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EVALUATING THE PERFORMANCE OF PROTECTED DESIGNATIONS OF ORIGIN AND PROTECTED GEOGRAPHICAL INDICATIONS: A MULTI-CRITERIA APPROACH

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Abstract

Geographical Indications of origin (GIs) are increasingly being adopted as public policy in the European Union for the identification of typical food products in the form of Protected Designations of Origin (PDOs) and Protected Geographical Indications (PGIs). In recent years substantial interest has emerged in improving this policy in order to encourage the adoption of PDO/PGI schemes as well as to enhance their effectiveness.

The increasing number of PDO/PGI recognitions (over one thousand at the beginning of 2011) and the ongoing overhaul of these policy schemes at the European level, make the assessment of the actual performance of the PDO/PGI policy a critical task for the revision and improvement of the policy itself. However, due to the dearth of official information, the deeply different production and marketing conditions among PDO/PGI products, and the variety of stakeholders involved, a comprehensive approach for the assessment of the impacts of PDO/PGI schemes in terms of achievement of their objectives is missing.

We contribute to the assessment of PDO/PGI schemes by building an approach to measuring the actual performance of the PDO/PGI products in relation to the objectives of the European Regulation 510/2006. We do this through a multi-criteria ex-post analysis that compares the performance of different PDO/PGI products with respect to multiple criteria. The present work develops a comparative evaluation of the performance of 31 Italian PDOs in the cheese sector and 30 Italian PDO/PGIs in the e-v olive oil sector: i) relative to the different objectives of the schemes, ii) by using a set of suitable indicators that inform on the effectiveness of a wide number of PDOs/PGIs with respect to the regulation's objectives, and iii) by considering the priorities of the different actors involved in PDO/PGI schemes, with regard to the importance of different objectives.

Results obtained in the two cases analyzed are consistent. We evidenced a trade off among the performance on the objectives which suggests a possible underlying contradiction of the policy itself: a success on the marketplace is not necessarily contributing to higher returns to producers placed upstream in the supply chain of the sector and vice versa, a stronger market power to producers, also in terms of relevance on the territory, is not in line with a good performance on the market. Although there are exceptions to this trend, the trade off at issue is indicative of a general ambiguity in the PDO/PGI policy and it reflects two opposite feasible strategies, practicable within the different PDO/PGIs. Moreover, the policy

maker scenario simulated in the two cases showed an overall higher performance of smaller PDOs, well rooted on the territory of origin, targeted to niche market segments, for both the cheese and the olive oil sectors. On the opposite, lower ranked PDOs tend to be larger (in terms of turnover, quantity and area of production covered), well established in the wider markets through large distribution systems. The evidence that smaller PDOs are performing, on the overall, better than the bigger ones, is somehow surprising and not trivial: nevertheless a better performance of small PDOs, especially in the baseline scenario, seems to be coherent with the Policy makers perspective.

Multi Criteria analysis is a promising approach to evaluating the performance of PDOs/PGIs. A “well aware” use of a Multi Criteria technique can be useful for the assessment of the performance of PDO and PGI schemes, to allow to gain insights on the cases of success (i.e. the best practices) and the conditions of the most effective realizations of the schemes, providing a support to the policy maker for the future revision of the policy.

Key words: Performance Assessment, Multi Criteria Analysis, Protected Designations of Origin, Protected Geographical Indications

Abstract

Negli ultimi anni è emerso un interesse sostanziale al miglioramento dell'efficacia della politica per la qualità dell'Unione Europea, di cui le Denominazioni d'Origine e le Indicazioni Geografiche Protette (DOP e IGP) rappresentano importanti strumenti. Il crescente numero di riconoscimenti (oltre un migliaio all'inizio del 2011) in tutta Europa, la previsione di un sostegno finanziario per la conformazione ai sistemi di qualità da parte degli agricoltori e la revisione in atto della politica europea per la qualità, rendono la valutazione della performance dei prodotti DOP/IGP un aspetto cruciale per il proseguimento ed il miglioramento della politica stessa. Un approccio complessivo di valutazione sistematica e trasparente attualmente è mancante a causa della scarsità di dati disponibili, delle profonde diversità nelle modalità di produzione, nelle condizioni di commercializzazione e negli interessi dei soggetti interessati, e si rende quanto mai necessario.

Il presente lavoro ha l'obiettivo di contribuire alla valutazione della performance dell'attuale sistema di DOP e IGP in relazione agli obiettivi del Regolamento Europeo 510/2006. Ciò viene fatto attraverso un' analisi multi-criteri che confronta, in un'ottica ex-post, le prestazioni di diverse DOP/IGP rispetto a criteri multipli. La valutazione comparativa è svolta su un campione di 31 DOP nel settore dei formaggi e 30 DOP/IGP nel settore degli oli extra vergine d'oliva italiani: i) relativamente ai diversi obiettivi del regolatore europeo, ii) utilizzando un insieme indicatori di efficacia relativi ad un ampio numero di DOP/IGP rispetto agli obiettivi del regolamento, e iii) considerando le diverse priorità dei portatori di interesse coinvolti nei sistemi DOP/IGP, relativamente ai diversi obiettivi.

I risultati ottenuti, coerenti nei due casi analizzati, evidenziano l'esistenza di un parziale *trade off* tra i diversi obiettivi della politica. In particolare, un successo sul mercato non necessariamente è in linea con un rafforzamento del potere contrattuale dei produttori a monte della filiera e viceversa, il potere contrattuale dei produttori, non si accompagna a buone prestazioni sul mercato. Pur con alcune eccezioni a questa generale tendenza della maggior parte delle DOP esaminate, il *trade off* in questione è indicativo di un' ambiguità di fondo dei sistemi DOP/IGP e riflette due strategie di sviluppo percorribili dalle DOP/IGP divergenti ed in parte inconciliabili. Inoltre, nella prospettiva degli obiettivi indicati dal Regolamento, sono le DOP più piccole, più radicate sul territorio di origine, prevalentemente mirate a segmenti di mercato di nicchia, ad ottenere i risultati migliori sia nel comparto caseario che in quello degli oli d'oliva. All'opposto, le DOP in basso nella classifica tendono

ad essere realtà più grandi (in termini di fatturato, quantità e areale di produzione), ben consolidate sul mercato attraverso sistemi di distribuzione di massa. L'evidenza che le piccole DOP si mostrano, nel complesso, migliori di quelle più grandi, è in qualche modo sorprendente e non banale: tuttavia, e soprattutto nello scenario di base, sembra essere coerente con la prospettiva del decisore pubblico.

L'analisi Multi Criteri è un approccio promettente per la valutazione della performance di DOP/IGP. Un utilizzo "consapevole" di questo strumento può essere utile per la valutazione delle prestazioni dei sistemi di DOP e IGP, per consentire di acquisire conoscenze sui casi di successo (le *best practices*) e sulle condizioni che li rendono possibili, fornendo un supporto al decisore pubblico per la futura revisione della politica.

Parole chiave: Valutazione della Performance, Analisi Multi Criteri, Denominazione di Origine Protetta, Indicazione Geografica Protetta.

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1. Executive summary: premise and concluding remarks

1.1 Introduction and research questions

The European policy on Protected Designations of Origin and Geographical Indications (PDOs, PGIs) assigns official recognition to products that are characterized by a link with the place of origin and to specific processing techniques. Besides establishing a harmonized scheme of registered names and labels across Europe, the policy aims include fostering diversification of agricultural production, raising farmer's income, enhancing fair competition, allowing consumers to make aware choices (as direct effects) and improving rural development (as a wider and more indirect effect). The European policy on denominations of origin has received a broad consensus, in terms of number of recognitions, nonetheless has sparked a heated debate at the international level on the degree to which these policy schemes are legitimate instruments to protect consumers from the risk of being misled in their purchase decisions and to foster the distinctive reputation of high quality producers being usurped by unfair competitors. On the opposite, some strongly held views claim that these instruments grant producers higher rents deriving from the possibility of excluding new entrants on the market and therefore represent an obstacle to fair competition.

The increasing number of PDO/PGI recognitions and the specific features of the European framework, such as the provision of financial support for farmers to comply with quality schemes (Carbone and Sorrentino, 2006), make the assessment of the actual performance of the PDO/PGI policy a critical task for the sustainable continuation and improvement of these schemes. To this end, the ongoing overhaul of the policy calls for sound impact assessments to assist political choices and support legislative proposals and guidelines.

The present work aims at shedding light on what are the expected results of the PDO/PGI schemes and what is meant by "performance". Further what criteria should be used for performance evaluation and how can these criteria be

measured. Lastly, how does the priority placed on the criteria by different stakeholders affect the performance evaluation.

We contribute to the assessment of PDO/PGI schemes by building an approach to measuring the actual performance of the PDO/PGI products in relation to the objectives of the European Regulation 510/2006. We do this through a Multi Criteria ex-post analysis that defines the performance of different products with respect to multiple criteria. This method allows us to carry out a cross sectional comparison among PDO/PGI products, based on the set of indicators identified, which are both qualitative and quantitative. Our effort is focused on pushing forward the common *acquis*, reached so far, in three directions by developing: i) an overall evaluation of the performance of PDO/PGI products that considers the different objectives of the schemes, ii) a set of suitable and informative indicators that can help to evaluate the effectiveness of a wide number of PDOs/PGIs with respect to the Regulation's objectives, and iii) an approach that can take into account that different actors involved in PDO/PGI schemes may have different priorities (or weights) with regard to the importance of different objectives in evaluating the performance of the schemes.

1.2 A critical review on theoretical impacts and actual performance of geographical indications of origin (Chapter 2)

In Chapter 2 we refer to the literature on the assessment of PDO/PGI schemes, both from a theoretical and empirical perspective, to understand what evidence supports the increasing interest in the use of PDO/PGIs, to obtain insights into the criteria selected for the evaluation and to assess whether the existing empirical work succeeds in evaluating the results of the policy.

The increasing relevance of Geographical Indications on the economic, juridical, political and social grounds has led, in the past decade, to numerous scientific contributions addressing the conceptual framework and the rationales of GIs (Herrmann and Marauhn, 2009; Bramley and Kirsten, 2007; Josling, 2006; Rangnekar, 2004). The international debate is particularly concerned with implications for competition, trade and development (Jena and Grote, 2010;

Anders and Caswell 2009; WIPO 2009; Grote 2008). The economic rationales at the heart of the introduction of a policy for designations of origin (discussed in paragraph 2.2) are: i) supplying credible information on credence attributes of food products to consumers, in order to ease products access on large distribution markets; ii) allowing the remuneration of firms' efforts in building individual and collective reputation for providing genuine high quality products to the market; and iii) preserving and fostering cultural heritage related to the production and promotion of specialty products linked to a specific geographical territory, especially in economically marginal areas. The assessment of impacts of GIs should give answers on whether, and to what extent, the existing GI schemes are able to contribute to the solution of the mentioned economic issues.

A growing body of literature focuses on the analysis of welfare effects of quality and GI schemes, in terms of impact on consumers, producers and society as a whole. The overview presented in paragraph 2.3 considers a few contributions of welfare analysis on GI schemes, relevant to the better understanding of the critical variables for the distribution of benefits and costs among the main stakeholders involved (Moschini *et al.* 2008, Langinier *et al.* 2008, Lence *et al.* 2007, Zago *et al.* 2004). Although the quality policy schemes aim at increasing both consumers' and producers' surplus, results may indicate a decrease in welfare, ultimately depending on the following critical variables: the actual quality differential between high and low quality products, production costs, the type of market structure and the degree of competition, potential restrictions on resources (i.e. land, raw material, know how) and the level of administrative costs related to the enforcement.

For consumers, the effectiveness of a GI is critically linked to the need of overcoming an information problem when quality cannot be judged prior to purchase (Moschini et al. 2008). In absence of a certified label, consumers cannot recognize the real quality of products, therefore consumers generally benefit from information disclosure, becoming able to distinguish between high quality and low quality goods. Producers must carefully compare incentives and costs in the decision to adopt new certification programs to differentiate their products. When the fixed cost of certification is not too high, the welfare effect is either positive or

null, depending on whether there is perfect competition or market power. The desirability of market power, in terms of overall effect on welfare, is controversial across the contributions considered. Lence et al. (2007) show that strong levels of protection and supply control may be welfare enhancing on the societal level, after a GI has been developed. On the contrary, Zago and Pick (2004) argue that the introduction of output restrictions, as it increases the profit of high and low quality producers and worsen the consumers surplus, has an overall negative impact on welfare. Moschini *et al* (2008) argue that market power cannot improve welfare because of the reduction of the quantity of high quality good supplied, but insist (and provide evidence) on the fact that public authorities should make an effort to lower firm's fixed costs of promotion, thus contributing to the efficient competitive provision of quality.

It must be noted that theoretical models are able to capture the impacts on social welfare, limited to the aggregation of individual welfare changes and cannot encounter other implications, such as externalities on the environment or rural development whereas these don't translate into impacts on producers and consumers, and other effects related to the value that consumers attach to specialty products per se (ex. because they are afraid of losing biodiversity or for the sake of sustaining their existence). Anyway, benefits for rural communities in marginal areas of the EU can only occur if producers of high quality commodities are actually located in these marginal areas (but this may not always be the case). Moreover, since the high quality production increases due to the regulation, this may lead to a higher use of inputs, which may translate into a worsening of the environmental effects of agricultural production (Zago and Pick, 2004).

Empirical work of applied economists aiming at the estimation of critical pieces of information on consumer and producer surplus, together with program costs is scarce. The increasing interest by the literature shows that the assessment of effects of PDO/PGI protection schemes has become an important research field (Barjolle et al. 2009) however there isn't a unique established method for it. The development of a sound impact assessment of the results of GI schemes is not a straightforward task, although there is an increasing call for it by different authors and policy makers. The contributions of the literature on designations of origin

mainly follow a case study approach, often focusing on one specific objective of the scheme or on one or a few PDOs (Belletti et al. 2007, De Roest 2000, Marescotti et al 2007, Arfini 2000, Carbone 1997). A comprehensive and replicable approach for the assessment of the impacts of PDO/PGI schemes in terms of achievement of their objectives is missing (Marescotti 2010). This is due to the deeply different production and marketing conditions among different products, to their relevance in terms of volumes and economic results (concentrated only in a few products) and - last but not least – to the scarce availability of detailed information on the economics of protected designations of origin, especially the smallest ones. These conditions have limited the possibility for a general comparative analysis on the effective role and functioning of PDOs/PGIs in the food market on an empirical ground.

The examination of different contributions (Barjolle Paus and Perret, 2009; Barjolle and Sylvander, 2000, London Economics 2008, Arfini and Capelli 2009) on the assessment of the impacts of the PDO/PGI policy has highlighted a series of critical issues. Although the reported studies address different aspects of the performance of PDO/PGI schemes, they converge on the idea that a successful PDO/PGI policy is a consequence of several conditions, such as the actual level of product differentiation, the marketing strategy adopted, and the level of coordination among the actors involved. Empirical studies, with respect to theoretical models, move from the maximization of utility and profit by each agent in the market, as a unique objective, to deal with a wider set of multiple objectives pursued (Barjolle and Sylvander, 2000). PDO/PGIs are a small group of firms, made of small businesses and industries who purse, through a collective action, a range of objectives among which survival, developing existing specialty quality products, saving rural economies, optimizing production rights, etc… This complicates the analysis making it hard to understand weather these objectives (and where) are achieved or not. Moreover, all objectives have a differentiated relevance, depending on the specific situation. For example, the importance of protecting a name against the risk of improper use is strictly related on the appeal of the name for widespread use outside the traditional area of origin. When notoriety is regional or local, the risk of infringement is relatively lower. Other

PDO/PGI are not in danger of seeing their name improperly used, therefore protection of the name may not be an issue. Moreover, differentiation of high quality products, as opposed to mass production of standardized product, is a relative concept and it is not always guaranteed among PDO/PGI products: some may be small productions but others may be produced on an industrial scale and by using intensive techniques (and still be a form of differentiated products). And again, impacts on rural development are hard to establish because we deal with indirect – more or less desirable – impacts. Finally, the impact on farmers income is biased by other agricultural policy measures such as aid for farmers in marginal areas. In general, the degree of "craftsmanship" of products as opposed to large scale industry is what, in theory, fits best the expected impacts of PDO/PGI in rural areas. But overall judgments are hard to be given without overshadowing the specificity of situations.

The contributions considered vary with respect to the methodology used, although there is a prevalence on subjective methods, based on the comparison of preferences, in terms of recognition, incentives, perceived expected outcomes and opinions of the actors involved (London Economics 2008). These approaches are largely based on interviews to experts and decision makers. From the methodological side, the most relevant challenges concern: i) the possibility to draw a clear distinction between determinants and effects of the performance of PDO/PGI schemes; ii) the choice between a subjective or an objective methodology[1] of analysis of the impacts of the PDO/PGI scheme; iii) the collection of reliable, synthetic data able to represent the key features of the PDO/PGI functioning and a representative sample that enables to draw generally valid conclusions.

Based on background research, there is still space for further attempts to assess the impact of designations of origin, based on a uniform approach that goes beyond the single case study. First, a sound impact assessment should consider the

[1] On one hand, objective methods provide a picture of the impact differential between two states, either by looking at the situation of GI products before and after its registration (i.e. diachronic evaluation) or by comparing two similar products, one with and the other one without a GI (i.e. synchronic evaluation). The synchronic method is based on the comparison of indicators which can be measured directly (statistical data, accounts data, field observation) eventually integrated by qualitative data.

multiple objectives of PDO/PGI as policy tools in the evaluation of the performance of PDO/PGI products. Second, it is necessary to work on a set of suitable key indicators informative on the degree of success with respect to the specific objectives of the policy. And lastly, the role of the different stakeholders involved in the functioning of the PDO/PGI schemes is not of secondary importance: their views and expectations on the objectives of the schemes should be part of the evaluation.

1.3 An overview of Designations of Origin in Europe (Chapter 3)

In Chapter 3 we give an overview of the regulatory framework and economic relevance of denominations of origin in Europe, with a focus on the Italian denominations.

At the European level, there is a substantial interest in encouraging the adoption of the PDO/PGI schemes and strengthening the quality policy. The European Commission has built and improved the quality schemes over the years, following a step-by-step approach. In 2008, the EU Commission decided to launch a reflection on how to ensure the most suitable policy and regulatory framework to protect and promote quality of agricultural products. It opened a wide consultation on the adequacy of the existing instruments and possible improvements and initiatives, through the "Green Paper on agricultural product quality: product standards, farming requirements and quality schemes" (end of 2008). In consideration of the feedback received from the Green Paper consultation, following the Prague conference (March 2009) and the various Impact Assessment reports drafted by DG Agri, the European Commission disclosed a "Communication on agricultural product quality policy" (May 2009). The strategic guidelines proposed for the revision of the European Quality Policy concerned all EU quality policy instruments (i.e. marketing standards, geographical indications, traditional specialties guaranteed, organic farming, and certification schemes) and prepared the ground for a possible simplification and more effective implementation of procedures. Following the Commission Communication, legislative proposals and guidelines were announced as part of a "Quality package" for December 2010. As a result of three years of extensive

consultation and participation of stakeholders, the Quality package comprises a new "Agricultural Product Quality Schemes Regulation" and lays the foundation of the overhaul of a more coherent agricultural product quality policy.

In the context of the CAP, and from the financial point of view, European Union Quality Policy had a limited and discontinuous relevance, as it is shown by the scarce resources devoted to its support. With Reg. 1698/2005 on support for rural development, there was a rearrangement of measures aiming at improving the quality of agricultural production and products by helping farmers to adapt to demanding standards based on Community legislation, supporting farmers participating in food quality schemes and supporting producer groups for information and promotion activities for products under food quality schemes. There are three measures in favor of quality schemes[2]. (measure 1.3.1.[3], 1.3.2[4] and 1.3.3.[5]).

By the beginning of 2011 in Europe, a total of 970 designations, of which 504 PDOs, 466 PGIs (and 34 TSGs) were registered. The greatest number of PDOs/PGIs is concentrated in the Mediterranean countries (78% of total designations are from Italy, France, Spain, Portugal and Greece), while the remaining registrations are mainly from UK, Czech Republic Austria and Poland. Such disparity may be explained by the historical profile of rural economies in Mediterranean countries, characterized by strong food traditions, and small or medium businesses that fit well the designations of origin schemes. In terms of product classes, the highest number of registrations is found in fruits, vegetables and cheeses, followed by fresh meats, processed meat products and oils and fats.

[2] In addition to the measures included in the rural development program, Reg.1782/2003 on support schemes for farmers (First Pillar) provides a measure directly addressing quality productions. Article 69 allows member states to destine up to 10% of resources assigned to a specific sector to promote superior quality standards in those sectors (arable crops, beef and veal and sheep and goat sectors): although this measure could have positive potential effects, wide discretion is left to Member States and the enforcement was rather limited, especially in Italy (Carbone and Sorrentino, 2005; Canali, 2010).

[3] It provides support to allow meeting standards based on Community legislation and covering costs incurred and income foregone caused to farmers who have to apply standards in the fields of the environmental protection, public health, animal and plant health, animal welfare and occupational safety.

[4] It provides support for the participation of farmers in food quality schemes.

[5] It gives support for information and promotion activities.

In terms of the evolution in time of the number of registrations, Italy and France are by far the countries with the highest number of registrations and kept increasing steadily up to the present year. New Entrant countries (with the exception of, Czech Republic and Poland) still have not taken the chance to join the EU schemes, partially due to the recent accession, but this may become part of the ongoing integration process in the next future.

Data on volumes and values of PDO and PGI designations in EU27 show that PDO/PGI total value is approximately 14.5 billion euro (in 2008), with a constant increase with respect to the previous years. PDO products represent the highest share of this value in comparison to PGI products, although the relationship is inversed when it comes to quantities. In terms of type of production, cheeses account for almost 40% of total PDO/PGI turnover. Almost 5% of the beer consumed in Europe is PGI beer. The main meat products are dry, salted products such as Prosciutto S. Daniele and Schwarzwälder Schinken, while fresh meats are in fourth position. For fruit and vegetables, the protected products consist in local specialties, linked to the production area by natural factors and with a long lasting tradition, but with a low unit value.

The Italian agri-food system has the highest number of food products with PDO/PGI recognitions, with 221 out of the 1004 across all food sectors in the European Union at the beginning of 2011. The registered denominations show a great heterogeneity in terms of different degree of link with the territory (area of production falls within the same region or among different regions), level of reputation, economic and productive dimension, reasons that led to the establishment of the registration and type of governance. The economic importance of PDO/PGI products across sectors in Italy is extremely concentrated in terms of value creation: 94% of total turnover (estimated at the producer price) is generated by the first 20 PDO/PGI products, mostly located in the north of Italy. Of these, the first 4 (represented by the two grains Parmigiano Reggiano and Grana Padano and two best-known Italian ham, Parma and San Daniele) account for a share of 68%. Consequently 173 denominations together represent only 6% of the total turnover, located in other Italian geographical areas. These show a

limited production potential, in most cases characterized restricted supply and lack of organizational strategies and explicit management.

1.4 A comparative assessment of the Performance of PDOs/PGIs: A Multi Criteria Analysis (Chapter 4)

Chapter 4 is focused on the methodology used and present the major steps followed in the analysis. Multi-Criteria techniques have been developed in the field of decision theory to aid problem-solving and are applicable to cases where multiple objectives and criteria enter the evaluation of an alternative among different options. Given that none of the options available can optimize all the criteria at the same time and a compromise solution must be selected, the multicriteria outcome is not the absolute best solution. It depends on two elements: the basic data available and the characteristics of the decision maker himself (i.e. his preferences on the criteria involved in the problem). Multi-Criteria analysis can be used for both ex-ante analysis of proposed actions and ex-post retrospective analysis on how decisions have worked out in practice. In the evaluation field, Multi Criteria analysis is usually an ex ante evaluation tool, for the examination of alternative projects or strategic solutions (OECD, 2008). The present work is focused on an ex post perspective for the assessment of a program or a policy through the appraisal of its impacts with regards to several criteria.

The different formal evaluation models that have been developed, from 1960 onward, are a set of explicit and well-defined rules to collect, assess and process information in order to make comparative assessments of alternative projects or measures, taking into account several criteria simultaneously. The methods are designed to evaluate the different options, explicitly considering, into a prospective or a retrospective framework, the opinions of the actors involved. The results are directed at providing operational advice or recommendations for decision making and policy. Here, Multi Criteria Analysis enables to carry out a cross comparison among PDO/PGI products for the assessment of the performance of PDO/PGI schemes, based on the following motivations: i) PDO/PGI schemes have different aims, therefore can be considered and evaluated for different characteristics; ii) PDO/PGI schemes' development and functioning

encounters different subjects, therefore can be valued according to the different perspectives and priorities of the actors involved.

The development of a Multi criteria analysis for the assessment of the performance of PDO/PGI products, which will be applied in the following chapter, encompasses several steps summarized in the next table.

Table 4.4 – Steps of the Multi Criteria Analysis for the evaluation of the PDO/PGI performance

Steps of the Multi Criteria Analysis …		**… in the PDO/PGI context**
1	Identification of the unit of analysis	The PDO product as a whole
2	Definition of the criteria	The objectives of the PDO/PGI schemes
3	Definition of indicators to the criteria	Quantitative and qualitative indicators of performance
4	Construction of information cards containing data available for each unit of analysis	Product cards in which relevant information available is summarized
5	Construction of the performance matrix	Specific indicators for each product are transferred into the performance matrix
6	Definition of the relevant stakeholders and relative weights on the criteria	Identification of stakeholders and analysis of relative interest for PDO/PGI objectives
7	Adoption of a specific Multi Criteria technique of analysis and suitable software	Application of the PROMETHEE outranking technique through Decision Lab software
8	Analysis of the results: ranking and relative performance on different criteria	Ranking of PDO/PGI products and profile analysis with respect to different criteria
9	Sensitivity analysis on alternative sets of weights	Exploration of alternative sets of weights from the perspective of the different stakeholders involved in the establishment and functioning of the PDO/PGI schemes

Source: author.

Performance of each PDO/PGI product is defined as the degree of achievement of the policy objectives, where the assessment of the performance on the different objectives relies on the definition of a set of suitable indicators. In general terms, an indicator is a quantitative or a qualitative measure derived from a series of observed facts that can reveal the relative position of a product in a given context (OECD, 2008). Indicators can be expressed both in quantitative and

qualitative terms and hence measured through different types of scales (continuous measures, binary terms, discrete variables, and ordinal scales). The construction of information cards for each PDO/PGI product is an important step because information cards represent the basic building blocks of the analysis, as it contains detailed information on the main characteristics of each PDO/PGI production reality. Once the information cards are completed, a subset of the indicators for each objective is reported into the performance matrix, in which the rows refer to each PDO/PGI product and columns refer to the indicators, grouped according to each objective. The intersections between rows and columns indicate the performance of the particular product on a specific indicator.

The choice of an appropriate methodology, out of all possible Multi Criteria methods available for the assessment of the performance of PDO/PGI schemes, was done drawing from "Outranking Methods", a specific branch of multi-criteria analysis based on pair-wise comparisons and "dominance" relations, which occurs when one alternative performs at least as well as another on all indicators and strictly better than the other on at least one indicator. It is possible for two options to be classified as not comparable when information on a particular indicator is missing. A particular feature of the outranking methods is that they do not force the translation of different scales and units of measurement for different criteria into a single common measure for purposes of comparison but rather compare products within each criterion (Henson et al. 2007). We adopt a particular version of outranking methods named Preference Ranking Organization Method for Enrichment Evaluations (PROMETHEE) (Brans et al. 1985) and apply it using *Decision Lab* software. This software is popular in the field of decision support systems developed to help in the selection of the best compromise alternatives (Brans and Mareschal, 2000). In PROMETHEE, once the performance matrix has been constructed, a specific preference function is defined for each criterion. This function is used to compute the degree of preference associated with the best performance and can take six possible shapes (see Brans and Vincke, 1985). PROMETHEE calculates positive and negative preference flows for each product analyzed. A positive flow represents the degree to which, on average, one product outperforms the other products in the pair-wise

comparisons. The larger the positive flow the higher the ranking of the product. A negative flow represents the degree to which, on average, the other products outperform the product considered in the pair wise comparisons. The smaller the negative flow the higher the ranking of the product. The net flow of a product, and consequently its ranking, is the result of a balance between the corresponding positive and negative flows. Rankings can be partial (PROMETHEE 1 gives an incomplete ranking when options are conflicting) or complete (PROMETHEE 2 is based on the balance of the two preference flows). Rankings are influenced by the weights allocated to the criteria. Further insights into performance can be gained by looking at a graphical representation provided through the Graphical Analysis for Interactive Assistance (GAIA) plane. GAIA makes use of the multivariate data method of Principal Component Analysis (PCA) applied to the net preference flows computed separately for each criterion. This visual support provides a global view of the characteristics of the results. The positioning of the PDO cheeses on the GAIA plane provides a clear representation of performance and allows the identification of clusters of products according to their performance (see Figure 19).

The rationale behind the choice of the outranking PROMETHEE approach is due to a series of reasons: i) PDO/PGI schemes encompass several dimensions and none unique criterion allows to state the actual success of such policy schemes on all dimensions. We need to simultaneously consider several indicators, both quantitative and qualitative, being able to group subsets of indicators and treat them as common categories and the PROMETHEE approach allow us to do so. ii) Outranking approaches allow us to adapt weights to alternative sets of preferences, thus taking into account the perspectives of different stakeholders, which we couldn't do if we resorted to a compensatory technique, (such as a Multi Attribute Utility approach). iii) Outranking methods do not force the translation of different scales and units of measurement for different criteria into a single common measure for purposes of comparison but rather compare products within each criterion (Henson et al. 2007). Comparing the performances on the indicators associated to the different objectives can be very useful in revealing the existence of trade-offs between different objectives.

Moreover it allows a transparent analysis of the determinants behind the final ranking, without censoring incomparabilities. v) The visualization of the decision problem is made possible by using the GAIA plane, which is a powerful tool to identify conflicts between criteria and to group the alternatives.

1.5 Multi Criteria assessment of PDO performance: empirical applications

Chapter 5 contributes to the assessment of PDO/PGI schemes by applying the multi-criteria approach to measuring the actual performance of the PDO/PGI products in relation to the objectives of the European Regulation 510/2006. We run the multi-criteria ex-post analysis to compare the performance of different PDO/PGI products in two production sectors with respect to multiple criteria. Based on a previous pilot study on a sample of PDO cheese products (Galli et al, 2010), We develop a comparative evaluation of the performance of PDO cheese products and PDO/PGI extra virgin olive oils in Italy.

The objectives identified for the evaluation of PDO/PGI schemes are grounded in the regulations and other subsequent official documents and are: i) providing reliable and relevant information to consumers on product origin. ii) Promoting differentiation of production. iii) Enhancing market performance of typical products, their market size, and their capacity to gain a price premium with respect to comparable, non certified products. iv) Enhancing PDO/PGI producers' bargaining power. v) Promoting local development.

