the practical application of the MCA lies in the nature of agricultural land characteristics, which are generally more qualitative and less technical than those of urban real estate. This makes them harder to standardize and measure, entailing fewer possibilities to use the MCA.

In fact, as seen above, nominal or dichotomic scales are advisable for a great part of the variables involved in rural land appraisal. Consequentially, marginal prices need to be estimated through the GAS. Since it is based on mathematical and matrix calculations, its use requires a number of comparables equal to the number of qualitative characteristics involved, plus one. For example, in the case of six qualitative characteristics (a plausible hypothesis, at least in this initial analysis of the characteristics involved), at least seven comparables are needed to use the GAS. This number would cause the MCA-GAS to no longer be a parsimonious method, and thus it would lose its advantage over single parameter and multiparameter methods based on Multiple Regression Analysis.

As this paper shows, the same progress has not been made for all the characteristics analysed. While for some of them it has been possible to hypothesize ways of estimating their marginal price, for others their complexity and the multiple interactions that a single characteristic can have with other ones casts doubts on their ability to be used in the approach at all.

Indeed, given the experimental nature of this investigation, an alternative method for calculating the marginal price could be found for one or more of the characteristics for which the adoption of GAS is currently suggested.

Nevertheless, the results of this research project could be practically useful for those operating in land real estate and credit (notaries, judges, professional appraisers, those involved in real estate court disputes, real estate agents, credit institutions, etc.), as well as for the academic community.

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From appraisal function to Automatic Valuation Method (AVM). The contribution of International Valuation Standards in modern appraisal methodologies

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Abstract. In the real estate appraisal, as well as for any other scientific discipline, there is a continuous development of knowledge with related theoretical and applicative evolution that takes place primarily on the doctrinal level. The discipline has been object of regulatory and technological improvement aimed at concretizing and defining theoretical principles and methodologies. The functions of value appraisal, formulated in the different procedures that fall within the Market Oriented Approach indicated by the International Valuation Standard, have undergone a process of evolution that has favoured the introduction of Automated Valuation Methods (AVM). This evolution process represents an improvement of the conventional appraisal models that have improved the techniques of data retrieval and data base access and certify the reliability of the models to build efficient evaluation processes and universally recognized. This article aims at reviewing the methodological evolution in relation to the national market approach that the estimation discipline has recorded in recent years by virtue of the drafting and adoption of the International Valuation Standards.

Keywords: value function, market-oriented procedures, appraisal reports, market comparison approach, mono-parametric appraisal procedure, appraisal system model, appraisal division system, automated valuation methods.
JEL codes: B23, C01, C02, C50, R31.

1. INTRODUCTION

Over the past 20 years, the world of real estate valuation has changed dramatically in terms of rules, assessment methods and computerization of valuation procedures. During the most recent years, the rapid economic change has encouraged real estate agents around the world to emphasize real estate by adopting internationally recognized valuation standards such as: International Valuation Standard (IVS), IVSC 2022; European Valuation Standard (EVS - "The Blue Book"), TEGOVA 2020; RICS Valuation – Global Standards ("Red Book Global Standards"), RICS 2022; Uniform Standards of Professional Appraisal Practice (USPAP), The Appraisal Foundation 2023. In

the particular Italian context, we can identify the subsequent standards: National Standard UNI 11612:2015 – 11558:2014; Codice delle Valutazioni Immobiliari, Tecnoborsa (2020); Linee Guida per la Valutazione degli Immobili in Garanzia delle Esposizioni Creditizie, ABI (2022), Manuale Operativo delle Stime Immobiliari (MOSI), Direzione Centrale Osservatorio del Mercato immobiliare e Servizi Estimativi dell'Agenzia del Territorio (2011).

Standards represent a set of uniform and common rules of a methodological and application nature that are systematically collected and presented (Hordijk, 2012; Manganelli, 2017). Rules, contained into international assessment standards, derive from factual models of professional practice, and consist of usually accepted common rules. Their origins and the constant link with current events lead to updates and revisions over time. Such adjustments must go hand in hand with the evolution of the real estate market. Essentially, International Valuation Standards (IVSs) regulate best practice and market data collection. Best practice guarantees the achievement of goals in the highest economy and quality. The collection of market data and information is the material basis of valuation standards (Schulte et al., 2005).

Valuations proposed by IVSs make full use of the principles and rules of the valuation methodologies. They are based on repeatable procedures that allow the definition of homogeneous processes, quantitative analysis, and quality control, guaranteeing the identification of values that should be free from errors and averting the occurrence of unforeseen complications (Simonotti, 2006). Particularly, IVSs are intended to establish issues such as: technical definitions; the evaluation criteria applicable; the qualification of evaluators and professional ethics; guidelines for application methodology.

The research in the field of appraisal has more recently develop new relevant analytical tools. Whitin the framework of point estimates, the traditional appraisal methodology has been enriched by the introduction and subsequent evolution of market-oriented procedures (Market Comparison Approach, General Appraisal System, Distribution System, Mono-Parametric Appraisal) (Simonotti, 2006).

In the area of large-scale estimates, numerous evaluation models have been tested and applied, many of which are based on the analysis of multiple regression, while others consider multilevel analyses (neighborhood, street, isolated), artificial neural networks, fuzzy logic, rough set theory (Bikdeli, 2020; Ciuna et al., 2017d; Del Giudice et al., 2017; Morano et al., 2015).

Moreover, the availability of data in different formats and with a different scale of resolution as well as advances in computer technology have further transform the image of valuations by creating a link of interoperability between traditional appraisal and computer modeling. From an operational point of view, the models based on Geographic Information Systems (GIS) are particularly interesting because of the accessibility, visualization, and data storage (Arcuri et al., 2020).

The technological evolution also allows to employ innovative solutions for the automation of evaluation systems (Automated Valuation Models, AVM) (Ciuna et al., 2017a; Glumac and Des Rosiers, 2021). An AVM is a system that bases the appraisal on comparable property data and other market information, through quantitative models and computer procedures, excluding physical inspection of the property. AVMs generally use GIS environment to offer the benefit of the geographic visualization of the data and the storage of all the information related to the real estate data, namely alphanumeric data, photographs, maps of the properties.

Over the past 15 years, the refinement and flexibility of AVMs has improved the reliability and quality of cadastral estimates based on real estate data in different countries, included Italy.

American cadastral evaluators were the first to pave the way for the use of AVMs to compensate for budget, time, and personnel limitations in the analysis of real estate data for tax purposes. Cadastral offices websites of the United States have a detailed map of the properties and cadastral data with various scans. The search can be carried out directly on the map by identifying the properties for which cadastral and civic references and building and real estate data are presented. From the property sheet, it is possible to find the corresponding cadastral sheet of paper documentation and to examine recent contracts of buildings of the boundary. In the Italian context, Revenue Agency doesn't have an official website where it is possible to do this. However, there are some publicly accessible software, developed by private companies, such as STIMATRIX forMaps, that help the user to identify a property (land or building), starting from the simple address or the precise cadastral coordinates such as: Common, Section, Sheet, and Particle.

Automated assessment models are radically transforming assessment tools also in other valuation fields. Investors increasingly require reliable real estate valuations, which are immediately available and cheap. The use of AVMs is widespread in the estimates of real estate offered as collateral for loans, particularly the case of renegotiation and periodic revaluations, because it allows a rapid and economic assessment of risk; their spread is slower for new loans due to higher risk levels. It is known that the three main risk factors associated

with loans secured by real estate include the value of the property, the Loan to Vale (LTV) ratio and the borrower risk profile (Agarwal, 2021). Since the LTV and the reliability of the borrower were deemed to have an equally significant impact when the value of the property on the severity and probability of default, the banks concluded that in some cases the cost and time savings of an AVM valuation outweigh the lower risk of a full inspection and traditional valuation of the property.

Some websites perform commercial real estate assessments in a geo-referenced context. The valuation system is open in the sense that the user enters the specific characteristics of their property (area, state of preservation, etc.) and the system indicates the value of the property based on the latest available real estate data. Each valuation is associated with a corresponding measure of confidence or level of uncertainty generated by the degree of correspondence of the property to be valued with comparable real estate. This provides the user with an indication of the accuracy of the assessment.

AVMs perform important instrumental tasks in the tax, administrative and commercial valuation of lands and buildings, but do not replace the professional assessment carried out by the qualified appraiser with the inspection of the property and the application of the standard appraisal methodology.

The paper aims at reviewing the methodological evolution in relation to the national market approach that the estimation discipline has recorded in recent years by virtue of the drafting and adoption of the International Valuation Standards.

The paper is structured as follows. In *Section 2*, the main relationships among the economic-appraisal quantities of the real estate market are discussed, especially the instrumental and mercantile indices and appraisal functions. In particular, in the *Sub-Sections 2.1*, *2.2* and *2.3*, the appraisal functions of the Mono-parametric Appraisal, the Market Comparison Approach, the Appraisal System Model and the Appraisal Division System are respectively presented. The evolution of these procedures and their integration into an Automated Valuation Model are given particular attention. Finally, in *Section 3*, we present the conclusions drawn from the study.

2. INSTRUMENTAL AND MERCANTILE INDICES AND APPRAISAL FUNCTIONS

In real estate sector and in professional practice, there is often recourse to some recurrent relationships among the economic-appraisal quantities of the real estate market. These ratios are of a different nature and can relate largely to unit prices of property characteristics, rates of change, percentages, and so on. In the field of real estate valuations, the main task of market relations is to make up for the lack of timely real estate data about prices and characteristics.

The study of the relationships and indices used in real estate activities is framed in a methodological scheme that allows to identify empirical relationships, to provide a symbolic formalization and a placement in an appropriate methodological field (Simonotti, 2001). This scope has been indicated in the appraisal functions that express in a simple way the relationship between the market price and the characteristics of the properties, using the spontaneous indications of the market and the information brought by the real estate data collected (Simonotti, 1997).

The main instrumental and mercantile indices used in the real estate appraisal are the following[1]:

– the mercantile relationship (π_i) between the prices of secondary areas (p_i) and the price of the principal area (p_1) (Simonotti, 2006):

$$\pi_i = \frac{p_i}{p_1} \tag{1}$$

– the position ratio (σ) between the hedonic price (p_1) and the average price ($\bar{p}_1$) of the surface (Simonotti, 2006):

$$\sigma = \frac{p_1}{\bar{p}_1} \tag{2}$$

– the complementary relationship (c_i) of part to the whole P that expresses the contribution of each individual characteristic (Simonotti, 2006):

$$c_i = \frac{p_i}{P} \tag{3}$$

– the corrective factor (r_j) in the sales adjustment grid (De Ruggiero and Salvo, 2011):

$$r_j = \left(\frac{x_{SUP_o} - x_{SUP_j}}{x_{SUP_j}} \right) \tag{4}$$

where x_{SUPo} and x_{SUPi} represent, respectively, the main surface of the subject (j=0) and the comparable (j) surface;

[1] The mercantile relationship and the complementary relationship belong to the real estate practice. The position relationship is a measure derived from knowledge about the real estate market. The correction coefficient in the sales adjustment grid is introduced to avoid problems of duplication in the adjustments of characteristics other than surface. The degree of similarity takes into account the degree of similarity of the comparable, while the degree of reliability assesses the reliability of the market prices of the comparable (Simonotti, 2006).

– the coefficients of similarity (gs_a^j, gs_q^j) and reliability (ga^j) (Simonotti et al., 2016):
Specifically, the similarity coefficient of a generic comparable , in terms of absolute value, can be expressed in the following way:

$$gs_a^j = \frac{\sum_{j=1}^{m}\sum_{i=1}^{n}\left|\frac{x_{ij}-x_{i0}}{\overline{x}_i}\right| - \sum_{i=1}^{n}\left|\frac{x_{ij}-x_{i0}}{\overline{x}_i}\right|}{(m-1)\cdot\sum_{j=1}^{m}\sum_{i=1}^{n}\left|\frac{x_{ij}-x_{i0}}{\overline{x}_i}\right|} \quad (5)$$

and the similarity coefficient gs_q^j of a generic comparable *j*, in terms of square standardized distances, can be expressed in the following way:

$$gs_q^j = \frac{\sum_{j=1}^{m}\sum_{i=1}^{n}\left(\frac{x_{ij}-x_{i0}}{\overline{x}_i}\right)^2 - \sum_{i=1}^{n}\left(\frac{x_{ij}-x_{i0}}{\overline{x}_i}\right)^2}{(m-1)\cdot\sum_{j=1}^{m}\sum_{i=1}^{n}\left(\frac{x_{ij}-x_{i0}}{\overline{x}_i}\right)^2} \quad (6)$$

where x_{ij} is the value of *i*-th characteristic of the *j*-th comparable property; x_{i0} is the value of *i*-th characteristic of the subject property; $\overline{x_i}$ is the value average of the considered characteristic; *m* is the number of comparables; Σ_j is the summation of terms of *j* comparables; *n* is the number of characteristics; Σ_i is the summation of terms of *i* characteristics.
The difference between the similarity coefficient gs_a^j and the similarity coefficient gs_q^j stems from the fact that the former is expressed in absolute value, whereas the latter is expressed in square standardized distances.

– the coefficients of reliability (ga^j) (Simonotti et al., 2016):

$$ga^j = \frac{\left(1-\left|\frac{P_{cj}-\overline{P}_{cj}}{\overline{P}_{cj}}\right|\right)^{m+1}}{\sum_{j=1}^{m}\left(1-\left|\frac{P_{cj}-\overline{P}_{cj}}{\overline{P}_{cj}}\right|\right)^{m+1}} \quad (7)$$

where p_{cj} is the value of the correct price of the *j*-th comparable property; $\overline{p_{cj}}$ is the value average of the correct prices of the considered comparables; *m* is the number of comparables; Σ_j is the summation of terms of *j* comparables.

– the compound coefficient (gc^j) (Simonotti et al., 2016):
Specifically, if the similarity coefficient gs_a^j is calculated in terms of absolute value, we can express the relating compound coefficient gc_a^j in the following way:

$$gc_a^j = \frac{gs_a^j \cdot ga^j}{\sum_{j=1}^{m} gs_a^j \cdot ga^j} \quad (8)$$

and, if the similarity coefficient gs_q^j is calculated in terms of square standardized distances, we can express the relating compound coefficient gc_q^j in the following way:

$$gc_q^j = \frac{gs_q^j \cdot ga^j}{\sum_{j=1}^{m} gs_q^j \cdot ga^j} \quad (9)$$

where gs_a^j and gs_q^j are the values of the similarity coefficients of the *j*-th comparable; ga^j is the value of the reliability coefficient of the *j*-th comparable property; *m* is the number of comparables; Σ_j is the summation of terms of *j* comparables.

As it concerns appraisal functions, they allow the passage from the empirical relationships (and eventually from the quotations in absence of real estate data) to quantitative functions. Their study aims to rationalize the contingent experience with the logic of estimates in the language of models of estimative statistical analysis based on real estate data.

The formulation of the appraisal functions allows the proposition of a standard for the estimative analysis of real estate data and routine calculation (Ciuna et al., 2017c).

The analysis based on appraisal functions allows to solve many problems of real estate valuation, among which:

– the problem of measuring the parameters of the real estate market segment;
– the problem of estimating a single building by interpolation and extrapolation from the appraisal functions, known at least one property data;
– the problem of estimating the properties of the same market segment (mass appraisal);
– the statistical problem of the exogenous appraisal of the coefficients of the interpolating equation constructed on the data samples;
– the known problem of structuring and organizing appraisal functions from empirical reports, information, and market data collection.

The appraisal functions, through unit prices, aim to establish a relationship between the market price and the characteristics of real estate. In the appraisal functions, average prices and marginal prices of characteristics are composed in the functional report. Three appraisal functions have been indicated in the literature: the multiplicative appraisal function of theoretical interest; the simple and multiple linear appraisal functions (mono and pluriparametric); the function of allocating the total price in the average prices of real estate characteristics[2].

[2] The multiplicative appraisal function is presented as follows: $V = b_0 \cdot x_1^{b_1} \cdot x_2^{b_2} \cdot \cdots \cdot x_n^{b_n}$ dove $b_0, b_1, \cdots, b_n$ represent the marginal prices of the

The appraisal functions have references to the Mono-parametric Appraisal, the Market Comparison Approach (MCA), the General Appraisal System, the Appraisal Division System, the Regression Analysis, and the Income Capitalization Appraisal. The first five procedures are part of the Market Oriented approach indicated by the International Valuation Standard (Simonotti, 2006).

2.1 The Mono-parametric Appraisal

The Mono-parametric (or synthetic) Appraisal method (Simonotti, 2006) is the most common procedure used in the professional practice of Italy for the market value assessment, even when the property to be estimated has many qualitative characteristics that affect its market value. The Mono-parametric Appraisal can lead to a reliable assessed value, when it is based on the collection of the market prices and also when a limited number of the characteristics are taken in consideration. According to IVSs, the eligibility of this method against those clustered in market comparison approach, is linked to the level of completeness of the comparison.

The Mono-parametric Appraisal requires both analysis and synthesis skills, such as the analysis of the multiple characteristics and peculiarities of the subject and the comparable, in search of similarities; and the synthesis of the complexity and plurality that contribute to the formation of the market value in a single parameter, represented by the comparison parameter. These operations obviously require considerable investigative capacity, adequate knowledge of the condition and objectives of the assessment, as well as significant market experience.

It should be noted that the Mono-parametric Appraisal can only be used scientifically and with reliable results if the characteristics of the peers are identical to those of the subject, except for the comparison parameter. Otherwise, ignoring the impact of the other characteristics in the assessment leads to an approximation of the evaluation results (Salvo et al. 2020).

The appraisal function representing the mono-parametric procedure is explained below:

$$V_0 = \frac{\sum_{i=1}^{n} P_i}{\sum_{i=1}^{n} \pi_i} \cdot \pi_0 \tag{10}$$

where V_0 is the market value of the property being evaluated; P_i are the selling prices, and π_i are the comparison parameters of n comparables; π_0 is the comparison parameter of the subject property and represents the average unit price.

The evolution of scientific research in the field of appraisal has offered the possibility of applying the Mono-parametric Appraisal using measures of rationality able to synthesize the differences in the quantity of real estate characteristics in coefficients of similarity aimed at quantifying the "weight" different characteristics of the comparable in relation to the different degree of similarity and to implement the methodological approach in relation to an AVM (Ciuna et al, 2017b). AVM is a software-based tool that is used in residential and commercial real estate to determine the market value of a property (Ciuna et al., 2017b). The software uses mathematical or statistical modeling with a combination of existing databases to determine the value of a specific property.

Compared to traditional evaluation methods, AVM shows the advantage of providing reliable values, quickly, automatically, efficiently, reducing costs. This advantage arises when the base date on which the system is implemented contains accurate and reliable data, when the appraisal analysis is consistent with the foundations of the appraisal principles included in the international valuation standards, and when the modelling is adequately tested before application (Ciuna et al., 2017b; Salvo et al., 2022). A prerequisite for the application of this method is the availability of real estate data previously collected in a computer database (Ciuna et al., 2017d).

The reliability of the results produced by an AVM is obviously linked to the reliability of the real estate data available in the support database, which must be continuously monitored and updated to verify its integrity.

The implementation of the Mono-parametric Appraisal in an AVM can be carried out according to international valuation standards in operational terms, making automatic selection of comparable, data processing, the calculation of similarity and reliability coefficients and, finally, the determination and evaluation of the market value (Ciuna et al., 2017b).

The main steps of applying an AVM according to the mono-parametric procedure are as follows:

1. subject definition and map detection;
2. definition of the market segment within which comparable properties are to be recognized;
3. identification of comparable properties;
4. parameter measurements for both the subject and the comparables;
5. calculation of similarity, reliability and compound coefficients and updated average price measurements;

property characteristics and $x_1, x_2, \cdots, x_n$ represent the property characteristics. The simple and multiple linear appraisal functions can be express as follows: the first one is $V = b_0 + b_1 x_1$, and the second one is $V = b_0 + b_1 \cdot x_1 + b_2 \cdot x_2 + \cdots + b_n \cdot x_n$. The function of allocating the total price in the average prices of real estate characteristics can be express as follows: $V = \overline{b}_0 + \overline{b}_1 \cdot x_1 + \overline{b}_2 \cdot x_2 + \cdots + \overline{b}_n \cdot x_n$, where the terms $\overline{b}_0, \overline{b}_1, \cdots, \overline{b}_n$ represent the average prices of the property characteristics.

6. determination of the appraisal value.

The appraisal value can be derived through the following appraisal functions:

$$V_0 = \frac{\sum_{i=1}^{n} P_i}{\sum_{i=1}^{n} \pi_i} \cdot gc_a^j \cdot \pi_0 \quad (11)$$

$$V_0 = \frac{\sum_{i=1}^{n} P_i}{\sum_{i=1}^{n} \pi_i} \cdot gc_q^j \cdot \pi_0 \quad (12)$$

The difference between the two functions consists in the use of the coefficient (8) in the first function and in the use of the coefficient (9) in the second one; there is not a preferable choice between them (Ciuna et al., 2017b).

2.2 The Market Comparison Approach

The MCA was proposed and used in the United States since the twenties of the last century to offer methods to reduce or eliminate subjective judgements of appraisers in the judicial field (Salvo and De Ruggiero, 2012). In Italy, the MCA was introduced with substantial changes in the methodology used in the United States, particularly in relation to the approach used to estimate the marginal price of real estate characteristics (Simonotti, 2006).

The MCA is a valuation procedure that leads to the valuation of the market value of a property through a monetary adjustment process applied to the market prices of comparable real estate considering differences that between the comparable and the property under valuation (Salvo et al., 2021).

In its traditional formulation, the main steps of the MCA appraisal procedure are the following:

1. Recording of recent sales of similar properties in the subject's market area;
2. Collection of the complete real estate data;
3. Choice of the property characteristics namely the elements of comparison;
4. Compilation of the sales summary grid;
5. Appraisal of the hedonic prices;
6. Drawing up the sales adjustment grid;
7. Reconciliation and presentation of the results.

The appraisal of hedonic prices is the central phase of the process, which is why knowledge about these prices is fundamental to calculating the adjustments (Phase 6) for each characteristic chosen. The hedonic prices appraisal is based on the principle of substitution, the principle of complementarity and the appraisal criteria (market value, cost value, processing value, complementary value, replacement value) (Herath & Maier, 2010; Lee and Whitacre, 2021; Salvo et al., 2021;).

The appraisal function used in the MCA to determine the most likely market value of a property is presented as follows:

$$V_0 = P_j + \sum_{i=1}^{n} p_{ij} \cdot \left(x_{i0} - x_{ij}\right) \quad (13)$$

where V_0 is the market value of the property being evaluated; P_j is the selling price of j-th comparable property; p_{ij} is the marginal price of the of i-th characteristic; x_{i0} is the value of i-th characteristic of the subject property; x_{ij} is the value of i-th characteristic of the j-th comparable property.

However, the application of the procedure has shown that the mathematical formulations derived from the valuation criteria for determining the marginal prices of the real estate characteristics contained some duplication, which may lead to overappraisal (or undervaluation) in property valuation (Simonotti et al., 2016).

For surface characteristics, especially, the determination of the marginal price refers to the so-called merchant price theorems[3] for the main area and some corollaries for other areas.

Subsequent studies have simplified and improved the first version of the methodology proposed by Simonotti (Simonotti, 2006) to face the issues of duplication of characteristics and reliability of sales data. The incidence of approximations was identified mathematically and resolved by observing the presence of repeated terms in the adjustment formula. As a result of this evolution, the appraisal function in the new version of the MCA, called MCA 2.0 (Simonotti *et al.*, 2016), takes the following form:

$$V_0 = P_j + \sum_{i=1}^{n} p_{ij} \cdot \left(x_{\mathrm{i0}} - x_{ij} \cdot \left(1 + r_j\right)\right) \quad (14)$$

where V_0 is the market value of the property being evaluated; P_j is the selling price of j-th comparable property; p_{ij} is the marginal price of the of i-th characteristic; x_{i0} is the value of i-th characteristic of the subject property; x_{ij} is the value of i-th characteristic of the j-th comparable property; r_j is the corrective factor (4).

In appraisal procedures based on adjustments, the similarity and reliability of the data are reflected in the reconciliation phase of the MCA (Phase 7) which determines the market value as the expected value of the adjusted prices, and unless otherwise assumed, attribute the same probability to each correct price. Therefore, it is accepted that the values to be reconciled are derived

[3] The merchant price theorems have been theorized by Simonotti (1997). These theorems allow the hedonic price's study of the surface characteristics. Six theorems are used to evaluate the hedonic value of the main surface, and several others are used to evaluate the hedonic values of the secondary surfaces.

from similar properties, characterized by equally reliable purchase prices.

The inevitable presence of anomalies suggested the opportunity to identify a procedure that can detect and measure dissimilarities and anomalies of comparison properties, introducing in the reconciliation a measure of probability associated with each correct price, built through the quantitative measure of the level of comparability of the properties with the property to be valued.

For this purpose, the mercantile ratios identified in the similarity coefficients (absolute and squared values), the reliability coefficients and the so-called compound coefficients have been formulated.

The appraisal function, therefore, assumes the following expression:

$$V_0 = \sum_{j=1}^{m} gc^j \cdot P_{cj} \tag{15}$$

where V_0 is the market value of the property being evaluated; gc^j is the compound coefficient related to the j-th comparable property; P_{cj} is the adjusted price of the j-th comparable property.

In accordance with the international valuation principles, the market comparison approach, both in its traditional version (MCA) and in its revised version (MCA 2.0) is also suitable to be implemented in terms of automated appraisal. In the AVM framework, in fact, there are many articles about the use of the MCA that is well suited for automated real estate valuations (Stang et al., 2023). The market comparison approach, since the beginning of the computer assisted mass appraisal (CAMA) era, has been automated by various researchers and is widely used in practice, especially in North America and the UK. Usually, the designed approaches follow a process to find the most similar sales properties. The market value of the property being evaluated is then calculated by taking the mean or similarity-weighted mean of these comparable sales prices. Underwood and Moesch (1982), Thompson and Gordon (1987), Cannaday (1989), McCluskey and Anand (1999) and Todora and Whiterell (2002) all used similarity-based finding of similar properties. More recently, Salvo and De Ruggiero (2011), although it is far from the idea of defining valid valuation equations based on regression models, implement an automatic procedure with the aim of defining equations relating to the peculiarities of a market in a very limited area. The proposed method is implemented through the ArcGIS Model Builder tool and has been tested on a pilot GIS for residential properties. Brunauer et al. (2017) design an approach for valuations of self-used property based on the sales comparison method. Kim et al. (2020) used an automated sales comparison method to evaluate apartments in Korea, and found that their approach outperformed machine learning methods. Using a computer-assisted expert algorithm, Larraz et al. (2021) consider differences in characteristics compared to similar properties and their relative location.

2.3 Appraisal System Model (ASM) and Appraisal Division System (ADS)

Market oriented evaluation methods referring to appraisal functions include the Appraisal System Model (ASM) and the Appraisal Division System (ADS) (Simonotti, 2006).

The ASM is applied through the setting and the resolution of a system formed by m linear equations, one for every building of comparison (of known price), in $n+1$ unknown, represented by the market value and marginal prices of the real estate characteristics examined. The weakness of the procedure lies in the need to have an adequate data number very similar to each other to reach acceptable results both mathematically and in appraisal.

The appraisal functions that make up the ASM are explained in the following equation system:

$$\begin{cases} P_1 = V_0 + \sum_{i=1}^{n}(x_{i1} - x_{i0}) \cdot p_i \\ P_2 = V_0 + \sum_{i=1}^{n}(x_{i2} - x_{i0}) \cdot p_i \\ \vdots \\ P_m = V_0 + \sum_{i=1}^{n}(x_{im} - x_{i0}) \cdot p_i \end{cases} \tag{16}$$

where $P_1,P_2,\cdots,P_m$ are the selling prices of the comparables; V_0 is the market value of the property being evaluated; p_i is the hedonic price of the of i-th characteristic; x_{i0} is the value of i-th characteristic of the subject property; $x_{i1},x_{i2},\cdots,x_{im}$ are the values of i-th characteristic of the comparable property.

ADS is an appraisal procedure based on the detection of similar properties of known price, carried out through the setting and resolution of a system consisting of linear m equations, one for each property of comparison (of known price) in n variables, for example, the average price of the properties in question is not known (Simonotti, 1994).

The appraisal functions that make up the ADS are explained in the following equation system:

$$\begin{cases} P_1 = \sum_{i=1}^{n} x_{i1} \cdot \bar{p}_i \\ P_2 = \sum_{i=1}^{n} x_{i2} \cdot \bar{p}_i \\ P_m = \sum_{i=1}^{n} x_{im} \cdot \bar{p}_i \end{cases} \tag{17}$$

where $P_1,P_2,\cdots,P_m$ are the selling prices of the comparables; V_0 is the market value of the property being evalu-

ated; $\bar{p}_i$ is the average price of the of i-th characteristic; x_{i1},x_{i2},$\cdots$,x_{im} are the values of i-th characteristic of the 1,2,$\cdots$,m comparable property.

Also, for ADS, the weakness is the need to have an adequate data number very similar to each other in order to identify acceptable results, both mathematically and in appraisal terms. The problem of the small size of the sample of similar properties has been solved through the possibility of expanding the survey sample by introducing comparison properties with a lower degree of similarity or data not always equally reliable, through the use of appropriate coefficients that can weigh the comparable differently in the comparison functions due to the different similarities in the characteristics of properties or in the reliability of prices as is the case in MCA 2.0 (Morano et al., 2019).

To achieve this aim, the ASM and the ADS have been modified by formulating, respectively, the Weighed Appraisal System Model (WASM) and Weighed Appraisal Division System (WADS) models (Tajani et al., 2020).

When similarity coefficients in absolute value are used, in the former model (WASM) the appraisal equations that make up the system assume the following formulation:

$$\begin{cases} ga^1 \cdot (P_1 - V_0) = \sum_{i=1}^{n} gs_a^j \cdot (x_{i1} - x_{i0}) \cdot p_i \\ ga^2 \cdot (P_2 - V_0) = \sum_{i=1}^{n} gs_a^j \cdot (x_{i2} - x_{i0}) \cdot p_i \\ \cdots = \cdots \\ \cdots = \cdots \\ ga^m \cdot (P_m - V_0) = \sum_{i=1}^{n} gs_a^j \cdot (x_{im} - x_{i0}) \cdot p_i \end{cases} \quad (18)$$

Otherwise, if square coefficients are used the WASM model became:

$$\begin{cases} ga^1 \cdot (P_1 - V_0) = \sum_{i=1}^{n} gs_q^j \cdot (x_{i1} - x_{i0}) \cdot p_i \\ ga^2 \cdot (P_2 - V_0) = \sum_{i=1}^{n} gs_q^j \cdot (x_{i2} - x_{i0}) \cdot p_i \\ \cdots = \cdots \\ \cdots = \cdots \\ ga^m \cdot (P_m - V_0) = \sum_{i=1}^{n} gs_q^j \cdot (x_{im} - x_{i0}) \cdot p_i \end{cases} \quad (19)$$

Similarly, in WADS model, if similarity coefficients in absolute value are used, estimate equations which compose the system take the formulation reported below:

$$\begin{cases} ga^1 \cdot P_1 = \sum_{i=1}^{n} gs_a^j \cdot x_{i1} \cdot \bar{p}_i \\ ga^2 \cdot P_2 = \sum_{i=1}^{n} gs_a^j \cdot x_{i2} \cdot \bar{p}_i \\ \cdots = \cdots \\ \cdots = \cdots \\ ga^m \cdot P_m = \sum_{i=1}^{n} gs_a^j \cdot x_{im} \cdot \bar{p}_i \end{cases} \quad (20)$$

If square coefficients are used, the WADS model became:

$$\begin{cases} ga^1 \cdot P_1 = \sum_{i=1}^{n} gs_q^j \cdot x_{i1} \cdot \bar{p}_i \\ ga^2 \cdot P_2 = \sum_{i=1}^{n} gs_q^j \cdot x_{i2} \cdot \bar{p}_i \\ \cdots = \cdots \\ \cdots = \cdots \\ ga^m \cdot P_m = \sum_{i=1}^{n} gs_q^j \cdot x_{im} \cdot \bar{p}_i \end{cases} \quad (21)$$

The Italian context has seen widespread application of the ASM and ADS models in the realm of professional practice (Simonotti, 1989). Furthermore, several official valuation manuals have highlighted its practical potential. The guidelines for the properties' valuation in guarantee of credit exposures, which were made by the Italian Banks Association (ABI, 2022), have said that the ASM and ADS are tools that can make property valuations transparent, good, and fair. The Tecnoborsa (2020) real estate valuation guide, which has integrated and aligned the International Valuation Standards with the Italian regulatory framework, has included the ASM and ADS models among the main appraisal techniques, capable of integrating the global best practices with the scientific principles and the practical realities of the Italian context. In the manual for property valuations of the Italian Revenue Agency (2011), the ASM and ADS models have been described as deterministic multi-parameter models that can be used in professional practice because they are scientifically valid and can be used in many different ways. Lastly, numerous guidelines for private entities and professional organizations have recognized the ASM and ADS as models that meets the requirements of the International Valuation Standards (OIV, 2015).

The integration of these two models into an automated valuation model is still a subject of research, but the possibility of endogenously assessing implicit prices or the average prices of the influencing factors through the detection of a few comparable data and the simplicity of the algorithm make the models suitable for automatic implementation, as well as the mono-parameter appraisal procedure or the market comparison approach.

3. CONCLUSIONS

This paper aims to provide a comprehensive overview of the methodological advancements in market approach procedures that the appraisal field has witnessed in recent times, owing to the creation and adoption of the International Valuation Standards.

The standards foundation has been operationally based on best practice. Best practices generally mean the most significant experiences, methods and techniques that have shown the best results achieved, and in fact

constitute a standard. The material basis for best practice and standards is the collection of market data and information. The market data, essential for the valuation, is a complex data formed by an economic part, consisting of the price, and a technical part that considers the characteristics of the property. The correct collection of such data, in addition to ensuring a more precise measurement, determines conditions of transparency and fairness of the appraisal judgment.

Over the years, technological evolution has led to the generation of a huge amount of data that has inevitably had an impact in different sectors, including real estate and appraisal. Its processing requires technologies and resources that go beyond conventional storage and management systems (De Ruggiero et al., 2020). Market data is the necessary condition for the formulation of appraisal functions in any appraisal process used for appraisal analysis. Regarding the appraisal, the example that is increasingly consolidated among the tools for managing and analyzing such data concerns the Automated Valuation Models (AVMs). They allow to obtain an accurate appraisal in a few seconds, despite the use of numerous factors and variables that are not always easily acquired in traditional appraisals. Automated assessment models can be distinguished in models that use statistical tools such as regression and in models that use intelligent systems, such as neural networks. Both represent an improvement of conventional valuation models and are mainly used for mass evaluation or mass appraisal. Automated assessment models can be implemented by additional tools. These include Geographic Information Systems (GIS) made up of software systems capable of managing many different aspects of data, improving analytical and measurement capabilities with three-dimensional visual aids. These tools combine geographical components with statistical components of design and detection making much more interactive the use of a cartographic representation, which can, thus, be queried, read, and analyzed according to different criteria and as needed. The use of spatial analysis models shows improved predictive performance of appraisal methods.

In light of the advantages stated, the real estate valuation sector and scientific research should consider consolidation of AVMs and AI-based appraisal methods based on the market approach procedures. This can accelerate the real estate valuation procedures while pursuing an increase in the accuracy of the valuations as the main goal. In this regard, we attempted to provide insights into the development of the procedures and their use in an automated way, trying to identify the areas where further investigations are needed.

The real estate appraisal, through its evolutionary process, had as a guiding thread the need to have appraisal judgments based on procedures: transparent, traceable, verifiable, objective as indicated by IVS. Using automated procedures can, on the one hand, facilitate the achievement of these goals and, on the other hand, facilitate the appraisal activity. It should be noted that the experience and the professional skills of the valuer, which acts in the *ex ante* phase, i.e. in the construction of the scales for the measurement of the influencing factors, and in the *ex post* phase, i.e. in the empirical verification of the results obtained, remain the mandatory requirement in all the aforementioned models.

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Discounted Cash Flow Analysis and Prudential Value DCFA Formula

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Abstract. According to IVS 2023 the terminal value of a DCFA can be calculated in respect of the three fundamental appraisal approach: market, income and cost. Specifically, "Where the asset is expected to continue beyond the explicit forecast period, valuers must estimate the value of the asset at the end of that period. The terminal value is then discounted back to the valuation date, normally using the same discount rate as applied to the forecast cash flow" (IVS 105 Valuation Approaches and Methods, para 50.20). Although academic and professional normally refer to direct capitalization to calculate the exit value (scrap value, going out value) different approaches are possible. In particular it is possible to calculate the exit value using the market approach. The present work starts from an original model of Discounted Cash Flow Analysis proposed by Simonotti (2006) to propose possible alternative to the original formula. The model proposed, as defined for the paper "Prudential Value DCFA Formula (PVF)" provides methodological alternatives to the original model in order to apply the method in different property market conditions allowing the appraiser to represent even property market in recovery or falling market phase, or prudential assessment of worth and opinion of value. In particular the proposed model replace the compound growth of the property value included in the traditional Simonotti's model, with a linear growth or even a combination of both. The paper emphasize how property valuation standards can not be considered as immutable but they may be considered in constant evolution. In delivering an opinion of value for mortgage lending purposes the approach of professional academician and real estate analyst need to be able to respond to change of external conditions, in consideration of the sustainability of the cash flows in the long term, for the entire duration of the loan (and therefore for the purpose of identifying the long-term sustainable value of the asset). The approach is functional, inter alia, for the purpose of identifying the "prudential value" as defined by the innovative banking regulation (Basel 3) according to the definition of loan-to-value (LTV) ratio for loan origination and monitoring.

Keywords: Discounted Cash Flow Analysis (DCFA), IVS, Prudential Value, Property Valuation, Simonotti DCFA Model, Long-Term Sustainable Value, Loan-to-Value (LTV) ratio, Sustainable investment, Sustainable lending.
JEL code: C19, E32, E43, R39.

1. INTRODUCTION

Discounted cash Flow Analysis (DCFA) is a model for the valuation of both investment value (assessment of worth) and market value of income producing properties. In addition to the investment value, the methods are applied to the study of atypical cash flows of properties, in particular situations not attributable to the direct or financial schemes of the other two methods of capitalization of income (Direct capitalization and Yield capitalization), generally consisting of properties subject to transformation or development that provide for exits and revenues over a period of time connected to the construction time of the construction site and marketing (or management) of the construction work carried out or redeveloped[1]. This family of models is recalled in the International Valuation Standards (IVSC, 2022, IVS 105, Valuation Approaches and Methods para 50.20 and followings) and in the Italian national standards Codice delle Valutazioni Immobiliari (Chap. 8 para 3.2.3). The methodology was also implemented in the "Linee Guide per la valutazione degli immobili a garanzia delle esposizioni creditizie" (i.e. Guidelines for the valuation of properties as collateral for credit exposures, promoted by ABI and others Italian organizations) (Chapter 8 para 2.5.1). Discounted Cash Flow Analysis is not a homogeneous group of property valuation techniques. The method is often adopted, with different formulas, in Commonwealth context, and other models normally are applied in US. In Italy, normally, are applied both models according to the valuer background. In the IVS 2022 the "terminal value" of a DCFA can be calculated in respect of the three fundamental appraisal approach: market, income, and cost. Specifically, "*Where the asset is expected to continue beyond the explicit forecast period, valuers must estimate the value of the asset at the end of that period. The terminal value is then discounted back to the valuation date, normally using the same discount rate as applied to the forecast cash flow*" (IVS 105 Valuation Approaches and Methods, para 50.20). Among the others Italian models, we consider the so called Simonotti Model of Discounted Cash Flow Analysis (Simonotti, 2006). In this model any prospective analysis should consider the integration in the analysis itself of the recurring changes of the property market conditions, in consideration of the cyclical nature of the markets in the long term, as well as the sustainability of the long-term value in consideration of the characteristics of the asset and the assessment of its life cycle. The original model is based on a hypothesis of compound growth of the value of the property at rate d. This term is different from the well-known g-factor, a term used both in direct capitalization with explicit growth and in terminal value calculation in DCF. The term g-factor indicates a growth both in term of rent and in term of property value, in the original Simonotti's model the term d refers to the growth of property price only. In both cases the growth is supposed to be a compound growth. A question may be raised: is this the only method to represent real estate growth? In general term real estate market is cyclical. This is particularly true in specific market condition (property market with a low growth or even falling market) and above all in the determination of mortgage lending value that should represent "*a long-term, sustainable value as a stable basis for judging the suitability of a property as a security for a mortgage which will continue through potential market fluctuations*" (European Banking Authority, 2015). According to Quentin (2009), mortgage lending value calculation should be: "*unattached from temporary, e.g. economically induced, fluctuations in value on the relevant property market and excluding speculative elements*". This is particularly true after the Global Financial Crisis. The seminal report of the Long-Term Working Group of the Property Industry Alliance Debt Group (2017) stated that "*…they must put in place and hardwire all the tools needed to identify when the market might be overheating and have a regular (likely quarterly) system that monitors that probability. This is where this long-term value methodology paper comes in…*" (Foreword, Long-Term Working Group of the Property Industry Alliance Debt Group, 2020, p.1). They presented three possible solutions for the valuation of long-term sustainable value: the Adjusted Market Value, the Investment Value based on a Discounted Cash Flow Analysis, Mortgage Lending Value based on German "Beleihungswert". The first one has been proposed in the document as the most reliable method, consisting in a market value adjusted by a factor calculated on the difference between market value and long-term capital values. It is an empirical solution that may have a wide application among professional property valuers. A further solution is based on the calculation of the investment value using a Discounted Cash Flow modelling as previously indicated in academic literature (Crosby, 2021). The final solution "Beleihungswert" is the defini-

[1] See the Italian Codice delle Valutazioni Immobiliari (Chap 8, para 3.2.3): "L'analisi del flusso di cassa scontato (discounted cash flow analysis) si applica allo studio dei flussi di cassa atipici di immobili in situazioni particolari non riconducibili agli schemi diretti o finanziari degli altri due metodi della capitalizzazione del reddito, in genere costituiti dagli immobili oggetto di trasformazione o sviluppo che prevedono uscite e ricavi in un arco temporale connesso ai tempi di realizzazione del cantiere e commercializzazione (o gestione) dell'opera edilizia realizzata o riqualificata" (Simonotti and Bambagioni, 2018).

tion of the opinion of value of the asset with the highest degree of probability over the period of loan (Werth, 1998; Gondring & Lorenz, 2001; Ruchardt, 2001).A second report proposed by the same group on 2020 explored the "…*models for estimates of longer run capitalisation (cap) rates* …" (IPF Research Program, Long-term Value Methodologies in Commercial real Estate Landing, p. 4). The proposed model of mortgage lending value by Pfandbrief Act (www.pfandbrief.de/site/en/vdp/real_estate/valuation/mortgage_lending_value.html) originated a debate (Crosby et al., 2011) based on the nature under the cycle or through the cycle meaning of mortgage lending value. According to the former approach mortgage lending value should be approximated to a straight line under the market level conditioned by the effect of the market cycle. In the latter approach the mortgage lending value should be approximated to market value. The difference is related to Institutional contexts, too. In UK there was not a specific definition of mortgage lending value. On the other side German Pfandbrief Act originated the previously described ridiculous former approach. Bienert and Brunauer (2017) showed the importance of deriving mortgage lending value from market value avoiding a lump sum estimation. Simonotti's DCF model is normally used for mortgage lending value determination of income producing properties. The proposed variant to the original Simonotti's DCF model tries to reach prudent opinion of value following previous contributions in the literature (Nordlund, 2008; Crosby and Hordijk, 2021) in order to determine a value "through the cycle". In Italian literature a further contribution for mortgage lending value determination is provided by the application of VaR methodology (Tajani and Morano, 2017). This paper proposes a variation of the original Simonotti's formula in order to allow the appraiser, investor, banks, and lenders of real estate development projects to consider also specific critical market phases with a prudent assessment of the value. In this variant of the original model, we focus on the term d that indicates the growth in capital term of the value over the time. It is useful to stress that in Simonotti's model the term d is distinct by the common term g defined growth factor recurring in academic literature (Gordon, 1958; Gordon and Shapiro, 1962). Whilst the term g is referred to the growth both in term of price and in term of rent in Simonotti's model the term d is only referred to property price growth. Therefore, d can be considered a part of the well-known g-factor. A prudential approach is relevant both for mitigating the risks associated with the investment and for the purposes of loan origination and monitoring. In fact, the banking regulations of reference are increasingly oriented towards the definition of the loan-to-value (LTV) ratio on the basis of a prudential value. Prudential Value is defined in Basel III (2017) as: "Value of the property: the valuation must be appraised independently using prudently conservative valuation criteria. To ensure that the value of the property is appraised in a prudently conservative manner, the valuation must exclude expectations of price increases and must be adjusted to take into account the potential for the current market price to be significantly above the value that would be sustainable over the life of the loan. National supervisors should provide guidance, setting out prudent valuation criteria where such guidance does not already exist under national law. If a market value can be determined, the valuation should not be higher than the market value […] In the case where the mortgage loan is financing the purchase of the property, the value of the property for LTV purposes will not be higher than the effective purchase price"[2]. It is worth to notice that *excluding expectation of price* increases should not be interpreted literally. It is possible to assume price increase without speculative component. It is easy to observe how the models proposed by the Long-Term Working Group include property price growth term. The phrase is referred to the need of adjusting the market value avoiding speculative components. (Long-Term Working Group of the Property Industry Alliance Debt Group,2020, p.12). The contribution is organized as follows: the following paragraph introduce the methodology of Discounted Cash Flow Analysis in general terms whilst in the following paragraph there is an introduction to Simonotti DCFA model and the proposed Prudential Value DCFA formula (PVF). Final remarks and future directions of research will be offered at the end.