In the first case we focus on 31 of the existing PDO cheeses in Italy (up to 2008) because of the importance of the sector itself. PDO cheeses account for 60% of the total PDO turnover in 2008 and a 22% share of total cheese turnover (ISMEA, 2010). Value creation is highly concentrated as 82% of total turnover is produced by four PDOs (Parmigiano Reggiano, Grana Padano, Mozzarella di Bufala, and Gorgonzola), while the other PDOs range in size from 9% down to 0.001% of total PDO cheese turnover. With respect to the geographical dispersion of PDOs across the entire Italian territory, there are many more cheese PDOs in

the north than in the remaining areas of the country (23 out of 34 are produced in the north).

In the second case of analysis, we decided to extend the approach to the extra virgin olive oil sector where PDO/PGI schemes are widely present, in terms of increasing number of recognitions (19% of total number of PDO/PGI products, with 38 registrations in 2008), following fruits and vegetables (38%). Olive oil production represents an important area of Italian agriculture since the olive tree is the most common tree species and is distributed throughout the national landscape according to the specific pedo-climatic conditions and therefore is in a strong connection with the territory of origin.

The two sectors show some relevant differences. One first feature of olive oil as a product is a narrower definition of the product compared to the extremely different cheese types available on the market and variety of aims and conditions of usage. Another relevant difference is in terms of value: the significant number of recognitions, increased over the years, does not correspond to an equally significant value in sales. We decided to exclude 8 PDO oils of recent establishment (from 2004 onward) to reduce the differences in terms of length of existence and allow a better comparison among the PDO/PGIs. Therefore we concentrated on 29 PDO e-v oil oils and one PGI (the Toscano oil).

A major step for the operationalization of the framework is to select measurable indicators of the performance objectives. The analysis is based on data available through official sources (ISTAT, Qualivita Foundation) and internet and institutions were directly contacted to obtain the database (ISMEA). This information has been integrated with internet websites of PDO Consortia, the Italian National Ministry of Agriculture, the European Commission and in depth interviews to the main stakeholders of several important denominations throughout Italy. The indicators used in the two cases are chosen as uniformly as possible in order to make the results comparable, with the exception of a few adjustments related to intrinsic diversity of the sectors analyzed. The most significant difference in the two cases relates to the differentiation objective, in

terms of different number of indicators used but also in terms of the meaning of differentiation[6].

The multi-criteria analysis proceeds in two steps. The baseline scenario hypothesizes that the five objectives of the regulation are equally important to the decision-maker and/or stakeholders. I refer to the baseline scenario as the "Policy Maker Scenario", where all five objectives are weighted equally. The second step in the analysis is to build alternative scenarios where the weights placed on the objectives are varied based on the results obtained in the baseline scenario, in order to reflect different preferences/stakeholders' perspectives. The two particular perspectives analyzed are linked to different strategies in the development and management of PDO cheese: on one side PDO producers with bargaining power, well linked to the local economy and characterized by "niche" dimensions ("Producers bargaining power /Local market PDOs", second scenario); on the other side PDO producers characterized by a positive market performance, not necessarily present on the local market but rather focused on large distribution markets ("Market Performing Scenario"). The following table summarizes the weights assigned to the objectives in the three scenarios.

Table 5.5 - Three Scenarios with differing weights on objectives

	Weights on Objectives		
Objectives	Scenario 1 Policy Maker	Scenario 2 Niche/Local market PDOs	Scenario 3 Market Performing PDOs
Information	20%	0%	0%
Differentiation	20%	20%	0%
Market Performance	20%	0%	100%
Bargaining Power	20%	40%	0%
Local Development	20%	40%	0%

Source: author's

The analysis of the GAIA plane allows to gain insights into the results. The main axis on the plane correspond to the two principal components resulting

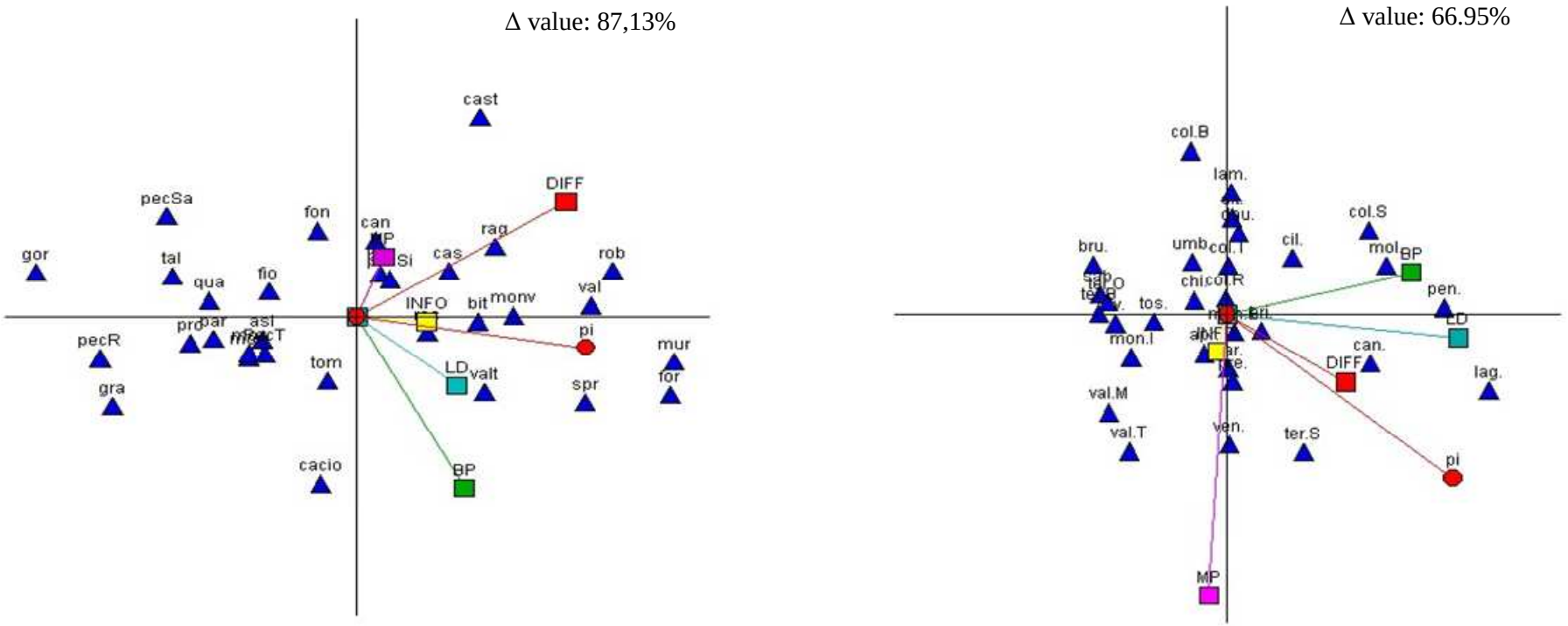
[6] In the case of cheese I limited the indicators to variables related to the size of the PDO (both in terms of quantity certified and extension of the area covered) because of the high level of heterogeneity among the cheeses, (in the sense of a "horizontal" differentiation of products). In the case of oil, the greater uniformity of the product in question and the availability of consistent quality variables obtained through a comparative reading across the specifications, made it possible to construct quality indicators, according to a "vertical" meaning of differentiation.

from a principal component analysis applied on the single criterion net flows matrix (see chapter 4 for further details) The colored axes represent the objectives and the shapes represent the PDO cheeses and olive oils, positioned according to their performance with respect to the objectives. The orientation of the axes and their length give meaningful information on the relationships between the objectives. These directions provide insights into tradeoffs between the achievement of multiple objectives at the same time. In particular, objectives pointing in the same direction can be considered in general agreement. The length of the axes indicates objectives for which more important deviations are observed: a very short axis on the GAIA plane corresponds to low deviations between products on performance for that objective. “Shorter” objectives will have a smaller impact on the PROMETHEE 2 ranking and vice versa. The red axis labeled Pi represents the weights of the criteria. Its orientation emphasizes which criteria are predominant and shows a compromise solution between the objectives, as proposed by PROMETHEE. The closer the products to the decision axis (which represents the best compromise in the evaluation) the higher is the position in the ranking. The representation in the cheese case can be considered of good quality since more than 87% of information preserved after the projection. The GAIA plane represented for the PDO/PGI olive oil case represents a lower amount of information, with respect to the cheese case: only 67% of the information is preserved after the projection. Probably, the higher number of dimensions of the multicriteria problem (i.e. number of indicators included in the performance matrix) decreases the amount of information that can be preserved and projected on the plane. However, the authors of the PROMETHEE method indicate that a value between 60% and 70% is sufficient for a representation to be reliable (Brans and Mareschal, 2005). Looking at the general orientation of the axes on the plane, the first evidence is that, overall, there are no complete tradeoffs among the objectives of the policy. Such evidence indicates that the policy can, to a certain extent, partially achieve all the objectives. Moreover, the significant length of the decision axis indicates that the evaluation can be carried out without inconsistencies or contradictions, in the sense that the criteria are not strongly conflicting and the selection of a good compromise is possible. Looking

at the orientation and length of each single axis, a closer alignment of the directions of the axis representing Bargaining power and Local Development emerges. In the cheese case the former has a stronger discriminating impact (i.e. longer length) than the latter, while in the olive oil case the opposite applies. Market Performance points in a clearly different direction with respect to Bargaining Power and Local Development, indicating a certain degree of conflict between these objectives. The Information axis in the cheese case occupies a position that tends to LD and BP, while in the olive oil case it is in line with MP. However the Information objective doesn't seem to be a very discriminating criteria on the final result (i.e. very short axis) in both cases. The Differentiation axis in the cheese case is orthogonal to BP and LD (i.e. objectives are independent or not related to each other), and very long, indicating the strong impact of the corresponding indicators on the results. In the olive oil case the Differentiation axis occupies a central position, although with a shorter length and accordingly, influence on the results, than the cheese case. This is probably due to the fact that oils are a relatively homogeneous product, at least as regards the quality attributes considered for the indicators.

Moving to the alternative scenarios, the rankings obtained on the basis of the corresponding phi values show that the baseline scenario is highly consistent with the ranking obtained in the "Producers' BP/Local market PDOs" (0.935 Spearman coefficient in the cheese case and 0.83 coefficient in the olive oil case). The correlation between baseline ranking and "Market performing PDOs" ranking (0.46 for cheeses and 0.36 for olive oils) is much lower and the (linear) relationship between "Producers' BP/Local market PDOs" and "Market performing PDOs" (0.25 for cheeses and -0.06) absolutely drops. Although there are some exceptions it clearly indicates that highly ranked PDOs in the first and second scenarios tend to have a much lower ranking in the third scenario. At the same time, the lower ranked PDOs gain a higher ranking moving from the first (or second) to the third scenario.

Figure 5.19 - The GAIA Plane for the Baseline Scenario: PDO cheese case (left) and PDO/PGI olive oil case (right).



Source: author's elaboration (software: Decision Lab)

Moving to other of the main results obtained, the next figures report the relative rankings in the two cases analyzed, based on the net flows obtained under the baseline scenario of PDO cheese and PDO/PGI e-v olive oils respectively. In the PDO cheese baseline scenario, the top ranked PDOs are from northern Italy. The ranking also shows a high correlation between the performance of the PDOs and other characteristics.

Figure 5.1 - Ranking and Net Flows of Italian PDO Cheeses, Baseline Scenario

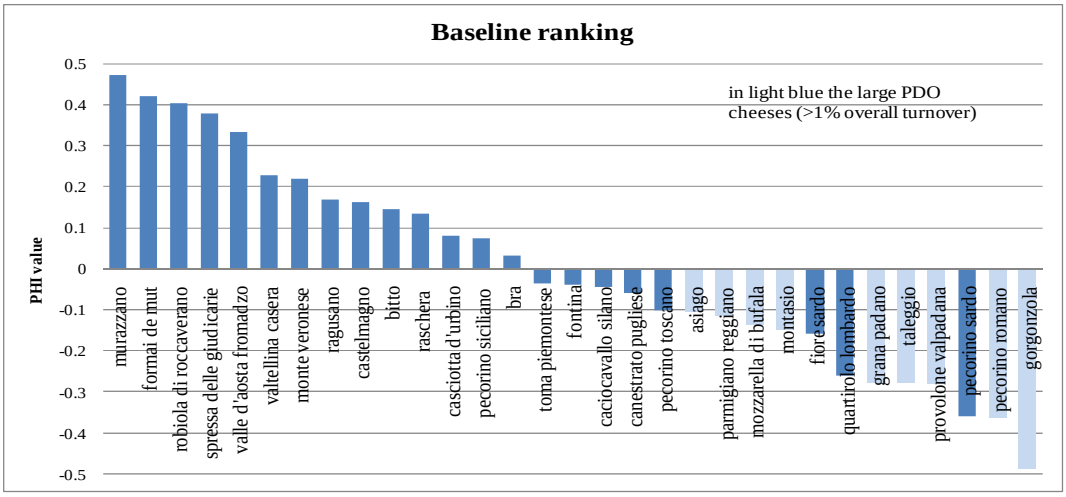
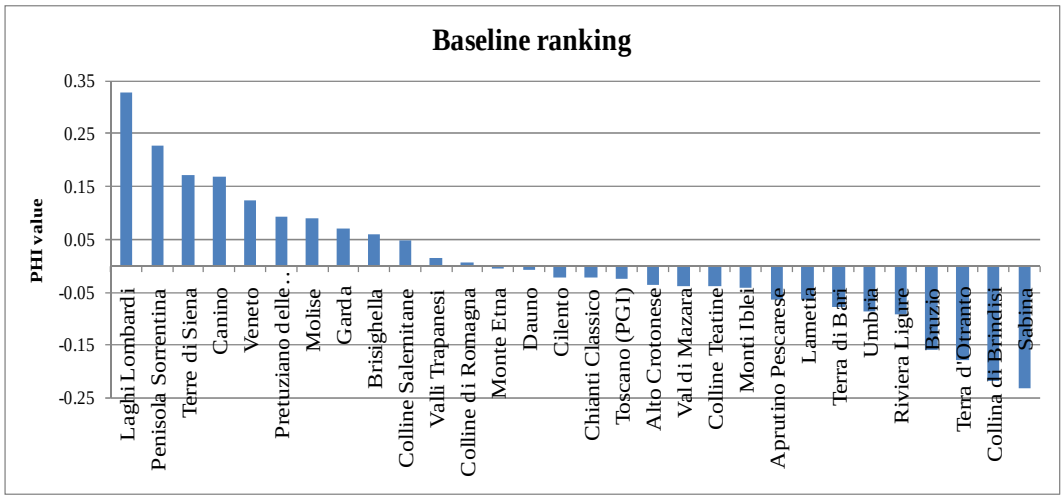


Figure 5.10 - Ranking and Net Flows of Italian PDO/PGI E-V Olive Oils, Baseline Scenario



Source: author's

The higher ranked PDOs in the baseline scenario are small, niche products that are not well known in wider markets. Lower ranked PDOs tend to be larger (in terms of turnover), older and well established in the wider markets through large distribution systems. To a certain extent this result is not surprising if one

considers that it is consistent with the rationale of the European Regulation, specially targeted to the smallest traditional production chains and those chains where small firms are prevalent.

In the PDO/PGI olive oil baseline scenario, the top ranked PDOs are not from a specific geographical area. The first three are respectively from north (Laghi Lombardi), south (Penisola Sorrentina) and center (Terre di Siena). In terms of value, (excluding Toscano IGP), the average ranking of large PDOs (turnover values between 4,4 million euro and 7,5 million euro) is 25, that of medium sized PDOs (turnover values between 490 thousand euro and 1,9 million euro) is 15 and the average ranking of small sized PDOs (between zero and 300 thousand euro) is 14. Again the primacy in the ranking belongs to the small denominations (in terms of economic size), although not as clearly as in the PDO cheeses probably due to the smaller size of all the elements of the sample.

1.6 Concluding remarks and further extensions

We developed a multi-criteria framework for the assessment of the performance of the PDOs/PGIs. The performance of PDOs/PGIs is defined with respect to five objectives set out in EU Regulation 510/2006. Performance on these objectives is measured with several indicators. The approach compares PDOs/PGIs performances and generates rankings based on alternative weightings of the five objectives to reflect different perspectives and interests of actors involved. We applied the framework to 31 Italian PDOs in the cheese sector and 30 Italian PDO/PGIs in the e-v olive oil sector.

Multi Criteria analysis seems to be a promising approach to evaluate the performance of PDOs/PGIs. It offers a means to systematically explore the effect of multiple objectives and weightings of those objectives on the evaluation of the performance of individual PDOs/PGIs. We evidenced a consistency in the results obtained in the two cases analyzed. From the analysis of the GAIA planes, which allows to visualize the relative positioning among the performance of the PDO/PGIs on the objectives, an evident alignment between Bargaining Power and Local Development objectives emerges in both cases. There is a conflicting relationship between these objectives and the Market Performance objective,

(although not a complete opposition). These first results are at the heart of the choice of the alternative scenarios subsequently explored. The second scenario focuses on the Bargaining Power, Local Development and, to a lower extent Differentiation while the third highlights uniquely the performance on the market. Information was not included in any of the alternative scenarios because of the very limited incidence of this objective on the final results (in terms of length of the axis, which indicates a low variability of PDOs with respect to the indicators chosen).

According to the framework of analysis presented, successful PDO schemes do not show a significant absolute economic value. In particular for the PDO cheese case, the PDOs positioned in the first half of the ranking (i.e. with positive phi value) represent only 3.2% of total PDO cheeses' turnover, (excluding Parmigiano Reggiano and Grana Padano); while for the olive oil case, PDOs positioned in the first half of the ranking represent 17% of total PDO e-v olive oil (excluding the extreme value of Toscano PGI turnover, which has a phi value just below zero). The evidence that smaller PDOs are, on the overall, performing better than the bigger ones with respect to the Regulation aims, is somehow surprising and not trivial. Nevertheless a better performance of small PDOs, especially in the baseline scenario, seems to be coherent with the Policy makers perspective. The policy maker scenario simulated in the two cases emphasizes an overall higher performance of smaller PDOs, well rooted on the territory of origin, targeted to niche market segments, for both the cheese sector and the olive oil sector. On the opposite, lower ranked PDOs tend to be larger (in terms of turnover, quantity and area of production covered), older and well established in the wider markets through large distribution systems.

According to the results obtained through the simulations on different scenarios, it possible to detect four different types of performance profiles:

i) PDOs with a high profile, in the sense of a good performance with respect to all the EU Regulation objective. These PDOs (both olive oil and cheeses) show a high ranking in all scenarios and according to all the different perspectives explored.

ii) PDOs with a high profile with respect to bargaining power of producers, local relevance and differentiation of the product but with a poorer market performance.

iii) PDOs with a high market performance profile but with a poorer performance on bargaining power of producers, local relevance and differentiation.

iv) PDOs with a low profile, in the sense of a low ranking with respect to all policy makers' objectives. From the perspective of both bargaining power of local producers and market performance, results are scarce.

While the first and the last typology give indications on the characteristics of the "best" and "worst" PDO performances, the intermediate cases evidence a trade off which is of some interest for the policy itself, as it suggests a possible underlying apparent contradiction. The presence of a trade-off between objectives, should be further explored in future research extensions aimed at finding ways that could foster the effectiveness of the scheme.

The three scenarios presented have significant implications on how policy makers and producers evaluate PDO policy and PDO products, beyond the evidence that smaller PDOs seem to be the ones that perform better with respect to the goals of the regulator. Firstly, the Information objective, which is surely one of the rationales at the heart of the policy itself, doesn't show sharp positive results: there is a limited incidence of this objective on the overall performance. Certainly the Information objective is particularly difficult to measure and the indicators used can be further improved. Nevertheless, it should be noted that the different positioning of the information objective in the two cases analyzed may give suggestions on possible alternative marketing and promotion strategies for the different sectors. For olive oils (as a matter of fact, a more standardized product) the Information objective is in line with the market performance: synergies between these two objectives suggests that a strategy of mass marketing and consumption would be preferable. This result is in opposition to the cheese case, in which the Information objective shows a closer alignment with the combination of objectives bargaining power and local development. In the latter

case a niche strategy (particularly appropriate whereas the production areas and potential production is limited) would be more suitable

Secondly, the tradeoff highlighted between BP/LD and MP is a cue of an ambiguity in the PDO/PGI policy: a success in the marketplace is not necessarily contributing to higher returns to producers placed upstream in the supply chain of the sector and vice versa, a stronger market power to producers, also in terms of relevance on the territory, is not in line with a good performance on the market. Although there are exceptions to this general trend, the trade off at issue is consistent with a general ambiguity in the application of the PDO/PGI policy and it reflects two opposite feasible strategies, practicable within the different PDO/PGIs.

Concluding, although all the evaluation models suffer from limitations and may have limited performances according to the different context in which they are applied, decision and evaluation models are still useful in many regards. In fact they imply a substantial effort to explicitly and rationally structure a problem and provide a transparent representation of the issue at hand, offering a common ground for discussion between the stakeholders; moreover they allow to compare several options, handling different – and contrasting – dimensions of the problem.

For these reasons, we think that a "well aware" use of a Multi Criteria technique can be useful for the assessment of the performance of PDO and PGI schemes, to allow to gain insights on the cases of success (i.e. the *best practices*) and the conditions of the most effective realizations of the schemes, providing a support to the policy maker for the future revision of the policy.

Despite these features, some caveats have to be made on what should be the expected results and thus the limitations of the performance analysis through the multi criteria approach concerned. First, the outcome of the evaluation is a relative ranking, a comparison, of the performances within the different units analyzed. It is important to underline that the method does not provide in any sense, an absolute assessment of the performance of the units analyzed. Defining a benchmark that will provide an absolute measure of performance for PDOs/PGIs and analyze the factors that influence performance is not part of the aim of this

work, although, of course could be considered as an important and even necessary extension of the research. Moreover PROMETHEE does not provide any guiding principle for determining the weights, but assumes that the decision-maker is able to weigh the criteria correctly. Furthermore, the evaluation criteria that have been adopted in the analysis are not differentiated in order to distinguish between PDOs and PGIs, and this is an important step feature to focus on. Lastly, the assessment of the performances is essentially static, except for the indicators of variation in time included in the analysis, and it does not allow to consider the different development stage of the PDO/PGI. The monitoring of the performance of PDO/PGI products should be continued over a period of time, by including the new registered products and new criteria.

2. A critical review on theoretical impacts and actual performance of geographical indications of origin

2.1 Introduction

Geographical Indications of origin (GIs) are increasingly being adopted in the European Union. Key examples are Protected Designations of Origin (PDO) and Protected Geographical Indications (PGI) for the identification of specialty food products. These schemes grant producer groups the right to label the geographical origin of their products, in order to make them recognizable to consumers. Based on the definition provided by EC Reg. 511/06 that establishes PDO/PGI schemes, for a PDO product the link with the territory of origin is related both to the provenance of the raw materials and to the area where the processing stage takes place, according to a particular processing technique that has been developed locally, by means of tradition over time. For a PGI product, the link to the territory relates to the area where the processing stage takes place, allowing for the raw material to be provided from outside the officially identified processing area.

There is a substantial interest in strengthening the European policy and encouraging the adoption of the PDO/PGI schemes. The ongoing revision of the policy calls for sound assessments that help to gain insights into the benefits and costs related to the policy itself. Their introduction has sparked a heated debate both at the European and at the international level on the degree to which these policy schemes are legitimate instruments to protect consumers from the risk of being misled in their purchase decisions and, at the same time to protect and foster the distinctive reputation of some producers being usurped by unfair competitors. On the opposite side, some strongly held views claim that these are instruments of granting producers higher rents deriving from the possibility of excluding new entrants on the market and therefore an obstacle to fair competition[7].

[7] This aim would be coherent with a shift of the European Common Agricultural Policy towards differentiated high quality products, that would provide farmers with a compensation for (or in alternative to) price support (Josling, 2006).

Significant study has been done to explore the different features of the policy by testing, from a theoretical point of view, the rationales on which the policy is grounded (Herrmann and Marauhn, 2009; Bramley and Kirsten, 2007; Josling, 2006; Rangnekar, 2004) through evaluations of the expected welfare impacts on the different actors of society (Moschini *et al.* 2008, Langinier *et al.* 2008, Lence *et al.* 2007, Zago *et al.* 2004). Other studies provide empirical assessments of the policy in terms of its multiple impacts. Empirical contributions draw their conclusions on the basis of single cases (Belletti *et al.* 2007, De Roest 2000, Arfini 2000, Carbone 1997) and supported by anecdotal evidence. A comprehensive and replicable approach for the assessment of the impacts of PDO/PGI schemes in terms of achievement of their objectives is missing (Marescotti 2010).

Here we focus on the policy implications of the existing contributions of the literature aiming at shedding light on the following questions: do analyses to date support the increasing interest in the use of geographical indications, with particular reference to the PDO/PGI schemes? According to these analyses, what are the conditions necessary for the achievement of the objectives of the policy? Do the existing empirical assessments support the conclusions of the theory and, most importantly, are these analyses able to effectively assess the policy?

We use Geographical Indications (GIs) as a generic term for names or signs used on products that correspond to a specific geographical location. Protected Designations of Origin and Protected Geographical Indications (PDO/PGI) are specific forms of GIs, according to the European quality policy, that do not only convey the geographical origin of the product but make a direct link between geographical origin and quality of the product.

In the first section we briefly review contributions from the literature in the past 10 years on the rationales of GIs and PDO/PGI policy. The second section reviews some recent theoretical articles on welfare effects deriving from the introduction of designations of origin schemes, focusing on the main policy implications. The third section presents empirical contributions on the assessment of GI systems and highlights the main criticisms encountered in the analysis to

date, in order to understand to what extent empirical evidences inform and support the conclusions of the theory.

2.2 Economic rationales underlying GI schemes

The increasing attention of the scientific literature to Geographical Indications shown in the past 10 years is due to their relevance on the economic, juridical, political and social grounds and has led to numerous contributions addressing the conceptual framework and the rationales of GIs (Herrmann and Marauhn, 2009; Bramley and Kirsten, 2007; Josling, 2006; Rangnekar, 2004). The international debate is particularly concerned with implications for competition, trade and development (Jena and Grote, 2010; Anders and Caswell 2009; WIPO 2009; Grote 2008).

The economic rationales at the heart of the introduction of a policy for designations of origin correspond to the following objectives: i) supplying credible information on different attributes of food products to consumers; ii) allowing the remuneration of firms' efforts in building individual and collective reputation for providing genuine high quality products to the market; and iii) preserving and fostering cultural heritage related to the production and promotion of specialty products linked to a specific geographical territory, especially in economically marginal areas. A classification of the most relevant literature related to the above mentioned dimensions is reported at the end of the paragraph in Table 2.1.

2.2.1 Information asymmetry on product attributes: GI labels as information tools for facilitating consumer choices

Food markets are affected by price and other non price factors, such as quality, safety and other product attributes (Unneveher et al, 2010). The information availability allows distinguishing such attributes among search, experience and credence (Nelson, 1970) depending on whether the consumer is able to evaluate the attributes before (search attributes) or after consumption (experience attributes), or unable to evaluate either before or after purchase (credence attributes). Because of the different information environment, there are

different incentives for producers to maintain quality standards depending on whether the quality of the product is more or less linked to the different types of attributes. Different degree of policy intervention is needed in order to limit possible *moral hazard* and *free riding* issues deriving from low incentives - or high costs - in supplying sufficient and truthful information to the consumer.

For the search attributes, there is usually enough information for consumers and enough incentive to producers to supply them. For experience attributes, if customers purchase only one time the producer who sells experience goods has strong incentives to only sell goods to the lowest possible quality level acceptable to the one-time consumer, (McCluskey, 2000, pp. 3). However if purchase is repeated, a reduction in standards leads to the growth of a bad reputation and to a fall in future profit levels (Anania e Nisticò, 2004). A solution to this is given by labeling, advertizing and warranties, as means of supplying – costly - extra information. For credence attributes, the information imperfection is the strongest: there is a need for an "exogenous mean" to fill the gap of information and trust, such as clear labeling associated with reliable third party monitoring. The objective, as suggested by Caswell and Mojduszka (1996) is to transform (experience and) credence attributes into search attributes by providing information, according to a suitable information-based policy.

PDO/PGI products can be considered a bundle of all three types of attributes: search attributes have specific features (in fact packaging and design are important clues of the tipicity of the product) and an even greater role is played by experience attributes (ex. unique taste, texture and other sensory characteristics) related to higher quality of products. Such search and experience attributes are (or should be) all outcomes of a particular processing technique taking place in the specific place of origin (credence attributes). The market success of products with a non verifiable claim requires a mix of verifiable attributes and non verifiable ones, that together will credibly signal quality (as Grolleau and Caswell suggest in their contribution on environmental labeling, 2006, pp.474). GI labels such as the PDO/PGI ones, are extrinsic indicators, that together with other cues (e.g., brand name, packaging, price) can be used to provide signals about intrinsic quality attributes. Verifiable attributes will

"reinforce" the credibility of non verifiable attributes and vice versa. Beyond a personal relationship between consumer and producer and a deeper knowledge by the consumer on the geographical area, a reliable third-party certification process is a verifiable attribute that can help to assure that the product truly conforms to the quality description given by producers and provides consumers with a substitute for the information and trust they lack[8].

A high degree of awareness, understanding and knowledge by the consumer is somehow implied and cannot be taken for granted. Origin may not be a determinant driver of consumers' choices, as it is shown by Lusk and Briggeman[9] (2009), at least if compared with other values such as price and willingness to pay or other attributes (ex. safety and nutrition). Other related issues are the (formal and substantial) definition of geographical indications, the risk of misunderstanding for the consumer (the slick difference between PDO and PGI is an example[10]) and information overload for consumer, and the appropriateness and suitability of existing denominations of origin logos (FSA, 2010).

2.2.2 Safeguarding reputation of high quality producers: GIs as a means to invest in collective reputation

The lack of information on different attributes of food products leads to biased competition when product quality is differentiated. Assuming that on the market there are high quality and low quality producers, and that no effective way is available to signal quality credibly, the efforts to maintain high quality are exposed to unfair competition by lower quality producers that can sell at the same average price (Akerlof 1970). Reputation plays an economic role in overcoming

[8] McCluskey (2000) shows through a game theory analysis of search, experience, credence products that third party certification, together with repeated purchase relationships, are required for high quality credence goods (the authors focus on Washington apples in their application) to be available and necessary in building credibility and fostering efficiency in organic food markets.

[9] They carry out a best-worst analysis on a panel of approximately 200 consumers of organic products in the US.