2. DISCOUNTED CASH FLOW ANALYSIS AND SUSTAINABLE LENDING

The origin of Discounted Cash Flow Analysis as a valuation procedure is not academic. For the first time was an important academic of last century who discovered the use of such technique among real estate professionals (Graaskamp, 1969). In 1976 an analysis on 158 corporation working in the sector of real estate showed how they used the before tax cash flow modelling for 60% and after-tax models for 22% (Wiley, 1976). In another work (Farragher, 1982), 354 real estate investment companies were discovered to use for 66% the Discounted Cash Flow Analysis both in before

[2] See: BIS, Basel Committee on Banking Supervision – Basel III: Finalising post-crisis reforms, https://www.bis.org/bcbs/publ/d424.pdf

tax and in after tax. Growing interest was registered in further works (Page, 1983; Webb, 1984). A further enquiry (McIntosh, 1986) discovered that among 32 managers from the most important real estate investment companies in US the greatest part preferred using Discounted Cash Flow Analysis instead of the traditional Direct Capitalization. Discounted Cash flow analysis was introduced in UK by the seminal paper of Marshall (Marshall, 1976). Studies on the relationship between inputs and outputs of DCFA have been more frequent between 1960 and 1980. (Downs, 1966; Ratcliff, 1972; Dilmore, 1971). Several reasons may be in favour of the use of Discounted Cash Flow. Several contributions highlighted the role of uncertainty and the forecast in Discounted Cash Flow Analysis (French Cooper, 2000). Reliability in the valuation of cash flow has been required by (Willinson, 1999) and vacancy rate and market analysis (Rabianski, 2002). Critics have been raised in the application of Discounted Cash Flow Analysis which "*…can be very accurate, but it can also be very inaccurate, and the degree of accuracy will depend upon the accuracy of the valuation inputs …" (*Millington, 2000, p.187); an analysis that, as authors of this publication, we fully share. A reliable forecast of inputs in the valuation has been underlined in further studies. "*… The importance of achieving rental growth may be judged from the knowledge that inflation has risen again recently and that the average annual rate of inflation in the 64 years from 1925 has been 5,2% …*" (Scarrett, 2000). Further contributions in the same contexts (Hendershott and Hendershott, 2002; Taylor and Rubin, 2002; Wheaton et al., 2001). A warning was launched on the application of Discounted Cash Flow Analysis in the construction of real estate index (Hordijk and Van de Ridder, 2004). DCFA can be also a tool for assessment of worth or investment value determination. In methodological terms the model assumes a holding period of the property followed by the direct capitalization using a going out cap rate to determine the exit value (going out value, exit value, scrap value). The valuation method is useful both for market value and investment value (assessment of worth) determination. US DCFA models are normally focused on the role of taxation. We have therefore before tax and after-tax modelling (Lusht, 1997). The going out value is normally calculated using a dividend discount model or a normal capitalization. In the UK, it is possible to see short cut DCFA, hybrid, and equated yield models (Millington, 2000). DCF is also used for property valuation based on mortgage lending value. The sustainability of the value of the property, subject to the mortgage guarantee (collateral), is an essential factor in identifying the degree of risk of the loan. At the same time, projections based on historical series and statistical datasets, in an increasingly dynamic, global, and interconnected markets, cannot be considered reliable for a very long-time horizon. In the case of analyzes related to very long-term mortgages, the situation could be affected by a radical change to an existing industry or market due to factors of significant impact and discontinuity. Disruptions, such as those experencied during the global financial crisis (originating in 2008), the Covid-19 pandemic, and regulatory innovations such as those that could be introduced by the Basel 3 Agreement and/or by other Supervisors, requires a growing attention to (*i*) the quality of the data, (*ii*) the skills of the valuers, and (*iii*) the valuation methods since some approaches, more than others, are suitable for mitigating the effects of the estimate (sometimes an overestimation) of the market value defined in the loan origination phase (d'Amato et al., 2023).

3. SUSTAINABLE INVESTMENTS AND PRUDENTIAL VALUE DCFA FORMULA (PVF)

Within the Italian context, while taking into account the IVS, Simonotti (Simonotti, 2006) proposed a different approach to Discounted Cash Flow Analysis. In compliance with to IVS 1997, Simonotti proposed the valuation of exit value, scrap value, going out value using market value. The original idea was the computation of the terminal value using a market-oriented approach as follows:

$$V = \sum_{t=1}^{n} \frac{F_t}{(1+i)^t} + \frac{V(1 \pm d)^n}{(1+i)^n} \tag{1}$$

In Formula 1 the value is equal to the sum of the cash flows deriving from the holding period summed up to a terminal value that is the original value to be estimated increased or decreased at a compound growth factor d. It is possible to rewrite the formula as follows:

$$V - \frac{V(1 \pm d)^n}{(1+i)^n} = \sum_{t=1}^{n} \frac{F_t}{(1+i)^t} \tag{2}$$

And finally in the Formula 3:

$$V = \frac{\sum_{t=1}^{n} \frac{F_t}{(1+i)^t}}{1 - \frac{(1 \pm d)^n}{(1+i)^n}} \tag{3}$$

In the Formula 3: V is the market value (or assessment of worth), the term i is the discount rate, target rate of return, equated yield, the term d is a growth (or decrease) factor in term of capital from the moment of the valuation to the end of the holding period. The model diminishes the number of the inputs normally required for a Discounted Cash Flow Analysis. An important assumption is the compound growth of the price of property at an annual d rate from the moment of the valuation to the end of the holding period. It is worth to say that if d is equal to i the formula is meaningless, like in the original formula of Dividend Discount Model. Generally speaking, the term d is not a financial information that should calculated according to rule of financial maths but a real estate one. It is the perspective real estate growth of property price in the specific period of time, in the specific market segment. In mathematical term, the Simonotti's formula is based on an exponential measure of the growth of the same asset in two different moments. The origin is indicated in the Formula 4 below:

$$P_t = P_0(1+d)^n \Rightarrow d = \sqrt[n]{\frac{P_t}{P_0}} - 1 \tag{4}$$

The d factor can be positive as negative according to the specific market conditions of market segment. This is related to the specific temporal and statistical trend of property market price. If d is a perspective growth of real estate price, it can be measured in several ways. Although the variation along the time may be positive or negative, the form of the growth may be also linear instead of exponential. In this case the measure of variation can be expressed in the Formula 5 below:

$$P_t = P_0(1+dn) \Rightarrow d = \frac{P_t - P_0}{P_0 n} \tag{5}$$

Assuming a linear variation, less intense that exponential one, the original DCFA Simonotti's formula 1 will be changed as follows:

$$V = \sum_{t=1}^{n} \frac{F_t}{(1+i)^t} + \frac{V(1 \pm dn)}{(1+i)^n} \tag{6}$$

The Formula 6 may be referred to a real estate market in a critical condition. Therefore, the final Formula will be modified as follows:

Table 1 Assumptions for the Determination of Property Value Using DCFA.

	Revenue	Revenue Growth	Cost	Cost Growth	Difference between Revenue and Cost
1	1,000.00€	0.01	400.00€	0.015	600.00€
2	1,010.00€		406.00€		604.00€
3	1,020.10€		412.09€		608.01€
4	1,030.30€		418.27€		612.02€
5	1,040.60€		424.54€		616.05€

Table 2 Present Value Calculated on a Discount Rate Varying from 0.03 to 0.15.

Discount Rate, Yield, Target Rate of Return,Saggio di Capitalizzazione nella Capitalizzazione Finanziaria	Present Value of Difference between Revenue and Cost
0.03	2,783.46€
0.04	2,705.39€
0.05	2,630.71€
0.06	2,559.23€
0.07	2,490.77€
0.08	2,425.18€
0.09	2,362.30€
0.1	2,301.98€
0.11	2,244.09€
0.12	2,188.51€
0.13	2,135.11€
0.14	2,083.79€
0.15	2,034.44€

$$V = \frac{\sum_{t=1}^{n} \frac{F_t}{(1+i)^t}}{1 - \frac{(1 \pm dn)}{(1+i)^n}} \tag{7}$$

In Formula 7 V is the value, i is the discount rate, d is the linear growing factor whilst n is the length of the forecast period (also holding period). For the present article the formula will be defined as Prudential Value DCFA Formula (PVF)[3]. A comparison between the two formulas provides an idea of the impact of the difference. Assuming the valuation of an income producing properties with the following characteristics:

Therefore, the value of the cash flow actualized at the following discount rate, target rate of return, yield rate is indicated in the following Table 2.

[3] Or even: "Prudential Value DCFA D'Amato-Bambagioni Formula"

Table 3 Comparing Final Result of Simonotti's DCFA Formula with Prudential Value DCFA Formula.

	Discount Rate, Yield, Target Rate of Return,Saggio di Capitalizzazione nella Capitalizzazione Finanziaria	d	Numerator	Denominator	Appraised Value Using Simonotti's DCF Formula	Appraised Value using PVF Formula
1	0.03	0.005	2783.46544	0.115609262	24076.49163	24031.43979
2	0.04	0.005	2705.394469	0.157318203	17196.95753	17174.41266
3	0.05	0.005	2630.712607	0.196688815	13374.99844	13361.62495
4	0.06	0.005	2559.2321295	0.233872621	10942.84619	10934.06841
5	0.07	0.005	2490.777677	0.269010026	9259.051472	9252.889758
6	0.08	0.005	2425.1853319	0.3022312	8024.271274	8019.733808
7	0.09	0.005	2362.3017564	0.333657031	7080.029886	7076.566496
8	0.1	0.005	2301.9834119	0.363399635	6334.578209	6331.859925
9	0.11	0.005	2244.0958377	0.391563282	5731.119181	5728.937614
10	0.12	0.005	2188.5129918	0.418244905	5232.611240	5230.828200
11	0.13	0.005	2135.1166442	0.443534695	4813.866121	4812.386494
12	0.14	0.005	2083.7958200	0.467516626	4457.158749	4455.915016
13	0.15	0.005	2034.4462871	0.490268929	4149.653723	4148.596689

Finally, it is possible to compare the value using the Simonotti's DCFA and the Prudential Value DCFA Formula (PVF) (Table 3).

The Table 3 indicates a comparison between the opinion of value derived by the two procedures. It is possible to observe the valuation variation between the models assuming the following variation rate between the two results, using the following equation:

$$\Delta = \frac{V_{SM} - V_{PVF}}{V_{PVF}} \tag{8}$$

In the Formula 8 the variation ratio Δ between Simonotti's formula and Prudential Value DCFA formula is calculated as follows: V_{SM} stands for the value calculated using traditional Simonotti model, V_{PVF} stands for the value provided with the same assumptions by the Prudential Value DCFA model. In the following table (Table 4) the variation ratio has been calculated applying both the Simonotti's formula and the Prudential Value DCFA formula for a holding period of five years.

In the Table 4 the column reports the estimation of valuation variation between the two models (Simonotti's

Table 4. Valuation variation. Comparing Final Result of Simonotti's DCFA Formula with Prudential Value DCFA Formula assuming a holding period of 5 years.

Discount Rate	Δ calculation per each value of d holding period 5 years d term				
	0.005	0.01	0.015	0.02	0.025
0.03	0.001874704	0.0093295081	0.0278570791	0.073936607	0.22996643
0.04	0.0013127009	0.006097758	0.0163881892	0.036250573	0.0751743355
0.05	0.001000887	0.0044837009	0.0114775472	0.023697939	0.0442332071
0.06	0.00080279150	0.0035166974	0.00875293212	0.0174285469	0.030984888
0.07	0.00066592316	0.0028732015	0.00702191977	0.0136723641	0.023634025
0.08	0.00056578752	0.0024145507	0.00582588551	0.0111727136	0.018963705
0.09	0.00048941661	0.0020714136	0.0049508044	0.0093910194	0.015736653
0.1	0.0004293026	0.00180527290	0.0042833693	0.00805799354	0.013375472
0.11	0.00038079796	0.0015930180	0.0037579812	0.0070240314	0.011574484
0.12	0.000340871	0.0014199426	0.0033340315	0.0061993706	0.0101567172
0.13	0.00030746215	0.0012762421	0.00298503610	0.0055268897	0.00901261582
0.14	0.00027911948	0.0011551290	0.00269298613	0.0049685076	0.0080707323
0.15	0.00025479324	0.0010517552	0.00244520871	0.0044978611	0.0072824823

Table 5. Valuation variation. Statistical Data for 5 years holding period.

Arithmetic Mean	0.103831988
Maximum Value	0.229966438
Minimum Value	0.0362505738
Dev. Standard	0.0860080264

DCF and PVF) according to different combination of discount rate and progression rate d. The row indicates the estimation of the discount rate whilst the column indicates the progression rate d. Per each cell there is the relative estimation of Δ or valuation variation between the models. It is clear that in every cell the valuation variation is positive therefore the Simonotti's DCF formula is always higher than the PVF as expected not different. It is possible to observe significative difference in term of valuation variation with low discount rate included between 0.03 and 0.04 for a d factor varying between 0.02 and 0.025. In the Table 5 below it is possible to observe the statistical data about the valuation variation between the two different models for a holding period of 5 years.

It is possible to observe that for the interval selected the valuation variation become meaningful reaching 22% in some case. Opinion of value based on Simonotti's formula may be higher than PVF of a 22%. A further analysis has been carried out increasing the holding period. The Table 6 below reports the same differences of Table 4 related to a holding period of 15 years. It shows a significant valuation variation between the methods higher than the previous one obtained for a holding period of 5 years.

In the Table 6 the column reports the estimation of d whilst the row indicates the estimation of the discount rate. It is possible to observe significative difference in term of valuation variation with low discount rate included between 0.03 and 0.05 for a d factor varying between 0.02 and 0.025. In the Table 7 below it is possible to observe the statistical data about the valuation variation between the two different models for a holding period of 15 years.

Comparing Table 7 with Table 5, the arithmetic mean of valuation variation between the opinion of value of the two methods is almost doubled. The difference in the maximum case reaches the 66% the standard deviation is almost three times than the one observed in the table 5. Consequently, the difference grows proportionally to the holding period. A further alternative is the combination of a linear and a compound variation ratio in order to create more flexibility in the valuation process. In this way it is possible to use an exponential variation rate for a certain number of years and a linear variation rate for the remaining part of the years like in the Formula 9 below:

$$V = \frac{\sum_{t=1}^{n} \frac{F_t}{(1+i)^t}}{1 - \frac{(1 \pm d)^n (1 \pm dt)}{(1+i)^n}} \tag{9}$$

Table 6. Valuation variation. Comparing Final Result of Simonotti's DCFA Formula with Prudential Value DCFA Formula assuming a holding period of 15 years.

Discount Rate	Δ calculation per each value of d holding period 15 years d term				
	0.005	0.01	0.015	0.02	0.025
0.03	0.0055857238	0.02762971	0.081992746	0.21625901	0.6683565
0.04	0.0037092259	0.017139674	0.045817219	0.10079288	0.20785236
0.05	0.0026794005	0.011949283	0.030447912	0.062571069	0.11623006
0.06	0.0020341098	0.0088775096	0.022011246	0.043655449	0.077297539
0.07	0.0015955865	0.0068639085	0.016723273	0.032457920	0.055921492
0.08	0.001280857	0.0054539352	0.013128456	0.025115434	0.0425195207
0.09	0.0010459832	0.00442026825	0.010547418	0.019972157	0.0334056563
0.1	0.00086552055	0.0036365848	0.00862040582	0.0161999947	0.0268594757
0.11	0.0007237132	0.0030270706	0.00713908177	0.0133387780	0.021969953
0.12	0.00061028411	0.0025434687	0.00597444305	0.011112330	0.01820951
0.13	0.00051824440	0.0021536042	0.0050423408	0.0093448617	0.0152514753
0.14	0.000442677	0.0018352036	0.0042855514	0.0079191620	0.0128827428
0.15	0.0003800245	0.0015723637	0.0036638145	0.006754091	0.0109584031

Table 7 Valuation variation. Statistical Data for 15 years holding period.

Arithmetic Mean	0.228676998
Maximum Value	0.6683565
Minimum Value	0.0625710695
Dev. Standard	0.223828442

In the Formula 9, the variation ratio presents an exponential form from the moment valuation to year n and a linear relation from the time n to the end of the holding period calculated as t. The PVF may be seen as a family of valuation belonging to income approach.

4. CONCLUSIONS

The paper proposed a modification to the Simonotti's formula to identify the sustainability of investments in the long term and, in particular, to calculate the DCFA Prudential Value for Real Estate lending, in the framework of the EBA Guidelines for loan origination and monitoring[4]. The variation proposes a different calculation of d emphasizing the fact that the term d has a real estate nature instead of a financial one. Therefore, as a variation of price along the time can be modelled not only using the exponential function like in the original Simonotti's DCFA formula but also in a linear way using a linear variation ratio. For this paper the method has been defined Prudential Value DCFA Formula (PVF) and allows the valuer, the investor and/or the lender to reach more prudent opinion of value. The original formula may be applied in real estate market increasing or decreasing in an exponential market; whilst the PVF may be used in specific context where these variations are weaker, or in the case in which a prudential assessment of the asset is appropriate since the time horizon under analysis is very broad and therefore the forecasts of performance in the long term are very uncertain.

This contribution shows that the previous Simonotti's model may be modified to represent better market reality and the sustainability on the value in the long term (i.e. Long-term sustainable value, LTSV)[5]. Professional operators need to be able to respond to change of external conditions, in consideration of the sustainability of the cash flows in the long term, for the entire duration of the investment (and therefore for the purpose of identifying the long-term sustainable value of the asset). The approach is functional, inter alia, for the purpose of identifying the "prudential value" as credit risk mitigant, as defined by the innovative banking regulation (Basel 3) according to the definition of loan-to-value (LTV) ratio for loan origination and monitoring. Future directions or research may be a comparison on real sample of these different relationship or introducing other possible kinds of modelling of d factor in the valuation process expanding the methodological possibilities of the formula.

[4] See: European Banking Autority (EBA) Guidelines on loan origination and monitoring (EBA/GL/2020/06).

[5] About the "Long-Term Sustainable Value, LTSV" see: Bambagioni, G. (2021) "*Sostenibilità del valore nel finanziamento immobiliare*" (i.e. Sustainability of value in real estate financing), Maggioli Politecnica; Chapters 1, 2, 4 and Introduction.

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La scuola estimativa italiana, gli International Valuation Standard (IVS) e il Codice delle valutazioni immobiliari: i problemi di natura metodologica e applicativa

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Abstract. In some Anglo-Saxon countries, such as Australia and the United States, initiatives have already emerged to promote standardized evaluation practices. However, in Italy, this process is still evolving. Since 1994, the International Valuation Standards Committee (IVSC) has been working on various documents to establish uniform evaluation practices globally. These International Valuation Standards (IVS) are gradually gaining recognition in Italy. Through the efforts of organizations like ABI, Tecnoborsa, the Revenue Agency, and professional associations, IVS are being integrated into evaluation practices for credit approval and public administration requirements.

Keywords: International Valuation Standard (IVS), Italian Appraisal School, Market Value, Real Estate Appraisal, Valuation Models.
JEL code: R30.

1. INTRODUZIONE

Con la globalizzazione delle economie e il crescente ruolo del sistema finanziario nei processi di sviluppo il tema della definizione di standard comuni di valutazione ha assunto una sempre maggiore rilevanza. A partire dagli inizi del secolo in alcuni Paesi anglosassoni (Australia e Stati Uniti in particolare) si sono sviluppate iniziative per la promozione di standard comuni di valutazione con lo specifico scopo di aumentare la sicurezza e la fiducia degli utenti verso i servizi di valutazione stabilendo pratiche di valutazione trasparenti e coerenti. L'International Valuation Standards Committee (IVSC) ha formulato vari documenti a partire dal 1994 per la formalizzazione di pratiche valutative omogenee a livello mondiale. Gli International Valuation Standards (IVS) si sono quindi affermati quale riferimento a livello internazionale (RCS, 2016) e anche in Italia, con l'attività di ABI, di Tecnoborsa, delle Agenzia delle entrate e degli ordini professionali, e sono stati

recepiti nelle pratiche valutative per la concessione del credito e anche nella Pubblica Amministrazione.

L'introduzione di tali standard nel contesto professionale estimativo italiano è stata motivata da varie circostanze, fra cui sicuramente la crisi finanziaria internazionale del 2007-2008 legata alle valutazioni immobiliari nel mercato statunitense, ma anche al diffondersi nella pratica estimativa di stime immobiliari così dette "a vista", non analitiche, che ponevano vari dubbi sulla loro oggettività e attendibilità. Mentre "*l'applicazione di metodologie intellegibili e replicabili basate su oggettivi elementi economico-estimativi e sulla rilevazione delle specifiche caratteristiche quantitative e qualitative del bene immobiliare oggetto di stima sono alla base dell'applicazione degli standard di valutazione e della dottrina estimativa moderna*" (International Valuation Standard Committee, 2022). È infatti, solo con l'adozione di valutazioni trasparenti, basate su elementi oggettivi, riproducibili che è possibile stabilire rapporti di reciproca fiducia fra tutte le componenti di un sistema economico e quindi creare le condizioni essenziali per lo sviluppo.

La diffusione della certificazione di IVS compliance per le stime immobiliari rappresenta, quindi, un importante passo avanti nelle pratiche estimative nazionali. Il punto su cui riteniamo sia però necessario fare chiarezza riguarda le linee guida per l'applicazione di tali principi ai procedimenti di stima. Nelle diverse edizioni del Codice delle Valutazioni Immobiliari di Tecnoborsa, che si sono succedute a partire dal 2000, sono presenti definizioni dei procedimenti di stima non sufficientemente rispondenti alla funzione che il manuale si pone e cioè quello di essere uno strumento di supporto all'attività professionale. Vista l'importanza della materia e delle sue implicazione nella vita della società, abbiamo ritenuto opportuno intervenire sul tema partendo proprio dai principi dell'estimo della scuola italiana al fine della delimitazione e strutturazione del dominio di ricerca e di definire, anche dal punto di vista terminologico, le componenti elementari della stima. Riteniamo, infatti, che una precondizione per affrontare un tema complesso come quello delle valutazioni sia la chiarezza nei termini impiegati. Nella parte successiva del lavoro saranno descritti gli International Valuation Standards, con riferimento specifico alle stime del valore di mercato degli immobili, e proposto un confronto con l'approccio estimativo italiano. In ultimo verrà affrontato il tema dei procedimenti di stima, approfondendo in particolare la valutazione del più probabile valore di mercato e dei limiti che i procedimenti proposti nei documenti citati presentano.

2. L'APPROCCIO DELLA SCUOLA ESTIMATIVA ITALIANA

Oggetto dell'estimo, come definito dalla scuola estimativa italiana, è la determinazione di un **valore monetario** per i beni economici (Serpieri, 1911). L'estimo approfondisce la logica e la metodologia per formulare motivati giudizi di stima dei valori monetari dei beni economici, in funzione di uno specifico scopo (Di Cocco, 1960; Michieli, 1975; Polelli, 2008).

Il valore non è una qualità intrinseca e permanente dei beni, ma si determina in relazione allo scopo e al momento della stima (Grillenzoni and Grittani, 1994).

Come osserva Medici "*il carattere fondamentale dell'estimo è quello di insegnare ad esprimere giudizi circa la somma di moneta che si può attribuire, per soddisfare date esigenze pratiche, ad un qualsiasi bene economico oggetto di stima; si tratta, dunque, di insegnare ad esprimere giudizi di valore*" (Medici, 1972).

Con il giudizio di stima non si misura una grandezza, ma si determina la sua più **probabile** misura. "*Il valore va inteso come proposizione logica espressa in cifre*" (Medici, 1972).

Per beni economici si intendono tutti quei beni materiali e immateriali (servizi), disponibili in quantità limitata, in grado di soddisfare un particolare bisogno, generare una utilità. In questa accezione fanno parte dei beni economici anche i beni pubblici e le esternalità produttive e rientrano quindi anch'essi fra i possibili oggetti dell'estimo (Merlo, 1991).

La **metodologia estimativa è unica** per qualunque oggetto e scopo di stima e si basa sulla **comparazione** (Serpieri, 1911)**.** La comparazione è implicita in ogni scelta economica, la decisione di acquisto è sempre legata ad una comparazione fra l'utilità del bene e il suo prezzo/disutilità in considerazione anche delle alternative disponibili. Su questo principio si sviluppa la metodologia estimativa. Nel caso dei beni di mercato il valore del bene da stimare è ottenuto attraverso una comparazione con i beni simili alternativi di cui si conosce il prezzo, il reddito immobiliare o il costo di fabbricazione/riproduzione (Tempesta, 2018). Nel caso dei beni non di mercato il valore lo si ricava o dal confronto con altri beni di mercato necessari per la loro fruizione/produzione o con la disponibilità a pagare per ottenere quel bene o ad accettare un compenso per rinunciarvi.

Le fasi in cui si sviluppa la metodologia estimativa attraverso la comparazione possono considerarsi uniche per tutti i beni, anche se nella realizzazione operativa la stima dei beni pubblici si sviluppa in modo sostanzialmente diverso da quella dei beni privati. Tali fasi sono le seguenti:

1. Definizione dello scopo della stima
2. Definizione dell'universo/segmento di riferimento
3. Raccolta dati
4. Sintesi valutativa
5. Giudizio di stima

2.1 Definizione dello scopo della stima

Lo scopo (ragion pratica, il fine, l'uso, l'impiego) è la premessa della stima, più in dettaglio questa fase implica la definizione dell'oggetto da stimare e del contesto in cui si colloca il valore ricercato. Ad esempio: stima di un immobile per la vendita, stima di un immobile per il risarcimento di un danno (Orefice, 1984).

La corretta definizione del quesito di stima è fondamentale per la validità di tutto il procedimento, in quanto il quesito ci consente di individuare lo specifico scopo della stima fra tutti i possibili scopi generati dai rapporti economici, giuridici e sociali (Simonotti, 1985). In ogni caso va sottolineato che quesito e scopo servono per conoscere che cosa il giudizio di stima deve determinare ossia l'aspetto economico del bene da considerare.

"*Una valutazione in moneta ha sempre carattere ipotetico: non si può attribuire alle cose un determinato prezzo se non relativamente ad un determinato impiego che se ne debba fare*" (Famularo, 1985).

In letteratura, in prevalenza, tutti gli scopi di stima vengono ricondotti a 5 criteri di stima (aspetti economici) (Medici, 1972)[1]: **valore di mercato; valore di costo; valore di trasformazione; valore di surrogazione, valore complementare**. Il Medici, inoltre, nei suoi Principi di Estimo rileva come in realtà i valori di costo, trasformazione, surrogazione e complementare siano tutti riconducibili al valore di mercato e sarebbero identici tra loro se il mercato fosse perfettamente concorrenziale.

Il criterio del valore di mercato fa riferimento alla ricerca del più probabile valore monetario che il bene assumerebbe in una compravendita nello specifico mercato considerato. Il criterio del costo fa riferimento al più probabile costo di produzione necessario per costruire o ricostruire il bene. Il criterio del valore di trasformazione fa riferimento al più probabile valore della differenza fra il valore del bene trasformato e il costo per la sua trasformazione. Il criterio del valore di surrogazione fa riferimento al più probabile valore di mercato di un bene perfetto sostituto di quello da stimare. Il criterio del valore complementare fa riferimento al più probabile valore della differenza fra il valore di mercato del bene integro e quello dello stesso bene dopo una sua alterazione.

L'individuazione dei criteri di stima è utile soprattutto dal punto di vista operativo, in quanto permette di classificare tutte le innumerevoli casistiche estimative in categorie caratterizzate da particolari aspetti metodologici.

Sempre dal punto di vista operativo è importante un'ulteriore classificazione dei possibili scopi delle stime in due grandi categorie: *la stima del valore di compravendita* e *la stima della perdita di valore per danni e limitazioni della proprietà* (Michieli e Cipollotti, 2018). Per entrambe le categorie è possibile applicare tutti criteri di stima precedentemente elencati con l'eccezione del valore complementare che è normalmente riferibile alla sola stima dei danni.

Deve però essere ben chiaro come i criteri di stima impiegabili nelle due categorie assumano connotazioni diverse. Per le stime relative alle compravendite il criterio fondamentale è quello del valore di mercato, qualora però non siano disponibili informazioni su beni comparabili sono applicabili i criteri di surrogazione, di costo e di trasformazione con la specifica funzione di approssimare al meglio il valore di mercato. Per le stime finalizzate alla valutazione dei danni i criteri di stima pur formalmente coincidenti (ad eccezione del valore complementare) rispondono però a obiettivi completamente diversi e quindi richiedono di considerare la specificità del bene e del soggetto danneggiato.

In particolare, il valore di costo/trasformazione nell'ambito delle compravendite ha la funzione principale di sostituire il valore di mercato nei casi in cui non siano disponibili informazioni su beni comparabili, mentre nella valutazione dei danni può rappresentare un obiettivo specifico della stima (Grittani, 1995; Simonotti, 2006).

Infatti, l'art. 2058 c.c. dispone che "il danneggiato può chiedere la reintegrazione del danno in forma specifica, qualora sia in tutto o in parte possibile. Tuttavia, il giudice può disporre che il risarcimento avvenga solo per equivalente, se la reintegrazione in forma specifica risulta eccessivamente onerosa per il debitore". Quindi in questa fattispecie il risarcimento del danno può richiedere la stima del valore di mercato (per equivalente) e del valore di costo, potenzialmente anche molto diversi fra loro.

Caso a sé è rappresentato dal valore complementare. Il ricorso a questo criterio nella stima dei danni è necessario quando l'alterazione dell'integrità del bene determini una perdita di valore superiore a quella desumibile considerando solo il danno dell'alterazione a sé stante. In questi casi è infatti necessario considerare anche gli effetti dell'alterazione sul bene residuo e ciò è possibile solo considerando il valore complementare. Ad esempio,

[1] "Lo scopo … [della stima] costituisce la premessa della stima, nel senso che in dipendenza di esso viene a determinarsi l'oggetto della ricerca e, cioè, l'aspetto economico del bene da stimare"

la stima del danno determinato della realizzazione di un elettrodotto non può limitarsi alla sola valutazione delle superfici interessate, ma deve anche tener conto della perdita di valore dell'intero fondo (art. 123 L. 1775/1933; TU dpr 327/2001).

2.2 Definizione dell'universo/segmento di riferimento

La delimitazione spaziale e temporale del "mercato" di riferimento, cioè dello specifico segmento di mercato da considerare per la raccolta dei prezzi, è essenziale sia per la validità dei risultati sia per la trasparenza e comparabilità degli stessi nei confronti dei terzi interessati dalla valutazione. Qualunque operazione di compravendita risente inevitabilmente del numero dei soggetti coinvolti: potenziali venditori/compratori. Il valore di stima potrà quindi cambiare anche notevolmente in funzione della diffusione delle informazioni, ad esempio sull'immobile in vendita, e ciò sia in relazione all'estensione spaziale del mercato contattato sia del tempo in cui può permanere sul mercato il bene.

2.3 Raccolta dati

Una fase fondamentale è costituita dalla definizione delle componenti elementari/caratteristiche del bene oggetto della valutazione sulla cui base si dovranno selezionare i comparabili e reperire i relativi prezzi di mercato.

Per oggetti semplici potremmo avere anche un solo elemento, ma più frequentemente sarà necessario analizzare oggetti complessi il cui valore finale sarà dato dall'aggregazione di molteplici valori elementari. È quindi importante definire quali siano le caratteristiche intrinseche ed estrinseche che determinano il valore del bene oggetto di stima e conseguentemente individuare beni comparabili con il maggior numero di caratteristiche rilevanti simili. La raccolta dei prezzi di mercato è un'attività particolarmente critica nella stima in quanto da un lato è onerosa sia in termini finanziari sia temporali, dall'altro la qualità dei dati rilevati è decisiva per tutte le fasi successive e quindi per il giudizio finale. Proprio per questi motivi i risultati sulla ricerca dei prezzi di mercato potrebbe determinare la necessità di rivedere le caratteristiche prescelte per il bene da stimare per adeguarle alle condizioni reali del mercato.

Sviluppare protocolli di rilevazione chiari e completi è quindi un passaggio molto importante e può servire anche a meglio definire le condizioni di validità della stima. La scelta dei "beni analoghi" (*comparables*) per cui sono noti i prezzi di mercato è una operazione di fondamentale importanza per la validità della stima finale. Tali beni devono essere il più possibile omogenei rispetto al bene da stimare per le caratteristiche che principalmente determinano il valore. Il numero di beni analoghi reperibili sul mercato può quindi determinare anche la scelta del procedimento di stima da seguire. Ad esempio, in presenza di un numero di *comparables* modesto e di elevata variabilità nei dati non sarà corretto procedere all'impiego di strumenti statistici quali il prezzo edonimetrico o la regressione multivariata.

Fra gli elementi che è necessario completino la relazione di stima si evidenziano, inoltre, le descrizioni del territorio di rilevazione; del periodo di rilevazione (indispensabile quando sia necessario determinare prezzi soggetti a variazioni significative nel tempo) e delle modalità di rilevazione (indagine su statistiche ufficiali, indagine diretta con intervistatore, ecc.).

2.4 Sintesi valutativa

Completata la raccolta dati è cruciale la modalità adottata per giungere alla sintesi valutativa. Essa dipenderà dall'aspetto economico considerato e dal conseguente procedimento di stima prescelto.

Aspetto economico valore di mercato: procedimenti di comparazione di prezzi/redditi di beni simili a quello oggetto di valutazione; procedimenti operanti sui redditi del bene oggetto di stima (l'assunto è che per tale bene il valore di mercato è determinato dalla sua redditività).

Aspetto economico valore di costo: procedimenti operanti sui prezzi dei beni necessari alla produzione del bene oggetto di stima.

Su questa struttura si sviluppano tutti i procedimenti di stima che si basano sempre su un approccio comparativo e possono sinteticamente raggrupparsi, in funzione della specifica configurazione del sistema di prezzi di riferimento, nelle seguenti tre categorie:

- procedimenti di comparazione di prezzi di beni simili a quello oggetto di valutazione (Market approach, IVS);
- procedimenti operanti sui prezzi dei beni necessari alla produzione del bene oggetto di stima (Cost approach, IVS);
- procedimenti operanti sulle redditività potenziali (Income approach, IVS).

In ogni caso la sintesi dovrà essere sviluppata in modo coerente con le ipotesi teorico-economiche sottostanti alle ipotesi di stima adottate, impiegando modelli di stima adeguati. Ad esempio, modelli che impiegano funzioni lineari delle caratteristiche, presuppongono una logica compensatoria, cioè che il valore di stima deriva da una semplice somma pesata delle componenti elementari. Questa ipotesi non è però sempre accettabile, in

molte situazioni la presenza/assenza di un dato elemento o il raggiungimento di dati valori soglia per una caratteristica, può già di per sé determinare profondi cambiamenti nel valore non compensabili da altri elementi. È quindi fondamentale che la scelta del modello di stima sia coerente con le modalità reali di formazione del valore di mercato.

2.5 Giudizio di stima

Come accennato all'inizio, con il giudizio di stima non si misura una grandezza, ma si determina la sua più **probabile** misura. In questo senso l'individuazione del valore più probabile può essere utilmente integrata dalla descrizione dell'intervallo di variabilità del risultato. Tale intervallo può risultare o dall'applicazione di diversi procedimenti di stima o dall'analisi di sensitività di alcuni elementi risultati particolarmente aleatori nell'indagine sui prezzi di mercato, ad esempio utilizzando approcci statistici che consentono di definire la probabilità del realizzarsi di un certo valore in un dato intervallo.

Riconducendo le fasi ora descritte al problema della valutazione del più probabile prezzo di compravendita di un immobile avremo la struttura delle diverse opzioni estimative illustrata nella Tabella 1.

3. GLI INTERNATIONAL VALUATION STANDARDS E LA LORO APPLICAZIONE ALLA VALUTAZIONE DEGLI IMMOBILI

Gli IVS hanno rappresentato una importante novità nel panorama estimativo internazionale. A partire dai primi anni '90 si sono progressivamente affermati come punto di riferimento per la formalizzazione di pratiche valutative omogenee a livello mondiale.

"*The objective of the IVS is to increase the confidence and trust of users of valuation services by establishing transparent and consistent valuation practices*" (International Valuation Standard, 2022). Coerentemente con questo obiettivo vengono definite linee guida per la valutazione delle principali categorie di oggetti di valore. Gli IVS sviluppano le linee guida generali in 4 parti: **Investigation, Reporting**, **Bases of value** e **Valuation Approaches and Methods**. Ciascuna di queste parti offre indicazioni sui principi e sugli elementi necessari per lo svolgimento di una corretta valutazione. Successivamente tali indicazioni sono specificate per le principali categorie di valutazioni.

In questo contributo ci concentreremo sulle parti: Bases of value e Valuation Approaches and Methods con riferimento alle valutazioni immobiliari e con un approfondimento sull'approccio (aspetto economico) del valore di mercato.

Valore per cui gli IVS definiscono molto chiaramente tutte le specificità e le attenzioni necessarie per la corretta valutazione. Di seguito riportiamo i principali passaggi del documento originario (International Valuation Strandard, 2022).

3.1 Il valore di mercato (IVS)

La definizione di valore di mercato è del tutto coerente con quanto presente nella tradizione estimativa nazionale e formalizza molto efficacemente vari aspetti metodologici importanti per una corretta valutazione.

30.2. The definition of market value must be applied in accordance with the following conceptual framework: (a) "The estimated amount" refers to a price expressed in

Tabella 1. Stima del più probabile prezzo di compravendita, aspetto economico, procedure di stima e modelli di stima.

Scopo della stima	Aspetto economico	Procedure di stima	Modelli di stima
Stima del più probabile prezzo di compravendita	Valore di mercato	Comparazione dei prezzi (*Market approach IVS*)	i) Comparazione semplice ii) Regressione semplice iii) Stima per valori unitari/tipici iv) Regressione multipla v) Stima per prezzi marginali (*Market Comparison pproach)* vi) Sistema di equazioni
		Analisi del reddito (*Income Approach IVS)*	vii) Capitalizzazione del reddito
		Analisi dei costi *(Cost Approach IVS)*	viii) Ricostruzione del costo (computo metrico estimativo)

Fonte: nostre elaborazioni da Tempesta (2018).

terms of money payable for the asset in an arm's length market transaction. Market value is the most probable price reasonably obtainable in the market on the valuation date in keeping with the market value definition. It is the best price reasonably obtainable by the seller and the most advantageous price reasonably obtainable by the buyer. This estimate specifically excludes an estimated price inflated or deflated by special terms or circumstances such as atypical financing, sale and leaseback 22 General Standards General Standards – IVS 104 Bases of Value arrangements, special considerations or concessions granted by anyone associated with the sale, or any element of value available only to a specific owner or purchaser.
30.3. The concept of market value presumes a price negotiated in an open and competitive market where the participants are acting freely. The market for an asset could be an international market or a local market. The market could consist of numerous buyers and sellers, or could be one characterised by a limited number of market participants. The market in which the asset is presumed exposed for sale is the one in which the asset notionally being exchanged is normally exchanged.
30.4. The market value of an asset will reflect its highest and best use (see paras 140.1-140.5). The highest and best use is the use of an asset that maximises its potential and that is possible, legally permissible and financially feasible. The highest and best use may be for continuation of an asset's existing use or for some alternative use. This is determined by the use that a market participant would have in mind for the asset when formulating the price that it would be willing to bid.
30.5. The nature and source of the valuation inputs must be consistent with the basis of value, which in turn must have regard to the valuation purpose. For example, various approaches and methods may be used to arrive at an opinion of value providing they use market-derived data. The market approach will, by definition, use market-derived inputs. To indicate market value, the income approach should be applied, using inputs and assumptions that would be adopted by participants. To indicate market value using the cost approach, the cost of an asset of equal utility and the appropriate depreciation should be determined by analysis of market-based costs and depreciation.
30.6. The data available and the circumstances relating to the market for the asset being valued must determine which valuation method or methods are most relevant and appropriate. If based on appropriately analysed market-derived data, each approach or method used should provide an indication of market value.
*30.7. Market value does not reflect attributes of an asset that are of value to a specific owner or purchaser that are not available to other buyers in the market. Such advantages may relate to the physical, geographic, economic or legal characteristics of an asset. Market value requires the disregard of any such element of value because, at any given date, it is only assumed that there is a willing buyer, not a particular willing buyer. (*International Valuation Standard Committee, 2022*)*

3.2 Valuation Approaches and Methods

Passando a considerare i **Valuation Approaches and Methods** gli IVS si concentrano su tre approcci sostanzialmente corrispondenti alle **procedure di stima** dell'estimo tradizionale.

*10.1. Consideration must be given to the relevant and appropriate valuation approaches. One or more valuation approaches may be used in order to arrive at the value in accordance with the basis of value. The three approaches described and defined below are the main approaches used in valuation. They are all based on the economic principles of price equilibrium, anticipation of benefits or substitution. The principal valuation approaches are**: (a) market approach, (b) income approach, and (c) cost approach***
10.2. The goal in selecting valuation approaches and methods for an asset is to find the most appropriate method under the particular circumstances. No one method is suitable in every possible situation. The selection process should consider, at a minimum: (a) the appropriate basis(es) of value and premise(s) of value, determined by the terms and purpose of the valuation assignment, (b) the respective strengths and weaknesses of the possible valuation approaches and methods, (c) the appropriateness of each method in view of the nature of the asset, and the approaches or methods used by participants in the relevant market, and (d) the availability of reliable information needed to apply the method(s).

Relativamente al **Market Approach** gli IVS forniscono le seguenti linee guida per la sua applicazione alla valutazione degli immobili (Real Property Interests).