[10] There are exceptions in the application of the general rule for the definition of PDO products, as happens for example for several Italian processed meat products. Based on the official specifications, swine's legs are taken from animals bred outside the processing area, as it should be for PGIs. This lack of clarity can confuse the perception of the consumer and therefore negatively impact on the effectiveness of the geographical labeling.

the asymmetric information problem by signaling the real product quality to consumers and an incentive for producers to keep providing high quality products on the market.

Information imperfections in the market and the economic role of reputation form the main rationales behind intellectual property rights in general, distinctive signs such as trademarks in particular. In addition, the protection of intellectual property aims at guaranteeing the remuneration of the investments made to build reputation (i.e. brand development) and consequently the prevention of misappropriation of the value associate with the trademark. Accordingly, PDO/PGI labels provide a means for producers to differentiate production by signaling quality, creating the potential for quality premiums and capturing the willingness to pay of consumers who value the origin of the product, per se.

Two important distinguishing features of GIs with respect to trademarks - and a determinant of the success of specialty or local products – are: i) the "collective" nature of the reputation (Winfree and McCluskey, 2005, pp. 206) referred to a number of enterprises and ii) the link with the geographical territory where the firms are located and the product is produced. GIs define who can make a particular product, where the product is to be made, and what ingredients and techniques are to be used so as to ensure "authenticity" and "origin".

In fact, markets for food products with a regional identity are typically characterized by the presence of numerous, small and autonomous firms that make independent business decisions and retain their own profits, but share a common brand, thus a collective reputation based on aggregate quality. Fishman et al. (2008) consider the consequences of a shared brand name, such as geographical names used to identify high quality products, on the incentives of otherwise autonomous firms to invest in quality in particular when the scale of production is too small for individual firms to establish reputation individually. Collective branding may become a viable way to build reputation, by facilitating the transmission of information about quality to the consumer (Castriota e Del Mastro 2008, Winfree and McCluskey 2005, Tirole 1996).

Collective reputation issues in PDO/PGI schemes may be distinguished on two levels:

i. reputation issues concerning the relationship between the firms that belong to the PDO/PGI region and meet the constraints to have the right to label their products as such, and producers of the same product out of the PDO/PGI region, who don't comply with the specific rules and related investments. Producers not belonging to the PDO/PGI may try to free ride by selling non authentic PDO/PGI products, with the risk of being sanctioned. In this case, the PDO/PGI rules aim at protecting the reputation of the "real" high quality producers through a monitoring system and sanctions[11].

ii. Reputation issues between producers belonging to the PDO/PGI that contribute differently to the overall reputation of the PDO/PGI: some firms' performance may add value to the shared reputation, while others may benefit (or extract value) despite their poorer performance, leading to free riding of some members on the efforts made by other members. The risk of free riding on reputation may increase with the number firms admitted to the brand, weakening the incentive to invest by all. According to Winfree and McCluskey (2005) provision of high quality and prevention of free riding can be achieved in two ways: by setting clear common specifications of production and by providing and effective monitoring scheme, able to trace and punish the attempts of fraud.

[11] Anania and Nisticò (2004) provide an interesting explanation of the weakness of PDO/PGI regulation systems. They consider a context in which there are both high quality and low quality producers and compare situations of perfect regulation, nonexistent regulation and imperfect regulation. An imperfect regulation will allow some producers to label their product using the protected denomination even if its characteristics are not of the same quality as the "high" quality products. They find that a non fully credible regulation may be preferred to a "perfect" one, both by high quality and low quality producers. The intuition behind this is that low quality producers will prefer a situation in which an imperfect regulation is approved because this will leave them the possibility to attempt to sell low quality products as high quality products. At the same time high quality producers rather than having the low quality producers "block" the introduction of the regulation, prefer to reach a compromise which leads to the approval of a not fully credible regulation so that the market of the "high" quality good does not cease to exist (Anania e Nisticò, 2004 pp.15).

2.2.3 Fostering rural development: GIs as a public policy instrument

Origin labeled products owe their unique characteristics to the local environment and the human - technical resources, therefore are intrinsically linked to the territory. "Geography is at the heart of GIs" (Marsden, 1998), in the sense that geographical indications reflect the identity of the territory they represent. The protection of GIs as a public policy instrument, particularly evident in the European framework, is based on the conception of typical products as public goods and aims at encouraging the *spillovers* (Rangnekar, 2004), deriving from the promotion of such product and indirectly, of the territory to which the products owe their features.

GIs in the European framework are a form of public goods because no institution exercises exclusive control over the knowledge embedded in the protected indication. The right to use the name is not exclusive to a single owner and cannot be denied to any producer inside the boundaries of the geographical area, who complies with the officially recognized specifications. While certification marks and trademarks indicate the correspondence between the mark and their owner (which is the single firm), GIs identify the correspondence between the attributes of a product and a combination of features which belong to a community, to its territory and tradition[12]. The ownership belongs to the State (or a parastatal institution), who keeps a unique register, and the right associated is mainly public. The registration of the PDO/PGI is the result of public and collective action. Registration of the product can only be formally asked for an association of producers, and not a single agent (with very few exceptions). The compliance with the standards indicated in the specification (shared and agreed upon by the group of producers who ask for the protection) is monitored by the government or an independent organization. The Consortia is the representative body of the PDO/PGI and can carry out the definition of programs aimed at the improvement of the quality of products (in terms of sanitary, safety, chemical,

[12] A detailed analysis of the difference between trademarks and GI schemes is provided by Rangnekar (2004), Bramley and Kirsten (2007), Josling (2006) with emphasis on the trade implications and Hayes, Lence and Babcock (2005) on the reasons of the disagreement between the US and the EU on GIs.

physical, organoleptic and nutritional characteristics), contributing to safeguarding the PDO/PGI from unfair competition and promoting the product.

Given these specific features, the PDO/PGI policy can be viewed as a real example of "co-regulation" (Martinez et al, 2007), based on the cooperation between the public and private sectors in the process of creating new rules, and implies a mix of instruments, ranging from binding legislation (ex. the Regulations) to flexible forms of self regulation (ex. the specifications, written and agreed upon by producers). In the PDO/PGI schemes, there is also a coordinated action between private actors, because firms join together and agree to determine the specifications before applying for registration of the PDO/PGI mark, and the regulator that acts first via the national authority (who evaluates and assesses the request) and then via the European Commission (who publishes and keeps the register of the names)[13]. The risk of pressures by interest groups in the process of regulation to the detriment of collective interests (i.e. *regulatory capture*), is a crucial element in the relationships between the regulators and the regulated, from a political economy perspective (Martinez et al, 2007).

The protection ensured by the action of public regulation aims at reinforcing the capacity of small niche producers to survive in the global market, in the long run. As Paolo De Castro[14] suggested in a recent statement: *a quality product is an "ambassador" of the territory and opportunities for development and protection of indigenous knowledge may be built around it (…)*[15]. Geographical Indications may serve as opportunities for marginal areas to preserve and foster the economic and social activities that are worth maintaining, in virtue of the cultural heritage that they represent. The possibility of GIs to enhance rural development is dependent on a number of external conditions, such as the nature of the product and its level of elaboration, the characteristics of the

[13] The process for the recognition and registration of a PDO/PGI product will be extensively discussed in the next chapter.

[14] Paolo De Castro is the actual Chair of the EU Parliament's Committee on Agriculture and Rural Development. The intervention cited was in occasion of the presentation of the 2009 report on PDO, PGI, TSG food products, by Qualivita Foundation, January 2010.

[15] He continues *"…not only a model of agriculture based on competition and competitive advantage, but a system that fosters balanced paths of local development that takes into account cultural, landscape and environmental components that revolve around the concept of food quality"*.

production process, the marketing channels allowed by the nature of the product, the impact on landscape and environment, the structure of the supply chain and the role of the product in the local culture (Pacciani et al, 2001). Moreover, the effects on rural development are linked to the ability of the local actors to take possession of the rents associated with the product, with respect to the actors located out of the delimited region of origin. The link between the protected designations of origin and the development of the corresponding rural areas is mediated by the extent to which participants in the GI, and in particular producers, benefit from the valorization of the product that the GI protection should favor but this is not at all a straightforward outcome. The impacts of GIs on rural development are dependent on a range of intertwined factors but mostly on the spread of economic effects within the rural area, the level of participation of local actors, the sustainability and the reproduction of the social system and the environmental impacts (Sylvander, 2004). Economic models have difficulties in accounting for all these factors.

Table 2.1 – Literature on rationales and underlying critical dimensions of GI schemes

Economic issue	Contributions from international literature	Rationale of GIs
i) Information asymmetry on product attributes	Nelson, (1970) Akerlof, (1970) Caswell and Padberg, (1992) Caswell and Mojduszka (1996) McCluskey, (2000) Cho and Hooker (2002) Rangnekar, (2004) Grolleau and Caswell (2006) Bramley and Kirsten, (2007)	GI labels as information tools for facilitating consumer choices
ii) Safeguarding reputation of high quality producers	<u>Single firm reputation</u> Shapiro (1983) Choi (1997) Andersson (2002) Dana and Spier (2009) Cai and Obara (2006) Menapace and Moschini (2009) <u>Collective reputation</u> Tirole (1996) Rangnekar, (2004) Winfree and McCluskey (2005) Josling (2006) Bramley and Kirsten (2007) Fishman et al. (2008) Castriota and Delmastro (2009)	GIs as a means to invest in collective reputation
iii) Fostering rural development	Darby and Karny (1983) Pacciani et al (2001) Rangnekar (2004) Hayes, Lence, Babcock (2005) Josling (2006) Bramley and Kirsten (2007)	GIs as a public policy instrument

Source: author's

2.3 The expected impacts of the GI schemes in terms of welfare effects

The assessment of impacts of GIs should give answers on whether, and to what extent, the existing GI schemes are able to solve the economic issues discussed above: reduction of information asymmetry, protection of high quality producers' reputation and safeguarding of traditional knowledge for the development of rural areas. This is a challenging task, which can be addressed both from a theoretical and from an empirical perspective. The present paragraph aims at presenting the most relevant results of the literature on the former aspect, and the limitations. A growing body of literature focuses on the analysis of welfare effects of quality and GI schemes, in terms of impact on consumers, producers and society as a whole. In general theoretical models are able to capture the impacts on consumers and producers, while social welfare effects result from the aggregation of individual welfare. By definition, societal welfare may not be able to capture other implications, such as on the environment or rural development whereas these effects don't translate into impacts on producers and consumers.

We provide an overview of these formal contributions that study GIs, comparing the different assumptions made and the results (see Table 2.2). Results in general see consumers benefiting from information disclosure, becoming able to distinguish between high quality and low quality goods, and producers having to carefully compare incentives and costs in the decision to adopt new certification programs to differentiate their products.

Zago and Pick (2004) investigate the welfare impacts of labeling policies of agricultural commodities with specific characteristics, with emphasis on the European Regulation on PDO/PGI. The distribution of benefits among consumers, producers and society is ultimately dependent on the following variables: the type of market structure and the degree of competition, eventual restrictions on resources (i.e. land), the level of administrative costs related to the enforcement, the quality differential between high and low quality products and production costs. Even if the regulation aims at increasing both consumers' and producers'

surplus, the result may be welfare decreasing in some circumstances and careful cost benefit analysis is needed.

The authors construct a model ex-ante the introduction of the Regulation (i.e. the undifferentiated market) and then analyze two ex-post situations: the first in which two competitive markets emerge, one for high quality and one for low quality producers, and the second in which a producer group exercises market power (via land restrictions located to specialty products or price determination). The "baseline model" considers consumers preferences that are vertically differentiated by including a preference parameter (a la Mussa and Rosen, 1978) to represent the different utilities associated with the different goods. It considers an undifferentiated market with a unique average price and an average expected quality, as consumers are not able to distinguish the real quality of products. The quality of the good and the number of producers are exogenous. Technology is assumed to show constant returns to scale and cost functions are different for high and low quality productions since a higher effort for high quality is needed. Consumers', producers' surplus and total welfare are a function of average quality and average production costs.

Once the Regulation is introduced, higher quality goods are labeled with the grant of the regulator. Authors assume that the regulator recognizes the quality of the commodity perfectly and therefore it is fully trusted: this leads to the emergence of two distinct products, one with the label (the high quality product) and one with no label (low quality). Costs related to the administration of the EU quality scheme are borne by high quality producers and fixed. The conclusion drawn from the first case is intuitive: after the introduction of the regulation, with competitive markets, consumers' surplus increases because information becomes perfect and consumers can choose according to the quality they prefer. On the other hand, production levels and surplus are lower for low quality producers (as they don't benefit from uncertainty anymore) and higher for high quality producers[16]. The net impact on overall welfare depends on the cost difference needed to produce the high quality good with respect to the low quality one (ex.

[16] See their first proposition, pp. 157.

there are high administrative costs linked to the Regulation, which is often the case in reality) and the quality differences between the two variants of the commodity. In particular, the welfare effect can be negative when administrative costs and production cost differences are high and quality differences low.

According to the second case, if it is possible for producer groups to exercise market power (i.e. markets are non competitive because of supply restrictions) there is a negative impact on consumers' surplus, which is transferred to high quality producers. The negative impact increases as the quality difference between low and high quality variants increases. As expected, compared to competitive markets, the welfare impact of the regulation is less positive with land restrictions, all else equal. If the land constraint is binding, welfare result becomes negative for a lower level of administrative costs. Also in the case of monopolistic price determination, consumers' surplus is lower after price determination and production and surplus are higher for high quality producers and lower for low quality producers.

In a more recent work, Langinier and Babcock (2008) study GI scheme starting with a different assumption. Indication of origin on products does not always fully reveal information to consumers in the sense that, if high quality goods are certified, it does not necessarily mean that all non-certified goods are of low quality (differently from Zago and Pick, 2004). Therefore producers who do not comply with the geographical indication scheme may still produce a good of high quality. They set up a model with vertically differentiated demand, in which firms produce goods of a given quality and, as information is asymmetric, consumers ignore the quality of the good unless the high quality producers (or some of them) obtain a certification for it. Based on these considerations, the authors distinguish three scenarios: i) none of the high quality producers comply with the GI scheme (i.e. no revelation of information); ii) all high quality producers get the GI label, (full revelation of information); iii) only a fraction of the high quality producers adopts the label and consumers partially know the real quality of the products they buy.

High quality producers are organized as *clubs* (i.e. group of producers that comply with specific quality requirements and share the costs associated with them). Club goods are characterized by being non-rival, congestible (if too many firms have access to it, the profit of everyone will decrease) and excludable (those who don't get certified are excluded from benefits) and a club is formed if and only if all the potential members agree to its formation. Certification costs are considered ad being fixed. They define the "Cournot equilibrium"[17] (as producers in this setting have the power to decide the quantities that go on the market) for each possible scenario and compare quantities, prices, profits, consumer surplus and total welfare under the different regimes. The variable that will be crucial for the distributional results is the size of certification costs

Relative to a baseline case of no certification, a certification program that fully reveals quality benefits high quality producers and is detrimental for low quality producers: the sizes of welfare gain – loss depend on the level of certification costs. Both consumers with high and low willingness to pay benefit from the certification. Moving to the case of a certification program that does not fully reveal quality (i.e. some producers may sell high quality but consumers are not aware of it), if a producer club is allowed to be formed (i.e. barriers to entry are possible) there might be no welfare gain with the introduction of the certification if (again) certification costs are too high and too few producers benefit from it. This may partially explain why some countries (US among the others) are reluctant to adopt GI protection, preferring trademarks as a sufficient, less expensive device to protect GIs.

Moschini, Menapace and Pick (2008) take a different approach in modeling GIs markets compared to Langinier and Babcock (2008), who, as we have seen, treat GIs as tools to prevent entry, through clubs. Moschini et al. assume that the use of a GI cannot be denied to any producer in the geographic area, therefore they propose a model of perfect competition and analyze the implications of competitive entry. Contrary to trademarks, which are used and owned by the single firm, GIs are essentially public goods and are used by many

[17] Form of oligopoly competition based on quantities decision by firms.

(small) firms simultaneously. They emphasize that in the European Union there are no limitations on which and how many firms can use a GI, given that the specifications and the geographical origin are met. The same thing is valid for certification marks in the United States, where any firm that meets certifying standards is entitled to use the corresponding geographical names (Moschini et al, 2008, pp. 795). Given the possibility of competitive entry/exit, it is likely that an expansion of production may be limited by the accessibility of relevant inputs: however most PDO/PGI labels are generally not utilized at full potential. The authors refuse the presumption that GI producers have an effective way of controlling aggregate quantity supplied (this topic is discussed by Lence and Marette, 2007 in the following) so there doesn't seem to be room for uncompetitive returns for producers. The authors derive a different model from the previous one discussed, also with respect to other critical assumptions: they relax the constraint of *ex ante* exogenous identification of high quality and low quality producers by allowing for the endogenous identification of producers' types.

The demand side is stylized according to the vertical product differentiation model. The supply side is modeled in relation to different production costs for high and low quality goods, therefore making the supply of high quality goods endogenous. Producers are price takers, consistent with the assumption of a competitive setting. In order to make GI more credible the authors include further promotion and certification costs, in addition to the costs for providing high quality. These costs are considered as proportional to the quantities produced by each producer. In addition, given that a GI can be interpreted as a common brand, producers can join together to share the marketing, promotion and certification costs, by paying a share of an overall fixed cost. These costly activities build a goodwill in terms of brand value to the GI as a whole, and therefore can be considered similar to a public good[18].

[18] The authors also include an enforcement mechanism in the model, stylized as a sequential "auditing game", in a way that allows them to assess its effects on the equilibrium. They model and compare the costs related to compliance with the rules (costs of producing high quality plus a per unit cost of production for monitoring) to the situation in which producers violate the rules (i.e. they produce a low quality good and bear a lower costs compared to the high quality producers,

The authors consider the long-run partial equilibrium conditions that are relevant when firms enter/exit the market: as firms enter, profits will be driven to zero, so each firm will be producing at minimum efficient scale (i.e. point that minimizes average costs). For the high quality producers, the good will be supplied depending on the required certification costs and the willingness to pay by consumers for high quality. At the industry level, the per unit certification cost is declining as the number of firms that produce the GI product increases. As expected, the industry's unit cost of production is decreasing in the number of high quality producers (and the industry output). This positive externality on the industry level brings increasing returns to scale and therefore the supply function of the high quality good in the industry is downward sloping: this is decisive to the results.

There are three possible situations for the provision of both high and low quality goods: i) for a certain threshold of fixed costs, there is only one equilibrium for the supply of high quality goods; ii) if fixed costs are higher than a threshold, certification is too costly and competitive equilibrium does not include high quality goods; iii) if fixed costs are lower than a threshold, the authors find two equilibriums and the choice between them is made referring to stability criteria[19].

The welfare analysis derives the following results: at the equilibrium there are no profits to producers (as expected in a long run competitive equilibrium) and consumers surplus is positively affected by the availability of the GI product (consumers of the high quality good gain from the introduction of a GI because of a demand for additional quality).

The competitive equilibrium doesn't deliver the first best outcome, in terms of quantity of high quality good that a social planner would provide. This

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but certify their quality as high anyway) by considering a suitable probability of inspection and a penalty, in case of failure of inspection. So the total cost for violators is given by the low quality cost of production plus a certification cost plus a penalty imposed with a certain level of probability. The regulator must weigh the probability of inspection and the penalty level to obtain a certain compliance level. In equilibrium the scheme ensures producers' compliance, with the high quality producers bearing an additional costs.

[19] They refer to "marshallian stability" concept, for further details see Moschini et al 2008, pp. 804.

under provision of high quality products is due to the fact that producers include in their marginal cost the share of the fixed costs of certification, without considering that the firm's entrance lowers the share of costs for the other firms. This failure can be overcome by the government with the introduction of a lump sum subsidy, to support the producer association for the promotion of quality.

In this model, returns to producers are driven to zero, based on two assumptions: the long run horizon of the analysis and the constancy of unit costs (which is crucial to getting a downward sloping supply function). Limited supply of inputs and prices of raw materials would determine a positive slope of the supply curve. They include in the high quality cost function (more specifically the supply of additional quality) a measure of the firm's individual efficiency (so that, as production levels increase, marginal cost increases allowing for decreasing returns of scale and positive slope of supply). This has two results: the low quality producers still don't have returns, while the provision of the high quality goods can bring returns to high quality producers and consumers. Therefore in favor of GI schemes, the introduction of a GI certification will certainly benefit consumers, while it may also benefit producers of the high quality product depending if the production draws on specialized inputs in scarce supply. The effectiveness of a GI is critically linked to the need of overcoming a real information problem for consumers when quality cannot be judged prior to purchase, but the welfare of producers depends on the presence of scarce factors that they own.

Lence et al (2007) explore the effects of curtailment of production factors on welfare outcomes of Geographically Differentiated Agricultural Products (GDAPs), as legally established collective organizations aiming at "supply control" mechanisms to encourage producers to pay the cost of differentiating their production. The control may be related to either the amount of land devoted to GDAP (PDO/PGI areas are sometimes so small that they act as an artificial supply control mechanism) or the production practice (ex the strict definition of technologies often implies a constraint to the expansion of production), or both. In

general, these forms of supply control, although not explicitly based on prices and quantities[20] can indirectly allow production restrictions[21].

The authors analyze different types of organizations that represent a wide spectrum of situations existing in the real world. They compare five scenarios: i) producers organizations not able to control supply in any way (ex Idaho potatoes in the United States); ii) a theoretical scenario where producers have complete market power; iii) GDAP controlling both the amount of land and the practices used (ex. Brunello di Montalcino case); iv) the GDAP controlling the total amount of land but not the production practices (ex. Lentils from Castelluccio di Norcia); v) the organization of producers controlling the production practices but not the land used to produce GDAP (minimum quality standards selecting the product that goes on the market). The authors model consumption considering the price premium due to the uniqueness of the differentiated product with respect to the generic commodity and production considering the extra costs for producers. All producers are supposed to be equal, the production function shows constant returns to scale with respect to land and decreasing returns to scale with respect to all other inputs included in the production function (i.e. it is more expensive to produce the GDAP than to produce the commodity).

From a societal perspective, the authors show that if fixed costs are too high, developing a GDAP has a negative impact on societal welfare so the optimal social planner will not develop it, on the contrary if fixed costs are low enough the social planner will invest in it. The results show that the stronger the level of property right protection, the greater the incentives for producers to introduce and develop GDAPs. Contrary to expectations, the authors demonstrate that strong levels of protection may be welfare enhancing on the societal level even after a

[20] Some exceptions regard Parmigiano Reggiano cheese and Parma Ham, which have encountered the intervention of the Antitrust Authority, see Esposito (1998).

[21] The latter aspect can be considered one of the major criticisms at the heart of the opposition between the United States and the European Union, which has encouraged complaints in the WTO context. Beyond the cultural and legislative differences, the US position strongly discourages supply control and limitations to entry, with the exceptions on minimum quality standards (which allow some kind of indirect restriction through grading and packaging requirements) while the EU regulations permits a stronger level of supply control.

GDAP has been developed. This favors the EU rules, that are likely to dominate in terms of societal surplus, in opposition to US position.

Table 2.2 – Overview of welfare analysis on GI schemes

Rationales	Main objectives	Authors	Market Structure	Main Results
Producer Impact	Analyze welfare effects of GI schemes in different market settings and with different levels of supply control	Zago and Pick (2004)	Competitive markets compared to market power situations (land restrictions and price)	Welfare results depend on production cost differences, quality differences and size of administrative costs
		Langinier Babcock (2008)	HQ producers groups modeled as clubs (oligopoly)	Distributional benefits depend critically on certification costs
Consumer Impact		Moschini, Menapace, Pick (2008)	Perfect competition	It is possible to have provision of high quality in competitive markets through GIs Welfare gains are for consumers and for producers who own scarce factors
Societal Welfare (as sum of individual welfare)		Lence et al (2007)	Comparison among different types of market power situations between perfect competition and monopoly	The stronger the level of property right protection, the greater the incentives for producers to develop new GI. Stronger property right protection may be welfare enhancing

Source: author

The present overview considers a few contributions of the growing body of literature on the theoretical impacts of GI schemes: they are relevant to the better understanding of the critical variables for the distribution of benefits and costs among the main stakeholders involved. The modeling of GI schemes may include several variables and can be more or less complex and consistent with realty. Moschini et al. (2008) gives an interesting contribution in this direction.

In short, we evidenced the following results: even if the regulation aims at increasing both consumers' and producers' surplus, the result may be welfare decreasing in some circumstances and careful cost benefit analysis is needed. In general, in absence of label, consumers cannot recognize the high from the low

quality. Results see consumers benefiting from information disclosure, becoming able to distinguish between high quality and low quality goods. The effectiveness of a GI is critically linked to the need of overcoming a real information problem for consumers when quality cannot be judged prior to purchase (Moschini et al. 2008).

Producers must carefully compare incentives and costs in the decision to adopt new certification programs to differentiate their products. With competition, when fixed cost of certification (which is implicitly shared by producers) is not too high, the welfare effect is positive unless certification costs are too high. High quality producers gain, while low quality producers loose[22] (Zago and Pick, 2004). The introduction of output restrictions decreases the welfare impact of labeling, because it increases the profit of high quality producers, of low quality producers and worsen the consumers, therefore has an overall negative impact on welfare. Across the contributions considered, the desirability of market power in terms of producers' benefits is controversial. Lence et al. (2007) show that strong levels of protection and supply control may be welfare enhancing on the societal level, after a GI has been developed. On the contrary Moschini *et al* argue that market power cannot improve welfare in their context because granting market power to a club of high quality producers would further reduce the quantity of the high quality good supplied (providing that fixed costs for marketing and promotion are not too high, as this will prevent high quality product from being supplied at all). The authors argue that public authorities should attempt to lower firm's fixed costs of promotion, so contributing to the efficient competitive provision of quality.

The distribution of benefits among consumers, producers and society is ultimately dependent on the following variables: the type of market structure and the degree of competition, eventual restrictions on resources (i.e. land, raw material, know how), the level of administrative costs related to the enforcement, the quality differential between high and low quality products and production

[22] In absence of labeling, low quality producers were benefiting of the absence of information as consumers evaluate an average quality for the good which is higher than the quality of their product. Conversely high producers were losing.

costs. All these variables are hardly measurable in the in variety of situations that characterize denominations of origin and empirical studies suffer from data scarcity, as we will see in the following paragraph.

One last consideration on the benefits for rural communities in marginal areas of the EU community: such benefit can occur only if producers of high quality commodities are actually located in these marginal areas (but this may not always be the case). Moreover, since the high quality production increases due to the regulation, this may lead to a higher use of inputs, which may translate into a worsening of the environmental effects of agricultural production (Zago and Pick, 2004). And lastly, models don't allow to take into account externalities deriving from the value that consumers attach to specialty products per se, because they are afraid of losing biodiversity and for the sake of sustaining their existence.

2.4 Assessments of the actual results of the PDO/PGI schemes

According to the intention of the European Regulator, consumers, producers and society as a whole should benefit from the protection of PDO/PGI products. The previously reviewed welfare analysis give indications on what the critical variables and possible implications for the main protagonists of the PDO/PGI schemes are. As suggested in the previous paragraph, decisions on the establishment of PDO/PGI schemes should pass a thorough cost benefit analysis before and during being put into place, to avoid potential negative welfare effects (Zago and Pick, 2004). Empirical work of applied economists aiming at the estimation of critical pieces of information on consumers' and producers surplus, together with program costs is scarce. The increasing interest by the literature shows that the assessment of effects of PDO/PGI protection schemes has become an important research field (Barjolle et al. 2009) however there isn't a unique established method for it. The analysis of the ex post effects of the PDO/PGI policy requires a set of criteria in order to be a comprehensive assessment of the policy, traceable in the main rationales behind the protection of designations of origin.

The development of a sound impact assessment of the results of the GI schemes is not a straightforward task, although there is an increasing call for it by different authors and policy makers. The contributions of the literature on designations of origin mainly follow a case study approach, often focusing on one specific objective of the scheme or on one or a few PDOs (Belletti et al. 2007, De Roest 2000, Marescotti et al 2007, Arfini 2000). This is due to the deeply different production and marketing conditions among different products, to their relevance in terms of volumes and economic results (concentrated only in a few products) and - last but not least – to the scarce availability of detailed information on the economics of protected designations of origin, especially the smallest ones. These conditions have limited the possibility for a general comparative analysis on the effective role and functioning of PDOs/PGIs in the food market on an empirical ground.

In the present section we review a set of contributions from the literature that deal with the assessment of the impacts deriving from the introduction of the European PDO/PGI scheme. To what extent does the current empirical assessments refer to the rationales of the policy? Do the current empirical assessments support the welfare analysis results? Do they succeed in assessing actual results of the policy relative to the significant factors? Are all relevant factors considered?

In this section we review some contributions to the assessment of the PDO/PGI policy: Table 2.3 summarizes the main features of the contributions by comparing objectives, approaches used, criteria considered and most relevant results.

2.4.1 Approaches to impact assessment: an meta analysis on GIs studies

In a recent work, Barjolle, Paus and Perret (2009) give an overview of the different methods used throughout the literature for assessing the impacts of the geographical indication system, drawing from the results of a European research program titled "Strengthening International Research on Geographical Indications" (SINER-GI), supported by the European Commission. Impacts are considered as observed effects deriving from the implementation of a geographical indication system or protection scheme on the dimensions of sustainable rural development (economic, social and environmental factors). However "the factors which are causing the impacts are complex to identify" (pp.3): PDO/PGI schemes are developed in different contexts and conditions, therefore it is challenging to identify what impacts derive by the introduction of the scheme, all else equal.