20.1. The market approach provides an indication of value by comparing the asset with identical or comparable (that is similar) assets for which price information is available.
20.2. The market approach should be applied and afforded significant weight under the following circumstances: (a) the subject asset has recently been sold in a transaction appropriate for consideration under the basis of value, (b) the subject asset or substantially similar assets are actively publicly traded, and/or (c) there are frequent and/or recent observable transactions in substantially similar assets.
50.1. Property interests are generally heterogeneous (ie, with different characteristics). Even if the land and buildings have identical physical characteristics to others being exchanged in the market, the location will be different. Notwithstanding these dissimilarities, the market approach is commonly applied for the valuation of real property interests.
50.2. In order to compare the subject of the valuation with the price of other real property interests, valuers should adopt generally accepted and appropriate units of comparison that are considered by participants, dependent upon the type of asset being valued. Units of comparison that are commonly used include:

(a) price per square metre (or per square foot) of a building or per hectare for land,
(b) price per room, and
(c) price per unit of output, eg, crop yields.
50.3. A unit of comparison is only useful when it is consistently selected and applied to the subject property and the comparable properties in each analysis. To the extent possible, any unit of comparison used should be one commonly used by participants in the relevant market.
50.4. The reliance that can be applied to any comparable price data in the valuation process is determined by comparing various characteristics of the property and transaction from which the data was derived with the property being valued. Differences between the following should be considered in accordance with IVS 105 Valuation Approaches and Methods, para 30.8.
Specific differences that should be considered in valuing real property interests include, but are not limited to:
(a) the type of interest providing the price evidence and the type of interest being valued,
(b) the respective locations,
(c) the respective quality of the land or the age and specification of the buildings,
(d) the permitted use or zoning at each property,
(e) the circumstances under which the price was determined and the basis of value required,
(f) the effective date of the price evidence and the valuation date, and
(g) market conditions at the time of the relevant transactions and how they differ from conditions at the valuation date.

Infine, relativamente al **modello di valutazione** usato gli IVS evidenziano le seguenti raccomandazioni:

90.1. A valuation model refers collectively to the quantitative methods, systems, techniques and qualitative judgements used to estimate and document value.
90.2. When using or creating a valuation model, the valuer must:
(a) Keep appropriate records to support the selection or creation of the model,
(b) Understand and ensure the output of the valuation model, the significant assumptions and limiting conditions are consistent with the basis and scope of the valuation, and
(c) Consider the key risks associated with the assumptions made in the valuation model.

Nel complesso gli IVS hanno pertanto il merito di aver formalizzato e sistematizzato tutte le fasi della metodologia estimativa in modo del tutto coerente con i principi della scuola estimativa italiana, offrendo così un valido aiuto agli operatori per lo svolgimento della pratica estimativa.

Da evidenziare come gli IVS non affrontino il tema dei modelli di stima da impiegare per la comparazione dei prezzi di mercato: regressione semplice o multipla, stima per valori tipici, sistemi di equazioni, prezzi marginali, ecc., ma forniscano solo le linee guida per la loro corretta scelta e applicazione.

4. DAGLI IVS AL CODICE DI VALUTAZIONE IMMOBILIARE

La pubblicazione del Codice delle Valutazioni Immobiliari (CVI) nel 2000 (Tecnoborsa, 2000) costituisce il primo tentativo di offrire uno strumento operativo capace di rispondere alle numerose innovazioni normative (Europee e Nazionali) con l'obiettivo di indicare procedure e modelli valutativi adeguati alle caratteristiche del mercato immobiliare italiano e coerenti con le esigenze deli operatori. Tra i molteplici obiettivi del CVI c'è quello di "armonizzare" gli standard di valutazioni sviluppati nel contesto normativo italiano con quelli definiti a livello internazionale. In realtà il CVI va molte oltre quanto definito all'interno degli IVS (o degli altri standard internazionali esistenti, come ad esempio EVS, USPAP) in quanto entra nel merito dell'individuazione dei modelli di stima da applicare nei diversi procedimenti e contesti, cosa che non è invece affrontata nell'ambito degli IVS. Il progetto è molto ambizioso e di sicura utilità visto che uno degli scopi del CVI è proprio quello di fornire un supporto alle esigenze dei professionisti che operano nel settore, ma al contempo anche molto complesso in quanto richiede l'illustrazione esaustiva degli strumenti di stima proposti e l'indicazione del legame tra scopo della stima e modello indicato.

Data la vastità degli argomenti trattati all'interno del CVI l'attenzione si è concentrata sul tema più rilevante e cioè sull'analisi critica del Capitolo 9 dell'ultima edizione del CVI (Tecnoborsa, 2018): "Metodo del confronto di mercato".

Prima di entrare nel merito del capitolo è necessario premettere l'importanza di una terminologia univoca, qualsiasi essa sia e cioè riconducibile alle categorie della scuola estimativa italiana o a quelle degli standard internazionali. Riprendendo quanto esposto nella prima parte del Codice, è bene chiarire che se "le valutazioni immobiliari si fondano sulla definizione e identificazione del valore di mercato" che corrisponde a "un valore di scambio e di stima con input tratti dai dati e dalle informazioni di mercato" (CVI, p. 22) questo "valore di mercato" va inteso come un "aspetto economico" del bene che si vuole stimare o per usare altri termini che troviamo in letteratura "il criterio di stima" o la "tipologia di valore". Così come è importante premettere che tale aspetto, criterio o tipologia deriva dallo scopo della stima. Questa gerarchia molto chiara e riconducibile ai padri della

scuola estimativa italiana, ma individuabile anche negli standard internazionali, deve costituire una premessa essenziale in qualsiasi giudizio di stima. Nel CVI, anche se con una sequenza espositiva non così gerarchizzata, si accetta nella sostanza tale impostazione (vd. Cap. 1, 3 e 4). Un primo problema terminologico riguarda l'unicità del metodo. Nel CVI si ribadisce, conformemente alla letteratura estimativa, che "La metodologia estimativa pone come unico fondamento logico della valutazione la comparazione tra l'immobile oggetto di stima e gli altri immobili di prezzo noto con caratteristiche tecnico-economiche simili presi a confronto" (CVI, p. 54), riconoscendo in sostanza l'unicità del metodo. Nel capitolo 8 si usano però i termini procedimenti e metodi come sinonimi, il capitolo si intitola "procedimenti di stima" e il primo paragrafo indica "Introduzione ai metodi di stima", generando sicuramente confusione e di fatto contraddicendo quando affermato nel capitolo 4 in merito all'unicità del metodo. Il problema terminologico iniziale si riscontra anche nel capitolo successivo.

Nell'introduzione al capitolo si parla di modalità di applicazione del "metodo", e si precisa che i "criteri nell'ambito dei quali possono essere classificate le metodiche valutative" sono riconducibili al metodo del confronto di mercato (*market approach* o *market comparison approach*), metodo dei flussi di cassa attesi (*income approach*) e metodo del costo (*cost approach*).

Il primo rilevo è sempre di natura terminologica in quanto il "metodo del confronto di mercato" deve intendersi come un **aspetto economico** e i "criteri" come **procedimenti di stima** . Per ciascuno procedimento sono poi descritti 4 modelli estimativi.

Entrando nel merito della descrizione di tali modelli la prima osservazione riguarda il fatto che sarebbe opportuno indicare che si tratta solo di alcuni esempi di modalità di determinazione del valore di mercato nell'ambito del procedimento del "metodo del confronto di mercato" e non certo dell'elencazione di tutti i modelli che troviamo in letteratura. Il secondo rilievo riguarda l'assenza di precise indicazioni in merito alla scelta del modello in relazione all'oggetto della stima.

Il primo modello proposto è nominato "metodo del "market approach" (MA), ma in realtà si tratta del Market Comparison Approach (MCA). La differenza è sostanziale proprio in riferimento a quanto precedentemente illustrato in merito agli standard internazionali in quanto, mentre il MA è un procedimento di stima, il MCA è un vero e proprio modello di stima, teorizzato da Marco Simonotti, e non riconducibile a quanto definito negli IVS (*cfr. par.* 3.1). Basti per tutti citare il riferimento al punto 2.1.2 o 2.1.3 di p. 104 del CVI in cui si fa riferimento agli aggiustamenti sistematici o ai prezzi marginali delle categorie che non trovano riscontro negli IVS. Per evitare confusioni terminologiche da qui in poi useremo il termine MCA per indicare questo modello.

Oltre al MCA sono illustrate altre 3 "metodologie valutative", anche in questo caso da intendersi come modelli di stima: il "Sistema di stima", il "Market approach e sistema di stima" e il "Sistema di ripartizione" (2.2, p. 104).

Tali modelli vengono presentati come modelli complementari e integrativi del MCA con specifiche finalità e più precisamente:

- "Sistema di stima". "Sistema di equazioni riguardanti i confronti fra i comparabili e l'immobile da valutare": la differenza di prezzo è funzione delle differenti caratteristiche;
- "Market approach e sistema di stima". Combinazione del MCA e del sistema di stima.;
- "Sistema di ripartizione". "Sistema di equazioni relativo al confronto tra i comparabili e l'immobile da valutare, l'equazione elementare ripartisce il prezzo di mercato di un immobile nei prezzi unitari medi delle singlole caratteristiche". Si basa sull'assunto per il quale il prezzo è funzione delle caratteristiche possedute. Da notare che tale assunto è presente, come è ovvio, anche per i due precedenti modelli**.**

4.1 Il modello "MCA"

L'ipotesi di base del modello è che il prezzo di mercato dell'immobile sia determinato dalla sommatoria delle sue caratteristiche moltiplicate per i rispettivi prezzi marginali. Tale ipotesi implica, quindi che vi sia sempre una relazione lineare fra le dimensioni delle caratteristiche e il valore dell'immobile, cosa che può essere accettabile per variazioni limitate delle caratteristiche "quantitative", ma che non appare realistica per caratteristiche qualitative di tipo multinomiale (piano, aggettivi di qualità, ecc.). Nella descrizione del metodo/modello si rilevano alcune criticità relative all'assenza sia di riferimenti circa l'applicabilità del metodo sia alla determinazione di alcuni valori. Nel primo caso, ad esempio, si parla di "scelta delle caratteristiche" (3.4, p. 105), ma non si trovano indicazioni relative alle modalità di scelta. Nel caso della determinazione dei valori riferibili ai prezzi marginali, manca ogni riferimento inerente la loro determinazione, cosa che è particolarmente critica visto che essi esprimono la variazione del prezzo di mercato di un immobile al variare della caratteristica. La determinazione del prezzo marginale per ognuna delle caratteristiche individuate dovrebbe essere effettuata avendo la disponibilità di un numero congruo di rilevazioni dei prezzi di immobili che differiscano tra loro solo per la caratteristica considerata,

cosa estremamente difficile da rilevare nel mercato reale. Il prezzo marginale, al contempo, costituisce il punto centrale del modello di stima in quanto permette di effettuare quegli "aggiustamenti" indispensabili per individuare i valori della "Tabella di valutazione" che consentono di arrivare alla "Sintesi valutativa" costituita dal valore medio dei prezzi contenuti nella "Tabella di valutazione" (prezzi corretti) e cioè al più probabile valore di mercato del bene oggetto di stima. Risulta pertanto evidente che quello indicato a p. 105 del CVI non sia riferibile al MA, ma al MCA, quindi ad uno specifico modello di stima rispetto al quale mancano indicazioni essenziali per la sua applicabilità. Si rinvia al paragrafo 5 per un'analisi degli aspetti di criticità applicativa del modello proposto che verranno più avanti illustrate.

4.2 Il modello "Sistema di stima"

Il secondo modello di stima proposto, denominato "Sistema di stima", si basa sull'ipotesi che il valore dell'immobile da stimare sia determinato dalla differenza fra il prezzo dei comparabili e la sommatoria delle differenze fra le rispettive caratteristiche moltiplicate per i relativi prezzi marginali. Le incognite del sistema: valore dell'immobile, prezzi marginale delle differenze, sono ottenuti con la risoluzione classica del sistema di equazioni, dipendente dalla relazione fra numero di incognite e numero di equazioni. Da evidenziare come l'adozione di questo procedimento deterministico implichi, oltre alla linearità della funzione di aggregazione, anche che la soluzione del sistema non considera la diversa importanza delle caratteristiche. Come vedremo nel paragrafo 5.2 queste condizioni, oltre a non essere realistiche, possono condurre anche a risultati economico-estimativi non corretti.

Anche per questo modello non sono definite tutte le fasi necessarie al suo sviluppo. Ad esempio, manca l'analisi delle dinamiche di mercato. Inoltre, l'uso di una terminologia non univoca non aiuta nella comprensione dei concetti illustrati e di conseguenza nella loro applicabilità. Non sono infatti chiari i motivi per cui questo "Sistema di stima" sia particolarmente apprezzabile quando siamo di fronte a caratteristiche qualitative "*per le quali non esiste un referente nel prezzo […] Per i piccoli campioni dove non si può applicare l'analisi statistica […] e il Sistema di stima è l'unico modo di stimare i prezzi marginali delle caratteristiche qualitative*" (3.38, p. 114).

Infine, il CVI evidenzia come la risoluzione dei sistemi di equazioni richieda l'impiego algoritmi con calcoli complessi che implicano il ricorso a "strumenti di calcolo" che però non sono definiti (3.35, p. 113). Nel paragrafo 5.2 sono evidenziati con alcuni esempi i limiti sostanziali dell'applicazione di questo modello per la stima degli immobili.

4.3 Il modello "Market approach e sistema di stima"

Il terzo modello, denominato "sistema" misto, combina l'approccio del MCA con quello del "Sistema di stima". Il modello prevede di applicare prima il MCA considerando le caratteristiche quantitative e calcolando i prezzi corretti per effetto di queste caratteristiche; in sequenza si applica il "Sistema di stima" per considerare le caratteristiche qualitative. Anche in questo caso esistono differenze nell'elencazioni delle fasi da seguire rispetto ai due precedenti modelli, ma non si dà evidenza del significato di tali differenze. I prezzi di mercato corretti che scaturiscono dall'approccio MCA differiscono a causa degli "effetti residui delle caratteristiche qualitative". Si interviene, quindi, con lo schema del "Sistema di stima" per arrivare a determinare tramite un sistema di equazioni il valore di mercato dell'immobile da stimare (3.47.1, p. 116). Risulta non chiarita la procedura per arrivare a determinare i prezzi marginali per le solo caratteristiche quantitative rispetto ad immobili che differiscono anche per le caratteristiche qualitative. In ogni caso per questo modello si verificano entrambi i problemi applicativi rilevati per i modelli separati: difficoltà se non impossibilità di stima dei prezzi marginali, limiti nei risultati del sistema di equazioni.

4.4 Sistema di ripartizione

Si tratta anche in questo caso di un modello basato su un sistema di equazioni e si differenzia dal sistema di stima in quanto l'equazione di mercato si basa sulla ripartizione del prezzo "*di mercato di un immobile nei prezzi unitari medi delle singole caratteristiche*" (3.58, p. 121). Nel caso del sistema di stima, invece, l'equazione elementare si fondava sul principio che "*la differenza di prezzo tra due immobili è funzione [non intesa in senso matematico, ma va letta nel senso di stimabile come] delle differenze nelle loro caratteristiche*" (3.21, p. 110). Anche in questo caso il sistema si risolve nella determinazione del vettore dei prezzi medi che soddisfi contemporaneamente le equazioni del sistema. Per questo modello si rilevano delle differenze rispetto all'articolazione delle fasi dei precedenti modelli che sembrano di natura più espositiva che sostanziale, ma rispetto alle quali non si trovano esplicitate le motivazioni. Così come non è chiaro in cosa consista la scelta delle caratteristiche in dipendenza "*delle operazioni di analisi estimativa*" (3.64, p. 122)

Per tutti i modelli proposti si pone il tema della realisticità delle ipotesi sottostanti. In particolare, tutti si rifanno all'ipotesi di linearità delle relazioni fra caratteristiche e valore del bene che, se accettabile per piccole variazioni, non può applicarsi ad ogni fattispecie. Ciò implica l'importanza della corretta definizione dell'insieme di riferimento e della necessaria specificità delle stime, difficilmente estendibili nei risultati ad altri contesti. Inoltre, per tutti i modelli si pone il problema della definizione dei prezzi marginali delle caratteristiche. Nel caso del MCA non si offre alcuna soluzione operativa per la loro stima e nella pratica estimativa è purtroppo più che evidente come la determinazione dei prezzi marginali sia molto difficile, se non derivata da indicazioni esterne precostituite. Nei modelli basati su sistemi di equazioni il problema sembra essere risolto proprio con la soluzione dei sistemi stessi, ma è facile verificare come le ipotesi su cui essi si basano conducono a risultati non sempre corretti (cfr. par. 5.2).

5. I PROBLEMI DI NATURA STRUTTURALE E METODOLOGICA DEL CVI

Il CVI recepisce le procedure degli IVS proponendo anche le relative procedure operative, offrendo quindi un primo riferimento per gli operatori pur presentando vari limiti. Della necessità di arrivare ad una definizione univoca dei concetti e del miglioramento della organizzazione espositiva del Codice si è già detto nel precedente paragrafo, qui vorremmo soffermarci sul fatto che il quadro conoscitivo/metodologico proposto necessita di miglioramenti dal punto di vista dei requisiti di chiarezza, coerenza e completezza.

Una prima nota riguarda il fatto che entrando il CVI nel merito dell'individuazione degli specifici modelli e procedimenti di stima, al contrario di quanto avviene per gli IVS, dovrebbe indicare con chiarezza l'intero panorama dei modelli utilizzabili in relazione ai diversi procedimenti prescelti. Sarebbe auspicabile utilizzare una delle classificazioni che compaiono nella manualistica dell'estimo (Tempesta, 2018; Simonotti, 1985), in cui si elencano i vari modelli estimativi a supporto del procedimento estimativo che lo scopo della stima, e l'aspetto ad esso associato, suggeriscono di adottare.

In alternativa, andrebbe ben specificato che nella scelta del CVI si illustrano solo alcuni dei modelli possibili, ma andrebbero anche indicati i motivi che hanno portato ad escluderne altri.

Una seconda criticità è riconducibile ai mancati riferimenti circa le fonti dei dati e agli aspetti che ne possono determinare o meno l'attendibilità, così come mancano precisi riferimenti all'applicabilità dei modelli proposti in funzione del quesito di stima e della disponibilità dei dati (Manganelli, 2017). Come è noto la disponibilità e la bontà dei dati diventa spesso un elemento decisivo nell'individuazione dell'aspetto economico, si pensi ad esempio al più probabile valore di mercato e al più probabile valore di trasformazione, aspetto quest'ultimo generalmente impiegato nel caso in cui il mercato non offra indicazioni o non dia la possibilità di rilevare direttamente i prezzi di compravendita del bene in sé, ma siano altresì disponibili numerose informazioni su beni che derivano da una sua trasformazione.

Nelle conclusioni del capitolo sono sicuramente interessanti le notazioni in cui si elencano alcuni degli elementi imprescindibili all'interno della relazione di stima come il "sufficiente numero di recenti e attendibili transazioni" (Tecnoborsa, 2018, p. 126). Manca, però, qualsiasi riferimento al numero e all'attendibilità di queste transazioni che, come è noto, potrebbero portare a giudizi di stima molto lontani tra loro. Si rimanda al capitolo successivo la discussione relativa all'affermazione che il *market comparison approch* e i sistemi ad esso associati consentano il "riscontro con i dati di fatto e la dimostrazione del risultato della stima", anche se si può anticipare che la "dimostrazione" è di natura puramente matematica, soprattutto nei casi dei sistemi di equazioni, ma potrebbe essere molto lontana da quella di natura economico estimativa. Molto opportune sono le prescrizioni indicate nei punti dal 4.7 al 4.13 delle pp. 126 e 127 di Tecnoborsa 2018), in quanto rimandano all'esigenza di una standardizzazione delle relazioni di stima e alla necessità di indicare e spiegare le fasi del giudizio di stima, di documentare i dati utilizzati e di riportare le schede di rilevazione delle caratteristiche degli immobili *comparables e subject*.

Mancano altresì importanti riferimenti necessari per l'individuazione dei prezzi marginali (nel caso di applicazione del MCA) e ai limiti della risoluzione di sistemi di equazione a prescindere che essi siano sovradeterminati o sottodeterminati.

Questi ultimi due aspetti costituiscono il punto di maggiore debolezza delle linee guida proposte dal CVI, in quanto mancano sufficienti indicazioni per una loro applicabilità.

5.1 Il tema dei Prezzi marginali

Nella descrizione delle fasi del "metodo del confronto di mercato" troviamo l'"analisi dei prezzi marginali (adjustements)" che successivamente vengono così definiti: "il prezzo marginale di una caratteristica immobi-

liare esprime la variazione del prezzo di mercato di un immobile al variare della caratteristica". Sulla base di tale definizione e della "Tabella di valutazione" proposta si possono identificare le seguenti ipotesi sottostanti l'applicazione del MCA:

A. il prezzo dell'immobile è una funzione lineare delle sue caratteristiche
B. i prezzi marginali delle caratteristiche sono costanti a prescindere dalle loro dimensioni
C. il sistema è deterministico, non si considera alcuna componente di errore
D. le caratteristiche binarie, presenza/assenza delle stesse (variabili *inaestimabilis*), sono considerate come addendi a grandezza fissa
E. non sono considerate le possibili interazioni tra le diverse caratteristiche.

Si tratta evidentemente di ipotesi eroiche difficilmente riscontrabili nella realtà estimativa e che fanno giungere alle seguenti considerazioni. Anzitutto, la rigorosità e la semplicità del MCA sono più apparenti che sostanziali dato che la stima dei prezzi marginali richiede analisi di mercato specifiche, che se svolte correttamente, risulterebbero più complesse della stima del valore dell'immobile e comunque sarebbero valide solo in contesti molto prossimi a quello studiato e quindi non utilizzabili in altri casi di stima. L'eventuale impiego di prezzi marginali derivati da fonti esterne e/o non spiegati vanifica ovviamente tutti i presupposti di validità del MCA. In ogni caso l'applicazione di un modello di stima con così elevati problemi di definizione dei parametri senza che vi sia un'esposizione dei gradi di probabilità/incertezza dei valori ottenuti non risponde ai principi di base degli IVS a cui il manuale afferma di rifarsi. La validità del *Market approach* è pienamente riconosciuta "principalmente perché consente il riscontro con i dati di fatto e la dimostrazione del risultato della stima" (International Valuation Standard, 2022).