Table 2.3 – A comparison between assessments of impacts of GI and PDO/PGI schemes

Authors	Barjolle and Sylvander (2000)	London Economics, European Commission (2008)	Arfini and Capelli (2009)	Barjolle, Paus and Perret (2009)
Objective	Identification of factors of success for origin labeled products	Evaluation on the implementation, usage and effectiveness of the PDO/PGI scheme	Provide an exhaustive picture of the economic characteristics of the Italian PDO/PGI designations or origin and define a typology of such designations according to a set of variables	Discuss and review existing methods for assessing economic, social and environmental impact of geographical indication systems
Approach	Correlation between "calculated" indicators and "observed" indicators	Judgment of the authors based on available evidence (literature, secondary data, case studies) for a series of indicators of the different effects	Cluster analysis, non-hierarchical, method of k-means	Classification of expected impacts according to a set of relevant variables
Criteria considered	Factors relating to supply and demand, organization and coordination within and between firms and social effects	▪ Ensuring quality of products ▪ Analysis of market share ▪ Distribution of returns along the supply chain ▪ Prevention of effects on non PDO/PGI products ▪ Ensuring differentiation of products ▪ Rural development ▪ Establishment of cultural values	▪ # companies with certified product/total companies registered with protection consortia or associations ▪ consumer price in the prevalent channel/production price ▪ % volume of certified product sold by direct sale ▪ % volume of certified product sold by traditional sale ▪ % volume of certified product sold by modern distribution	▪ Economic: market stabilization/increase, price premium, value added ▪ Social: local employment, empowerment of producers, cultural value and tradition ▪ Environmental level: local breed and variety, extensive farming, natural resources
Database	21 food chains in 7 countries in Europe	Case studies of 18 PDO/PGI products in 10 Member States, existing literature and secondary data (when available)	Mean data relative to the period 2005-2007 for a sample of 98 designations in Italy	14 case studies in different countries around the world, the frame of the SINER-GI research program
Results	The factors chosen account for the success of the supply chains studied. It is stated that the objectives of the regulation have been achieved	Recommendations: need to increase availability of data, promotion and communication campaigns to consumer, to increase awareness of the scheme	Varied picture of PDO/PGI products, companies should concentrate on distinctiveness of the product, service content and adoption of specific market strategies	Observed or expected impacts of geographical indication systems are linked mainly with economic issues. However the only presence of economic concerns brings crucial risks.
Caveat	It is hard to evaluate the expected impacts of the regulation. No single factor can guarantee the success: it is a conjunction of factors required!	Most of the results are not representative of the population. Lots of "depends" type of answers.	The scope of the work is mainly descriptive. The cluster is based on a limited number of variables because the aim of the paper is essentially to discuss the marketing stage	No representativeness of sample, subjective assessment of expected effects, overlooking the actual effects

Source: author

There is a major distinction between different evaluation methods based on the objective or subjective approaches used. On one hand, *objective methods* provide a picture of the impact differential between two states, either by looking at the situation of GI products before and after its registration (i.e. diachronic evaluation) or by comparing two similar products, one with and the other one without a GI (i.e. synchronic evaluation). The synchronic method is based on the comparison of indicators which can be measured directly (statistical data, accounts data, field observation) eventually integrated by qualitative data. On the other hand, *subjective methods* are based on the comparison of preferences, in terms of recognition, incentives, perceived expected outcomes and opinions of the actors involved. This approach is largely based on interviews to experts and decision makers which expand the range of indicators that can be used[23].

The authors elaborate a conceptual framework for the harmonized assessment of a set of case studies results, once the different case studies have been carried out (during the development of the SINER-GI project[24]). The authors provide a comparison of the 14 case studies, after having identified criteria and a set of relevant indicators. The criteria for the identification of the factors, beyond their relevance, is the possibility to compare across the studies and assign a score to them (from 0, non-relevant to 6, most expected effect) by discussing with expert who carried out each single study. They consider the following different dimensions of performance: on the economic level they look at market stabilization (or increase), price premiums and value added in the region. On the social level they focus on local employment, levels of empowerment of producers and cultural value/tradition related to the product. On the environmental level they are interested in local breed/variety, the use of extensive farming and natural resources.

[23] Different works from the literature that apply the methods proposed are indicated in their review.

[24] The project "Strengthening International Research on Geographical Indications" (SINER-GI) aims to build and share a coherent scientific basis world-wide, regarding economic, legal, institutional and socio-cultural conditions of success of GIs, in order to support their legitimacy in the framework of WTO negotiations. The objective of the SINER-GI project is to generate a robust theoretical knowledge regarding the transferability of the geographical indication concept as a key to understanding the conditions of their transferability and to negotiate their international recognition. See the following website for further information: http://www.origin-food.org/.

The authors provide a cluster analysis of the GIs, which are either already established and just introduced (and for which results are only expected) and distinguish them in terms of the performance with respect to the different dimensions chosen. Out of the newly established ones, three groups of GI products are indicated: the "enthusiasts" are those for whom the most important expected impacts are the market stabilization or increase, the value added in the region and also preservation of local breeds and varieties; "the socio-environmentalists" are those for whom the expectations on economic issues are less important than the social and environmental ones; the third group of GIs is defined to be "undecided", even though the highest scores are given to the expected economic impacts.

The expectations in terms of economic effects are generally prevalent, although the other dimensions are also important, in diverse ways according to the local context. They highlight that if the economic concerns are the only ones that motive the implementation of the GI protection schemes, there are crucial risks in terms of consequences on small farmers. For example, this can lead to the concentration of market power in the hand of the biggest actors of the GI, limiting access in the market to small farmers. Therefore there is a problem related to who captures the added value, if it is produced. This is why it is necessary to consider different relevant dimensions at the same time. A main limitation of the research is that it draws its conclusions only based a limited number of cases (only 12), therefore limiting its representative value.

2.4.2 Evaluating the performance of PDO/PGIs on firm's multiple objectives: controversial aspects and open issues

Barjolle and Sylvander (2000) are the first authors who provide an overview of the specific conditions and institutional requirements for the development of PDO and PGI products[25]. The author's focus is the collective process of value creation as an essential factor that must be supported by a suitable public policy, whereas the producers are networks of small firms with limited resources and visibility. So their work moves along two lines: the

[25] For further details see the FAIR project 1 - CT 95 – 0306, "PDO and PGI products: market, supply chains and institutions", Final Report.

conditions for value creation and the discussion of the policy features. Their assessment of the performance of the PDO/PGI policy is done in terms of the success of the agri-food supply chains that produce and commercialize PDO/PGI products. A supply chain must fulfill a number of conditions if it is to be successful (Barjolle and Sylvander, 2000, pp.46) therefore the identification of the essential factors behind the successful PDO/PGI products is the ultimate objective of their work..

The authors explicitly move away from a context of welfare analysis and market efficiency, characterized by profit and utility maximizing agents, where resources are allocated by the market. They refer to the ability of firms to formulate a wider set of relevant objectives and manage their activity accordingly. If firms can have different objectives, it is possible to evaluate their performance relative to their objectives in addition to performing a cost-benefit analysis. It follows that the ability of a firm to set itself suitable and relevant objectives is in itself a factor on success.

PDO/PGI are a small group of firms, made of small businesses and industries who purse, through a collective action, a range of objectives among which survival, developing existing specialty quality products, saving rural economies, optimizing production rights etc… The authors indicate all the objectives of the PDO/PGI regulation as objectives of the firms, by widening their set of relevant objectives, beyond the mere profit maximization. It is interesting to notice that all actors involved share a range of objectives which are not exclusive to each actor: therefore the different actors are all interested, to some extent, in the abovementioned objectives.

The authors base their results on field surveys on twenty-one supply chains in seven countries where products are registered at the European level. The factors chosen to explain successful PDO/PGI products are the degree of product specificity[26] and differentiation, the relevance on the market[27] and the “quality” of

[26] The underlying assumption is that success is dependent on the product being highly specific, with reference with the discernible/measurable and indiscernible characteristics, perceived as different by the consumer buying the finished product.

[27] The success of the specific product is often dependent on the definition of the relevant market for it. The relevant market is not always defined by the nature of the actual product or its common

the collective action (as the success of PDO supply chains and products is closely related to the ability of firms to manage the PDO collectively).

The way they indentify the factors of success is by starting from the set of earlier mentioned, relevant criteria (product specificity, relevance on the market, internal organization and coordination). Once the criteria are identified, a score for each product is calculated according to each criterion (i.e. calculated success). The calculated success is then compared to five measures of market performance, which are meant to be indicating the actual, observed success: turnover, growth rate compared to the reference market, notoriety of the product, premium price and rural employment. The degree of correlation between calculated and observed success suggests the goodness of the identification of the success indicators previously hypothesized.

The relevant factors considered are several and highly articulated, revealing the interest of authors in depicting the reality of PDO/PGI as thoroughly as possible. However this level of detail goes to the detriment of simplicity and mostly, it clashes with the scarcity of concrete, trustworthy data on a wide set of PDO/PGI products. Moreover the assessment of a wide range of different factors by assigning scores faces relevant scaling issues, on which no exhaustive information is given in the paper. Another critical issue is given by the choice of comparable products for the definition of relevant markets and price differentials.

In the last section of their work, the authors discuss the scopes and objectives of the EU regulation in the light of the case studies analyzed. They highlight a set of criticisms in the objectives of the policy. The importance of protecting a name against the risk of improper use (a primary objective of the policy) is strictly related on the appeal of the name for widespread use outside the traditional area of origin (therefore appealing for big enterprises). When notoriety is regional or local the risk of infringement is relatively lower. Other PDO/PGI are not in danger of seeing their name improperly used, therefore protection of the

use (ex Parmigiano Reggiano must be looked at in the market of meal ingredients, while some extra virgin olive oil aim at farm products bought by holyday makers). The relevance of the market is evaluated by looking at: customer appeal by the product specific characteristics, willingness to pay, correct choice of the distribution channel.

name may not be an issue. Consumer protection (another central objective) in terms of danger of confusion among similar products is again recalled to support the validity of the Regulation in allowing consumers to dispose of more information (if such information is understood and valued by the consumer is a different – critical – issue not discussed by the authors). Differentiation (third objective), as opposed to mass production of standardized product, is a relative concept and it is not always guaranteed among PDO/PGI products: some may be small productions but others may be produced on an industrial scale and by using intensive techniques (and still be a form of differentiated products). Anyway, the Regulation doesn't set clear restraints in this regard (ex. on the dimension of firms that belong to the PDO). Impacts on rural development (fourth objective) are hard to establish because we deal with indirect – more or less desirable – impacts. And the factors involved are complex (ex. the impact on farmers income is biased by other agricultural policy measures such as aid for farmers in mountain areas). The degree of "craftsmanship" of products as opposed to large scale industry is what, in theory, fits best the expected impacts of PDO/PGI in rural areas. But overall judgments are hard to be given without overshadowing the specificity of situations. It could be argued that policy objectives should always be verifiable for the policy to be a good policy. If a good policy must set verifiable objectives, should indirect effects be considered in the evaluation of a policy at all? This is an open issue.

2.4.3 An evaluation of the PDO/PGI schemes in relation to the objectives of the Regulation

An evaluation of the PDO/PGI scheme is provided by London Economics (2008)[28], who carries out a detailed description of the implementation and usage of the schemes over the period 1992-2006. The study aims at evaluating the effectiveness of the PDO/PGI schemes in relation to its objectives. The analysis of the implementation and usage of the scheme covers the 27 Member States and draws its conclusion on publicly available information, academic literature and detailed case studies of 18 PDO/PGI products in 10 Member States. A wide use of

[28] Commissioned by London Economics on behalf of European Commission, with the involvement of other universities throughout Europe.

subjective methods and expert evaluations is done to judge the effectiveness of the scheme in relation to the following aspects:

i) *ensuring the quality and diversity of products*: producers and other stakeholders were asked to list the characteristics of their PDO/PGI product that indicate a higher quality compared to other comparable ones. A critical issue is given by the subjective definition of the "comparison" product to judge the level of quality: the results differ depending on the type of comparator chosen, whether it is a generic product or a product with a strong reputation. The experts used the responses from 157 interviews and summarized the main consumption and production characteristics mentioned for each PDO/PGI and comparator. Although the responses can be indicative, subjective perceptions and personal judgment make it is difficult to make a clear assessment of whether one products is of a higher quality than another.

ii) *Increasing the market shares of PDO/PGI products in domestic*[29] *and export markets*. It is difficult to distinguish the effect of other exogenous factors that impact on domestic and export markets, such as the capabilities of firms in implementing PDO/PGI marketing strategies and the impact of collective organizations. However they conclude that the registration as a PDO/PGI in itself does not guarantee that market shares will increase and that PDO/PGI scheme is more effective when a number of additional factors are also present, such as the intention of producers of increasing market shares, a real interest from consumers, the existence of alternative forms of promotion (such as a collective trademark with a strong name). If small PDO/PGI products are produced under very stringent specifications and are marketed in niche markets, they may be very profitable despite being produced in small quantities compared to the relevant market. Therefore, the analysis of market shares by itself is not a good indication of the performance of PDO/PGI. The authors assert that in some circumstances, rather than being helpful in

[29] The authors refer respectively to the ratio of national sales of PDO/PGI production to domestic apparent consumption of the relevant product category and the ratio of export sales of PDO/PGI products to total exports for the relevant product category.

increasing market share, the PDO/PGI schemes have prevented the decrease/disappearance from the market

iii) *The returns along the supply chain.* The indicators[30] are estimated using primary data collected by the experts for the range of products covered by the case studies. In the field work survey, a total of 139 stakeholders were asked to provide their views on how prices, profits and revenues are distributed along the supply chain for unbranded, PDO/PGI, and products with trademarks. The results vary depending on the case study it is looked at and we don't really know whether the farmers benefit from the scheme or not.

iv) *Insuring diversification of products.* The authors rely on three indicators of diversity: the number of products preserved[31], number of products introduced[32] and innovation in the industry[33]. Again, the analysis is based on the responses of producers and producers' groups interviewed in the case studies, therefore it may not necessarily be representative of the entire population.

vi) *Increasing economic activity in rural areas.* There are a number of ways in which the PDO/PGI scheme can contribute to higher economic value and economic development in a region: examples are larger sales volumes, higher prices and higher profits achieved by producers of PDO and PGI products. Moreover, direct spending effects from the higher level of economic activity of PDO/PGI producers, including the additional employment, or the employment which was safeguarded and the direct additional spending in the local area by the PDO/PGI employees. Other types of "spillovers" are related to technology and marketing, whereas other producers of non-PDO/PGI producers may learn from the experience and success of the PDO/PGI producers and adopt some of the practices of the

[30] The distribution of the share of the final price at different stages of the supply chain (PDO/PGI vs. comparator) and distribution of revenues and profits along the supply chain (PDO/PGI vs. comparator).

[31] Contribution to maintaining individual producers' product ranges, and the contribution to maintaining the range of products on the market.

[32] The scheme's impact on the extension of individual producers' product ranges, and the impact on the availability of new products on the market.

[33] Examples of technical innovations in the supply of PDO/PGI products.

PDO/PGI producers. Or again, "spillovers" concerning the general adoption of specific quality standards by non PDO/PGI producers in imitation of the PDO/PGI producers[34]. The authors draw almost exclusively on answers from case studies as publicly available data are inadequate for the purpose of the analysis.

vii) *Establishing cultural value in rural areas.* This is essentially linked to the incentive for residents and businesses to remain in the rural area rather than migrating to urban centers. Cultural events linked to the PDO/PGI products; local associations linked to the PDO/PGI products; social or environmental benefit linked to the PDO/PGI scheme; public profile of the area (i.e. the perception of the area by the public at large) are all indicators drawn from the answers of the participants.

The final main recommendations addressed to the EU Commission concerns the need to improve the availability of administrative and statistical data on the PDO/PGI scheme, the call for promotion of the scheme and for active communication campaigns in order to raise consumer knowledge of the PDO/PGI symbols and meaning.

2.4.4 Evaluation on one specific objective: the performance of PDO/PGI on the market

Another recent contribution from Arfini and Capelli (2009) addresses one of the objectives of the PDO/PGI schemes, as means of providing better economic returns to producers. As discussed in the first section, this objective is rooted in the rationale of fostering the collective reputation of small producers, allowing them to share the investments needed for the promotion of the product. The authors point out that an important condition for the achievement of this objective is the "capacity of companies to develop an action of governance with the power to help them obtain remunerative prices on the relevant market" (pp.1).

[34] The authors use the following indicators: evidence of improvement in conditions for development; population change in the region; retention of rural populations; benefit to the regional economy; employment growth. The authors rate the effect of the PDO/PGI scheme along the indicators chosen varies, from strong to weak.

The authors identify in quality, commercial strategies and governance the key factors for understanding the performance of each designation on the market. While the difference between PDO and PGI products, in terms of link with territory and agricultural phase is ambiguous (compared to the idea of the legislator), there is a clear distinction between typical productions realized in large volumes with industrial methods and typical productions that may be considered niche products. These diversities are linked to different economic and commercial objectives set by players and by technological and production restrictions that characterize the production phase.

The authors give a detailed analysis of the number and territorial distribution of designations, the characteristics of consortia and associations, the economic and marketing aspects and the brand strategies, based on the data contained in the Qualivita Atlas (provided by Qualivita Foundation) for year 2006. Subsequently they seek for constants and an overall interpretation inside this complex system, by carrying out a cluster analysis based on a series of variables, on a sample of 98 designations. They identify five clusters through a k-means methodology, pinpointing the variables that have the most impact on the strategies of Italian designations: the positioning on the sales channels, the added value accumulated on the supply chain and the quality management. They obtain five indices for the purpose of representing the characteristics of the supply chain, the production price and consumer price with respect to the type of distribution[35]. The authors note that the positioning and the value creation are independent of the product category and the type of designation possessed (weather it is PDO or PGI).

The authors emphasize that those designations that are sold in the modern distribution channels do not succeed in significantly increasing their added value at the point of sale, even though they possess prestigious designations, because they suffer from weak contracting ability when facing the large retailers. Secondly a few PDOs succeed in really creating the value of the product: there are both

[35] The ratio between the number of companies with certified product and total companies registered with protection consortia or associations, the ratio between the consumer price in the prevalent channel and the production price, the volume of certified product sold by direct sale, traditional sale and modern distribution.

mass consumption destined products (ex Parma Ham) and niche market products (ex. Borgotaro mushroom) but they are mainly sold through large scale distribution and share distinctiveness of the product, service content and packaging features.

Concluding, designations of origin as such, provide only partial information to consumers and is certainly not a guarantee of success. In order to achieve greater commercial efficiency, it is essential to focus on distinctiveness of the product, service content and adoption of specific marketing strategies. The indication is to develop collective commercial strategies to increase added value of the product and enhance bargaining power of enterprises that turn to large scale distribution and traditional retailing.

2.4.5 Critical findings and further extensions

The thorough examination of different contributions on the assessment of the impacts of the PDO/PGI policy has highlighted a series of issues. Although the reported studies address different aspects of the performance of PDO/PGI schemes, they converge on the idea that a successful PDO/PGI policy is a consequence of several conditions, in particular: i) an actual level of product differentiation, ii) an effective marketing strategy, and iii) a strong coordination among the actors involved. The PDO/PGI policy shows its effects through the functioning of the market: therefore the assessment of the performance of a scheme, at least at a preliminary stage, should be carried out by focusing on impacts on the components of agri-food supply chains that produce and commercialize PDO/PGI products, along with the impacts on consumers who should benefit from a reduction in information asymmetry.

Empirical studies, with respect to theoretical models, do not only concentrate on utility and profit maximization by each agent in the market but deal with the multiple objectives pursued. Although this is more adherent to the different realties belonging to PDO/PGI schemes, it complicates the analysis making it hard to understand weather these objectives (and where) are achieved or not. The performances seem to be related with the deeply different conditions, therefore it is hard to give an overall judgment. The contributions considered have

focused essentially on the economic impact on producers and vary with respect to the methodology used (qualitative or quantitative).

From the methodological side, the most relevant challenges concern: i) the possibility to draw a clear distinction between determinants and effects of the performance of PDO/PGI schemes. ii) The unambiguous correspondence between the objectives of the PDO and the indicators used. iii) The choice between a subjective or an objective methodology of analysis of the impacts of the PDO/PGI scheme (or both). The choice of a reference point for assessment in static terms, between the PDO/PGI product and a suitable comparison product (at the same moment in time) and in dynamic terms, before and after the introduction of the scheme (and choice of a suitable time interval). iv) The collection of reliable, synthetic data able to represent the key features of the PDO/PGI functioning. and a representative sample that enables to draw generally valid conclusions.

As it emerges from the literature, there is still space in literature for further attempts to assess the impact of designations of origin, according to a uniform approach that goes beyond the single case study. In particular, in order to carry out a sound impact assessment, first of all, it is important to consider the multiple objectives of PDO/PGI as policy tools. In this regard, it is important to understand if the PDO/PGI policy is a necessary and sufficient tool for the achievement of the policy objectives. The answers is still to be given product by product and a clear methodology must be set for the answers to be supported by evidence. In particular, the “necessity condition” implies the clear definition of what are the conditions that make a PDO/PGI needed. The “sufficiency condition” requires a deep understanding of the particular situation of the PDO/PGI context and explicit parameters fixed by the policy maker. Second, it is necessary to work on a set of suitable key indicators informative on the degree of success with respect to the specific objectives of the policy. And lastly, the role of the different stakeholders involved in the functioning of the PDO/PGI schemes is not of secondary importance: their views and expectations on the objectives of the schemes should be included in the evaluation.

3. An overview of Designations of Origin in Europe

3.1 Introduction

The present chapter outlines the development of the European Food Quality Policy from a regulatory and economic perspective, highlighting its growing importance in the context of the Common Agricultural Policy. The chapter is divided into three sections.

The first paragraph gives a brief summary of the most relevant stages that have brought Member States to the establishment of a uniform system of designations of origin and geographical indications at the community level and presents the main steps leading to the ongoing revision of the policy. Subsequently, the economic resources at the European level devoted to the support of high quality production practices are presented and discussed. The last subparagraph examines the EU Regulations in depth, focusing on the salient aspects that distinguish PDOs and PGIs from other Geographical Indications systems, highlighting the objectives pursued and the procedures required for the recognition and functioning of PDO/PGI schemes. We decided not to focus on Traditional Specialties Guaranteed as this represents a different scheme, with its own regulations and with very limited relevance in terms of application.

The second paragraph focuses on the enforcement of the PDO/PGI system at the European level. In the first subsection, the total number of registrations is analyzed, drawing from an official community database (DOOR - Database of Origin & Registration) by crossing the production sector, the country of origin, and the year of registrations since 1996 (when the first products were actually registered) up to 2010. Then an overview of the economic consistency of PDO/PGI in terms of volumes and values is provided.

In the third paragraph, we linger on the Italian PDO/PGI case, and give an overview on the number of registrations and their economic relevance in the different sectors. We focus on Italy for two reasons: first, because it is the country were the PDO/PGI schemes present the highest number of registrations, still growing in number in all production sectors; second, that is needed for a better

understanding of the application of the evaluation procedure presented in chapter 5.

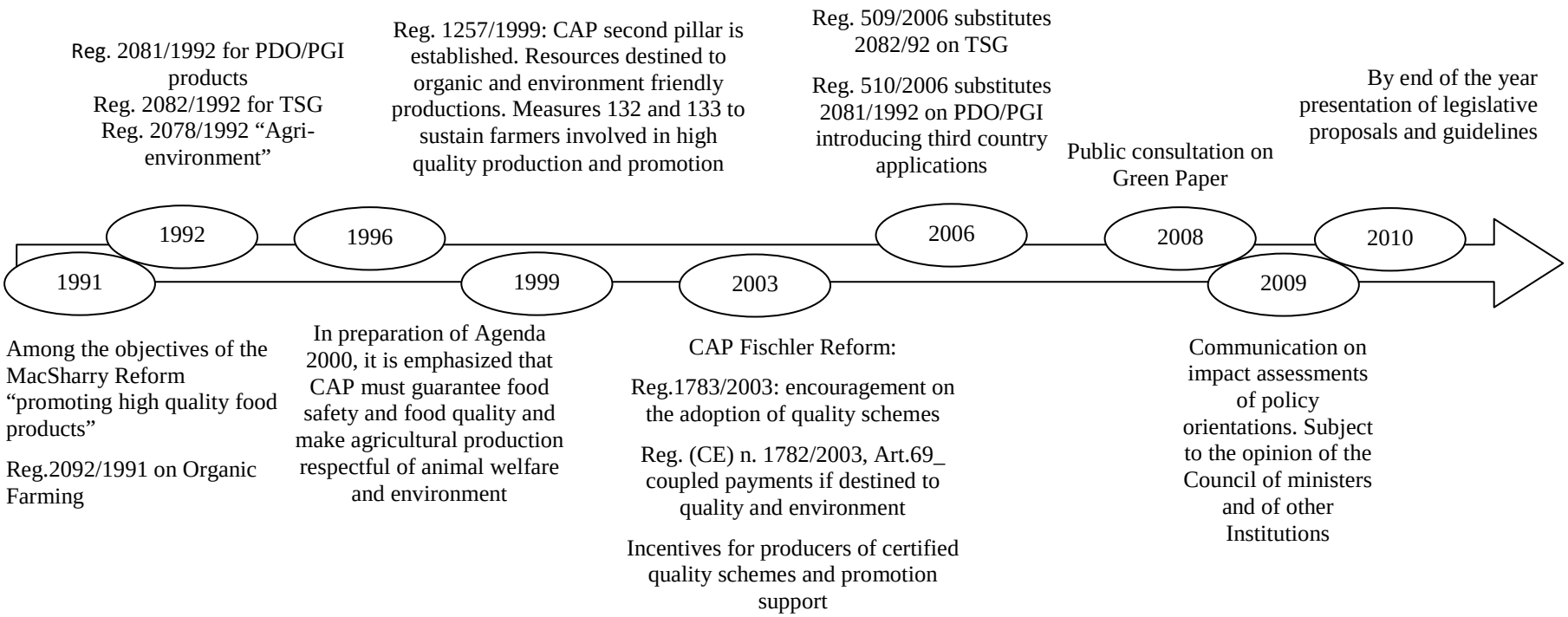
3.2 Regulatory development of European Quality Policy

3.2.1 The timeline of EU Quality Policy

The objectives of the Common Agricultural Policy (CAP) indicated in art. 39 of the Treaty of Rome (march 1957), were initially focused on the achievement of self-sufficiency in food production, stability of markets, income support to workers in the agricultural sector and affordable prices for consumers. These objectives were in line with the historical context and the social needs in which they were recognized and pursued. The policy instruments included several rather protectionist market policies, such as guaranteed minimum prices, import tariffs and export subsidies. In addition, income support to farmers coupled with production and, to a lower extent, structural adjustment of farms were other cornerstones of the CAP. Several reforms have followed, since the early eighties onward, due to the structural excess production determined by the incentives, the financial constraints (also due to the EU expansion from 15 to 27 countries) and the loss of centrality of the CAP in the process of European integration. European Food Quality Policy started off quite late in the CAP path and in parallelism with the crisis of competitive strategies based on standardized commodities and cost control (see the timeline on the evolution of the European Quality Policy, Fig.3.1).

The Mac Sharry Reform in 1992 represents a watershed than the past, because it explicitly calls for the necessity of a gradual reduction of intervention prices, the introduction of set aside payments and, most importantly, the partial decoupling of financial support for farmers (i.e. not linked to size of production, but to the type of production). Objectives shifted towards a greater attention to higher quality food products and environmentally friendly production practices. These instances became official with three regulations: Reg. 2081/1991 on Organic Farming, Reg. 2081/1992 on Protected Designations of Origin and Geographical Indications, (PDO/PGI) and Reg. 2082/1992 on Traditional Specialties Guaranteed (TSG). However, if Organic Farming and Integrated Pest Management (the latter explicitly recognized with Reg. 2078/1992) were enforced

Figure 3.1 - Timeline EU Quality Policy



Source: author's on EU Commission website (http://ec.europa.eu/agriculture/quality/, consulted on 12/24/2010)

right away, a slower pace distinguished the application of other Regulations, particularly 2081/1992 (Canali 2010, p.19). After the introduction of PDO/PGI schemes in 1992, the first formal registrations came only four years later, in 1996, and included high reputation historical products such as Parma Ham, Parmigiano Cheese and Grana Padano cheese, and also less famous, but economically relevant products such as Fontina cheese, Culatello di Zibello ham, Brisighella and Collina di Brindisi oils already protected under the national regulations[36].

Agenda 2000, a strategic document containing a broad reflection on the CAP overall direction and objectives, confirmed the interest for quality standards in the new perspective of "multifunctional agriculture". However a major concern was given by food safety issues (i.e. related to the then current BSE crisis) that led to the development of the HACCP (Hazard Analysis and Critical Control Points) standards, traceability and the establishment of the European Food Safety Authority (EFSA). The instruments relevant for high quality food products were not substantially modified, until the 2003 Mid Term Review (or Fischler Reform), in which specific support measures were made available to farmers willing to engage in high quality productions[37].

In 2006, the European Commission launched two new Regulations to update the definition of Traditional Specialty Guaranteed (with Reg. 509/2006 on TSG) and Indications of Origin (with Reg. 510/2006 on PDO/PGI). These new Regulations substituted the previous ones from 1992 and regulated most relevant aspects related to the definition and protection of Designations of Origin (the content of Reg. 510/2006 will be further discussed in paragraph 3.2.2., and synthesized in table 3.2). The major innovations with respect to Reg 2081/92, are given by: i) an extension of the protection to geographical indications of third countries, where these are protected in their country of origin; ii) a simplification of the bureaucratic procedures for the registration of new designations and the monitoring practices by the third party certification bodies.

[36] A total of 56 products protected under the national legislation, became PDO/PGI products after it was made sure that they complied with the rules.

[37] The financial incentives of the EU quality policy will be presented in the next paragraph.

In 2008, the EU Commission decided to launch a reflection on how to ensure the most suitable policy and regulatory framework to protect and promote quality of agricultural products, without creating additional costs or burdens. It opened a wide consultation on the adequacy of the existing instruments and possible improvements and initiatives, through the "Green Paper on agricultural product quality: product standards, farming requirements and quality schemes" (from October 2008 to December 2008). Different stakeholder categories of respondents participated: 560 contributions were received from National and Regional authorities, Third Countries, Organizations from the farming sector and processing sector, organizations from the trade sector and retail and consumers organizations answered several questions on all aspects of agricultural product quality policy. The main messages from stakeholders included strong support for the EU's main quality schemes (geographical indications and organic farming) and marketing standards, but also called for simplification and streamlining of procedures, for the increase of funding assigned to promotion campaigns, the introduction of indications on origin of raw materials and place-of-farming labeling. They also emphasized the difficulties faced by users of geographical indications when exporting their PDO/PGI products (such as the lack of protection in third countries, relations with trademarks and translation issues), the necessity for the indication of PGI/PDO ingredients used in processed products/prepared foods and the simplification and harmonization of EU systems for protection of geographical indications.

In consideration of the feedback received from the Green Paper consultation, following the high level Prague conference[38] and the various Impact Assessment reports drafted by DG Agri, the European Commission disclosed a "Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on agricultural product quality policy" (May 2009). It summarizes the strategic guidelines proposed for the revision of the European Quality Policy that will be considered by the Council and other Community Institutions. The Communication

[38] The Quality Policy Conference (12-13 March 2009) was organized by the Czech Presidency in Prague and was focused on the presentation of the conclusions from the consultation on the Green Paper.

encounters all EU quality policies: marketing standards, geographical indications, traditional specialties guaranteed, organic farming, and certification schemes and prepares the ground for a possible recast of the geographical indications legislation on the following lines:

- simplification: unification of the different schemes for wines and spirits, agricultural products and foodstuff into a single regulatory scheme is being considered (the same is true for PDO/PGI schemes), provided that the link with the area of production, the collective nature of the geographical indication, and guarantee EU recognition are preserved. Moreover efforts need to be made to streamline administrative procedures and to shorten registration periods.
- Clarification of intellectual property rights, and particularly the relation between different types of intellectual property.
- Clarification on what is meant by “generic terms” (i.e. names that have become the common name for an agricultural product or foodstuff).
- Information on the place of farming of raw materials where this is different from the place indicated by the geographical indication;
- Guidelines to be developed on using geographical indications as advertised ingredients on the labels of processed products and encouraging producer groups to include sustainability criteria in product specifications.