5.2 I modelli basati su sistemi di equazioni

Il problema dei prezzi marginali può essere risolto secondo il manuale TB attraverso l'applicazione dei modelli definiti "sistema di stima" e "sistema di ripartizione", che si basano sulla risoluzione di sistemi di equazioni, e quindi il prezzo marginale delle caratteristiche e il valore del bene risultano automaticamente dalla risoluzione di tali sistemi. In realtà anche con questo approccio restano valide le critiche esposte in precedenza. Le ipotesi su cui si fondono sono le stesse sopra descritte e quindi anche i conseguenti limiti. Qui però si può incorrere in limitazioni anche maggiori. La struttura dei sistemi di equazioni è tale per cui le unità di misura utilizzate, le caratteristiche degli immobili, la numerosità dei comparables, possono condurre a risultati non sempre attendibili, come dimostrato nei semplici esempi di seguito riportati. Con l'ulteriore aggravante che lo stimatore non riceve dal modello nessuna informazione sulla validità, affidabilità, probabilità dei risultati ottenuti.

Di seguito si propongono a titolo esemplificativo i risultati dell'applicazione del modello Sistema di ripartizione secondo il CVI a un caso ipotetico di valutazione immobiliare.

L'obiettivo della stima è quello di individuare il più probabile valore di mercato di un immobile avente le seguenti caratteristiche fondamentali, superficie commerciale immobile (x) metri quadri, superficie garage (y) metri quadri.

Per la risoluzione del problema di stima sono stati individuati quattro immobili che possono essere considerati comparabili rispetto a quello da stimare, individuati sul portale www.immobiliare.it per il segmento di mercato prescelto.

Gli immobili sono stati selezionati in una zona omogenea, sono tutti ristrutturati, con caratteristiche strutturali simili e possiedono un garage. Il criterio di scelta è stato infatti quello di considerare tipologie di immobili simili il cui valore è spiegato, a meno di un certo errore, dai due parametri superficie e garage. La Tabella 2 riporta i quattro beni simili.

Una volta selezionati i dati, è possibile analizzarli secondo l'approccio del sistema di ripartizione.

Poiché sono state individuate due incognite (superficie (x) e garage (y)) sono necessarie due equazioni per risolvere il relativo sistema in funzione dei vettori **x** e **y**. In questo caso siamo quindi difronte a un sistema sovra determinato, in cui vi sono più dati di quelli necessari per la risoluzione. Sorge pertanto un primo problema che è quello della selezione dei comparabili da impiegare, a cui il codice delle Valutazioni non fa riferimento.

In assenza di una procedura esplicita per la selezione dei comparabili, sono state individuate tutte le combinazioni delle coppie di immobili a partire dai quattro beni. La matrice delle combinazioni a coppie dei beni simili è quella riportata nella Tabella 3.

La matrice delle combinazioni a coppie è utilizzata per calcolare in modo deterministico tutti i possibili coefficienti (alfa e beta) che risolvono le relative equazioni (valore = alfa **x** + beta **y**), così come riportato nella Tabella 4, in modo da calcolare i prezzi marginali per le caratteristiche.

La Tabella 4 indica valori dei coefficienti della superficie e del garage ottenuti risolvendo i 6 sistemi di equa-

Tabella 2. Beni comparabili al bene da stimare (E).

id	Valore osservato (euro)	Superficie (**x**)	Garage (**y**)
A	720.000	198	16
B	780.000	165	16
C	780.000	194	25
D	780.000	217	25
E	?	180	15

Tabella 3. Matrice delle combinazioni a coppie.

	B	C	D
A	AB	AC	AD
B	-	BC	BD
C	-	-	CD

Tabella 4. Risoluzione dei sistemi della matrice dei coefficienti delle diverse combinazioni a coppie.

	AB	AC	AD	BC	BD	CD
Coef. Superficie	-1.818	2.990	3.735	6.876	10.750	0
Coef. Garage	67.500	7.996	-1.218	-22.155	-62.113	31.200

zioni individuati. Come si può osservare si tratta di valori profondamente eterogenei e difficilmente interpretabili e giustificabili da un punto di vista estimativo. In alcuni casi, i coefficienti delle superfici presentano un segno negativo o nullo, il che è ovviamente non accettabile. La procedura di stima dell'immobile incognito attraverso il sistema di equazioni non è analiticamente definita nel Codice delle Valutazioni, in cui si rimanda a generici "strumenti di calcolo automatico" senza entrare nel merito dei passi da seguire per, ad esempio, determinare quale siano i criteri per decidere l'accettabilità o meno delle soluzioni del sistema di equazioni. Lo stesso Codice delle Valutazioni non offre una giustificazione scientificamente valida sull'utilizzo dei coefficienti individuati per via deterministica. Ovviamente, queste eterogeneità nei prezzi marginali stimati con la risoluzione dei sistemi di equazioni comporta altrettanta eterogeneità nei valori del bene da stimare (Tabella 5).

Da sottolineare come la presenza di un numero di comparables superiore alle incognite ha permesso di evidenziare l'instabilità dei risultati a secondo del campione scelto e soprattutto come il sistema di equazioni non offra alcuna informazione sulla qualità del risultato. Per cui, qualora sia stata individuata una singola coppia di comparables, lo stimatore non avrebbe alcun modo per verificare se il risultato sia accettabile o meno.

Tabella 5. Stima del valore del bene incognito mediante il sistema di equazioni.

Coppia di coefficienti	Stima valore bene E (euro)
COEF. AB	685.260
COEF. AC	658.140
COEF. AD	654.030
COEF. BC	905.355
COEF. BD	1.003.305
COEFF. CD	468.000

L'assenza di una procedura codificata, riproducibile e scientifica rende l'approccio del *sistema di ripartizione* e analogamente quello del *sistema di stima*, come proposti nel CVI, troppo soggettivo, col rischio di produrre risultati fuorvianti e concettualmente sbagliati.

Alla luce delle elaborazioni sopra esposte, si riportano le seguenti criticità del sistema di ripartizione:

- Assenza di una giustificazione teorica per l'impiego di un approccio deterministico nella stima dei beni. L'approccio deterministico fa sì che la soluzione sia unica al fine di soddisfare il sistema di equazioni senza tenere in considerazione il diverso peso che le caratteristiche possono assumere nel modello.
- Nel caso di sistema sovradimensionato emerge il problema di scegliere la coppia di valori e i risultati mostrano valori molto eterogenei e discordanti tra le coppie individuate. Questo accade perché i coefficienti sono individuati in modo deterministico.

I risultati possono tradursi in valori di stima molto eterogenei e discordanti tra loro e senza qualsiasi possibilità di validazione della qualità delle stime.

6. CONCLUSIONI

La diffusione della certificazione di IVS compliance per le stime immobiliari rappresenta una importante novità nel panorama estimativo nazionale. Gli IVS hanno definito linee guida per la valutazione delle principali categorie di oggetti di valore "*the objective of the IVS is to increase the confidence and trust of users of valuation services by establishing transparent and consistent valuation practices*" (International Valuation Standard Committee, 2022). Essi rappresentano quindi un importante passo avanti nelle pratiche estimative. Quello su cui abbiamo ritenuto di fare chiarezza riguarda la loro relazione con i principi dell'estimo tradizionale e la loro applicazione proposta nel CVI. L'analisi condotta ha evidenziato la totale coerenza fra i principi teorico metodologici della scuola estimativa italiana con quanto

previsto dagli IVS. Gli IVS non affrontano però il tema dei modelli estimativi, cioè degli strumenti operativi per giungere alla quantificazione del valore di stima (Grillenzoni and Grittani, 1994; Gallerani et al., 2004; Tempesta, 2018).

Il CVI costituisce un importante punto di riferimento per le pratiche estimative immobiliari. Esso recepisce le procedure degli IVS proponendo anche le relative procedure operative, offrendo quindi una buona guida di riferimento per gli operatori, tuttavia esso necessita di ulteriori miglioramenti per poter costituire effettivamente una guida operativa per i professionisti. Nei paragrafi precedenti abbiamo evidenziato le principali criticità per la stima del valore di mercato. Ci rendiamo conto della difficoltà di combinare approcci rigorosi con situazioni reali di mercato e operative molto difformi, con limiti informativi rilevanti, e con vincoli di tempo e di costo stringenti, ma riteniamo comunque possibile migliorare la modellistica proposta e individuare soluzioni più utili per la pratica estimativa. In particolare riteniamo che l'approccio econometrico possa rappresentare una soluzione molto interessante. La crescente disponibilità di dati sulle compravendite effettive, ma in molti casi anche la sola ampia disponibilità di asking prices, potrebbero consentire l'applicazione corretta di tecniche statistiche alla stima dei valori immobiliari, con il vantaggio fondamentale di ottenere misure dell'attendibilità/significatività delle stime, pur operando con tempi e costi relativamente contenuti.

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Rassegna giurisprudenziale II semestre 2023

a cura di Nicola Lucifero

AGRICOLTURA

CGUE, 07/12/2023, C-329/22

Rinvio pregiudiziale – Agricoltura – Finanziamento da parte del Fondo europeo agricolo per lo sviluppo rurale (Feasr) – Regolamento (UE) n. 1305/2013 – Sostegno allo sviluppo rurale – Articolo 29, paragrafo 3 – Agricoltura biologica – Sostegno finanziario alla produzione biologica in conversione – Nozioni di "primo periodo" e di "periodo di conversione" – Regolamento (CE) n. 889/2008 – Apicoltura biologica – Periodo minimo di conversione – Articolo 38, paragrafo 3 – Regolamento (CE) n. 834/2007 – Articolo 17 – Conversione

L'articolo 29, paragrafo 3, seconda frase, del regolamento (UE) n. 1305/2013 del Parlamento europeo e del Consiglio, del 17 dicembre 2013, sul sostegno allo sviluppo rurale da parte del Fondo europeo agricolo per lo sviluppo rurale (FEASR) e che abroga il regolamento (CE) n. 1698/2005 del Consiglio, deve essere interpretato nel senso che:

– esso non osta a una disposizione nazionale che circoscrive la possibilità di beneficiare di un sostegno finanziario per la conversione all'apicoltura biologica al periodo minimo di conversione previsto all'articolo 38, paragrafo 3, del regolamento (CE) n. 889/2008 della Commissione, del 5 settembre 2008, recante modalità di applicazione del regolamento (CE) n. 834/2007 del Consiglio relativo alla produzione biologica e all'etichettatura dei prodotti biologici, per quanto riguarda la produzione biologica, l'etichettatura e i controlli;

– in tal modo, gli Stati membri possono fissare un periodo massimo per la concessione del sostegno per la conversione all'agricoltura biologica, allineandosi al periodo di conversione specifico che, in conformità all'articolo 17, paragrafo 1, lettera c), del regolamento (CE) n. 834/2007 del Consiglio, del 28 giugno 2007, relativo alla produzione biologica e all'etichettatura dei prodotti biologici e che abroga il regolamento (CEE) n. 2092/91, è definito dalla normativa dell'Unione europea in funzione esclusivamente del tipo di coltura o di produzione animale;

– gli Stati membri possono pertanto decidere che la conversione all'agricoltura biologica dia eventualmente luogo ad un sostegno per un periodo più breve di quello compreso tra cinque e sette anni previsto all'articolo 29, paragrafo 3, prima frase, del regolamento n. 1305/2013.

CGUE, Sez. VI, 7/09/2023, C-169/22
Rinvio pregiudiziale – Politica agricola comune – Fondo europeo agricolo per lo sviluppo rurale (FEASR) – Misure di sostegno allo sviluppo rurale – Pagamenti per il benessere degli animali – Regolamento (CE) n. 1974/2006 – Articolo 44, paragrafo 1 e paragrafo 2, lettera a) – Articolo 47, paragrafo 1 – Cessione dell'azienda agricola a un nuovo beneficiario – Successiva cessazione, da parte di tale beneficiario, delle sue attività agricole – Casi di "forza maggiore o circostanze eccezionali" – Obbligo di rimborsare una parte o la totalità dell'aiuto percepito – Principio di proporzionalità
1) L'articolo 47, paragrafo 1, del regolamento (CE) n. 1974/2006 della Commissione, del 15 dicembre 2006, recante disposizioni di applicazione del regolamento (CE) n. 1698/2005 del Consiglio sul sostegno allo sviluppo rurale da parte del Fondo europeo agricolo per lo sviluppo rurale (FEASR), come modificato dal regolamento di esecuzione (UE) n. 679/2011 della Commissione, del 14 luglio 2011, deve essere interpretato nel senso che la perdita del diritto di utilizzare i beni locati a causa della risoluzione del contratto di locazione relativo a tali beni, conseguente al fallimento del locatore, il quale era oggetto di una procedura di insolvenza al momento della conclusione di tale contratto, non costituisce un caso di «forza maggiore o [una] circostanz[a] eccezional[e]», ai sensi di tale disposizione.
2) L'articolo 44, paragrafo 1 e paragrafo 2, lettera a), del regolamento n. 1974/2006, come modificato dal regolamento di esecuzione (UE) n. 679/2011, letto alla luce del principio di proporzionalità, deve essere interpretato nel senso che qualora, durante il periodo di esecuzione di un impegno sottoscritto come condizione per la concessione di un sostegno, l'azienda di un beneficiario sia ceduta a un altro soggetto che subentra volontariamente in tale impegno e che, in seguito, cessa definitivamente le sue attività agricole, quest'ultimo beneficiario dell'aiuto è tenuto a rimborsare l'aiuto ricevuto a titolo dell'insieme di detto impegno, compresi gli importi ricevuti dai precedenti beneficiari di tale aiuto, a meno che lo Stato membro di cui trattasi abbia deciso di non esigere tale rimborso in base all'eccezione prevista a detto articolo 44, paragrafo 2, lettera a), e le condizioni di tale eccezione siano soddisfatte.

Cass. civ., Sez. lavoro, Ordinanza, 13/02/2024, n. 3973
Coltivatore diretto – assicurazione - requisiti
Ai fini dell'applicabilità dell'assicurazione per l'invalidità, la vecchiaia ed i superstiti, la qualità di coltivatore diretto - rispetto alla quale manca nell'ordinamento una nozione generale applicabile ad ogni fine di legge - deve essere desunta dal combinato disposto degli artt. 2 della L. n. 1047 del 1957 e 2, 3 della L. n. 9 del 1963. Non è, pertanto, richiesto il carattere imprenditoriale dell'attività, con la destinazione, anche parziale, dei prodotti del fondo al mercato, essendo sufficiente che gli stessi siano destinati al sostentamento del coltivatore e della sua famiglia, né è prescritto che il coltivatore abbia personalmente prestato centoquattro giornate lavorative annue, riferendosi tale limite al fabbisogno del fondo e non all'attività del singolo.

Cass. civ., Sez. Unite, 15/11/2023, n. 31730
Agricoltura – sovvenzioni – PAC – limiti – superamento – riduzione - recupero
In materia di contributi all'agricoltura, nell'ambito delle finalità della cd. PAC (Politica agricola comune) il Regolamento (UE) n. 1307 del 2013, disciplinando l'istituto dei pagamenti diretti, impone che gli importi destinati al finanziamento in agricoltura siano rispettosi dei massimali annui stabiliti dal Regolamento (UE) n. 1306 del 2013, così che l'importo totale dei pagamenti diretti, concedibili in uno Stato membro per un dato anno civile, non può esser superiore al corrispondente massimale stabilito nell'allegato III del Regolamento citato. Ne consegue che, qualora l'importo totale dei pagamenti diretti da corrispondere in uno Stato membro sia superiore al massimale stabilito, è obbligatorio per l'autorità nazionale di coordinamento (per l'Italia, Agea) praticare una riduzione lineare degli importi di tutti i pagamenti diretti, eccezion fatta per quelli concessi a norma del Regolamento (UE) n. 228/2013 e del Regolamento (UE) n. 229/2013. La riduzione lineare è suscettibile di essere eseguita anche dopo il pagamento del contributo, e non è confondibile con la mera rettifica degli importi corrisposti per effetto di un semplice errore di calcolo commesso in fase di erogazione, sicché a essa non si applica la regola tratta dal Regolamento (UE) n. 809 del 2014, art. 7, secondo la quale il contributo non può essere recuperato ove sia stato effettuato per errore dell'autorità competente o di un'altra autorità e se l'errore non poteva ragionevolmente essere scoperto dal beneficiario. Accertare se nel concreto si sia dinanzi all'una o all'altra delle situazioni dette spetta al giudice del merito, e la relativa valutazione resta insindacabile in cassazione ove adeguatamente motivata.

ALIMENTI E BEVANDE

CGUE, Sez. VII, 19/10/2023, C-591/22
Rinvio pregiudiziale – Igiene dei prodotti alimentari – Riduzione della salmonella nei gruppi di riprodut-

tori di Gallus gallus – Regolamento (UE) n. 200/2010 – Allegato – Punto 2.2.2.2, lettera c) – Prelievo di campioni di routine – Risultato positivo – Prelievo di campioni di conferma – Casi eccezionali – Dubbio sui risultati – Portata

Il punto 2.2.2.2, lettera c), dell'allegato del regolamento (UE) n. 200/2010 della Commissione, del 10 marzo 2010, recante attuazione del regolamento (CE) n. 2160/2003 del Parlamento europeo e del Consiglio per quanto riguarda la fissazione di un obiettivo dell'Unione di riduzione della prevalenza dei sierotipi di Salmonella nei gruppi di riproduttori adulti della specie *Gallus gallus*, come modificato dal regolamento (UE) 2019/268 della Commissione, del 15 febbraio 2019, deve essere interpretato nel senso che si può considerare che la situazione di un'azienda di gruppi di riproduttori di *Gallus gallus* che è stata sottoposta a test mediante un prelievo di campioni di routine i cui risultati abbiano rivelato la presenza di salmonella rientri nella nozione di «casi eccezionali» in cui l'autorità competente «ha ragione di dubitare dei risultati dei test», ai sensi di detta disposizione, qualora l'autorità competente constati il verificarsi di eventi o di incidenti tali da compromettere il corretto svolgimento dei processi di prelievo e di analisi dei campioni o ritenga, in considerazione del livello di eccellenza raggiunto dall'insieme delle condizioni dell'azienda e tenuto conto delle caratteristiche epidemiologiche della salmonella, che vi sia un serio rischio che simili eventi o incidenti si siano verificati. La presenza di più risultati negativi per il tipo di salmonella individuata, ottenuti a partire da campioni prelevati successivamente ad iniziativa dell'operatore interessato e trasmessi all'autorità competente dopo l'adozione di una decisione da parte di quest'ultima, nonché il fatto che solo alcuni pollai siano risultati positivi e che solo uno dei due campioni prelevati per ogni pollaio si sia rivelato positivo non costituiscono circostanze rilevanti al fine di qualificare una siffatta situazione come rientrante in tale nozione. Lo stato vaccinale del gruppo e la storia pregressa dell'azienda sotto il profilo della prevalenza del tipo di salmonella individuata, quando eccellenti, costituiscono circostanze da prendere in considerazione a tal fine, ma che non consentono da sole di qualificare detta situazione come rientrante nella nozione in questione.

CGUE, sez. V, 23/11/2023, C-354/22

Rinvio pregiudiziale – Agricoltura – Organizzazione comune dei mercati – Etichettatura e presentazione nel settore vitivinicolo – Denominazioni di origine e indicazioni geografiche – Regolamento delegato (UE) 2019/33 – Articolo 54, paragrafo 1, secondo comma – Indicazione dell'azienda viticola che effettua la vinificazione – Affitto di vigneti e locazione dell'impianto di pressatura presso un'altra azienda viticola – Vinificazione effettuata interamente nell'azienda viticola eponima

1) L'articolo 54, paragrafo 1, secondo comma, del regolamento delegato (UE) 2019/33 della Commissione, del 17 ottobre 2018, che integra il regolamento (UE) n. 1308/2013 del Parlamento europeo e del Consiglio per quanto riguarda le domande di protezione delle denominazioni di origine, delle indicazioni geografiche e delle menzioni tradizionali nel settore vitivinicolo, la procedura di opposizione, le restrizioni dell'uso, le modifiche del disciplinare di produzione, la cancellazione della protezione nonché l'etichettatura e la presentazione, come modificato dal regolamento delegato (UE) 2021/1375 della Commissione, dell'11 giugno 2021, deve essere interpretato nel senso che: il fatto che la pressatura delle uve provenienti da vigneti presi in affitto avvenga in un impianto che l'azienda viticola eponima prende in locazione per un breve periodo da un'altra azienda viticola non esclude che la vinificazione sia considerata interamente effettuata nell'azienda viticola eponima, ai sensi di tale disposizione, purché tale impianto sia messo a disposizione esclusiva dell'azienda viticola eponima per il tempo necessario all'operazione di pressatura e quest'ultima azienda assuma la direzione effettiva, il controllo stretto e permanente nonché la responsabilità di tale operazione.

2) L'articolo 54, paragrafo 1, secondo comma, del regolamento delegato 2019/33, come modificato dal regolamento delegato 2021/1375, deve essere interpretato nel senso che: una vinificazione è interamente effettuata nell'azienda viticola eponima, ai sensi di tale disposizione, anche se l'operazione di pressatura è stata realizzata da collaboratori dell'azienda viticola che ha locato l'impianto di pressatura all'azienda viticola eponima, purché il proprietario di quest'ultima azienda assuma la direzione effettiva, il controllo stretto e permanente nonché la responsabilità di tale operazione. Il fatto che l'azienda viticola che concede in locazione l'impianto di pressatura abbia un interesse proprio alle modalità con cui viene effettuata la pressatura, in particolare a motivo di una clausola contrattuale che prevede un supplemento di remunerazione in funzione della resa e della qualità per ettolitro di vino, non incide sulla questione se la vinificazione possa essere considerata effettuata nell'azienda viticola eponima.