Following the Commission Communication on agricultural product quality policy, the Commission studied the reaction of other EU Institutions and began stakeholder's consultations. Legislative proposals and guidelines were announced as part of a “Quality package” for end 2010.

3.2.2 Economic resources destined to the EU Quality Policy

European Union Quality Policy had a limited and discontinuous relevance, as it is shown by the scarce resources devoted to its support. The absence of specific incentives to support high quality production practices, with an exception given by the Mac Sharry reform, (which, in the accompanying measures, provided explicit income support for producers who engaged in organic production practices) lasted until the Mid Term Review in 2003, when the introduction of (a

few) specific measures in the Rural Development policy context, indicate the growing awareness on the importance of differentiation strategies of agricultural products, based on qualitative characteristics and production techniques.

With Reg.1783/2003, new measures were introduced to support farmers who intended to move from conventional practices to certified quality production practices. This support consisted of an annual financing (max three thousand euro per firm) aiming at covering the fixed costs linked to the participation to quality schemes (Carbone and Sorrentino, 2005). Provision of financial support was also granted to those who carried out information and promotion projects, covering up to 70% of the total cost.

With Reg. 1698/2005 on support for rural development by the European Agricultural Fund for Rural Development, the previous measures were unified. Article 20, letter c, contains measures aimed at improving the quality of agricultural production and products by: (i) helping farmers to adapt to demanding standards based on Community legislation; (ii) supporting farmers participating in food quality schemes; (iii) supporting producer groups for information and promotion activities for products under food quality schemes. Reg. 1974/2006 lays down detailed rules for the application of Reg. 1698/2005 on support for rural development by the European Agricultural Fund for Rural Development, by regulates the three measures in favor of quality schemes:

- Measure 1.3.1.: support to allow meeting standards based on Community legislation and covering costs incurred and income foregone caused to farmers who have to apply standards in the fields of the environmental protection, public health, animal and plant health, animal welfare and occupational safety.
- Measure 1.3.2.: support for the participation of farmers in food quality schemes
- Measure 1.3.3.: support for information and promotion activities

Recently, Sotte et al. (2009) have quantified the economic support destined to the measure for food quality schemes, with reference to the rural development plan for the time frame 2007-2013, in Italy. Only about 2,4% of national resources

for rural development were destined to the three measures 1.3.1, 1.3.2 and 1.3.3, equal to 402,3 million euro.

In addition to the measures included in the rural development program, Reg.1782/2003 on support schemes for farmers (First Pillar) provides a measure directly addressing quality productions. Article 69 allows member states to destine up to 10% of resources assigned to a specific sector to promote superior quality standards in those sectors (arable crops, beef and veal and sheep and goat sectors): although this measure could have positive potential effects, wide discretion is left to Member States and the enforcement was rather limited, especially in Italy (Carbone and Sorrentino, 2005; Canali, 2010).

3.2.3 Reg. 510/2006 on PDO/PGI schemes: focus on the objectives and contents

In the recitals included before the articles of the regulation, the Commission identifies a set of objectives, thus motivating the introduction of PDO/PGI schemes (Table 3.1 summarizes the recitals and synthesizes the objectives). The objectives identified are[39]:

1. *Promoting differentiation of production.* Consumer demand is increasingly oriented towards quality and product variety. Thus promoting differentiation and quality can contribute to finding a better market equilibrium between supply and demand, helping European producers to be competitive, and to better remunerate input suppliers.
2. The promotion of products, characterized by a link with the place of origin and to specific processing techniques, preserved and renewed by means of tradition over time, will lead to: i) *the enhancement of producers' bargaining power.* Often, producers of high quality, typical products are very small and face many structural constraints that are hard to remove. Their economic size negatively affects their bargaining power and their ability to carry out market strategies targeted to communicate and promote product quality and its value. Thus, the scheme aims to give them a tool to build a collective reputation, to increase market power, and to increase the share of

[39] The objectives of the PDO/PGI schemes will be discussed in depth in chapter 5, as they will become an important element in the framework of analysis suggested for the evaluation of PDO/PGI schemes.

value added they receive. ii) *The development of rural areas:* PDO/PGIs are seen as an indirect lever to foster rural society, to preserve cultural identity, and to preserve traditions linked to typical products. iii) *Enhancement of market performance.* This refers to the market performance of typical products, their market share, their ability to enter new markets and their capacity to gain a price premium with respect to a generic product.

3. The provision of *reliable and relevant information to consumers on product origin*. Markets for differentiated products need sufficient information but this is not always at hand and not always reliable, especially for attributes like product origin, which is a credence attribute. The aim of the European regulator is to establish a uniform framework on the community level, to ensure fair competition among producers (also extended to requests that originate from third countries) and the credibility of products at the consumers' eyes.

Reg. 510/2006 regulates the most relevant aspects of the registration and following development of the protected designations of origin and geographical indications, summarized in Table 3.2. Although the regulation provides a set of clear-cut rules, Member States have the right of adapting the enforcement through ad hoc implementation rules.

The first set of articles includes the definition of the scope of the regulation, what is meant with designation of origin and geographical indication and what is excluded from the definition (ex. generic names, supposing that these are clearly identifiable).

Article 4 deals with the content of the specification, in which the reference to a geographical area of production is required: such area needs to be clearly defined but may not correspond precisely to the geographical name indicated (i.e. in this case it must include it anyway). One of the most critical aspects that shall be explicitly indicated, is given by the set of elements that justify the link between quality of the product and the geographical environment. The specification has a twofold objective: a regulatory function for the protection of producers from unfair competition but also a communication function to consumers that are

allowed to know the exact processing recipe, differently from private firms which are not required to disclose their processing techniques (Arfini *et al*, 2010).

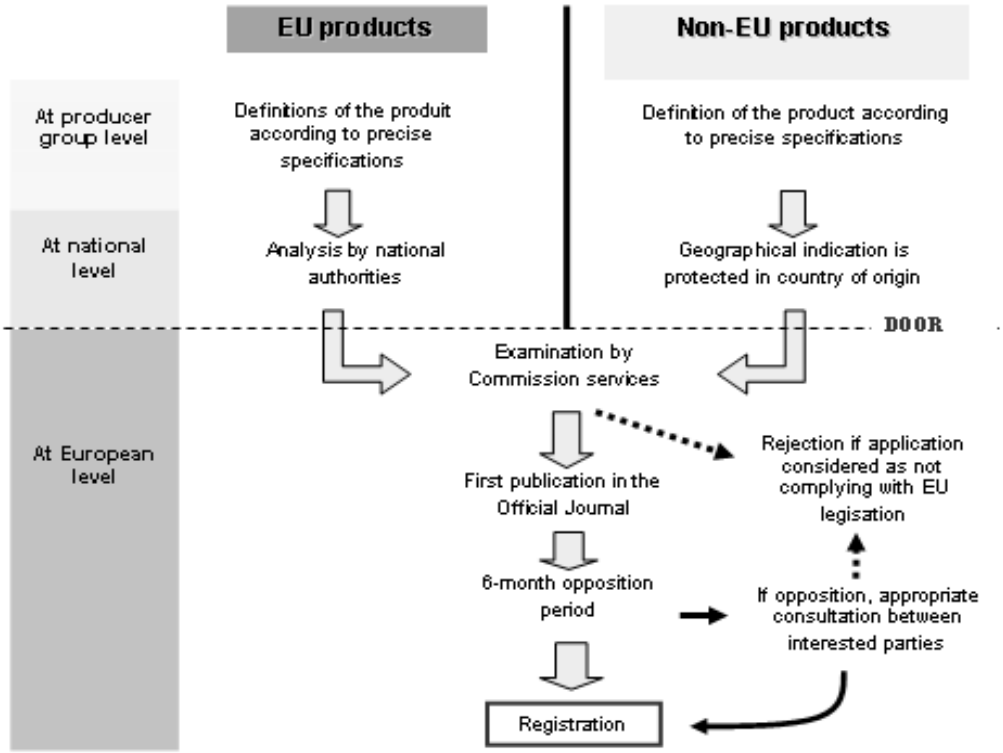
Table 3.1 – Objectives of PDO/PGI schemes as indicated by the recitals of Reg. 510/06

Reg. 510/2006 - Recitals	Key concept: the objectives
"The diversification of agricultural production should be encouraged so as to achieve a better balance between supply and demand on the markets"	Differentiation of agricultural production
"The promotion of products having certain characteristics can be of considerable benefit to the rural economy, particularly in less-favored or remote areas …by improving the incomes of farmers and by retaining the rural population in these areas."	Promotion of products to: ▪ improve market performance ▪ increase income of farmers ▪ contribute to the development of rural
"A constantly increasing number of consumers attach greater importance to the quality of foodstuffs … this generates a demand for agricultural products or foodstuffs with an identifiable geographical origin. " … the consumer should, in order to be able to make the best choices, be given clear and succinct information regarding the product origin"	Provision of clear and credible information to consumers
"Provision should be made for a Community approach to designations of origin and geographical indication …. by providing a more uniform approach, such a framework ensures fair competition between the producers of products bearing such indications and enhances the credibility of the products in the consumer's eyes."	Establishment of a community uniform framework of PDOs and PGIs
"The protection afforded by this Regulation, subject to registration, should be open to the geographical indications of third countries where these are protected in their country of origin."	… open to third countries registrations requests

Source: author's on Reg. 510/2006

Articles 5,6 and 7 deal with the procedures required for application and registration (the registration procedure is illustrated in figure 3.2). It is worth noticing that no single producer, but only producer groups are entitled to apply for the registration, whereas producer groups are meant to be "any association, irrespective of its legal form or composition of producers and processors working with the same agricultural product or foodstuff" (Art. 5). Once the documents required for the application are prepared, the registration proceeds on three levels (first regional, then national and lastly on the community level) and a time frame is given in order to allow interested parties (Member States, Third Countries or any natural or legal person having a legitimate interest) to object the proposed registration, by presenting a duly substantiated statement.

Figure 3.2 - The procedure for PDO, PGI and TSG product registration into the EU list



Source: European Commission, Agriculture and Rural Development, Quality policy PDO-PGI-TSG, available at: http://ec.europa.eu/agriculture/quality/schemes/index_en.htm, accessed 27/12/2010.

Another set of critical articles concerns the official controls: according to Reg. 510/06 a third party control body is to be made in charge of the verification of compliance with the specifications, while up to Reg. 2081/92 (in Italy) producer consortia themselves ensured the compliance with the specifications, thus working as a first-party certification system. The Italian Ministry is the national authority that plays the role of supervising and coordinating the control system: it charges the third party control bodies which can either be public authorities or approved private bodies.

Finally, article 13 defines the extent of the protection accorded by designations of origin and geographical indication against (direct or indirect) commercial use of a registered name in respect of comparable products not covered by the registration, which may exploit the reputation of the protected

name. Protection is granted against misuse, imitation or evocation, even if the true origin of the product is indicated (the same is true for translations accompanied by expressions such as “style”, “type”, “method”, “as produced in”, “imitation” or “similar”) and finally, any practice liable to mislead the consumer as to the true origin of the product (ex. misleading indications on the packaging and advertizing material).

Table 3.2 – Summary of the content of Reg. 510/2006

Reg. 510/2006 on the protection of geographical indications and designations of origin for agricultural products and foodstuffs	
Consideranda	Context and objectives of the regulation.
Art.1	**Scope:** protection of designations of origin and geographical indications for agricultural products for human consumption (except wines and spirits).
Art. 2	**Definition of PDOs and PGIs,** with exceptions for certain geographical designations (recognized as designations of origin in the country of origin before 2004) that can be treated as designations of origin where the raw materials for the products concerned come from a geographical area larger than, or different from, the processing area (with some conditions).
Art. 3	Ruling out from registration **generic names**, names conflicting with names of plant varieties or animal breeds, homonyms and trademarks.
Art. 4	**Product specification** and minimum requirements that need to be included in it: name, product characteristics, area definition, evidence of the link with territory and geographical environment, etc..
Art. 5, 6, 7	**Application for registration:** limited to groups of producers or processors entitled, contents of the application. Scrutiny procedures by Member States and national objection procedures. Transmission of files to the EU Commission. **Scrutiny by the Commission:** publication or rejection. **Objection:** within 6 months from the publication, admissible objections can be addressed and discussed. **Decision on registration** and final publication, once eventual controversies have been solved.
Art.8	Use of names, indications and symbols.
Art. 9	Conditions for approval of changes to specifications.
Art.10, 11, 12	**Official controls:** Member States shall designate the competent authority or authorities responsible for controls. **Verification of compliance with specifications:** this is to be ensured by one or more public authorities designated by the third country and/or one or more product certification bodies. **Cancellation procedures** of the registered name.
Art. 13	**Protection** against indirect commercial use of the registered name, misuse, imitation or any other false or misleading practice liable to mislead the consumer.
Art. 14	Relations between trademarks, designations of origin and geographical indications.
Art. 15, 16, 17	Committee procedure, Implementing rules, Transitional provisions.
Art. 18, 19, 20	Fees, Repeal, Entry into force

Source: author’s.

3.3 Economic features of PDOs/PGIs in Europe

3.3.1 Number of registrations: evolution, provenance and sectors

By the beginning of 2011 in Europe, a total of 970 designations, of which 504 PDOs, 466 PGIs (plus 34 TSGs) were registered. We will briefly illustrate the situation of European registrations by looking both at the number of PDO/PGI per country and product class (Table 3.3) and at the evolution of registrations per country in time (Figure 3.3 and 3.4), distinguishing between EU15 and EU27. The first feature to be noted is the disparity between South and Centre-North of Europe: the greatest number of PDOs/PGIs is concentrated in the Mediterranean countries (approximately 78% of total designations are from Italy, France, Spain, Portugal and Greece), while the remaining registrations are mainly from UK, Czech Republic Austria and Poland (the latter showing a significant increase of registrations going from 6 to 17 in just one year, as it will be further illustrated). Such disparity may be explained by the historical profile of rural economies in Mediterranean countries, characterized by strong food traditions, and small or medium businesses that fit well the designations of origin schemes.

In terms of product classes, the highest number of registrations is found in fruits, vegetables and cheeses (47% of registered products), followed by fresh meats, processed meat products and oils and fats (82% of registrations, cumulative). In Mediterranean countries, registrations are concentrated in fruits, vegetables and cereals (30% of 758 fruit and vegetables registrations in Mediterranean countries), cheeses (20%) and oils and fats (14%), the latter due to the spread of olive cultivation for extra virgin olive oils, followed by fresh meats (13%) and meat products (12%). In Northern countries, registrations are much more distributed among product classes: out of 169 registrations the highest number is found in the cheese sector (18%), mineral and spring waters, beers, fruits and vegetables (14% in each category), followed by breads and pastry and meat products (9% each).

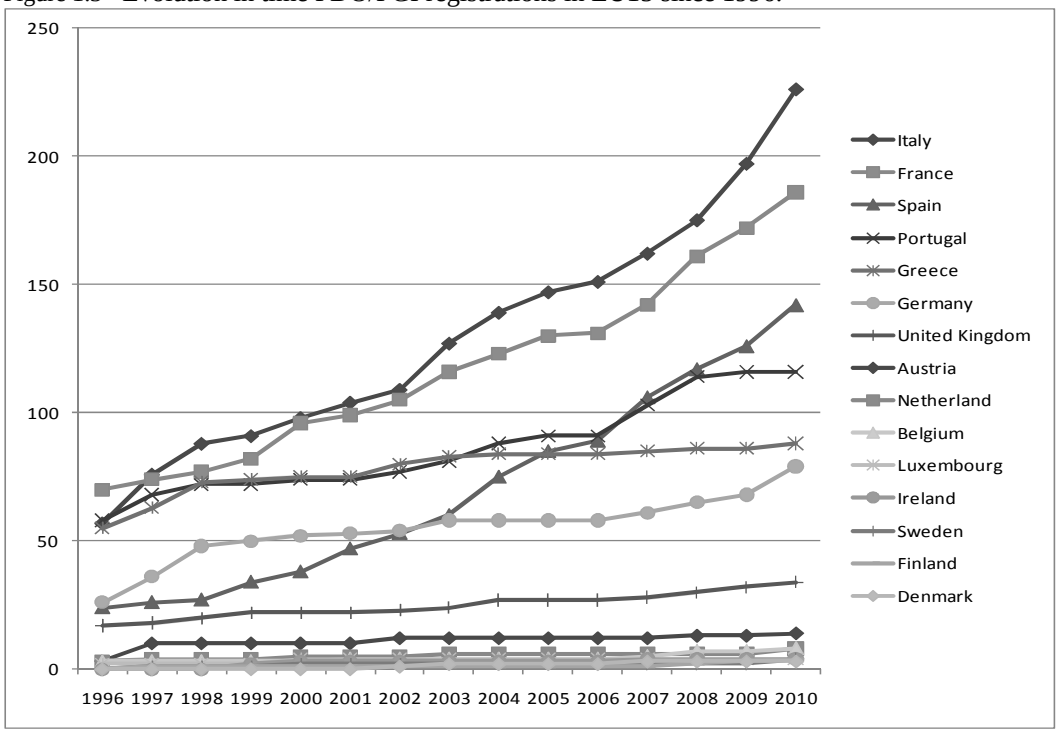
Table 3.3 – PDO and PGI registrations in EU27

EU 27	Fresh meat	Meat products	Cheeses	Other prod. of animal origin	Oils and fats	Fruits, veget. and cereals	Fish, moll. and crust.	Others *	Bread, pastry, confect.	Beers	Mineral and spring waters	Other food products	Non-food products	Total per Country
Italy	3	36	41	2	41	88	2	6	6	0	0	0	1	226
France	57	5	52	7	9	40	3	6	2	0	0	3	2	186
Spain	14	12	25	3	25	44	3	5	11	0	0	0	0	142
Portugal	27	36	12	10	6	24	0	0	1	0	0	0	0	116
Greece	0	0	20	1	27	34	1	1	1	0	0	2	1	88
Germany	3	11	6	0	1	9	3	3	6	12	24	1	0	79
United Kingdom	8	1	12	1	0	2	5	3	0	2	0	0	0	34
Czech Republic	0	0	3	0	0	2	2	3	6	9	0	0	0	25
Poland	0	1	4	3	0	6	0	0	3	0	0	0	0	17
Austria	0	2	6	0	1	4	0	1	0	0	0	0	0	14
Netherland	0	0	6	0	0	2	0	0	0	0	0	0	0	8
Belgium	0	1	1	0	1	2	0	1	1	0	0	0	1	8
Hungary	0	4	0	0	0	2	0	1	0	0	0	0	0	7
Luxembourg	1	1	0	1	1	0	0	0	0	0	0	0	0	4
Ireland	1	1	1	0	0	0	1	0	0	0	0	0	0	4
Sweden	0	0	1	0	0	1	1	0	1	0	0	0	0	4
Finland	1	1	0	0	0	1	0	0	1	0	0	0	0	4
Slovakia	0	0	3	0	0	0	0	0	1	0	0	0	0	4
Denmark	0	0	2	0	0	1	0	0	0	0	0	0	0	3
Slovenia	0	1	0	0	1	0	0	0	0	0	0	0	0	2
Cyprus	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Bulgaria	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Estonia	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Latvia	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lithuania	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malta	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Romania	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL EU 27	115	113	195	28	113	262	21	30	41	23	24	6	5	976

* (species, condiments, ciders and perries, teas…)

Source: authors' elaboration on EU Commission data (DOOR accessed 4 Dec. 2010).

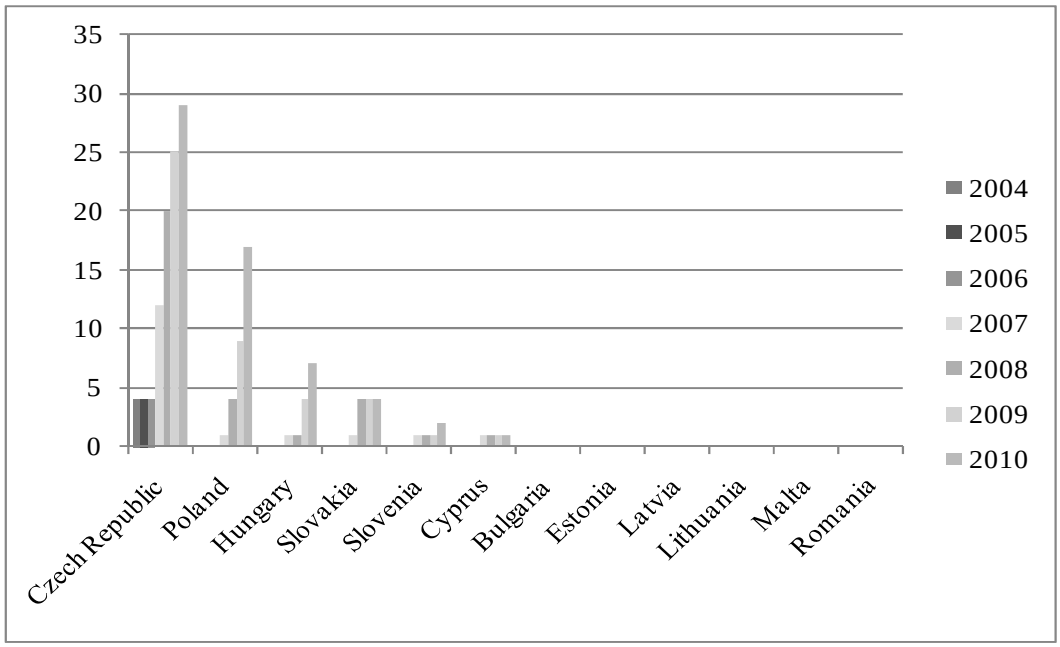
Figure 1.3 - Evolution in time PDO/PGI registrations in EU15 since 1996.



Source: authors' elaboration on EU Commission data (DOOR accessed 10/12/2010).

In terms of trend in the number of registrations, we first focus on EU15 countries who had the first PDO/PGI registrations recognized in 1996, most of which were already disciplined under the national legislations. As shown in Figure 3.3, Italy and France are by far the countries with the highest number of registrations since the beginning and kept increasing steadily up to the present year. Then we have Spain, that started off with a lower number but increased rapidly up to the same level as Portugal and, to a lower extent Greece. Germany is the northern country with the highest number of registrations (mainly concentrated in the mineral water and beer sectors), followed by UK. However there is no significant increase in time neither here, nor in the other northern EU15 countries, indicating a lower interest in the promotion of typical productions or perhaps lower perceived benefits in joining the schemes.

Figure 3.4 - Evolution in time of PDO/PGI registrations in New Entrant countries since 2004.



Source: authors' elaboration on EU Commission data (DOOR accessed 10/12/2010).

Moving to the New Entrant countries (Figure 3.4), Czech Republic is above all the others both in terms of overall number and in terms of increase since 2006 onward; Poland also seems quite interested in the EU protection for its typical productions due to the rapid increase in registrations in the fruits and vegetables and in cheese sectors since 2007. The remaining countries still have

not taken the chance to join the EU schemes, partially due to the recent accession, but this may become part of the ongoing integration process in the next future.

Finally, 111 products, of which 5 from China and 1 from Thailand, are currently being published attending for the final registration to be accomplished and 169 product registrations have been presented to the EU Commission evaluation. Third Country participation to the European PDO/PGI schemes seems increasing as several products from Thailand, Vietnam, Turkey and again, China have been presented for evaluation.

3.3.2 Economic value of PDO/PGI at the EU level

Official information on the economic value of PDO/PGI registrations is released by the European Commission's Directorate-General for Agriculture and Rural Development (http://ec.europa.eu/agriculture/quality/index_en.htm) although there is no uniform and accessible data collection system on the EU level, (beyond the information contained in the DOOR dataset on applied, published and registered designations). Data on volumes and values of PDO and PGI designations in EU27 is available for years 2006, 2007 and 2008: it shows that PDO/PGI total value corresponding to almost 800 registered products is approximately 14.5 billion euro (in 2008), with a constant increase with respect to the previous years (2,5% on average from one year to the other).

Table 3.4 - Volume (t) and value (k€) of products according to designation type in the UE 27

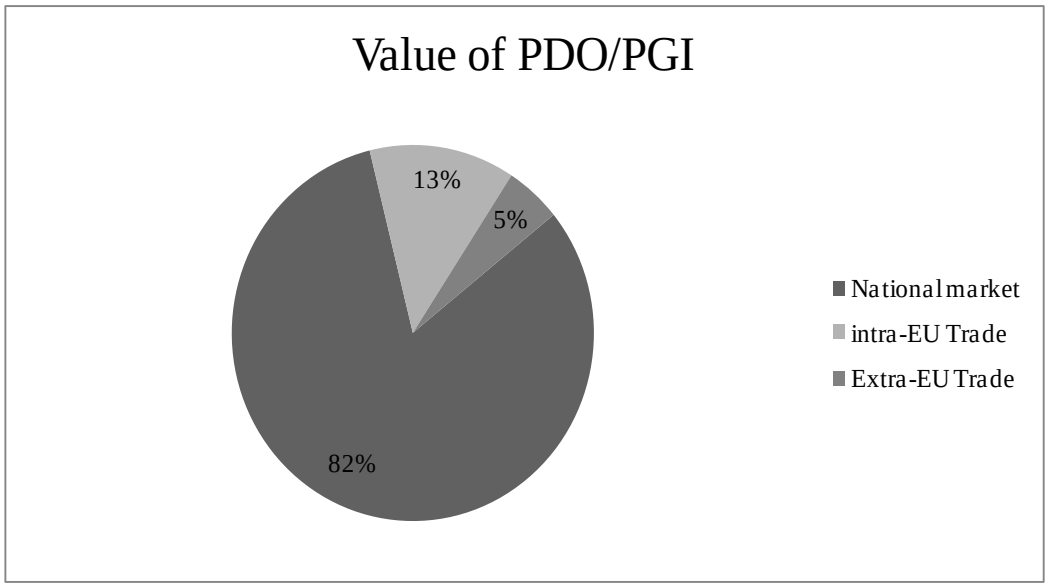
Type of scheme	Number in 2008	2006		2007		2008	
		Volume (t.)	Value (k€)	Volume (t.)	Value (k€)	Volume (t.)	Value (k€)
PDO	434	1.956.052	7.340.621	2.054.991	7.636.004	1.978.406	7.806.906
PGI	330	3.694.354	6.468.959	3.689.532	6.560.803	3.695.211	6.711.773
Total	764	5.650.406	13.809.580	5.744.523	14.196.807	5.673.617	14.518.679

Source: European Commission's Directorate-General for Agriculture and Rural Development (2010).

PDO products represent the highest share of this value in comparison to PGI products (54% of total value), although the relationship is inversed when it comes to quantities: 65% of total volume is given by PGI products. It is estimated that 82% of total value of PDO PGI comes from the national market, 13% derives

from intra EU trade, while remaining 5% from extra EU trade, as it is shown in the following graph.

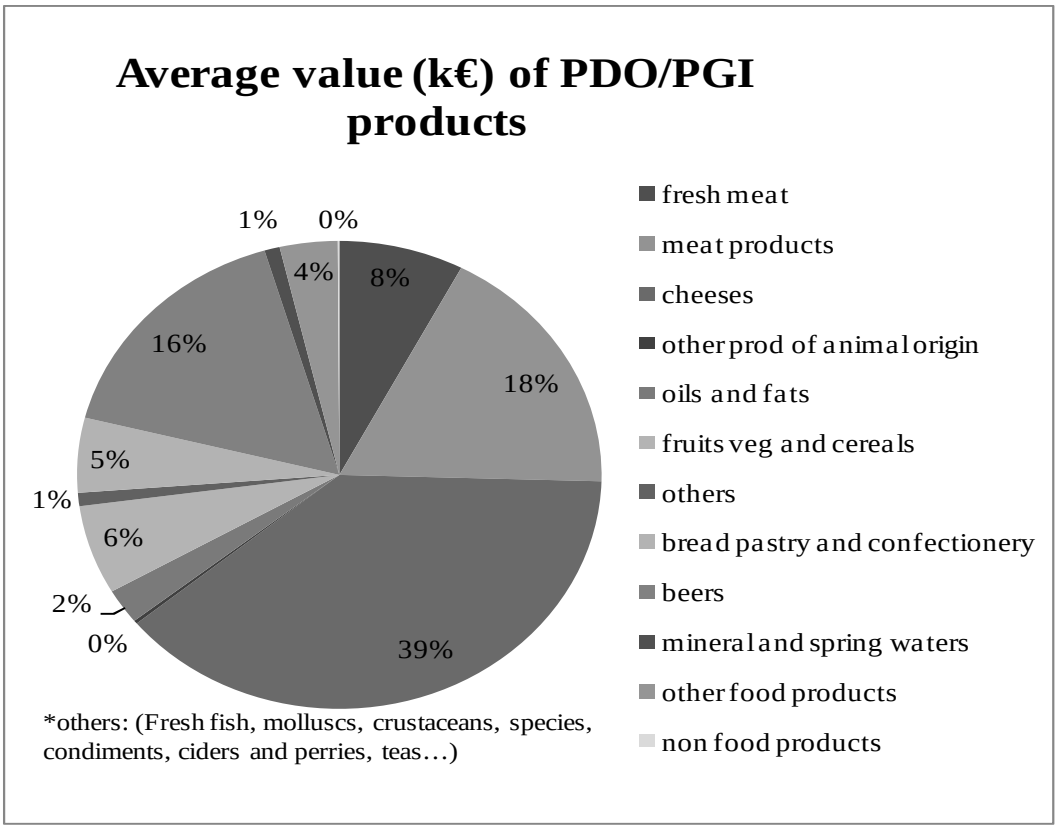
Figure 3.5 – Total value of PDO/PGI on national market, intra and extra EU trade



Source: European Commission's Directorate-General for Agriculture and Rural Development (2010).

As indicated in the Figure 3.6, cheeses account for almost 40% of total PDO/PGI turnover: 8% of the cheese produced in the EU (EU Commission) is protected. Names entered in the register include Grana Padano, Comté, Queso Manchego and Feta. Almost 5% of the beer consumed in Europe is PGI beer (Münchener Bier, Českobudějovické Pivo, etc.). The main meat products are dry, salted products such as Prosciutto di S. Daniele and Schwarzwälder Schinken. Fresh meats are in fourth position: the most important products (in terms of turnover) are Scotch Beef, Welsh Lamb, Ternera de Galicia and some types of French poultry. For fruit and vegetables, the protected products consist in local specialties, linked to the production area by natural factors and with a long lasting tradition. However, they show a low unit value. Most of the bakery products and confectionery entered in the register are PGI, mainly German cakes and pastries. Registered fish products have a unit value that varies considerably (the best known is Scottish Farmed Salmon).

Figure 3.6 – Average value (k€) of PDO/PGI products by type of product (2007-2008).

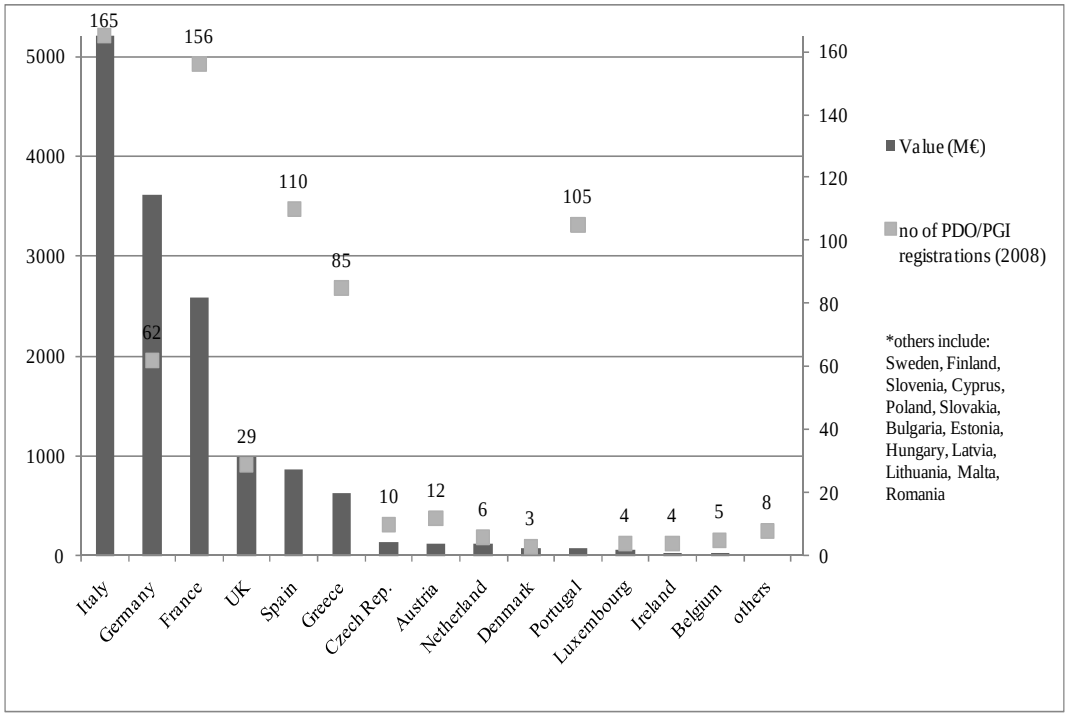


Source: authors' elaboration on European Commission's Directorate-General for Agriculture and Rural Development (2010).

Figure 3.7 shows the turnover value of PDO/PGI products (main axis) and number of registrations (secondary axis) by Member State in 2008. The main countries in terms of value of PDO/PGI production are Italy (36% of the total), Germany (25%), France (18%) and the United Kingdom (7%). Next comes Spain with 859 million Euros (6%), Greece with 622 million Euros (4%) and Czech Republic with 132 million Euros (1%). However, it is worth to underline that the number of names single Member Countries have registered does not show a correlation with turnover. Portugal, for example, has many names in the register, mainly fruit and vegetables, but the corresponding turnover is very low. Surprisingly, France has the second highest number of registrations but is third after Germany in terms of economic value: we notice that France's PDO/PGIs are mainly concentrated in the cheese sector (both in terms of number of registrations and value) while Germany's are highly concentrated in the beer sector, which probably has higher values per unit of product. The United Kingdom, on the other

hand, has a very high turnover of PDO/PGI products, because of its fish. Most of the protected products from countries that joined the European Union in 2004 or later were registered later and figures therefore include only a small part of the turnover for these products. In 2008, however, 8 geographical indications had been registered for these countries.

Figure 3.7 - Value of PDO/PGI products (main axis) and number of registrations (secondary axis) by Member State (2008)



Source: authors' elaboration on European Commission's Directorate-General for Agriculture and Rural Development (2010).

3.4 Overview of PDOs/PGIs in Italy

3.4.1 Data sources

This paragraph describes the evolution, the economic role and the characteristics of PDOs and PGIs in Italy, in the light of the production features and the marketing strategies adopted. This overview is based on recent data available from the following different Italian statistical sources, which were screened and integrated.

The Italian Central Statistics Institute (ISTAT) makes available the main findings of a survey on PDOs, PGIs and TSG from 2004 to 2009. The survey covers all persons, producers (farmers) and processors, authorized by the European Union to carry out the production and/or processing of agricultural commodities in high quality food products. The survey and census is carried out in collaboration with the Ministry of Agriculture, Food and Forestry (MiPAAF) from administrative records of the inspection bodies of each product.

A similar service is provided by the Institute of Services for agricultural and food markets (ISMEA), which is a public body established with the aim to provide information services, insurance and financial services to agricultural enterprises and their associated forms, in order to encourage information and transparency markets, facilitate the relationship with the banking and insurance, promote business competitiveness and reducing the risks inherent in operating production and market. Through the Observatory on PDO and PGI products, on behalf of the Ministry of Agriculture and Forestry (MiPAAF), it carries out the monitoring of certified products related to industry designations and geographical indications, through the collection of data from certification bodies. These have been supplemented by data from Consortia, the ISMEA Observatory on prices for agricultural products and the ISMEA Observatory food consumption, to provide the basis for calculations and estimates of the economic value of the fund of PDO and PGI. In addition to publicly available information, we directly contacted ISMEA and, thanks to their helpfulness, obtained a complete dataset on volumes, values, exports, market segments, distribution channel for years 2000 to 2008.

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In addition to the previous data source, we turned to the Qualivita Foundation, a nonprofit entity that "aims to facilitate the development of scientific research and technical progress of certified products, thus becoming an instrument to defend and promote the rural culture, particularly that related to the production of quality food and wine" (Qualivita website). We have drawn from the 2009 and 2010 "Socio- Economic Report" which contain the analysis of the agricultural food production DOP/IGP/STG. In addition to containing information sheets on individual products, the report presents a framework for analysis of aggregate and individual sectors.

Moreover we integrated with other secondary data on the Italian agricultural and food market, by drawing from the last Italian Census on Agriculture (provided by ISTAT), Federalimenatare, the National Institute of Agricultural Economics (INEA) and Eurostat.

Finally we supplemented secondary data with data obtained from direct interviews with several representatives involved in PDO/PGI schemes in different ways: PDO/PGI producers, consortia, consumer associations, institutions, certification bodies and experts of quality products.

3.4.2 Development and spread of PDOs/PGIs

The Italian agri-food system has the highest number of food products with PDO/PGI/STG recognitions, with 223[40] out of the 1004 across all food sectors in the European Union at the beginning of 2011.

Just over the last year, 25 products were added to the 194 Italian products are already registered. Out of those 25, 19 fruits and vegetables, 2 extra virgin olive oils, and 4 cheeses were recorded. In addition 6 products requested the registrations, while 18 have been published and waiting for the registration. Registered names in terms of product category are summarized in Annex 1. The registered denominations show a great heterogeneity in relation to the different degree of link with the territory (ex. area of production falling within the same region or among different regions), level of reputation, economic and productive

[40] Out of these, Mozzarella and Pizza Napoletana are the only Italian products to have obtained the qualification of Traditional Specialty Guaranteed under EEC Regulation 2082/92.

dimension, reasons that led to the establishment of the registration and type of governance. Regional distribution of denominations (Table 3.5) is a good indicator of the vocation of different territories in terms of food culture: the Regions with the highest number of denominations are Emilia Romagna, Veneto and Lombardia, while about 45% of Italian denominations are concentrated in five regions (Emilia Romagna, Veneto, Lombardia, Toscana and Piemonte). Regional distributions is also related to specialization with respect to production sectors: PDO cheeses are mostly present in the North, together with PDO/PGI processed meats, while olive oils are mostly present in southern regions. On the opposite, fruits and vegetables (which are mainly PGIs) are well dispersed throughout the country, depending of the pedo-climatic conditions.

Table 3.5 – Total number of designations per Region

	Absolute values			Relative values		
Region	PDO	PGI	TOT.	PDO	PGI	TOT.
Emilia Romagna	14	10	24	10%	14%	11%
Veneto	13	10	23	9%	14%	11%
Lombardia	13	6	19	9%	8%	9%
Toscana	9	8	17	6%	11%	8%
Piemonte	12	4	16	8%	5%	7%
Sicilia	10	6	16	7%	8%	7%
Campania	8	7	15	5%	10%	7%
Puglia	10	3	13	7%	4%	6%
Lazio	8	4	12	5%	5%	5%
Calabria	9	2	11	6%	3%	5%
Marche	5	2	7	3%	3%	3%
Prov. autonoma di Trento	6	1	7	4%	1%	3%
Abruzzo	5	1	6	3%	1%	3%
Basilicata	2	3	5	1%	4%	2%
Sardegna	4	1	5	3%	1%	2%
Umbria	3	2	5	2%	3%	2%
Friuli Venezia Giulia	4	0	4	3%	0%	2%
Molise	4	0	4	3%	0%	2%
Valle d'Aosta	4	0	4	3%	0%	2%
Liguria	2	1	3	1%	1%	1%
Prov. autonoma di Bolzano	1	2	3	1%	3%	1%
Total	146	73	219	100%	100%	100%

Source: Arfini, Belletti, Marescotti on Qualivita data (2010).-

3.4.2 Economic results of PDO/PGI

This paragraph aim at giving an overall picture of the consistency and economic relevance of Italian PDO/PGI productions, based on the most recent data available from ISMEA and Qualivita. We will present the main results in terms of trend of certified volumes, values at the producer and consumer level, marketing strategies and distribution channel used, exports and domestic consumption.

In terms of certified production, after a steady increase occurred between 2004 and 2007, total certified PDO/PGI production has fallen in 2008 and 2009. The decline in 2009 occurred in the fruit and vegetables sector (-20% approximately), mainly because of the climate change issue (hail) and, to some extent business decisions, which concerned Mela Val di Non and Alto Adige (ISMEA, 2010). Also the decrease of certified volumes (during 2008) of orange Red Sicily, due to climate issues as well, has contributed to the decline.

Table 3.6 – Evolution in number of recognitions and certified production (no., ton, 000 liters)

	2004	2005	2006	20007	2008	2009
Cheeses						
No.	31	32	32	34	35	36
Certified production	415,709	424,798	456,820	449,857	469,986	462,422
Fruits and vegetables						
No.	42	47	49	55	58	70
Certified production	134,442	231,554	399,644	538,688	432,562	347,162
Processed meats						
No.	28	28	28	29	29	31
Certified production	180,848	194,089	188,145	191,677	195,652	196,327
Vinegars						
No.	2	2	2	2	2	3
Certified production	10	13	13	15	11	12,487
Olive Oils						
No.	35	37	37	38	38	38
Certified production	5,040	7,080	7,782	7,166	8,509	10,356
Fresh meats						
No.	2	2	2	2	2	3
Certified production	5,417	6,001	6,708	7,126	7,575	6,873

Source: Ismea, data based on control bodies, and European Commission

A significant drop in the amount certified (-1.6%) was also recorded in the cheese sector, while meat products are more stable. Other sectors have experienced a

significant growth, as that of extra virgin olive oils (+21.7%) and balsamic vinegar (due to the new entrance on the market of Aceto Balsamico di Modena).

In terms of value creation, the economic importance of PDO/PGI products across sectors in Italy is extremely concentrated: 94% of total turnover (estimated at the producer price) is generated by the first 20 PDO/PGI products, mostly located in the north of Italy. Of these, the first 4 (represented by the two grains Parmigiano Reggiano and Grana Padano and two best-known Italian ham, Parma and San Daniele) account for a share of 68%. Consequently 173 denominations together represent only 6% of the total turnover, located in other Italian geographical areas. These show a limited production potential, in most cases characterized by a restricted supply and lack of organizational strategies and management. Consequently, the highest share of the total value of quality products is limited to cheeses and processed meats, whose impact on the total is between 56 and 64 percent, for the cheeses, and between 34 and 42 per cent for processed meats, respectively in production value or consumption value. On the contrary, extra virgin olive oils and fruits and vegetables together have a weight that hardly exceeds 6%.

The following tables report the estimations of potential turnover at production and consumption prices, between 2004 and 2009.

Ismea estimates a potential turnover of 5.35 billion euro for PDO/PGI production and a consumption value of about 9.42 billion, of which 80% resulting on the domestic market (2009). In relation to production turnover, the rise of more than 3% in 2009, confirmed the trend of almost uninterrupted growth recorded in the earlier period, while consumption turnover is declining by 2.5% after a constant rise between 2004 and 2008. The increase in farm gate sales was driven by an increase in prices at the origin both in Italy and, especially abroad, which more than offset the decline in volumes on the market. The decline in sales for consumption on the domestic market depends instead on the lower volumes certified for the domestic market, which have not been offset by an increase in consumer prices.

Table 3.7 – Evolution of production turnover (million euro)

	2004	2005	2006	2007	2008	2009
Cheeses	2,819.80	2,847.90	2,843.00	2,963.20	3,127.70	3,088.90
Meat Products	1,565.90	1,606.40	1,534.10	1,588.80	1,671.80	1,873.40
Fruits and Vegetables	109.9	184.6	237.4	341.8	269.8	225.2
Fresh meat	49.8	60.9	64.7	60.3	60	84.1
Vinegar	29.8	29	36.5	37.1	40.5	39.9
Olive Oil	3.5	5.3	6.2	7.2	8.5	33.2
Total	4,578.70	4,734.10	4,721.90	4,998.40	5,178.30	5,344.70

Source: Ismea, data based on control bodies, and Consortia Network

Table 3.8 – Evolution of consumer turnover (million euro)

	2004	2005	2006	2007	2008	2009
Cheeses	3,403.60	3,423.10	3,491.90	3,530.60	3,863.30	3,710.60
Meat Products	2,728.30	2,952.70	2,851.40	3,000.80	3,247.30	3,236.30
Fruits and Vegetables	157.1	261	422.4	647.8	407.3	323.9
Fresh meat	78.9	109.5	105.4	112.3	131.5	124.6
Vinegar	7.4	10.3	11	12.1	5.2	67.3
Olive Oil	44.8	63	57.4	53	72.4	68.8
Total	6,420.10	6,819.60	6,939.50	7,356.60	7,727.00	7,531.50

Source: Ismea, data based on control bodies, and Consortia Network

In the main sectors, the dynamics seem to be quite differentiated. The cheese market shows a decrease in both the potential production turnover and consumer prices, showing a substantial stability at the origin market and a decrease in retail prices. Meat products show stable volumes with an increase of 12% of production value and a stable consumption turnover. For fruit and vegetables, there are declines of -17% at the production level and over -20% at the consumption level between 2008 and 2009. Extra virgin olive oils, show a strong increase in sales thanks to the contribution of exports, opposed to a decline in sales on the national market. Finally, as regards fresh meat, a limited decrease in the firm’s turnover and a higher decrease of the consumer turnover is recorded.

Another important aspect for understanding the characteristics of the PDO/PGI production is the market channel mix adopted for distribution. The next table indicates the percentage of volumes sold per distribution channel. In terms of sales channel per production sector, the business strategies used depend on the territorial context, the product's reputation, the level of knowledge among consumers and the economic size of the denomination. There is a clear diversification: while PDOs are sold mainly through direct sales and traditional

sales (25% and 24%), PGIs make a significantly lower use of these two channels (16% and 18%), in favor of the modern distribution channel .

Table 3.9 – Percentage of certified volumes per market channel (2009)

	Sales channel				Market		Export	
	Direct sale	Traditional sale	Modern distribution	Restaurants	National	Foreign	EU	extra-EU
PDO	25	24	40	12	83	17	51	49
Vinegar	34	36	6	25	54	46	45	55
Other animal origin products	5	5	90		100	0	0	0
Processed meats	7	30	53	10	89	11	62	38
Cheeses	22	28	43	8	86	14	53	47
Olive oil	42	14	27	17	78	22	52	48
Fruits and vegetables	24	20	48	8	81	20	71	29
Bakery products	10	11	73	6	95	5	100	0
Spices	13	59	10	19	93	8	40	60
PGI	16	18	55	11	91	9	35	65
Meats	0	14	60	27	100	0	0	0
Processed meats	16	16	54	15	88	12	51	49
Olive oil	10	5	80	5	40	60	28	72
Fruits and vegetables	17	20	54	10	93	7	33	67

Source: Arfini, Belletti and Marescotti on Qualivita data.

In terms of exports, the volume of the exported PDO is equal to 16%, while PGI is 9%. PDO exports are destined mostly to the European market (51%) while PGI exports to the extra- EU market (over 60%). Exports (see Table 3.10) have always grown in the years 2004-2009, with the exception of sale volumes, decreased in the last year. The export turnover in 2009 amounts to 1.3 billion euro. For what concerns the various sectors, they have often registered a growth in terms of value: there is a significant increase in sales of PDO cheese, meat products (+21.6%), vegetables (+18.3%) and olive oil (+96.1%).

Table 3.10 –Trends in export (quantities and values) of Italian PDO and PGI products

(ton)	2004	2005	2006	2007	2008	2009
Cheeses	85,278	85,194	101,180	102,578	106,947	106,955
Fruits and Vegetables	28,728	46,064	111,990	121,343	130,345	104,305
Meat products	26,108	29,264	28,538	30,693	29,784	31,316
Vinegar	6	8	6	6	5	9,987
Olive Oil	1,534	2,850	3,052	2,856	3,261	5,408
Total	141,654	163,380	244,766	257,476	270,342	257,971

(million euro)	2004	2005	2006	2007	2008	2009
Cheeses	567.0	569.8	596.3	678.4	746.9	832.4
Meat Products	248.9	266.4	281.4	299.8	290.2	352.8
Fruits and Vegetables	16.1	27.8	25.0	37.9	48.7	57.6
Olive Oil	17.0	15.0	30.5	29.3	26.3	51.6
Vinegar	n.a.	n.a.	0.8	1.2	6.1	3
Total	849	879	934.10	1,046.6	1,118.2	1,297.5

Source: Ismea based on Consortia data.

Finally, a look to the consumption of PDO/PGI products on the national market.

Table 3.11 – Trend of PDO/PGI purchases on the domestic market (000 euro)

	2006	2007	2008	2009	Var. '09/'08	Var I sem 2010/I sem 2009
PDO/PGI total	2,390,883	2,411,966	2,459,458	2,428,032	-1.30%	0.10%
of which:						
cheeses	1,734,909	1,758,633	1,824,795	1,808,037	-0.90%	2.30%
processed meats	451,006	455,814	440,853	445,624	1.10%	-6.40%
fruits and vegetables	185,496	178,378	173,158	158,395	-8.50%	-4.30%
olive oils	19,472	19,140	20,652	15,976	-22.60%	-17.90%

Source: ISMEA

Table 3.12 - Trend of PDO/PGI purchases on the domestic market (ton and 000liters)

	2006	2007	2008	2009	Var, '09/'08	Var I sem 2010/I sem 2009
PDO/PGI total	347,755	329,340	314,500	314,199	-0.10%	1.70%
of which:						
cheeses	176,888	174,502	173,483	174,999	0.90%	0.80%
processed meats	22,458	22,280	21,023	21,620	2.80%	-3.90%
fruits and vegetables	146,302	130,544	117,659	115,703	-1.70%	3.70%
olive oils	2,107	2,014	2,335	1,877	-19.60%	-19.70%

Source: ISMEA

In terms of domestic demand, the data from the Ismea on PDO and PGI show that the economic crisis is negatively affecting Italian consumers purchase of PDO/PGIs, contrary to exports that helps to sustain the sector. The evolution of domestic consumption of PDO and PGI shows a decrease in terms of volume (Table 3.12) purchased since 2007, confirmed in subsequent years. Average retail prices has kept the growth of the sector in value. However, negative data is also present in terms of value (Table 3.11) and, there is evidence of stagnating total purchases (0.10% in 2010). Analyzing the evolution of consumption of PDO and PGI in the domestic market, we notice that, in terms of quantities purchased, the

downturn began in 2007, while in value the decline began only in 2009 and the first half of the year due to higher average retail prices.

4. A comparative assessment of the Performance of PDOs/PGIs: A Multi Criteria Analysis

4.1 Introduction: why do we need a Multi Criteria Analysis?

Most human problems have a multidimensional nature, in the sense that many aspects are relevant to understand/resolve the problem. Hence, multiple criteria have to be taken into account in order to make decisions. None of the options available can optimize all the criteria at the same time and a compromise solution must be selected: this implies that the identification of the absolute best solution should not be an expected outcome of a multi criteria analysis. The solution of a multicriteria problem depends on two elements: the basic data available and the characteristics of the decision maker himself (i.e. his preferences on the dimensions and criteria involved in the problem).

When faced with a large and complex problem, there may be too much information to handle simultaneously so "the decision maker is forced to use simplified mental strategies in order to arrive at a choice" (Goodwin and Wright, 2004, p. 27). Multi-Criteria techniques have been developed in the field of decision theory to aid problem-solving and are applicable to cases where multiple objectives and criteria enter the evaluation of an alternative among different options. Multi-Criteria analysis can be used for both ex-ante analysis of proposed actions and ex-post retrospective analysis on how decisions have worked out in practice. In the evaluation field, Multi-Criteria analysis is usually an ex ante evaluation tool, for the examination of alternative projects or strategic solutions (OECD, 2008). In ex post evaluations Multi-Criteria analysis can contribute to the assessment of a program or a policy through the appraisal of its impacts with regards to several criteria.

Multicriteria analysis includes several formal techniques to help decision making and assessment. Formal evaluation models are a set of explicit and well-defined rules to collect, assess and process information in order to be able to make recommendations in decision and/or evaluation processes (Bouyssou et al., 2000). The different methods that have been developed, from 1960 onward, allow to

make comparative assessments of alternative projects or measures, taking into account several criteria simultaneously. The methods are designed to evaluate the different options, explicitly considering, into a prospective or a retrospective framework, the opinions of the actors involved. The results are usually directed at providing operational advice or recommendations for decision making and policy.

Here, Multi Criteria Analysis enables to carry out a cross comparison among PDO/PGI products for the assessment of the performance of PDO/PGI schemes, from an ex post perspective. Its use can be justified for the following reasons:

i) PDO/PGI schemes have different aims, therefore can be considered and evaluated for different characteristics;

ii) PDO/PGI schemes' development and functioning entail different subjects, therefore can be valued according to the different perspectives and priorities of the actors involved.

As it will be shown in the following, all evaluation models suffer limitations and may perform poorly according to the different context in which they are applied. However decision and evaluation models are still useful in many respects because they: i) imply a substantial effort to explicitly structure a problem, therefore ii) provide a transparent representation of the issue at hand, offering a common ground for discussion between the stakeholders and ii) allow to compare several options, handling different – and contrasting – dimensions of the problem.

For these reasons, we think that a "well aware" use of a Multi Criteria technique can be useful for the assessment of the performance of PDO and PGI schemes. Eventually, this will allow to gain insights on the cases of success (i.e. the *best practices*) and the conditions of the most effective realizations of the schemes, providing a support to the policy maker for the future revision of the policy.

4.2 What is a Multi Criteria Analysis

4.2.1 Analogy between voting systems and multiple criteria decision methods

There is an interesting analogy between voting – the process by which the voters express their preferences about a set of candidates - and multiple criteria decision analysis - in which a *decision maker* wants to choose an alternative based on different and possibly conflicting viewpoints (i.e. criteria). *Voters* can be viewed as criteria and *candidates* as alternatives (Arrow and Raynaud, 1986; Bouyssou, 2000). Since the seminal works by Borda (1781), Condorcet (1785) and Arrow (1963), an important stream of research on collective preferences and social choice theory has followed throughout the 20th century and the comparison with multiple criteria preferences, in multiple criteria decision analysis, can lead to interesting results.

Election by ranking, as opposed to uninominal election, is the kind of election in which each voter provides a ranking without ties of the candidates in order to extract from all the rankings (as many as the voters are) the best candidate or a ranking of the candidates reflecting the preferences of the voters as closely as possible. During the 18th century in France, Borda (1781) and Condorcet (1785) proposed two main aggregation methods.

The Borda method is based on each voter's ranking among the candidates (1 for the first, 2 for the second, 3 for the third…). The Borda score for each candidate results from the sum for all voters of the candidate's rank: the candidate(s) with the lowest Borda score is(are) the best[41]. This method not only allows to choose the best one out of all the candidates, but also to rank them based according to the Borda scores.

The Condorcet method suggests to compare all candidates *pair wise*: a candidate *a* is preferred to candidate *b* if and only if the number of voters ranking *a* before *b* is larger than the number of voters ranking *b* before *a*. In case of a tie the candidates are indifferent. A Condorcet winner is a candidate that, opposed to each of the *n-1* other candidates, wins by a majority.

[41] It is possible to have several best candidates. In this case, these are considered equivalent, but the likelihood of indifferences decreases as the number of candidates or voters increases.

Both methods suffer different shortcomings. Although the majority principle underlying the Condorcet method seems appealing as it refers to the concept of democracy, it may happen that the Condorcet winner is also considered the worst by a great share of the voters (see pp. 14, Bouyssou et al, 2000) or that *Condorcet paradoxes*[42] verify when alternatives are compared not simultaneously but sequentially, thus reducing the effectiveness of the rule (Goodwin and Wright, 2004, p. 316).

The Borda rule for its part does not satisfy the *independence of irrelevant alternatives,* which implies that the relative position of two candidates in the overall ranking depends only on their relative positions in the individual's preferences, therefore other alternatives are irrelevant with respect to that pair (Bouyssou et al 2000, p. 17). While Condorcet winner doesn't not depend upon the presence of other candidates, the Borda winner does. In fact it may happen that the preference between candidate *a* and *b*, in presence of candidate *c*, is reversed if such candidate is removed and/or a new candidate *d* is introduced.

An important question to address is whether the Borda and Condorcet rules lead to different solutions. Fishburn (1973) proves that there are profiles where the Condorcet winner exists and is never selected by any scoring method. The two approaches are deeply different in nature and disagreement verifies frequently.

As proven by Arrow's with his *Impossibility Theorem* (Arrow, 1963) no aggregation procedure can satisfy simultaneously a certain set of desirable properties[43], implying that no voting method is ideal (OECD, 2008). Efforts should be spent in the search for a "reasonable" ranking procedure, for which no essential property with respect to the issue at hand, is lost.

[42] The Condorcet paradox verifies when the Condorcet method fails to elect a candidate. Considering three candidates, if *a* is preferred to *b*, *b* is preferred to *c* and *c* is preferred to *a*, it implies that preferences are not transitive and no candidate is preferred to all others (Goodwin and Wright, 2004).

[43] Arrow's theorem states that when the number of candidates is at least three, there exists no aggregation method satisfying simultaneously the properties of *universal domain*, *transitivity*, *unanimity*, *independence* and *non dictatorship* (Bosi, 2006).

4.3 Overview of Multi Criteria Analysis methods

Multi Criteria evaluation methods can be organized depending on whether they lead to a uni-dimensional synthesis (e.g. a value function which aggregates all the criteria in a single function in order to obtain a mono-criterion problem for which an optimal solution exists) or methods with the aim of producing conclusions adapted to the preferences and priorities of several different partners or stakeholders.

4.3.1 The weighted sum

When facing a multi-dimensional evaluation of alternatives, the most common reaction would be to build a synthetic one-dimensional indicator. The Borda method mentioned previously can be seen as a method of construction of a synthetic evaluation of the alternatives in multiple criteria decision analysis, the points of view corresponding to the voters and the alternatives to the candidates: all criteria-voters have equal weight and coding by the rank number of the position of the candidate in a voter's preference may be considered as a particular case of weighted sum (Bouyssou et al, 2000).

Having a set of alternatives $a \in A$ evaluated on n different criteria by a vector $g(a) = (g_1(a), g_2(a), \dots, g_n(a))$, we consider the value $f(a)$ obtained by linearly combining the components of g such as

$$f(a) = k_1 g_1(a) + k_2 g_2(a) + \cdots + k_n g_n(a) \tag{4.1}$$

When all criteria are to be maximized, the larger the value $g_i(a)$ the better the alternative a on criterion i. On the contrary, if $g_i(a)$ were to be minimized, we would substitute $g_i(a)$ with $-g_i(a)$ (or use negative weights k_i). The best alternative will be the one associates with the largest values of f.

However simple this procedure may be, it relies on very strong assumptions and presents some difficulties for a proper use, which we briefly recall:

- *Cardinal character of evaluations on all scales:* even when evaluations result from the re-coding of ordinal data, they are treated as numbers.

- *Scaling and weights*: weights represent *trade-offs* (i.e. an advantage of k_j units for criterion i is needed to compensate for a disadvantage of k_i units for criterion j) therefore they depend on the determination of the unit on each scale (how many units on the scale of i are needed to compensate one unit of j). This explains the need to normalize the evaluations (i.e. transform values to make them independent of the choice of the unit) and there are several ways to do so.
- *Linear preferences:* decision maker should be aware that equal differences in values on a criterion result in equal differences in the overall evaluation function f, with no relation to the position of the interval of values corresponding to that difference on the scale (i.e. same degree of preference, difference on the values being equal, not depending on the position of the interval).
- *Independence with respect to preferences.* Evaluations of the options on the basis of different criteria can be positively or negatively correlated in a statistical sense and this does not represent a limitation to the use of weighted sum, which means that it can be used in presence of strongly correlated attributes (Bouyssou et al, p. 106). However criteria should be independent with respect to preferences: if two options with the same profile on a subset of criteria compare in a certain way in the overall judgement, their relative position should not be altered when the profile they share on the subset of criteria is substituted by any other common profile.

Finally two aspects - related to data collection phase - condition the validity of the analysis: *imprecision/incompleteness* in the measurements of quantitative variables and *arbitrariness* in the coding of qualitative data. Both these sources of imprecision have an impact on the determination of the value of f, therefore a sensitivity analysis is required for the validation of the model, by varying the parameters one at the time.

There are two main approaches to solve the difficulties raised by the weighted sum:

i. thoroughly work on precision of evaluations, linearity and trade-offs: this is at the core of approaches focused on the development of *multi-attribute values* or *utility functions*.

ii. consider the imprecision in values and in preference elicitation from the start, by avoiding to exploit measurements as if they were completely reliable and use classes of values and ordered categories: this leads to *outranking approaches.*

4.3.2 Multi-attribute utility models

These Anglo-Saxon models, are based on the idea that the decision-maker behavior is intended to maximize his *utility* function. When a utility function is built, the multicriteria problem is reduced to a single criterion problem for which an optimal solution exists. The underlying assumption is that all alternatives may be evaluated on a single "super scale" reflecting the preferences of the decision-maker. In other words the decision maker attempts unconsciously to maximize his utility function aggregating all the different points of view which are taken into account (Vincke, 1992, pp. 39). Although we will limit ourselves to a brief outline relative to the certainty case, probabilities may be used in order to represent some lack of precision and take into account the uncertainty and risk which appears in the decision problem (Keeney and Raiffa, 1976).