Cass. pen., Sez. III, 09/11/2023, n. 5672

Alimenti – cattivo stato di conservazione – onere della prova – prelievo di campioni

In tema di disciplina igienica della produzione e della

vendita delle sostanze alimentari, ai fini della configurabilità del reato di cui all'art. 5, primo comma, lettera b), della L. 30 aprile 1962, n. 283, il cattivo stato di conservazione degli alimenti può essere accertato dal giudice di merito senza necessità del prelievo di campioni e di specifiche analisi di laboratorio, sulla base di dati obiettivi risultanti dalla documentazione relativa alla verifica e dalle dichiarazioni dei verbalizzanti, essendo lo stesso ravvisabile, in particolare, nel caso di evidente inosservanza delle cautele igieniche e delle tecniche necessarie ad assicurare che le sostanze si mantengano in condizioni adeguate per la successiva somministrazione. Dunque la fattispecie è integrata anche nel caso di mero congelamento non appropriato dei prodotti - come nel caso di congelamento in proprio o nel caso di ricongelamento - perché essa si incentra sul dato estrinseco del cattivo stato di conservazione degli stessi.

Cass. pen., Sez. III, 14/12/2023, n. 687
HACCP – Piano di autocontrollo – responsabilità operatore settore alimentare
La mera esistenza di un piano di autocontrollo HACCP non è sufficiente a escludere la colpa dell'operatore del settore alimentare. Ne consegue che l'omesso svolgimento di qualsivoglia accertamento analitico sul prodotto alimentare sfuso non regolamentare, previsto come facoltativo dal piano di autocontrollo, integra il reato di cui all'art. 5, L. 30 aprile 1962, n. 283, non valendo ad esonerare l'O.S.A. dalla sua responsabilità l'assolvimento dell'obbligo di tracciabilità, atteso che scopo principale della predisposizione di un piano di autocontrollo è quello di prevenire il rischio di immettere sul mercato prodotti non sicuri igienicamente recando un conseguente e potenziale danno ai consumatori, cui consegue l'obbligo di garantire che la filiera alimentare si concluda con l'immissione in commercio di prodotti alimentari perfettamente igienici ed a norma.

Cass. pen., Sez. III, 28/03/2023, n. 36173
Prodotti contaminati – obbligo di controllo – carenza – responsabilità
Il reato di cui all'art. 5, lett. c), L. n. 283/1962 è configurabile ogniqualvolta si vende, si detiene per vendere o si somministra come mercede ai propri dipendenti, o comunque si distribuiscono per il consumo, sostanze alimentari con cariche microbiche superiori ai limiti di legge, non rilevando la circostanza che il detentore non sia in grado di svolgere degli accurati controlli sulla contaminazione batterica presente o meno sugli stessi, dovendosi ritenere che, chi intenda esercitare un determinato commercio, debba dotarsi dei mezzi idonei acciocché quest'ultimo venga esercitato lecitamente, essendo colposo, quantomeno per imprudenza, il comportamento di chi, non essendo in grado di svolgere opportuni controlli, si assuma il rischio di acquistare per la rivendita prodotti alimentari contaminati.

AMBIENTE

CGUE, Sez. IV, 11/01/2024, C-252/22
Rinvio pregiudiziale – Ambiente – Convenzione di Aarhus – Articolo 9, paragrafi da 3 a 5 – Accesso alla giustizia – Società civile professionale di avvocati – Ricorso diretto a contestare atti amministrativi – Ricevibilità – Requisiti previsti dal diritto nazionale – Assenza di violazioni di diritti e di interessi legittimi – Non eccessiva onerosità dei procedimenti giurisdizionali – Ripartizione delle spese – Criteri
1) L'articolo 9, paragrafo 3, della convenzione sull'accesso alle informazioni, la partecipazione del pubblico ai processi decisionali e l'accesso alla giustizia in materia ambientale, firmata ad Aarhus il 25 giugno 1998 e approvata a nome della Comunità europea con la decisione 2005/370/CE del Consiglio, del 17 febbraio 2005 deve essere interpretato nel senso che esso non osta a una normativa nazionale in forza della quale a un soggetto giuridico diverso da un'organizzazione non governativa per la tutela dell'ambiente è riconosciuta la legittimazione ad agire contro un atto amministrativo di cui non è destinatario solo qualora faccia valere la violazione di un interesse legittimo privato o di un interesse legato a una situazione giuridica direttamente connessa al suo oggetto sociale.
2) L'articolo 9, paragrafi 4 a 5, della convenzione sull'accesso alle informazioni, la partecipazione del pubblico ai processi decisionali e l'accesso alla giustizia in materia ambientale, firmata ad Aarhus il 25 giugno 1998 e approvata a nome della Comunità europea con la decisione 2005/370 del Consiglio, in combinato disposto con l'articolo 47 della Carta dei diritti fondamentali dell'Unione europea, deve essere interpretato nel senso che al fine di garantire il rispetto del requisito della non eccessiva onerosità dei procedimenti giurisdizionali, il giudice chiamato a pronunciarsi sulla condanna alle spese di una parte soccombente, in una controversia in materia ambientale, deve tener conto di tutte le circostanze del caso di specie, ivi compresi l'interesse di tale parte e l'interesse generale connesso alla tutela dell'ambiente.

CGUE, Sez. II, 21/09/2023, C-116/22
Inadempimento di uno Stato – Ambiente – Direttiva 92/43/CEE – Conservazione degli habitat naturali e seminaturali e della flora e della fauna selvatiche

– Articolo 4, paragrafo 4, e articolo 6, paragrafo 1 – Mancata designazione delle zone speciali di conservazione – Mancata determinazione degli obiettivi di conservazione – Assenza o insufficienza di misure di conservazione – Prassi amministrativa

Sebbene il testo dell'articolo 4, paragrafo 4, della direttiva 92/43/CEE del Consiglio del 21 maggio 1992 non menzioni espressamente l'obbligo di fissare obiettivi di conservazione, tale disposizione esige, tuttavia, che le autorità competenti dello Stato membro interessato, in sede di designazione della zona speciale di conservazione, stabiliscano le priorità in funzione dell'importanza dei siti per il mantenimento o il ripristino, in uno stato di conservazione soddisfacente, di uno o più tipi di habitat. Orbene, stabilire tali priorità implica che detti obiettivi di conservazione siano stati preliminarmente fissati. Pertanto, tenendo conto anche del contesto e della finalità del paragrafo 4 dell'articolo 4 della direttiva 92/43/CEE del Consiglio del 21 maggio 1992, va ribadito che, sebbene da tale disposizione risulti che la designazione delle zone speciali di conservazione e la definizione delle priorità in materia di conservazione devono essere effettuate il più rapidamente possibile e, in ogni caso, entro un termine massimo di sei anni a decorrere dal momento in cui un sito di importanza comunitaria è stato selezionato nell'ambito della procedura di cui al paragrafo 2 di tale articolo, nemmeno la fissazione degli obiettivi di conservazione può superare tale termine, in quanto gli stessi sono necessari per la definizione di tali priorità e devono perciò precedere la definizione di queste ultime.

Inizio modulo

CGUE, Sez. VII, 06/07/2023, C-166/22

Rinvio pregiudiziale – Ambiente – Direttiva 92/43/CEE – Conservazione degli habitat naturali e della flora e della fauna selvatiche – Articolo 12 – Regime di rigorosa tutela di talune specie animali – Articolo 16 – Deroga – Modalità di concessione di una simile deroga – Diritto di partecipazione del pubblico

Gli articoli 12 e 16 della direttiva 92/43/CEE del Consiglio, del 21 maggio 1992, relativa alla conservazione degli habitat naturali e seminaturali e della flora e della fauna selvatiche, devono essere interpretati nel senso che una normativa nazionale volta a trasporre tali disposizioni nel diritto interno non può essere considerata contraria a detta direttiva per il fatto che essa non prevede, da un lato, un procedimento di autorizzazione che integri una decisione di un'autorità competente volta a determinare se occorra chiedere una deroga ai sensi dell'articolo 16 di tale direttiva a causa di elementi individuati dopo il rilascio dell'autorizzazione di un progetto e/o se siano necessarie indagini a tal fine, né, dall'altro, la partecipazione del pubblico a tale procedura di deroga.

CGUE, Sez. II, 29/06/2023, n. 444/21

Inadempimento di uno Stato – Ambiente – Direttiva 92/43/CEE – Conservazione degli habitat naturali e seminaturali e della flora e della fauna selvatiche – Zone speciali di conservazione – Regione biogeografica atlantica – Articolo 4, paragrafo 4, e articolo 6, paragrafo 1 – Mancata designazione di zone speciali di conservazione e mancata fissazione degli obiettivi di conservazione – Assenza o insufficienza di misure di conservazione

L'articolo 6 della direttiva «habitat» sottopone gli Stati membri a una serie di obblighi e prevede procedure specifiche intese ad assicurare, come emerge dall'articolo 2, paragrafo 2, della medesima direttiva, il mantenimento o, all'occorrenza, il ripristino, in uno stato di conservazione soddisfacente, degli habitat naturali e delle specie di flora e fauna selvatiche di interesse per l'Unione, al fine di conseguire l'obiettivo più generale della suddetta direttiva che è quello di garantire un livello elevato di tutela dell'ambiente per quanto riguarda i siti protetti in forza della stessa.

Cons. Stato, Sez. IV, 08/09/2023, n. 8235

Impianto agrivoltaico – differenze con fotovoltaico – autorizzazione ambientale - rilascio

E' illegittimo il diniego di rilascio del PAUR per la realizzazione di un impianto agrivoltaico, basato sulla valutazione delle competenti amministrazioni che hanno ritenuto preclusa la possibilità di rilasciare una positiva valutazione ambientale per effetto dell'assimilazione degli impianti agrivoltaici a quelli fotovoltaici. Non si comprende, infatti, come un impianto che combina produzione di energia elettrica e coltivazione agricola (l'agrivolotaico) possa essere assimilato ad un impianto che produce unicamente energia elettrica (il fotovoltaico), ma che non contribuisce, tuttavia, neppure in minima parte, alle ordinarie esigenze dell'agricoltura.

Fine modulo

Cons. Stato, Sez. IV, 31/08/2023, n. 8098

Ambiente – principio di precauzione – valutazione scientifica – criteri

La valutazione scientifica del rischio deve essere preceduta - logicamente e cronologicamente - dall'"identificazione di effetti potenzialmente negativi derivanti da un fenomeno" e comprende, essenzialmente, quattro componenti: l'identificazione del pericolo, la caratterizzazione del pericolo, la valutazione dell'esposizione e la caratterizzazione del rischio. Essa consiste, dunque, in un processo scientifico che deve necessariamente spettare a esperti scientifici, cioè agli scienziati.

La valutazione scientifica deve fondarsi su "dati scientifici affidabili" e su un ragionamento logico "che porti ad una conclusione, la quale esprima la possibilità del verificarsi e l'eventuale gravità del pericolo sull'ambiente o sulla salute di una popolazione data, compresa la portata dei possibili danni, la persistenza, la reversibilità e gli effetti ritardati". Il principio di precauzione consente, quindi, di adottare, sulla base di conoscenze scientifiche ancora lacunose, misure di protezione che possono andare a ledere posizioni giuridiche soggettive, sia pure nel rispetto del principio di proporzionalità inteso nella sua triplice dimensione di idoneità, necessarietà e proporzionalità in senso stretto. Se, dunque, la fase della valutazione del rischio è caratterizzata prevalentemente (anche se non esclusivamente) dalla "scientificità", la fase di gestione del rischio si connota altrettanto prevalentemente (anche se non esclusivamente) per la sua "politicità". Ne deriva che, contrariamente a quanto sostenuto dalla Regione appellante, il principio di precauzione non può legittimare un'interpretazione delle disposizioni normative, tecniche ed amministrative vigenti in un dato settore che nedilati il senso fino a ricomprendervi vicende non significativamente pregiudizievoli. La sua corretta applicazione non conduce automaticamente a vietare ogni attività che, in via di mera ipotesi, si assuma foriera di eventuali rischi per la salute delle persone e per l'ambiente, in assenza di un riscontro oggettivo e verificabile, richiedendo, di contro, una seria e prudenziale valutazione, alla stregua dell'attuale stato delle conoscenze scientifiche disponibili, dell'attività che potrebbe ipoteticamente presentare dei rischi, valutazione consistente nella formulazione di un giudizio scientificamente attendibile.

Cons. Stato, Sez. IV, 30/08/2023, n. 8040
Ambiente – autorizzazioni – vincoli successivi – rapporti – obbligo di motivazione.
L'avvenuto rilascio di un titolo autorizzativo, che consente di realizzare un dato impianto in un dato contesto ambientale, non preclude di per sé all'amministrazione di emanare un provvedimento di vincolo indiretto con riguardo alla medesima area, ma semplicemente obbliga, secondo logica, l'amministrazione stessa a tenerne conto nella motivazione, valutando l'interesse sotteso al predetto titolo autorizzativo.

Cons. Stato, Sez. VII, 06/07/2023, n. 6611
Ambiente – infoInizio modulormazione accessibile – oggetto.

Fine modulo
La nozione di informazione ambientale accessibile, di cui all'art. 2, comma 1, lett. a, n. 3), D.Lgs. n. 195/2005, riguarda non solo i dati e i documenti posti in immediata correlazione con il bene ambiente, ma anche le scelte, le azioni e qualsivoglia attività amministrativa che ad esso faccia riferimento; non possono pertanto essere esclusi dall'accesso ambientale atti e documenti espressione di un'attività amministrativa che, direttamente o indirettamente, involge l'ambiente e la sua tutela.

Cons. Stato, Sez. VII, 05/07/2023, n. 6578
Ambiente – Paesaggio – rapporto – art. 9 Costituzione – procedure autorizzatorie – criteri.
Il nuovo testo dell'art. 9 Cost., come novellato dalla legge costituzionale 11 febbraio 2022, n. 1, depone nel senso della maggiore, e non minore, tutela dei valori ambientali e paesaggistici nell'ottica della salvaguardia delle generazioni future e dello sviluppo sostenibile, sicché l'interpretazione delle disposizioni che disciplinano i procedimenti in materia di ambiente e paesaggio dovrebbe essere orientata nel senso di conseguire tale obiettivo di fondo e quindi accrescere e non diminuire il livello di protezione effettiva di tali valori.

T.A.R. Puglia Lecce, Sez. I, 16/10/2023, n. 1134
Tutela ambiente – principio di precauzione – contenuti
"Il c.d. principio di precauzione, di derivazione comunitaria, impone che quando sussistono incertezze o un ragionevole dubbio riguardo all'esistenza o alla portata di rischi per la salute delle persone, possono essere adottate misure di protezione senza dover attendere che siano pienamente dimostrate l'effettiva esistenza e la gravità di tali rischi; l'attuazione del principio di precauzione comporta dunque che, ogni qual volta non siano conosciuti con certezza i rischi indotti da un'attività potenzialmente pericolosa, l'azione dei pubblici poteri debba tradursi in una prevenzione anticipata rispetto al consolidamento delle conoscenze scientifiche" (CDS, sez. III, 3 ottobre 2019, n. 6655). Se ciò è vero, non va del pari trascurato che: "… sul piano procedurale, l'adozione di misure fondate sul principio di precauzione è condizionata al preventivo svolgimento di una valutazione quanto più possibile completa dei rischi calata nella concretezza del contesto spazio temporale di riferimento", ma "… non può legittimare una interpretazione delle disposizioni normative, tecniche ed amministrative vigenti in un dato settore che ne dilati il senso fino a ricomprendervi vicende non significativamente pregiudizievoli dell'area interessata; la situazione di pericolo deve essere potenziale o latente ma non meramente ipotizzata e deve incidere significativamente sull'ambiente e la salute dell'uomo; sotto tale angolazione il principio di precauzione non consente ex se di attribuire ad un organo

pubblico un potere di interdizione di un certo progetto o misura; in ogni caso il principio di precauzione affida alle autorità competenti il compito di prevenire il verificarsi o il ripetersi di danni ambientali ma lascia alle stesse ampi margini di discrezionalità in ordine all'individuazione delle misure ritenute più efficaci, economiche ed efficienti in relazione a tutte le circostanze del caso concreto" (CDS, sez. V, 27 dicembre 2013, n. 6250). La Comunicazione della Commissione europea del 2 febbraio 2000 fornisce indicazioni di indirizzo in merito alle condizioni di applicazione del principio di precauzione, individuandole nellediueseguenti: a) la sussistenza di indicazioni ricavate da una valutazione scientifica oggettiva, che consentano di dedurre ragionevolmente l'esistenza di un rischio per l'ambiente o la salute umana; b) una situazione di incertezza scientifica oggettiva che riguardi l'entità o la gestione del rischio, tale per cui non possano determinarsene con esattezza la portata e gli effetti. Nella prospettiva della Commissione Europea, l'azione precauzionale è pertanto giustificata solo quando vi sia stata l'identificazione degli effetti potenzialmente negativi (rischio) sulla base di dati scientifici, seri, oggettivi e disponibili, nonché di un "ragionamento rigorosamente logico" e, tuttavia, permanga un'ampia incertezza scientifica sulla portata del suddetto rischio.

BOSCHI E FORESTE

CGUE, Sez. III, 23/11/2023, C-213/22

Rinvio pregiudiziale – Politica agricola comune – Fondo europeo agricolo di orientamento e di garanzia (FEAOG), sezione Garanzia – Regime comunitario di aiuti alle misure forestali nel settore agricolo – Regolamento (CEE) n. 2080/92 – Articolo 3, primo comma, lettere b) e c) – Regime di aiuti – Premi di manutenzione e premi per perdita di reddito – Condizioni per la concessione – Normativa nazionale che prevede un requisito di densità minima di popolamento delle parcelle – Inosservanza del requisito per causa non imputabile al beneficiario – Obbligo di restituzione dell'aiuto – Forza maggiore – Principio di proporzionalità

L'articolo 3, primo comma, lettere b) e c), del regolamento (CEE) n. 2080/92 del Consiglio, del 30 giugno 1992, che istituisce un regime comunitario di aiuti alle misure forestali nel settore agricolo, e il principio di proporzionalità devono essere interpretati nel senso che essi non ostano a che sia imposto al beneficiario di premi di manutenzione e di premi per perdita di reddito, versati a titolo di un impegno pluriennale all'imboschimento di terre agricole a cui lo stesso ha aderito, di restituire tali premi qualora una condizione per la concessione stabilita dalla normativa nazionale, relativa alla presenza di una densità minima di popolamento forestale, non venga soddisfatta nel corso dell'esecuzione di detto impegno a causa del verificarsi di condizioni climatiche avverse.

CGUE, Sez. III, 16/11/2023, C-196/22

Politica agricola comune – Fondo europeo agricolo di orientamento e garanzia (FEAOG), sezione "Garanzia" – Regime comunitario di aiuti alle misure forestali in agricoltura – Regolamento (CEE) n. 2080/92 – Articolo 4 – Attuazione, da parte degli Stati membri, del regime di aiuti mediante programmi pluriennali – Tutela degli interessi finanziari dell'Unione – Regolamento (CE, Euratom) n. 2988/95 – Articolo 1 – Nozione di "irregolarità" – Articolo 2 – Carattere effettivo, proporzionato e dissuasivo delle misure e delle sanzioni amministrative – Articolo 4 – Revoca del vantaggio indebitamente ottenuto – Modalità di applicazione del sistema integrato di gestione e di controllo relativo a taluni regimi di aiuti dell'Unione – Normativa nazionale che prevede la decadenza dall'aiuto e la restituzione delle somme percepite in caso di irregolarità constatate – Principio di proporzionalità

Gli articoli 2 e 4 del regolamento (CE, Euratom) n. 2988/95 del Consiglio, del 18 dicembre 1995, relativo alla tutela degli interessi finanziari delle Comunità europee, gli articoli 2 e 4 del regolamento (CEE) n. 2080/92 del Consiglio, del 30 giugno 1992, che istituisce un regime comunitario di aiuti alle misure forestali nel settore agricolo, nonché il principio di proporzionalità, devono essere interpretati nel senso che essi non ostano ad una normativa nazionale la quale preveda, per il caso in cui si constati, nel corso dell'esecuzione di un impegno pluriennale, che la superficie rimboschita è inferiore del 20% rispetto alla superficie ammessa a titolo di tale impegno, la decadenza totale dagli aiuti all'imboschimento e, pertanto, l'obbligo di procedere al rimborso integrale di tali aiuti, nonché l'esclusione totale dagli aiuti che avrebbero dovuto essere versati a titolo delle restanti annualità di impegno.

Cons. Stato, Sez. IV, 01/02/2024, n. 1044

Vincolo paesaggistico – imposizione – ricognizione in atti di pianificazione Inizio modulo

Il vincolo boschivo, in quanto rilevante ex lege, prescinde dal suo effettivo recepimento negli atti di pianificazione generale ovvero dalla sua rappresentazione cartografica nella pianificazione paesaggistica, che al riguardo non interviene con effetti costituitivi limitandosi ad operare una mera ricognizione circa l'effettiva esistenza del bene tutelato in base alle sue qualità intrinseche.

Fine modulo

Cons. Stato, Sez. IV, 02/08/2023, n. 7475
Boschi – definizione – rapporto con il paesaggio.
La nozione di "bosco", richiamata ai fini della tutela paesaggistica, è innanzitutto nozione normativa perché fa espresso riferimento alla definizione oggi dettata dagli articoli 3 e 4 del D.Lgs. n. 34/2018, postulanti la presenza di un terreno di una certa estensione, coperto con una certa densità da vegetazione forestale arborea e, tendenzialmente, da arbusti sottobosco ed erbe. Accanto alla predetta nozione normativa, sussiste altresì una nozione sostanziale di bosco, perché la finalità di tutela del paesaggio, sottesa a tale nozione, implica il rispetto della ragionevolezza e della proporzionalità in relazione alla medesima finalità, con la conseguenza che le foreste e i boschi sono presunti di notevole interesse e meritevoli di salvaguardia, in quanto costituiscono elementi originariamente caratteristici del paesaggio, cioè del "territorio espressivo di identità". Quanto alla nozione di bosco, un bosco rappresenta un sistema vivente complesso insediato in modo tale da essere in grado di autorigenerarsi, così dissipando l'idea che per bosco debba intendersi l'insieme monocoltura di alberi destinati, ad esempio alla produzione di legname. L'art. 149, D.Lgs. n. 42 del 2004, ha escluso dall'ambito di applicazione dell'autorizzazione paesaggistica proprio le attività, quindi il taglio colturale, che rappresentano attività di gestione e di manutenzione ordinaria delle aree boscate. Ciò a riprova del fatto che la nozione di bosco non è in alcun modo riducibile a quella di un insieme di alberi.