Two types of issues have to be taken into account in the frame of this theory:

i) the properties that the decision maker's preferences must fulfill in order to be able to represent them by a function U with a given analytical form (additive, multiplicative, mixed, etc …);

ii) how to fix the parameters for a give analytical form to be estimated.

If we denote by $\succsim$ the preference relation of the decision maker on a set of alternatives,

$$a \succsim b \; iff \; u(a) \geq u(b) \tag{4.2}$$

The value of $u(a)$ is a function of the evaluations $\{g_1(a), i = 1, \ldots, n\}$. It is straightforward that if this function is a linear combination of $g_1(a), i = 1, \ldots, n$ we get back to the weighted sum. The following general case represents an additive multi-attribute value model:

$$u(a) = \sum_{i=1}^{n} u_i(g_i(a)) \tag{4.3}$$

The function u_i (single attribute value function) is used to recode the original evaluation g_i, while the weights k_i are included in the u_i functions.

The role of the researcher is to try to estimate such functions by asking the decision maker specific questions. If the preferences of the decision maker are compatible with an additive value model, a method of elicitation of the u_i may be used. Otherwise non-additive models (i.e. multiplicative, exponential, etc …) may be taken into account.

Direct methods for determining single-attribute value functions can either be based on direct numerical estimation (e.g. *Simple Multi Attribute Rating Technique* – SMART - introduced by Edwards in 1971, see Goodwin and Wright, 2004) or on indifference judgments. Several direct methods have been developed (see Fishburn, 1967 and Farquhar, 1984).

A specific direct method for the elicitation of a multi-attribute value function is *Saaty's eigenvalue method* for assessing attribute weights and single-attribute value functions as part of the "Analytic Hierarchy Process". The latter consists in structuring the decision problem in a hierarchical manner and encompasses the following steps (Vincke, 1992): i) building the decision problem as a hierarchy in which the top level is the main objective of the problem, the bottom levels are the options and the intermediary vertices represent the criteria which are taken into account; ii) performing a pair wise comparison of the vertices at each level of the hierarchy, from the point of view of their contribution to each of the higher level vertices to which they are linked. The pair wise comparison is made in terms of "preference ratios" (if they are actions) or "importance ratios" (if they are criteria) evaluated on a numerical scale; iii)

Suitably aggregating the numerical evaluations associated with all levels of the hierarchy as a weighted sum of single attribute value functions.

Indirect methods for the assessment of single attribute value functions and trade-offs are based on the assumption of an additive value model and inferring the shapes of all single attribute value functions and the values of the tradeoffs from the declared global preferences on a subset of well know options (e.g. Utilité Additive method, UTA, due to Jacquet-Lagrèze and Siskos, 1982). This implies inferring a general preference model from partial information about the decision maker's preferences.

Finally, it is to be noted that Multi Attribute Utility models can be used when preferences satisfy demanding hypothesis: once these have been accepted or proved valid, the decision becomes transparent. It is also necessary that the process of elicitation of the various parameters of the model is conducted in order to reflect the obtain their "real" parameters. Therefore there are two possible orders of limitations: i) satisfying the underlying hypothesis of the model and ii) being able to obtain reliable answers to difficult questions related to the decision maker's preferences.

A different formal approach, less demanding with regard to the precision of information required and whose outcome is not the construction of a one-dimensional synthetic evaluation is presented in the next section.

4.3.3 Outranking approach: overview of methods

Outranking methods avoid making strong assumptions concerning the 'true' preference structure of the decision maker. It is not necessary to assume that a utility function exists, or that it can be described with a certain functional form: the focus is on whether there is enough information to state that one alternative is at least as good as another. The Condorcet voting procedure recalled in paragraph 4.2.1, consisting in a kind of tournament where all candidates compare in pair wise contests and a candidate is declared to be preferred to another according to a majority rule, is the heart of the outranking methods in decision analysis. B. Roy author gives the following broad definition of the outranking approach (reported by Vincke 1992, p.58).

Definition: Given a preference relation S (as opposed to P, which is a "strict preference") and a set A of actions, objects, decisions, candidates ecc.. to be explored during the decision procedure, an outranking relation is a binary preference relation S defined in A such that *a S b* if, given what is known about the decision maker's preferences and given the quality of the valuations of the actions and the nature of the problem, there are enough arguments to decide that *a* is at least as good as *b*, while there is no essential reason to refute that statement.

Alternatives selected for a decision problem, usually perform better than the others on different criteria: when an alternative is efficient[44] on one criterion, another is efficient on another criterion. In fact, in the case of pair wise comparisons, an appropriate multicriteria method should provide the following information:

a is preferred to *b or vice versa*
a and *b* are indifferent
a and *b* are incomparable

Pair wise comparison often leads to incomparability and it is necessary to decide recurring to additional information. Trade-offs between criteria, weights reflecting the relative importance of criteria, value functions aggregating all criteria in a single function to obtain a mono-criterion problem where an optimal solution exists, etc… are all ways to deal with the problem of reducing the number of incomparabilities.

The outranking principle has been operationalized according to different procedures. There are two major families of Outranking methods, the ELECTRE procedures invented by Bernard Roy and colleagues in Paris (1974), and the PROMETHEE procedures invented by J.P. Brans and colleagues in Brussels (1982). They will be discussed in the following sections, after a brief overview of the main properties of outranking preference relations.

[44] An efficient alternative, following the definition given by Brans and Mareschal, is an alternative which is not dominated by any other.

4.3.3.1 Properties of outranking relations

Outranking methods, or more in general methods based on pair wise comparisons, may yield preferences that are:

i) *intransitive*. The transitivity property implies that the result of an aggregation must always be a ranking, possibly with ties. In other words if option *a* outranks option *b,* and option *b* outranks option *c,* this must imply that *a* outranks *c.* But, similarly to the Condorcet voting system, outranking methods do not verify transitivity.

ii) *cyclic*. This shortcoming verifies when option *a* outranks option *b* that outranks option *c* … that outranks option *a*! In order to obtain a ranking and reduce cycles as much as possible, more demanding levels of majority (i.e. the number of criteria in favor of option *a* with respect to option *b*) for the definition of the preferred option are imposed and a greater amount of information is lost.

Therefore methods based on comparisons of alternatives by pairs will seldom yield a complete ranking of the alternatives. In fact, outranking methods allow for *incomparability* between alternatives *a* and *b,* when neither option *a* outranks *b* or the opposite. Such explicit recognition of incomparability between some alternatives may still be an important piece of information for the decision maker (Bouyssou, 2000; DTLR, 2001). Incomparability may be justified by the recognition that two alternatives are too different to be compared, or by the lack of information available. It is worth highlighting that incomparability differs from *indifference*: the latter occurs when alternatives are almost equivalent, while the former indicates situations where there is a strong contrast between options.

The different procedures that have been developed to reduce incomparability and to derive a complete ranking, limit the possibility to always comply with the *property of independence of irrelevant alternatives*[45]. Such property is certainly satisfied in the construction of the outranking relation because outranking is based on the analysis, in turn, of the profiles of each pair of

[45] In social choice theory, the "independence of irrelevant alternatives" property requires that the social preferences between alternatives x and y depend only on the individual preferences between x and y. In other words, if x is preferred to y out of the choice set (x, y) then expanding the choice set to (x, y, z) must not make y preferred to x (i.e. rank reversal problem). The inclusion of z must not change the preference order between x and y.

alternatives, independently of the others. However it may be lost with the manipulation of the outranking relation and the rank reversal problem may verify (De Keyser and Peeters 1996, Macharis et al. 2004, Mareschal et al. 2008).

Rank reversal means that, in some cases, the complete ranking of the alternatives can be reversed when a new alternative is introduced. This risk finds its origin in the intransitivity related to outranking relations (see Mareschal, 2008 for the mathematical proof), however the non-transitivity of the pair wise comparisons model can be considered a strength of the outranking methods, as it enables to stay closer to the original multicriteria nature of the decision problem and to achieve a more natural modeling of the preferences of the decision-maker[46].

There are two major differences between outranking approaches and the approaches based on the weighted sum (and other more complex ways such as MAUT):

i) *role of weights.* As previously discussed, in the weighted sum model the weights represent the substitution rates between different criteria (how much it is required in terms of a criterion in order to compensate a disadvantage in terms of another criterion). Therefore the weights depend on the determination of the unit on each scale. In outranking methods, the interpretation of the weights is completely different because they do not represent tradeoffs between alternatives and are independent of the scales of the criteria. Weights represent the relative importance of the criteria. All criteria are considered equally important in the first place, although it is possible to take into account the relative importance of the criteria through the differentiation of weights. Assessing weights to the criteria is not straightforward because it involves the priorities and perceptions of the decision-maker. Such different interpretations of weights means that different elicitation processes of the importance of the criteria must be put into place. Consequently outranking methods allow to elicit weights by questioning the

[46] Anyway, the authors show rank reversal is limited to alternatives whose net flow values, (defined and discussed in paragraph 4.3.3.3 about the PROMETHEE method) are relatively close to each other (Mareschal, 2008, p. 960).

decision maker on the relative importance of criteria, without reference to the scale of the evaluations.

ii) *compensation behavior*. The use of weights with intensity of preference originates in compensatory Multi-Criteria methods and gives the meaning of tradeoffs to the weights. By contrast, the use of weights with ordinal criterion scores originates in non-compensatory aggregation procedures and gives the weights the meaning of importance coefficients (OECD, 2008). The compensation behavior of a method is in general terms, the possibility to counterbalance a disadvantage on one criterion by an advantage on another. The additive model of multiple attribute utility theory is a clear example of a compensatory method, while outranking relations non-compensation property derives from the fact that the sizes of the differences in the evaluations of options *a* and *b* for all criteria do not matter, but only the signs of those differences do. In other words, a large difference in favor of *a* over *b* on some criterion is of no use to compensate for small differences in favor of *b* on many criteria since all that counts for deciding that *a* outranks *b* is the list of criteria in favor of *a*. If, instead of numeric evaluations, the available information is the ranking of the options with respect to each criterion, the result of the outranking method is analogous to that given by the Condorcet procedure.

4.3.3.2 ELECTRE methods

The ELECTRE I (*Elimination et Choix Traduisant la Réalité*) method is the first and simplest outranking methods. Its aim is to obtain a subset *N* of actions, out of the initial set of actions, such that any action which is not in *N* is outranked by at least one action of *N*. Such subset (i.e. the *kernel*[47]) contains the option representing the "best compromise" and it is to be made as small as possible.

The *concordance index* computed for each pair of alternative, measures the "strength of the coalition" of criteria that support the idea that *a* is at least as

[47] Definition given by Bouyssou et al. (p. 136): "the kernel is the subset of alternatives that do not outrank one another and such that each alternative not in the kernel is outranked by at least one alternative in the kernel. In particular all non-outranked alternatives belong to the kernel".

good as *b*. The "strength of the coalition" is the sum of the weights associated to the criteria that constitute the coalition. As often as the evaluation of *a* passes or equals that of *b* on a criterion, its weight enters into the weight of the coalition (additively) in favor of *a*. In line with the Condorcet approach, the concordance index is proportional to the number of criteria in favor of *a* as compared to *b*.

Given a weight p_j assigned to each criterion, the concordance index is:

$$c(a,b) = \frac{1}{P} \sum_{j:g_j(a) \geq g_j(b)} p_j \,, \qquad where\ P = \sum_{j=1}^{n} p_j \tag{4.4}$$

$g_j(a)$ denotes the evaluation of alternative *a* for criterion *j*, which is assumed to be maximized. If it was to be minimized, the weight p_j would be added when the converse inequality holds, that is when $g_j(a) \leq g_j(b)$. A criterion can count both for *a* against *b* and the opposite, if and only if $g_j(a) = g_j(b)$. *c* takes its values between zero and one.

The ELECTRE I method presents two additional features: i) *a concordance threshold*: the level of the concordance index for which a coalition is judged strong enough (ex. in the Condorcet voting method such threshold is half the number of criteria); ii) a *veto* mechanism, which is introduced in order to prevent *a* from out ranking *b* where there are some large differences in disfavor of *a*. The *veto* works like a *discordance criteria*: there is a veto against declaring that *a* outranks *b* if *b* is so much better than *a* on some criterion that it becomes meaningless to pretend that *a* might be better *overall* than *b*. According to such two conditions, if the concordance index passes some threshold, and there is no veto of *b* against *a*, than *a* outranks *b*.

The most interesting alternatives, on which the attention of the decision maker should be focused and from which the best compromise should emerge, are included in the kernel. This process gives a binary relation on the set of alternatives, which may have cycles and be incomplete (neither *a* outranks *b* or the opposite). It is worth emphasizing that this is not the set of more or less good alternatives, but just the set of "best" alternatives, relatively to the others

considered. The following ELECTRE methods (II, III, and IV) that have been developed allow to get a ranking, and not just a subset of best option, focusing on more detailed preference modeling.

4.3.3.3 PROMETHEE methods

PROMETHEE (*Preference Ranking Organization Method for Enrichment Evaluations*) methods consist in building a valued outranking relation, based on concepts and parameters which have an economic interpretation, understandable by the decision maker (Vincke, 1992, p.73). PROMETHEE I and II methods were developed by J.P. Brans (1982) and a few years later (1985) J.P. Brans and B. Marschal developed PROMETHEE III and IV. In 1988, the same authors proposed the visual interactive module GAIA (*Graphical Analysis for Interactive Assistance*), briefly described in the following paragraph, to provide a visual support for the results of the PROMETHEE methods. In 1992 and 1994 J.P. Brans and B. Mareschal made two further extensions: PROMETHEE V and VI.

There is an increasing number of researchers and practitioners interested in the development and application of the PROMETHEE method, as shown in the comprehensive literature review presented by Behzadian et al. (2010), also due to the friendliness of use of the model. Along with papers focused on description of methods, the mathematical features and the software development (22 papers out of 217 papers reviewed), a great load of applications (195 papers out of 217) have been carried out, either with other Multi Criteria methods or without. According to the authors, the most popular application area concerns environment management, including waste management, Life Cycle Assessment, Environmental Impact Assessment and land use planning. Other relevant fields of empirical research that recur to PROMETHEE methods are Hydrology and water management, business and finance, chemistry, logistics and transportation, energy management and social applications. Not included in the review, is a more recent and interesting application of PROMETHEE methods to a prioritization framework for food borne risks that considers public health impact as well as market impact, consumer risk acceptance and perception, and social sensitivity (Ruzante et al. 2010). The framework provides an instrument to support

policymakers in complex risk prioritization decision making when different stakeholder groups are involved and when multiple pathogen-food combinations are compared.

The different PROMETHEE methods are distinguished on the basis of the type of ranking or on the type of application that they allow: the different PROMETHEE methods and main feature are summarized in table 4.1. The discussion hereafter will be focused on methods I and II, which will be used in the empirical applications presented in the following chapters.

Table 4.1 – PROMETHEE methods: main features and scope

PROMETHEE METHODS	MAIN FEATURE
I	*Partial ranking*
II	*Complete ranking*
III	*Ranking based on intervals*
IV	*Continuous case*
V	*Including segmentation constraints*
VI	*Representation of human brain*

Source: author based on Brans and Mareschal (2005).

The PROMETHEE methods were developed to treat multicriteria problems and the related evaluation table (see the generic performance matrix in Table 4.2). These methods require the following additional information in order to be applied: i) information on relations between the criteria; ii) information within each criterion.

Table 4.2 - Generic performance matrix

a	$g_1(.)$	$g_2(.)$	….	….	$g_j(.)$	….	$g_k(.)$
a_1	$g_1(a_1)$	$g_2(a_1)$	….	….	$g_j(a_1)$	….	$g_k(a_1)$
a_2	$g_1(a_2)$	$g_2(a_2)$	….	….	$g_j(a_2)$	….	$g_k(a_2)$
….	….	….	….	….	….	….	….
a_i	$g_1(a_i)$	$g_2(a_i)$	….	….	$g_j(a_i)$	….	$g_k(a_i)$
….	….	….	….	….	….	….	….
a_n	$g_1(a_n)$	$g_2(a_n)$	….	….	$g_j(a_n)$	….	$g_k(a_n)$

Source: Brans and Mareschal (2005).

i) Analyzing *information between the criteria* means understanding the relative importance of the criteria, or weights, such that:

$$\sum_{j=1}^{k} w_j = 1 \tag{4.5}$$

Assessing the weights to the criteria involves focusing on the priorities and perceptions of the decision maker.

ii) Analyzing *information within the criteria* is related to the degree of preference associated to the deviation between the evaluations of two alternatives on a particular criterion. Such deviations are given by:

$$d_j(a,b) = c - g_j(b) \tag{4.6}$$

and $P_j(a,b)$ represents the preference on alternative *a* with respect to *b*, relatively to criterion g_j, ad a function of the difference $d_j(a,b)$, such that

$$P_j(a,b) = F_j\left[d_j(a,b)\right] \quad j = 1, \dots, k \tag{4.7}$$

The preference function $P_j(a,b)$ takes values between 0 and 1 and equals zero when the deviations are negative. The following property holds:

$$P_j(a,b) > 0 \Rightarrow P_j(b,a) = 0 \tag{4.8}$$

The preference function assigns a smaller or null preference degree when deviations are small or negligible and larger preference degree when deviations are larger.

Six types of functional forms (see Fig. 4.2) have been proposed by the authors (Vincke e Brans 1985) in order to reflect the different degrees of preference associated to the different criteria. The pair $\{g_j(.), P_j(a,b)\}$ is the *generalized criterion* associated to criterion $g_j(.)$.

Figure 4.1 – Preference function

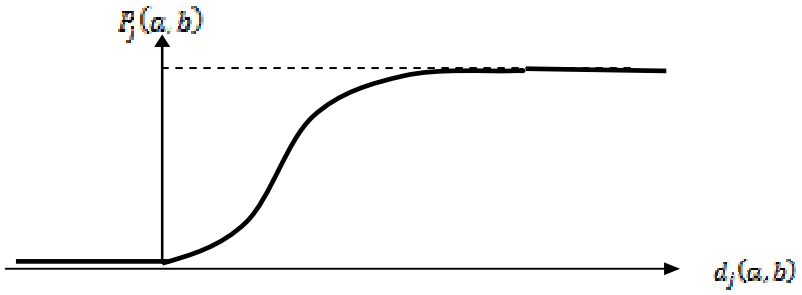
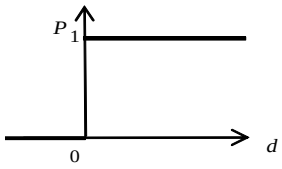
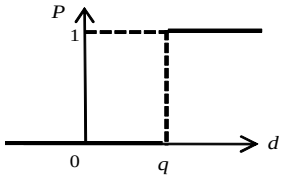
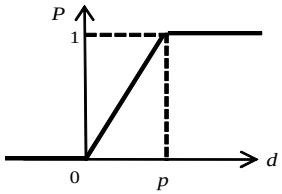
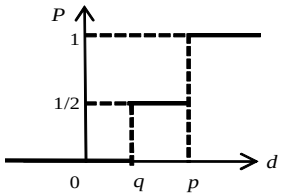
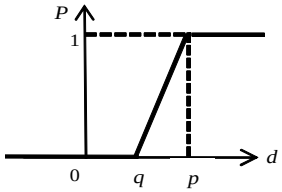
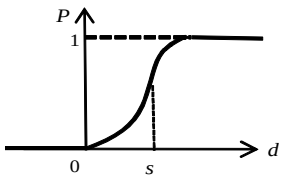


Figure 4.2 – Types of preference functions and generalized criteria

Generalized criterion		Parameters to fix	Definition
	Type 1 - Usual Criterion	*none*	$P(d) = \begin{cases} 0 & d \leq 0 \\ 1 & d > 0 \end{cases}$
	Type 2 - U-shape Criterion	q	$P(d) = \begin{cases} 0 & d \leq q \\ 1 & d > q \end{cases}$
	Type 3 - V-shape Criterion	p	$P(d) = \begin{cases} 0 & d \leq 0 \\ d/p & 0 \leq d \leq p \\ 1 & d > p \end{cases}$
	Type 4 - Level Criterion	q and p	$P(d) = \begin{cases} 0 & d \leq q \\ 1/2 & q < d \leq p \\ 1 & d > p \end{cases}$
	Type 5 - V-shape with indifference criterion	q and p	$P(d) = \begin{cases} 0 & d \leq q \\ 1/2 & q < d \leq p \\ 1 & d > p \end{cases}$
	Type 6 - Gaussian criterion	s	$P(d) = \begin{cases} 0 & d \leq 0 \\ 1 - e^{-\frac{d^2}{2s^2}} & d > 0 \end{cases}$

Source: Brans and Mareschal (2005).

The functional forms proposed by the authors require up to three parameters to be defined:

- q is a threshold of indifference: it is the largest deviation considered as negligible by the decision maker;
- p is a threshold of strict preference: it is the smallest deviation which is considered as sufficient to generate full preference;
- s is an intermediate value between q and p and defines the inflection point of the preference function

Once information between the criteria (i.e. weights) and information within the criteria (i.e. preference functions) have been determined, the PROMETHEE procedure can be applied.

Let $a, b \in A$, and let:

$$\begin{cases} \pi(a,b) = \sum_{j=k}^{k} P_j(a,b) w_j \\ \pi(b,a) = \sum_{j=k}^{k} P_j(b,a) w_j \end{cases} \tag{4.9}$$

$\pi(a,b)$ expresses with which degree a is preferred to b over all the criteria and $\pi(b,a)$ how b is preferred to a. $\pi(a,b)$ and $\pi(b,a)$ are also defined as "global preference indices" and are usually positive. They satisfy the following properties:

$$\begin{cases} \pi(a,a) = 0 \\ 0 \leq \pi(a,b) \leq 1 \\ 0 \leq \pi(b,a) \leq 1 \\ 0 \leq \pi(a,b) + \pi(b,a) \leq 1 \end{cases} \tag{4.10}$$

Each alternative a is facing $(n-1)$ other alternatives. For each alternative two types of indices are calculated:

- the positive outranking flow:

$$\phi^+(a) = \frac{1}{n-1} \sum_{x \in A} \pi(a,x) \tag{4.11}$$

It expresses how an alternative *a* is outranking all the others (its *outranking character* or strength). The higher $\phi^+(a)$ the better the alternative.

- the negative outranking flow:

$$\phi^-(a) = \frac{1}{n-1}\sum_{x \in A} \pi(x,a) \tag{4.12}$$

It represents how an alternative *a* is outranked by all others, its weakness or its *outranked character*. The lower $\phi^-(a)$ the better the alternative.

The PROMETHEE I partial ranking is obtained from the intersection of the positive and the negative outranking flows. Both flows do not usually induce the same ranking. Three situations may verify:

- Preference:

$$aP^Ib \quad iff \begin{cases} \phi^+(a) > \phi^+(b) \text{ and } \phi^-(a) < \phi^-(b) \text{ or} \\ \phi^+(a) = \phi^+(b) \text{ and } \phi^-(a) < \phi^-(b) \text{ or} \\ \phi^+(a) > \phi^+(b) \text{ and } \phi^-(a) = \phi^-(b) \end{cases} \tag{4.13}$$

In such case the information of both outranking flows is consistent and reliable.

- Indifference:

$$aI^Ib \quad iff \quad \phi^+(a) = \phi^+(b) \text{ and } \phi^-(a) = \phi^-(b) \tag{4.14}$$

This case implies the equivalence between the two options.

- Incomparability:

$$aR^Ib \quad iff \begin{cases} \phi^+(a) > \phi^+(b) \text{ and } \phi^-(a) > \phi^-(b) \text{ or} \\ \phi^+(a) < \phi^+(b) \text{ and } \phi^-(a) < \phi^-(b) \end{cases} \tag{4.15}$$

In this case information provided by outranking flows is not consistent: a higher power of one alternative is associated to a lower weakness of the other. This often happens when *a* is good on a set of criteria on which *b* is weak and reversely *b* is good on some criteria on which *a* is weak. PROMETHEE I ranking will not decide which action is best in such cases and it is up to the decision maker to take his subjective choice.

A step forward in this direction is give by the PROMETHEE II complete ranking, which is based on the *net outranking flow*:

$$\phi(a) = \phi^+(a) - \phi^-(a) \tag{4.16}$$

The net flow is the balance between the positive and the negative outranking flows and allows to eliminate the incomparabilities at the cost of losing some information. It shows the following properties:

$$\begin{cases} -1 \leq \phi(a) \leq 1 \\ \sum_{x \in A} \phi(a) = 0 \end{cases} \tag{4.17}$$

When $\phi(a) > 0$ a outranks all the alternatives on all the criteria, vice versa $\phi(a) < 0$ means that a is more outranked. The net flow $\phi(.)$ provides a complete ranking and it may be compared with a utility function. However the net flow is built on simpler preference information because it relies on comparative statements rather than on absolute statements.

Differently from the PROMETHEE I case, just two situations may verify:

- Preference:

$$aP^{II}b \quad iff \quad \phi(a) > \phi(b) \tag{4.18}$$

- Indifference:

$$aI^{II}b \quad iff \quad \phi(a) = \phi(b) \tag{4.19}$$

As the PROMETHEE II ranking is based on a numerical score (the net preference flow) there is an interesting relationship between the global aggregated score and the pair wise preference degrees. As demonstrated by Mareschal, Smet and Nemery (2008), it is reasonable to expect that net flows express as much as possible similar preferences, i.e. pair wise and global preferences should be as close as possible to each other. Based on their results, the PROMETHEE multicriteria net flow $\phi(a)$ is a centered score that minimizes the sum of the squared deviations from the pair-wise comparisons of the alternatives.

According to the given definition given above (…) it is also possible to express the net flow as:

$$\phi(a) = \phi^{+}(a) - \phi^{-}(a) = \frac{1}{n-1} \sum_{j=1}^{k} \sum_{x \in A} \left[P_j(a,x) - P_j(x,a) \right] w_j \tag{4.20}$$

consequently,

$$\phi(a) = \sum_{j=1}^{k} \phi_j(a) w_j \tag{4.21}$$

if

$$\phi_j(a) = \frac{1}{n-1} \sum_{x \in A} [P_j(a,x) - P_j(x,a)] \tag{4.22}$$

$\phi_j(a)$ is the *single criterion net flow* and it is obtained when only criterion $g_j(.)$ is considered (which is equivalent to saying that it gets full weight). It expresses how an alternative *a* outranks (>0) or is outranked (<0) by all the other alternatives on criterion $g_j(.)$ and it doesn't take into account the weights assigned to the criteria. The uni-criterion net flow matrix, reported in Table 4.3, allows to represent the profile of alternative, or the quality of the alternative with respect to the criteria, considering degrees of preference given by the generalized criteria in a dimensionless scale.

Table 4.1 – Single criterion net flows

a	$\phi_1(.)$	$\phi_2(.)$	….	….	$\phi_j(.)$	….	$\phi_k(.)$
a_1	$\phi_1(a_1)$	$\phi_2(a_1)$	….	….	$\phi_j(a_1)$	….	$\phi_k(a_1)$
a_2	$\phi_1(a_2)$	$\phi_2(a_2)$	….	….	$\phi_j(a_2)$	….	$\phi_k(a_2)$
….	….	….	….	….	….	….	….
a_i	$\phi_1(a_i)$	$\phi_2(a_i)$	….	….	$\phi_j(a_i)$	….	$\phi_k(a_i)$
….	….	….	….	….	….	….	….
a_n	$\phi_1(a_n)$	$\phi_2(a_n)$	….	….	$\phi_j(a_n)$	….	$\phi_k(a_n)$

Source: Brans and Mareschal (2005).

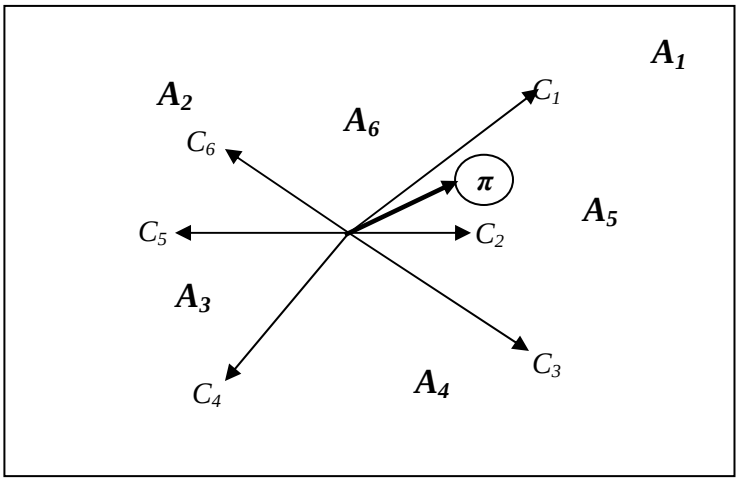
4.3.3.4 GAIA

The graphical representation provided through the Graphical Analysis for Interactive Assistance (GAIA) is a visual support of the global characteristics of the results: it represents, at the cost of a loss of part of the information, the projections of the criteria and the alternatives on a plane.

GAIA makes use of the multivariate data method of Principal Component Analysis (PCA). PCA is applied to the uni-criterion net preference flow matrix (Table 4.3) and derives the two eigenvectors corresponding to the two largest eigenvalues of the covariance matrix of the uni-criterion net flows (i.e. the axes of the plane correspond to the two first principal components).

The loss of information after the projection is expressed by the value 1.δ, where δ indicates the percentage of variance preserved. This needs to be sufficiently high (the authors indicate a threshold of 60%-70% as a reasonable value for reliance) for the representation to be significant. A generic representation of alternatives and criteria in the GAIA plane is provided by the following figure.

Figure 4.3 – Generic GAIA plane



Source: author on Brans and Mareschal (2005).

The axes represent the criteria and the alternatives are placed more or less close to them, depending on their performance. The lengths of the axes give meaningful information on the variability of the alternatives based on the criteria: a longer criterion axis indicates a more discriminating criteria. The orientation of the axes provides insights on the relationships between the criteria: criteria expressing similar preferences are represented by axes oriented in approximately the same direction. The orientation of criteria in opposite directions highlights the presence of a tradeoff, or, in other words, of a conflict, between preferences.

The darker axis labeled π introduces the impact of weights of the criteria on the plane. It represents the projection of the unit vector of the weights and it

takes the name of PROMETHEE decision axis. Its orientation emphasizes which criteria are predominant and shows a compromise or tradeoff solution between the criteria.