CACCIA E PESCA

Corte cost., 18/07/2023, n. 14
Caccia - Necessità di salvaguardare i livelli di tutela previsti dal legislatore nazionale a tutela dell'ambiente - Possibilità di elevare gli standard di tutela - Approvazione del piano faunistico-venatorio - Necessità di intervenire mediante provvedimento amministrativo, anziché legge regionale
La materia della caccia rientra nella potestà legislativa residuale delle Regioni, tenute nondimeno a rispettare i criteri fissati dalla legge n. 157 del 1992, a salvaguardia dell'ambiente e dell'ecosistema, punto di equilibrio tra il primario obiettivo dell'adeguata salvaguardia del patrimonio faunistico nazionale e l'interesse all'esercizio dell'attività venatoria; in considerazione di tale ratio della norma statale, la legge regionale può intervenire su detto profilo della disciplina esclusivamente innalzando il livello della tutela. L'approvazione con legge regionale, anziché con provvedimento amministrativo, del piano faunistico-venatorio comportando una modificazione in peius degli standard minimi e uniformi di protezione della fauna, contrasta con i principi che regolano la disciplina del prelievo venatorio desumibili dalla legislazione statale e implicanti la "procedimentalizzazione" dell'attività di adozione del piano e la sua approvazione con provvedimento amministrativo. (Nel caso di specie, è dichiarato costituzionalmente illegittimo, per violazione dell'art. 117, secondo comma, lett. s, Cost., l'art. 1 della legge reg. Veneto n. 2 del 2022, il quale esclude, agli Allegati B e C, il territorio del Comune di Rivoli Veronese dalla zona faunistica delle Alpi. La disposizione censurata dal TAR Veneto, nel disporre l'integrale approvazione con legge del piano faunistico-venatorio della Regione Veneto, non assicura il rispetto delle garanzie procedimentali imposte dalla legge dello Stato, così violando la competenza legislativa esclusiva statale in materia di tutela dell'ambiente. È altresì fondata la questione inerente all'esclusione del territorio del Comune di Rivoli Veronese dalla ZFA: dalla relazione al piano si evince che la scelta in esame è stata assunta in accoglimento della proposta della Provincia di Verona di modificare la ZFA rispetto al precedente piano faunistico-venatorio, in considerazione delle caratteristiche territoriali del Comune di Rivoli Veronese e di altri comuni, a causa della quota altimetrica in cui si trovano. Tuttavia, il legislatore statale, dettando standard minimi e uniformi di tutela dell'ambiente e dell'ecosistema, non ha fatto riferimento a dati puramente morfologici, né ha ritenuto il fattore altimetrico un criterio prioritario per individuare la ZFA).

Cass. civ., Sez. III, Ordinanza, 09/08/2023, n. 24265
Caccia - Sanzioni per violazioni - Divieto di caccia di esemplari selvatici protetti - Inclusione nelle specie protette delle paridae e dei fringuelli - Fondamento
In tema di caccia, rientrano nelle specie protette, per le quali sussiste il divieto assoluto di caccia, sia le paridae (cinciarelle) - incluse negli animali a rischio di estinzione di cui alla Convenzione di Berna del 19 settembre 1979 - che i fringuelli - la cui cacciabilità è stata totalmente esclusa dal d.p.c.m. del 22 novembre 1993 - atteso che l'art. 2 della legge n. 157 del 1992 nell'elencare le specie definite come "particolarmente protette, anche sotto il profilo sanzionatorio", oltre ad indicare una serie di uccelli, richiama le altre specie indicate come minacciate di estinzione da direttive comunitarie, convenzioni internazionali e appositi d.p.c.m., così consentendo che gli elenchi delle specie protette siano periodicamente aggiornati anche con fonti di rango inferiore a quella legislativa.

Cass. civ., Sez. II, Ordinanza, 02/08/2023, n. 23583
Caccia - Sanzioni per violazioni - Opposizione ad ordinanza ingiunzione - Disposizioni in materia di tutela

dell'ambiente dall'inquinamento, della flora, della fauna e delle aree protette - Competenza di cui all'art. 22 bis legge n. 689 del 1981 - Violazioni previste dall'art. 31, comma 1, lett. i) legge n. 157 del 1992 - Competenza del tribunale - Fondamento – Sanzioni - Competenza e giurisdizione - In genere
In tema di sanzioni amministrative e nel caso di opposizione ad ordinanza ingiunzione, ai sensi dell'art. 22 bis, comma secondo, della legge n. 689 del 1981, sussiste la competenza del tribunale in ipotesi di violazioni concernenti disposizioni in materia di tutela dell'ambiente dall'inquinamento, della flora, della fauna e delle aree protette. Ad esse è riconducibile la violazione di cui all'art. 31, comma 1, lett. i), legge n.157 del 1992 che, nel dettare norme per la protezione della fauna selvatica e per il prelievo veterinario, prevede una sanzione amministrativa per chi eserciti la caccia e non esegua le annotazioni sul tesserino regionale, prescritte proprio al fine di meglio disciplinare e regolamentare l'esercizio dell'attività venatoria.

CONSORZI

Cass. civ., Sez. I, Ordinanza, 03/08/2023, n. 23746
Consorzi di tutela – sanzioni amministrative
In tema di sanzioni amministrative, l'illecito sancito dall'art. 5, comma 1, D.Lgs. n. 297 del 2004, recante disposizioni sanzionatorie in applicazione del regolamento (CEE) n. 2081/92 sulla protezione delle indicazioni geografiche e delle denominazioni di origine dei prodotti agricoli e alimentari, ha come destinatari soltanto le organizzazioni di imprenditori interessati al medesimo prodotto agricolo o alimentare protetto dalla registrazione, che siano composte e strutturate in forme sovraindividuali (consorzi, associazioni, ecc.) e che conservino o assumano la denominazione protetta nella loro ragione o denominazione sociale 180 giorni dopo la pubblicazione sulla Gazzetta Ufficiale dell'avvenuto riconoscimento del Consorzio di tutela di quel prodotto agricolo o alimentare (o, se già riconosciuti prima dell'entrata in vigore del D.Lgs. cit., 180 giorni dopo l'entrata in vigore del menzionato D.Lgs.) il quale, proprio perché riconosciuto, a differenza di tali organizzazioni, gode dei particolari poteri e funzioni di cui all'art. 53, comma 15, L. n. 128 del 1998.

Cass. civ., Sez. V, Ordinanza, 24/07/2023, n. 22176
Bonifica - Consorzi - Contributi consorziali - Contributo per disponibilità irrigua - Contestazione della tipologia di coltivazione presuntiva - Onere di allegazione e prova - A carico del consorziato - Contenuto - Dichiarazione con indicazione di diversa tipologia colturale - CONSORZI - Contributi consortili - In genere
In tema di controversie relative ai contributi per disponibilità irrigua dovuti ad un consorzio di bonifica, il consorziato, a carico del quale gravano i relativi oneri di allegazione e prova, può contestare la misura dei contributi allegando e dimostrando di avere presentato la dichiarazione con indicazione di una tipologia colturale diversa da quella presuntivamente indicata nell'area dal regolamento e caratterizzata da un'esigenza idrica minore rispetto a quella individuata nell'atto impositivo.

CONTRATTI AGRARI

Cass. civ., Sez. III, Ordinanza, 16/11/2023, n. 31946
Diritto di prelazione e di riscatto - In genere - Prelazione agraria - Dichiarazione di voler esercitare il diritto - Effetto traslativo - Esclusione - Versamento del prezzo nel termine ex art. 8, comma 6, l. n. 590 del 1965 - Necessità - Rifiuto pretestuoso di accettazione - Deposito liberatorio entro lo stesso termine - Necessità - Fatti che escludono la mora del debitore senza liberazione dall'obbligazione - Equiparabilità – Esclusione
In tema di prelazione agraria, il termine di 30 giorni utile per l'esercizio del diritto decorre dal momento in cui la proposta di vendita, comunicata mediante trasmissione di copia del preliminare, giunge all'indirizzo del destinatario, in conformità con la natura di atto recettizio propria della "denuntiatio". ça dichiarazione del titolare di esercitare il relativo diritto non produce l'effetto traslativo della proprietà del fondo se non si avveri, entro il termine previsto dall'art. 8, comma 6, della l. n. 590 del 1965, la condizione sospensiva dell'effettivo versamento del prezzo e, nell'ipotesi di rifiuto anche pretestuoso dell'accettazione da parte del creditore, il deposito liberatorio della relativa somma nelle forme di cui all'art. 1210 c.c., senza che all'adempimento o al deposito si possano equiparare i fatti che escludono la mora del debitore, ma non lo liberano dalla sua obbligazione.

Cass. Civ., sez. II, sentenza, 06/11/2023, n. 30823
Cd. "livello" - Natura giuridica - Diritto reale di godimento - Assimilabilità all'enfiteusi - Configurabilità - Conseguenze - Accertamento - Dati catastali - Rilevanza - Esclusione
Il cd. "livello" ha natura di diritto reale di godimento su bene altrui, assimilabile all'enfiteusi, sicché la sua esistenza va accertata mediante il titolo costitutivo del diritto o l'atto di ricognizione, mentre è da escludersi la rilevanza dei dati catastali.

Cass. Civ., sez. III, ordinanza, 11/10/2023, n. 28415
Diritto di prelazione e di riscatto - prelazione - condizioni - mancata vendita di fondi rustici nel biennio precedente - onere della prova - a carico del riscattante - ammissibilità di ogni mezzo di prova - sussistenza
In tema di prelazione agraria, la mancata vendita di fondi rustici nel biennio precedente costituisce condizione per l'insorgenza del diritto di prelazione e di riscatto in capo al coltivatore diretto proprietario del fondo confinante, sicché chi esercita il relativo diritto, salvo espresso riconoscimento della controparte, deve dimostrarne la sussistenza, senza che la prova sia territorialmente delimitata e senza che rilevi il carattere di fatto negativo della stessa, il quale comporta solo la necessità di allegare fatti positivi contrari, la cui acquisizione può avvenire anche con testi e presunzioni, ivi compresi i certificati rilasciati dalla conservatoria dei registri immobiliari e le visure richieste agli uffici territoriali della agenzia delle entrate.

Cass. Civ., sez. III, ordinanza, 11/10/2023, n. 28413
Esercizio del diritto di prelazione da parte di un soggetto privo dei requisiti previsti dall'art. 8 della l.n. 590 del 1965 - Nullità dell'acquisto - Legittimazione in ordine alla relativa azione – Individuazione
L'esercizio del diritto di prelazione, di cui all'art. 8 della l. n. 590 del 1965, da parte di un soggetto al quale faccia difetto uno dei requisiti previsti dalla legge per il riconoscimento del diritto stesso, comporta la nullità dell'acquisto per contrarietà a norme imperative e tale nullità può essere fatta valere, a norma dell'art. 1421 c.c., da chiunque vi abbia interesse e, quindi, anche da coloro che abbiano stipulato un preliminare di compravendita, la cui efficacia è condizionata proprio dalla validità o invalidità del contratto conclusosi a seguito della prelazione anzidetta.

Cass. Civ., sez. III, ordinanza, 11/10/2023, n. 28374
Diritto di prelazione e di riscatto - Prelazione - Diritto di prelazione esercitato dal proprietario confinante - Requisiti - Qualifica di coltivatore diretto - Esercizio in concreto di tale attività sul fondo finitimo - Necessità - Fondamento - Prova - Fascicolo aziendale - Sufficienza - Esclusione - Ragioni
Ai fini dell'esercizio della prelazione agraria ex art. 7 l. n. 817 del 1971 è necessario non solo che il proprietario del fondo confinante rivesta la qualifica di coltivatore diretto, ma anche che coltivi concretamente il fondo adiacente a quello in vendita, giacché l'intento del legislatore è l'ampliamento dell'impresa coltivatrice diretta finitima e non l'acquisto della proprietà da parte di qualsiasi coltivatore diretto; in punto di prova, peraltro, la qualità di agricoltore non può desumersi dal fascicolo aziendale, atteso che le informazioni in esso contenute hanno finalità amministrativa e fiscale e non valgono a dimostrare la coltivazione effettiva del fondo.

Cass. civ., Sez. II, Ordinanza, 04/10/2023, n. 27986
Diritto di prelazione e di riscatto - Prelazione - Vendita di fondo destinato solo in parte all'attività agricola - Esercizio della prelazione con riferimento all'intero fondo - Esclusione - Conseguenze - Potere del proprietario di esigere l'estensione della prelazione all'intero fondo - Sussistenza - Condizioni – Fondamento
In tema di prelazione agraria, il carattere eccezionale delle norme impedisce un'interpretazione estensiva del concetto di fondo rustico, ex art. 8, comma 2, della l. n. 590 del 1965, tale da comportare l'applicazione della relativa disciplina a quelle parti del terreno che abbiano destinazione edilizia, industriale o turistica. Ne deriva che, quando sia alienato un fondo destinato solo in parte a scopi agricoli, il coltivatore diretto potrà esercitare il suo diritto di prelazione o di riscatto alla sola parte del fondo che abbia tale destinazione, fermo restando il potere del proprietario di esigere che la prelazione e il riscatto si estendano all'intero fondo, ove le parti rimanenti divenissero, all'esito, relitti inutilizzabili.

Cass. civ., Sez. II, Ordinanza, 05/09/2023, n. 25851
Diritto di prelazione e di riscatto - In genere - Art. 7 l. n. 817 del 1971 - Destinazione agricola - Normativa urbanistica - Mancata indicazione - Vocazione agricola al momento della prelazione e del riscatto - Rilevanza - Circostanze sopravvenute – Irrilevanza
Ai fini della prelazione agraria del confinante, ex art. 7, comma 2, della l. n. 817 del 1971, pur non essendo indispensabile l'esistenza della destinazione agricola del fondo nella normativa urbanistica, è comunque necessario, in assenza di tale espressa ed attuale destinazione, accertare se il fondo per il quale si invoca la prelazione del confinante sia ancora suscettibile di coltivazione agricola, o se abbia perso l'attitudine alla coltivazione, facendo riferimento alla situazione di fatto esistente alla data del preteso esercizio della prelazione e del riscatto, senza che al riguardo rilevino ipotetici futuri interventi di trasformazione del fondo.

Cass. civ., Sez. II, Ordinanza, 25/08/2023, n. 25285
Diritto di prelazione e di riscatto - In genere - Terreni con destinazione urbana - Diritto di prelazione agraria - Sussistenza - Esclusione - Qualificazione formale come terreni agricoli - Irrilevanza
L'art. 8 della l. n. 590 del 1965 deve essere interpretato nel senso che sono esclusi dalla prelazione agraria i

terreni cui gli strumenti urbanistici, anche in corso di approvazione, riconoscano una destinazione urbana, prevedendone un'edificabilità maggiore di quella per le zone agricole; tale destinazione prevale sulla qualificazione formale di tali terreni come agricoli. una volta esercitato, con l'atto introduttivo del giudizio, il diritto di riscatto di cui all'art. 8 della l. n. 590 del 1965, questo non è più suscettibile, in prosieguo, di variazioni di sorta, né con riguardo all'estensione del terreno, né con riferimento al prezzo offerto, essendo preclusa alla parte non soltanto una vera e propria "mutatio libelli", ma anche la mera "emendatio", poiché tali nozioni, proprie del processo, non sono trasferibili alle dichiarazioni negoziali. Siffatta possibilità è a "a fortiori" preclusa, stante il principio posto dall'art. 112 c.p.c., al giudice, a meno che dall'interpretazione della domanda non emerga che questa abbia non solo ad oggetto il riscatto di una determinata e puntualmente descritta porzione di terreno, ma contenga anche una pretesa subordinata, relativa ai (soli) fondi che in sede di giudizio dovessero essere accertati e ritenuti come effettivamente condotti in affitto dal retraente.

Cass. civ., Sez. III, Sentenza, 25/07/2023, n. 22330
Controversie - Disposizioni processuali - Tentativo di conciliazione (stragiudiziale) - In genere - Opposizione a precetto per il rilascio di fondo rustico - Preventivo esperimento del tentativo di conciliazione - Necessità - Opposizione all'esecuzione - Fase di merito - Limitazione
In tema di controversie agrarie, l'opposizione al precetto intimato per il rilascio di fondo rustico dev'essere preceduta dall'esperimento del tentativo di conciliazione, il cui onere, in caso di opposizione all'esecuzione ex art. 615, comma 2, c.p.c., è limitato, peraltro, alla sola fase di merito.

Corte d'Appello Palermo, Sez. III, Sentenza, 14/07/2023, n. 1334
Contratti agrari – controversie – domanda riconvenzionale – tentativo di conciliazione – condizione di procedibilità.
In tema di controverse agrarie, l'onere del preventivo esperimento del tentativo di conciliazione sussiste anche nei confronti del convenuto che proponga una riconvenzionale secondo uno dei criteri di collegamento previsti dall'art. 36 c.p.c. Il termine "convenuto" può essere riferito anche all'attore che abbia presentato domanda riconvenzionale.

IMPRESA

Cass. civ., Sez. I, 28/11/2023, n. 32977
Impresa agricola – fallimento – esenzione – riscossione canoni di locazione
Ai fini dell'assoggettabilità della società agricola a fallimento l'attività di mera riscossione dei canoni di un immobile affittato non costituisce di norma attività d'impresa, indipendentemente dal fatto che ad esercitarla sia una società commerciale, salvo che si dia prova che costituisca attività commerciale di intermediazione immobiliare e che si risolva nella messa a reddito professionale e organizzata di beni immobili, secondo lo schema del contratto di locazione.

PROPRIETA'

Cass. civ., Sez. I, Ordinanza, 11/01/2024, n. 1121
Proprietà – usucapione – fondo rustico – onere della prova – insufficienza attività di coltivazione
In relazione alla domanda di accertamento dell'intervenuta usucapione della proprietà di un fondo destinato ad uso agricolo non è sufficiente, ai fini della prova del possesso "uti dominus" del bene, la sua mera coltivazione, poiché tale attività è pienamente compatibile con una relazione materiale fondata su un titolo convenzionale o sulla mera tolleranza del proprietario e non esprime, comunque, un'attività idonea a realizzare esclusione dei terzi dal godimento del bene che costituisce l'espressione tipica del diritto di proprietà. A tal fine, pur essendo possibile in astratto, per colui che invochi l'accertamento dell'intervenuta usucapione del fondo agricolo, conseguire senza limiti la prova dell'esercizio del possesso "uti dominus" del bene, la prova dell'intervenuta recinzione del fondo costituisce, in concreto, la più rilevante dimostrazione dell'intenzione del possessore di esercitare sul bene immobile una relazione materiale configurabile in termini di "ius excludendi alios" e, dunque, di possederlo come proprietario escludendo i terzi da qualsiasi relazione di godimento con il cespite predetto. Inizio modulo
Fine modulo

TRIBUTI

Cass. civ., Sez. V, Ordinanza, 18/01/2024, n. 1933
IMU – esenzione - fabbricato rurale - destinazione
In materia di IMU, non ha alcuna rilevanza la questione dello svolgimento o meno di attività diretta alla manipolazione, trasformazione, conservazione, valorizzazione o

commercializzazione dei prodotti agricoli in quanto l'esenzione dall'IMU per i fabbricati di tipo rurale segue il criterio della determinazione catastale, nel senso che per la dimostrazione della ruralità dei fabbricati, ai fini del trattamento esonerativo, è rilevante solo l'oggettiva classificazione catastale con attribuzione della relativa categoria (A/6 o D/10), e solo l'immobile che sia stato iscritto come rurale, in conseguenza della riconosciuta ricorrenza dei requisiti previsti dal D.L. 30 dicembre 1993, n. 557, art. 9 non è soggetto all'imposta, ai sensi del D.L. 30 dicembre 2008, n. 207, art. 23, comma 1-bis, e del D.Lgs. 30 dicembre 1992, n. 504, art. 2, comma 1, lett. a).

USI CIVICI

Cass. civ., Sez. II, Sentenza, 04/10/2023, n. 28009
Accertamento - Soggetti legittimati a partecipare al giudizio - Individuazione - Termine di decadenza ex art. 3 l. n. 1766 del 1927 - Rilevanza - Esclusione – Limiti
Nel giudizio davanti al commissario per la liquidazione di usi civici, rivestono la qualità di contraddittori necessari tutti i soggetti che, pretendendo di esercitare usi civici sul fondo, ne abbiano fatta rituale comunicazione, senza che rilevi il termine decadenziale di sei mesi dall'entrata in vigore della l. n. 1766 del 1927, salvo che si tratti di terreni non appartenenti al demanio universale o comunale, ai sensi dell'art. 3, primo e secondo comma, della l. cit.

Cass. civ., Sez. II, Ordinanza, 27/07/2023, n. 22772
Liquidazione - Fondo attribuito ad università agraria - Destinazione ai bisogni rurali della popolazione - Regime giuridico - Uso civico - Successivo trasferimento al comune - Uso privato - Esclusione
I terreni appartenuti alle università agrarie regolate dalla l. n. 397 del 1894, sul riordinamento dei domini collettivi nelle province dell'ex stato pontificio, espressamente destinati ai bisogni della popolazione rurale del luogo, ancorché trasferiti ai Comuni o alle frazioni nel cui territorio sono compresi conservano, ex art. 25 della l. n. 1766 del 1927, la natura di terreni assoggettati ad uso civico.

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