If π is long, the PROMETHEE decision axis has a strong decision power and the decision maker should select alternatives in its direction. If π is short, it means that the criteria are strongly conflicting and the selection of a good compromise is a hard task.

A modification of the weights, following a change in preferences of the decision maker, impacts on the position of the decision axis, while the position of criteria and alternatives remains unchanged. Simulation of different weight distributions allows to carry out an effective sensitivity analysis of the results (i.e. verifying the stability of the ranking to different sets of weights).

4.4 A Multi Criteria Analysis for the assessment of PDO/PGI schemes

4.4.1 Steps of the Multi Criteria Analysis

The present work's effort is focused on developing: i) a comparative evaluation across the performance of PDO/PGI products, ii) with respect to a set of suitable and informative indicators that can help to evaluate the effectiveness of a wide number of PDOs/PGIs in reaching the regulation's objectives, and iii) an approach that can take into account that different actors involved in PDO/PGI schemes may have different priorities (or weights) with regard to the importance of different objectives in evaluating the performance of the schemes.

The development of a Multi Criteria analysis for the assessment of the performance of PDO/PGI products, which will be applied in the following chapter, encompasses several steps summarized in table 4.

The development of a Multi-Criteria analysis requires the identification of the unit of analysis: we decided to focus on the PDO/PGI product as a whole in order to be able to carry out the comparison across different PDO/PGI registrations, made possible thanks to secondary data available from official sources[48].

[48] Description of data availability will be given in the next chapter.

Table 4.4 – Steps of the Multi Criteria Analysis for the evaluation of the PDO/PGI performance

Steps of the Multi Criteria Analysis …		**… in the PDO/PGI context**
1	Identification of the unit of analysis	The PDO product as a whole
2	Definition of the criteria	The objectives of the PDO/PGI schemes
3	Definition of indicators to the criteria	Quantitative and qualitative indicators of performance
4	Construction of information cards containing data available for each unit of analysis	Product cards in which relevant information available is summarized
5	Construction of the performance matrix	Specific indicators for each product are transferred into the performance matrix
6	Definition of the relevant stakeholders and relative weights on the criteria	Identification of stakeholders and analysis of relative interest for PDO/PGI objectives
7	Adoption of a specific Multi Criteria technique of analysis and suitable software	Application of the PROMETHEE outranking technique through Decision Lab software
8	Analysis of the results: ranking and relative performance on different criteria	Ranking of PDO/PGI products and profile analysis with respect to different criteria
9	Sensitivity analysis on alternative sets of weights	Exploration of alternative sets of weights from the perspective of the different stakeholders involved in the establishment and functioning of the PDO/PGI schemes

Source: author.

Performance of each PDO/PGI product is defined as the degree of achievement of the policy objectives, where these objectives are measured by a set of proper indicators, as it will be clearer in the application chapter (see ch. 5). Thus the assessment of the performance on the different objectives relies on the definition of this set of indicators. In general terms, an indicator is a quantitative

or a qualitative measure derived from a series of observed facts that can reveal the relative position of a product in a given context (OECD, 2008). Indicators can be expressed in quantitative and qualitative terms as well as through different types of scales (continuous measures, binary terms, discrete variables, and ordinal scales).

The identification of the performance indicators is anticipated by the construction of an information card for each PDO/PGI product. The information card represents the basic building blocks of the analysis, as it contains detailed information on the main characteristics of each PDO/PGI production reality.

Once the information cards are completed, a subset of the indicators for each objective is reported into the performance matrix. This matrix represents a first key output of the Multi Criteria analysis and it is the basis for comparing the values measured for each indicator across products. The rows of the performance matrix refer to each PDO/PGI product and columns refer to the indicators, grouped according to the objective they refer to. The intersections between rows and columns indicate the performance of the particular product on a specific indicator.

As previously discussed (par. 4.3.3.1), Multi Criteria analysis implies a weighting of the criteria, but weights take a different meaning depending on the aggregation technique chosen. This is one of the reasons that justifies the adoption of an outranking non compensatory approach, in particular the PROMETHEE I and II methods, for which weights are essentially “importance coefficients” (i.e. the greatest weight being placed on the most important dimension, according to the priorities of the stakeholders). Varying numerical weights can be assigned to each objective in different scenarios to reflect different hypothesis on the importance placed on them by stakeholders (including the decision maker). To integrate the simulations based on hypothetical sets of weights, a field survey has been carried out addressing the major stakeholders involved in the establishment and functioning of the PDO/PGI reality to understand their real priorities on the objectives.

4.4.2 Adoption of the PROMETHEE methodology: expected results and limitations of the analysis

The choice of an appropriate methodology for the assessment of the performance of PDO/PGI schemes is a delicate task: Multi Criteria analysis offers a means to systematically explore the effect of multiple objectives, and weightings of those objectives, on the evaluation of the performance of each single PDOs/PGIs.

There are various types of models that can be used in a decision process. There is no best model in principle: all have some strong points and some weak points (Bouyssou et al, 2000). The rationale behind the choice of the outranking PROMETHEE approach is due to a series of reasons:

i. PDO/PGI schemes encompass several dimensions and none unique criterion allows to state the actual success of such policy schemes on all dimensions. We need to simultaneously consider several indicators, both quantitative and qualitative. When the number of criteria considered is large, it may become very difficult for the decision maker to obtain a clear view of the problem and to evaluate the results. However the PROMETHEE approach allow us to do so; as it will be further explained in the application, the feature of the software used (Geldermann and Zhang, 2001) allows to group subsets of indicators and treat them as common categories.

ii. PDO/PGI schemes are complex realities involving several categories of stakeholders who act from different perspectives, i.e. pursue different goals, not with the same priority of interests. Outranking approaches allow us to adapt weights to alternative sets of preferences which we couldn't do if we resorted to a compensatory technique, such as a Multi Attribute Utility approach. This allows to see how the assessment changes with respect to the category of stakeholders considered. In an ex post analysis, different rankings according to different weights might provide useful insights into the model of governance and the strategic choices implemented in the supply chain of the different PDO/PGI products

iii. A particular feature of the outranking methods is that they do not force the translation of different scales and units of measurement for different

criteria into a single common measure for purposes of comparison but rather compare products within each criterion (Henson et al. 2007). Confronting the performances on the indicators associated to the different objectives can be very useful in revealing the existence of trade-offs between different objectives.

iv. The outranking PROMETHEE method does not lead to the construction of a composite indicator, which would synthesize the complexity of several dimensions into a unique value, but allows a transparent analysis of the determinants behind the final ranking, without censoring incomparabilities. In this regard an interesting feature of outranking methods is that it is possible for two products to be classified as not comparable when information on a particular indicator is missing or when the performance on different indicators is extremely contrasted. Given the paucity of data on PDO/PGI products this is likely to be a relevant issue in our analysis.

v. The visualization of the decision problem is made possible by using the GAIA plane, which is a powerful tool to identify conflicts between criteria and to group the alternatives.

Despite the listed features, some caveats have to be made on what should be the expected results and thus the limitations of the performance analysis through the Multi Criteria approach concerned.

First, the outcome of the evaluation is a relative ranking, a comparison, of the performances within the different units analyzed. It is important to underline that the method does not provide in any sense, an absolute assessment of the performance of the units analyzed. In other words, Multi Criteria Analysis cannot show that an option adds more to welfare than it detracts. There is no explicit rationale or necessity for a Pareto Improvement rule that benefits should exceed costs and the “best” option can be inconsistent with improving welfare, so doing nothing could in principle be preferable (DTRL, 2001, p.17). Defining a benchmark that will provide an absolute measure of performance for PDOs/PGIs and analyze the factors that influence performance is not part of the aim of this work, although, of course could be considered as an important and even necessary extension of the research.

Second, we recall that with the PROMETHEE II method the partial ranking of PROMETHEE I is forced into a complete ranking of the alternatives (Macharis 2004). The appealing result given by the complete ranking which is obtained through the PROMETHEE II procedure, should be analyzed in parallel to the PROMETHEE I ranking, in order to avoid the loss of relevant information and simplistic conclusions.

Third, the PROMETHEE requirement of associating a preference function (out of the six available) to each of the criteria reflecting the degree of preference to differences options on the criteria, implies a substantial effort and the ability to structure preferences. This, especially in ex post analysis, may not be trivial or even necessary, depending on the type of output desired. Moreover PROMETHEE does not provide any guiding principle for determining the weights, but assumes that the decision-maker is able to weigh the criteria correctly.

Lastly, the assessment of the performances is essentially static, except when indicators of variation in time are included in the analysis. The monitoring of the performance of PDO/PGI products should be continued over a period of time, by including the new registered products and new criteria.

5. Multi Criteria assessment of PDO performance: empirical applications

5.1 Introduction

The present chapter contributes to the assessment of PDO/PGI schemes by applying the Multi Criteria approach to measuring the actual performance of the PDO/PGI products in relation to the objectives of the European Regulation 510/2006. We run the multi-criteria ex-post analysis to compare the performance of different PDO/PGI products in two production sectors with respect to multiple criteria. Based on a previous pilot study on a sample of PDO cheese products (Galli et al, 2010), the present work develops a comparative evaluation of the performance of PDO cheese products and PDO extra virgin olive oils in Italy. The evaluation is: i) relative to the different objectives of the schemes, ii) relative to a set of suitable and informative indicators that can help to evaluate the effectiveness of a wide number of PDOs/PGIs with respect to the Regulation's objectives, and iii) relative to the different actors involved in PDO/PGI schemes that may have different priorities (or weights) with regard to the importance of different objectives in evaluating the performance of schemes.

The next paragraph briefly recalls the policy objectives relevant for the evaluation, previously discussed in chapter 2. Paragraphs 5.3 and 5.4 present the applications on the PDO cheese sector and PDO/PGI extra-virgin olive oil sector respectively. Both paragraphs are articulated as follows: i) motivation of the choice of the sector and brief descriptive analysis of the main features of the sector; ii) presentation of the indicators chosen with respect to each objective, included in the performance matrix; iii) discussion of the results obtained in the baseline scenario (corresponding to a certain weight distribution on the policy objectives) in comparison to alternative scenarios, where the weights placed on the objectives are varied to reflect the possible preferences of different stakeholders. This allows exploration of the sensitivity of the rankings to changes in preferences among the objectives.

5.2 Definition of "performance": the five policy objectives

The identification of the objectives and the corresponding indicators is a crucial step of the multi-criteria analysis because they are the reference points for the performance evaluation. The identification of the objectives used for the evaluation of PDO/PGI schemes is grounded in the regulations and other subsequent official documents (EU Reg. 2081/1992, EU Reg. 510/2006, Green Paper and Communication on agricultural product quality policy). It is worth pointing out that the establishment of objectives in the Regulations is not totally explicit and systematic but is done on a general ground, referring to broad and comprehensive situations, according to legislative language and criteria. Therefore, the identification of objectives here, refers to related, relevant official documents and widely known literature (European Commission 2008). The objectives identified are:

1. *Providing reliable and relevant information to consumers on product origin*. Markets for differentiated products need sufficient information but this is not always at hand and not always reliable, especially for attributes like product origin, which is a credence attribute. This objective can be reached only if the consumer is conscious of the existence and the meaning of the PDO/PGI mark.
2. *Promoting differentiation of production.* Consumer demand is increasingly oriented towards quality and product variety. Thus promoting differentiation and quality can contribute to finding a better market equilibrium between supply and demand, helping European producers to be competitive, and to better remunerate input suppliers. PDO products represent higher quality products with respect to equivalent, unbranded products (i.e. they are vertically differentiated) because production techniques and the use of certain raw materials related to a definite origin, is explicit and guaranteed. At the same time, PDO products are also "horizontally differentiated", in terms of extension of geographic area and presence on the market.
3. *Enhancing market performance* of typical products, their market size, and their capacity to gain a price premium with respect to comparable, non certified products.

4. *Enhancing producers' bargaining power.* Producers of high quality, typical products are quite often very small and face many structural constraints that are hard to remove. Their economic size negatively affects their bargaining power and their ability to carry out market strategies targeted to communicate and promote product quality and its value. Thus, the scheme aims to give them a tool to build a collective reputation, to increase market power, and to increase the share of value added they receive.

5. *Promoting local development.* This refers to PDO/PGIs as an indirect lever to foster rural society, to preserve cultural identity, and to maintain traditions linked to typical products.

5.3 Evaluation of the Performance of PDO Cheeses in Italy

5.3.1 Why the PDO Cheese sector: brief descriptive analysis

The Italian agri-food system has the highest number of food products with PDO/PGI recognitions, with 221 out of the 1004 across all food sectors in the European Union at the beginning of 2011 (Qualivita website), as previously discussed in chapter 2. A closer look at the economic importance of PDO/PGI products across sectors in Italy indicates a strong concentration in terms of value creation: 94% of total turnover (estimated at the producer price) is generated by the first 20 PDO/PGI products. The highest share of sales is linked to denominations in the cheese sector, together with processed meats. In 2008, approximately 61% of the total turnover was produced by the famous cheese and ham PDOs/PGIs (Parmigiano Reggiano, Grana Padano, Prosciutto di Parma and Prosciutto San Daniele).

We focus on 31 of the existing PDO cheeses in Italy (up to 2008) because of the importance of the sector itself. PDO cheeses account for 60% of the total PDO turnover in 2008 and a 22% share of total cheese turnover (ISMEA, 2010). Focusing on a single sector at the time allows us to treat the events and dynamics specific to the Italian dairy sector that are common to all the products included as exogenous.

PDO cheeses are highly differentiated particularly with respect to turnover, quantities produced and certified, production scale, reference markets, distribution

channels, geographical location, and extent of the territory defined in the specification of production. Table 5.1 presents major characteristics of the PDOs studied including absolute and relative values of turnover (averaged over the time interval 2004-2008), dimension of the production area, geographic location, and type of cheese.

Table 5.1 - Major Characteristics of Italian PDO Cheeses

CHEESE PDOs	Average Turnover (2004-2008)_mln euro	Average Turnover (% on tot PDO cheeses, 2004-2008)	Dimension Area of Production (km^2)	Geographic area	Type
Parmigiano Reggiano	984.96	33.79%	14,472	North	hard
Grana Padano	958.43	32.88%	83,875	North	hard
Mozzarella di Bufala Campana	258.97	8.88%	11,764	Center-South	soft
Gorgonzola	192.60	6.61%	35,371	North	soft
Pecorino Romano	160.85	5.52%	45,802	Center-South	hard
Asiago	107.15	3.68%	11,631	North	semi-hard
Montasio	46.02	1.58%	18,614	North	semi-hard
Provolone Valpadana	44.96	1.54%	18,606	North	semi-hard
Taleggio	43.75	1.50%	19,330	North	soft
Fontina	26.08	0.89%	3,263	North	semi-hard
Pecorino Toscano	15.64	0.54%	23,534	Center	semi-hard
Quartirolo Lombardo	14.01	0.48%	16,714	North	soft
Pecorino Sardo	10.38	0.36%	17,208	South	hard
Valtellina Casera	10.09	0.35%	3,212	North	semi-hard
Caciocavallo Silano	8.47	0.29%	51,609	South	semi-hard
Toma Piemontese	6.57	0.23%	18,226	North	soft
Raschera	4.15	0.14%	6,903	North	semi-hard
Fiore Sardo	4.13	0.14%	24,090	South	hard
Bra	4.09	0.14%	6,954	North	hard
Monte Veronese	2.88	0.10%	1,241	North	semi-hard
Bitto	2.56	0.09%	3,384	North	semi-hard
Casciotta d'Urbino	1.80	0.06%	2,892	Center	semi-hard
Castelmagno	1.79	0.06%	111	North	semi-hard
Ragusano	1.12	0.04%	2,208	South	semi-hard
Canestrato Pugliese	1.02	0.04%	10,081	South	hard
Robiola di Roccaverano	0.88	0.03%	301	North	semi-hard
Spressa delle Giudicarie	0.81	0.03%	6,207	North	semi-hard
Formai de Mut dell'Alta Valle Brembana	0.57	0.02%	265	North	semi-hard
Murazzano	0.21	0.01%	617	North	soft
Pecorino Siciliano	0.14	0.005%	25,703	South	hard
Valle d'Aosta Fromadzo	0.03	0.001%	3,263	North	semi-hard
Total	2915.15	100.000%	487,451.99	Tot North: 21	Tot hard: 8
Mean	94	3.226%	15,724.26	Tot Center: 2	Tot semi-hard: 17
Standard deviation	242	8.317%	18,192.55	Tot Center-South: 2	Tot soft: 6
Coefficient of Variation	2.6	257.842%	1.16	Tot South: 6	

Source: author's elaboration on ISTAT, ISMEA.

Value creation is highly concentrated as 82% of total turnover is produced by four PDOs (Parmigiano Reggiano, Grana Padano, Mozzarella di Bufala, and Gorgonzola), while the other PDOs range in size from 9% down to 0.001% of total PDO cheese turnover. We will refer to large PDOs in terms of turnover as the top nine PDOs in Table 1, each of which has a share of total PDO sales of

more than 1% and an annual turnover of more than euro 40 million. The other 22 PDOs have on average less than 0.2 % of total turnover each, ranging from 30,000 euro (Valle d'Aosta Fromadzo) to 26 million euro (Fontina). With respect to the geographical dispersion of PDOs across the entire Italian territory, there are many more cheese PDOs in the north than in the remaining areas of the country (23 out of 34 are produced in the north). Finally, the cheeses are differentiated in terms of type with approximately 8 hard, 6 soft, and 17 semi-hard, all of them more or less matured. There can be more than one type of the same kind of cheese.

5.3.2 Indicators of performance: data sources and the performance matrix

Our analysis is based on data available through official sources (ISTAT, Qualivita Foundation) available from the internet or contacted directly to access the database (ISMEA). This information has been integrated with internet websites of PDO Consortia, the Italian National Ministry of Agriculture, and the European Commission (see paragraph 3.4.1 in chapter 3 for a description of data sources).

A major step for the operationalization of the framework is to select measurable indicators of the performance objectives. The choice is the result of a compromise between the explanatory value of the indicators and the availability of information on PDO/PGI schemes. The values for the indicators for each product are transferred into the performance matrix, which presents the PDO cheeses (the rows), the qualitative and quantitative indicators (the columns), and their actual values (Appendix 2 shows the complete performance matrix). Table 5.2 specifies whether the indicator is to be maximized or minimized to meet the corresponding objective, the average values, standard deviations, maximum and minimum values for each indicator.

The indicators chosen for each objective are the following:

Enhancing producers' bargaining power:

- Ratio of estimated turnover at producer price over estimated turnover at consumer price within the PDO (average percentage for the time interval 2004-2008, AVGTURNPROD). On average, producers of raw

material and processors of PDO cheeses retain 63% of the total turnover, ranging from 33% (Castelmagno) to 95% (Fontina). The remaining 37% represents the value for the distribution sector.

- Absolute variation of the ratio of estimated turnover at producer price over estimated turnover at consumer price within the PDO (average from 2004 to 2008 in percentage points, VARTURNPROD). On average, the value for producers and processors decreased by -6 percentage points between 2004 and 2008, although there are cases where there are increases up to 26 percentage points.
- Firms associated with the PDO Consortium over the total number of firms in the PDO chain (percentage in 2008, CONS). Participation to the Consortium indicates that firms do not behave in isolation, but coordinate with others in order to gain a stronger image on the market. This may enhance the bargaining power of each firm when interacting with downstream stages of the supply chain. On average, firms in the Consortium represent only 28% of the total number of firms in the supply chain.
- Share of production sold through direct sales (average percentage over the time interval 2004-2008, DIRSALE). Direct selling implies that producers fix the final price to the consumer, allowing them to retain most of the value added of their product, without being subjected to reductions by downstream distributors (that in most cases have a stronger bargaining power). On average, 23% of certified product is sold by farms and processing firms through direct sales, ranging from 0% to 100%.

Table 5.2 - Descriptive Statistics for Indicators in the Performance Matrix for Italian PDO Cheeses

Objective	Indicator	Acronym	Construction of the indicator	Preference	Obs	Mean	St. Dev.	Min	Max
Bargaining Power	Average producer turnover	AVG TURN PROD	producer turnover/consumer turnover %	MAX	31	62.7%	14.0%	33.2%	95.1%
	Variation of producer turnover	VAR TURN PROD	absolute variation (2004-2008, percentage points)	MAX	31	-0.06	0.16	-0.44	0.26
	Partecipation to Consortia	CONS	firms participating to Consotium/total no. of PDO firms %	MAX	30	28.2%	34.5%	0.4%	100%
	Direct sale	DIRSALE	direct sales/total sales %	MAX	31	22.4%	26.0%	0.0%	100%
Information	Reliability of information	VERINFO	indicator 0 = name extremely different relative to real area of production; 1 = name partially different relative to real area of production; 2 = name corresponding to area of production	MAX	31	1.52	0.76	0	2
	Precision of information	PRECINFO	indicator 0 = area less precisely identified; 1 = area more precisely identified	MAX	31	0.48	0.50	0	1
	Partecipation to Consortia	CONS	firms participating to Consotium/total PDO firms %	MAX	30	28.2%	34.5%	0.4%	100.0%
	Investments in promotion	INVPROMO	Investments in promotion and advertising in the last five years declared by the Consortium (000 euro)	MAX	14	3,766	8,200	3	30,193
Differentiation	Average quantity certified	AVGQUANT	average quantity certified (2004-2008, ton)	MIN	31	14,282	33,735	7	152,609
	Dimension of area	DIM	Production area included in the specification (% on total Km^2 of cheese PDO area)	MIN	31	3.2%	3.7%	0%	17.2%
Market Performance	Variation of quantity certified	VARQUANT	variation between 2004-2008 %	MAX	31	10.7%	21.0%	-17.8%	87.9%
	Actual vs potential use	ACTVSPOT	of actual vs potential use of PDO (Qualivita data, %)	MAX	20	75.1%	30.1%	12.0%	100%
	Average market share	AVGMS	Total PDO turnover/total sector turnover %	MAX	31	0.5%	1.3%	0.0%	5.8%
	Variation of turnover	VARTURN	% variation between 2004-2008	MAX	31	6.0%	10.7%	-16.7%	29.4%
	Average export	AVGEXP	exports over total sales %	MAX	31	11.5%	17.2%	0.0%	83.3%
	Variation of export	VAREXP	absolute variation (2004-2008, percentage points)	MAX	31	0.02	0.05	-0.03	0.26
	Average Premium Price	AVGPP	premium price relative to price of a comparable product (avg 2004-2008, %)	MAX	31	32.3%	55.2%	-36.7%	181.9%
Local Development	Traditional input	TRAD	indicator 1=presence, 0=absence of highly distinctive and deeply rooted traditional raw material (indicated in the specifications)	MAX	31	0.68	0.47	0	1
	Local and reginal sales	LOCREG	% of production sold on the local and regional market (average percentage, 2004-2008)	MAX	30	56.7%	31.7%	0%	100%
	Direct sale	DIRSALE	direct sales/total sales %	MAX	31	22.4%	26.0%	0%	100%
	Local promotion and Slow Food Presidia	PROMLOCSF	Promotion on local territory (dummy, 0 = absence, 1 = presence of local fairs, events (on the internet) or SlowFood Presidia, 2 = both)	MAX	31	0.87	0.66	0	2

Source: author's

Providing reliable information for consumers on the origin and other quality attributes of typical products

- Reliability of the information conveyed by the PDO name (VERINFO). This indicator addresses whether the name of the denomination indicates the actual area of production, through a dummy variable (0=not reliable 1=partially reliable, 2=reliable). A good example of this is Pecorino Romano cheese. It is scored 0 because it is produced, for the most part, in Sardinia (the specification includes Sardinia and Tuscany, beyond Lazio). Another example is Pecorino Toscano, mainly produced in Tuscany with a small part produced in Lazio (it gets a value of 1). Fontina Valdostana is actually produced in Valle d'Aosta and gets a score of 2 to reflect that the name conveys reliable information.
- Precision of the name with respect to the actual origin (dummy variable, 0=not precise, 1=precise, PRECINFO). This indicator distinguishes PDO cheeses relative to how precisely identified is the geographical area of the denomination (the wider the area, the less precise the information).
- Participation of PDO firms in the Consortium is also included in the information objective because the main function of the Consortium is to support promotion and advertizing (beyond safeguarding the PDO from frauds). A higher participation to the Consortium should correspond to a more intense activity of promotion of the PDO product image on the market, aimed at increasing consumers' awareness.
- Investments in advertizing (thousands of euro, sum of investments in the last five years, INV IN PROMO), indicated by the Consortium to the Qualivita Foundation shows how much effort is made by the producers in promotion and publicity.

Promoting differentiation of production

The two indicators used express the contribution to differentiation by the PDO cheeses, in terms of the quantity produced and available on the market and in terms of the dimension of the area of PDO production. Both average quantity produced and dimension of the area are minimized in order to reach the differentiation objective:

- PDO certified quantity (average quantity in ton, over the time interval 2004-2008, AVGQUANT). In percentage terms, the average percentage of quantity produced with respect to total PDO cheeses is 7.6%, with a strong concentration in the largest two (Grana Padano, 34%) and Parmigiano Reggiano, 26%). On average the others account for approximately 1% each.
- Dimension of the production area (in percentage over the overall cheese PDO/PGI area in Italy, DIM).

It was not possible to include further quality indicators to distinguish the quality characteristics among cheese products according to a vertical differentiation concept, because of the deep differences in terms of type, level of maturity and final use.

Enhancing market performance of PDO products

- Variation of PDO quantity certified (from 2004 to 2008, in percentage, VARQUANT). On average there was an increase of more than 10% in PDO cheese production over the time interval considered.
- Actual use versus potential use of the PDO certification (ACTVSPOT, %). Such indicator expresses the quantity produced and certified relative to the amount of product potentially certifiable under the territory defined in the specification (as indicated by Consortia interviewed by Qualivita).
- VARTURN indicates the variation of estimated turnover on the time interval considered (2004-2008).
- The average market share calculated in terms of quota of turnover with respect to the total turnover on the Italian reference market (AVGMS, %).
- Share of certified production that is exported (averaged over the time interval 2004-2008, AVGEXP). Overall, about 11% of certified production is destined to exports, ranging from zero (6 out of 31 PDOs do not export at all) to above 80%.
- Variation of share of exported certified production (from 2004 to 2008 in percentage points, VAREXP).

- Price premium of the PDO cheese with respect to a corresponding generic product (as a percentage, average over the time interval 2004-2008) (AVGPP%). On average, a PDO cheese has a price which is approximately 30% higher than the corresponding generic product (defined through ISMEA data bank on prices of dairy products, see performance matrix in appendix 2). However, there are some cases in which the PDO has a lower price than the generic product (e.g., on average Pecorino Romano costs 37% less than a generic hard cheese Pecorino Locale).

Promoting local development

- Use of highly distinctive and deeply rooted traditional raw material and/or techniques indicated in the specification (TRAD). This is a qualitative indicator (dummy variable, 1=presence, 0=absence).
- Quota of production sold on the local and regional market (average percentage over the time interval 2004-2008, LOCREG). Approximately 57% of sales are in local and the regional markets.
- Share of production sold through direct sales (average percentage over the time interval 2004-2008, DIRSELL%). This indicator is repeated under this objective because direct selling has an impact also in terms of the local territory. Firstly, the value gained through the sale of PDO products remains on the local territory. Secondly, the direct sale of the typical products, not limited to local people but for example to tourists, contributes to increasing the visibility of the area of origin itself.
- Promotion on the territory (dummy, 0=absence, 1=presence of local fairs (on the internet) or SlowFood Presidia, 2=both) (PROMLOC-SLOWFOOD). Both local fairs and Slow Food Presidia indicate initiatives for the promotion of the local product on the territory of origin. Local initiatives (fairs, events) and Slow Food Presidia were identified through internet search engines.

The final choice of indicators was made following an analysis of significant correlations (95% confidence level) among the indicators initially hypothesized (see the correlation matrix, showing correlations between the finally included indicators in appendix 3). Indicators initially assigned to the same objective that

were negatively correlated were excluded. In fact, a systematic (i.e. on all PDOs in the sample) negative correlation between indicators of an objective, makes it virtually impossible for the PDO to achieve a given objective. We had to exclude the following indicators: variation on the price premium (initially included in Market Performance), density of PDO businesses within the boundaries of the area of production (Local Development) and average size of enterprises (Bargaining Power). Moreover, because of scarcity of data, we excluded "number of farms that produce and transform raw material over the total number of firms in the PDO chain", initially included based on the assumption that breeders participating in a production process are more likely to be able to gain the value added related to the sale of the final product.

5.3.3 Preference functions assigned to each indicator

Recalling what we already discussed in chapter 4, the application of the Multi Criteria analysis through the PROMETHEE method encounters the definition of preference functions to express the degree of preferences associated to each pair wise comparison within each criterion (i.e. indicator). Following the suggestions given by the authors of the PROMETHEE method (Brans and Mareschal, 2005) and following applications (Podvezko and Podviezko, 2010) we assigned three different types of preference functions, out of the six available (see paragraph 4.3.3.3 in chapter 4), to the different categories of variables included in the performance matrix:

i) quantitative continuous indicator: we chose to use a "V-shape preference function", characterized by an interval between 0 and *p* (a threshold of strict preference) where the interval between the point of indifference of alternatives (no preference of one alternative over another, *f(d)=0*) and the point of strict preference of one alternative over another (*f(d) =1)* is linearly increasing. We set the threshold of strict preference to 50% of the difference between PDO products in each pair wise comparison.

ii) Binary indicators (1/0 values): we assigned to this type of indicators a "Usual preference function". Such function is used in cases when it is not possible to allocate importance for the differences between indicator values

and only “the more the better” counts as a general criterion. This function does not depend on any parameters.

iii) Qualitative indicators with more than two values (ex. indicators that take values 0, 1 and 2): in this case we assigned a “Level preference function”, that depends on two parameters *p* and *q*, thus both boundary values are set: the indifference threshold *q* and the strict preference threshold *s*. Hence, if the difference *d* between values of two alternatives is not greater than *q*, then the alternatives are indifferent (*f(d)=0*); when the difference *d* is greater than *p*, then one alternative has the strict preference over another (*f(d)=1)* and whenever the difference *d* falls between *q* and *p*, then the value of the preference function equals to 0.5. In this case one alternative has a medium preference over another (*f(d)=0.5)*.

5.3.4 Results of Multi-Criteria Analysis

The multi-criteria analysis proceeds in two steps. First, a baseline scenario was built in which the ranking among the PDO cheese products is based on the overall performance measured on the five objectives, with each given equal weight. In other words, the baseline scenario hypothesizes that the five objectives of the regulation are equally important to the decision-maker and/or stakeholders.

The second step in the analysis is to build alternative scenarios where the weights placed on the objectives are varied based on the results obtained in the baseline scenario, in order to reflect different preferences/stakeholders’ perspectives. This allows exploration of the sensitivity of the rankings to changes in preferences among the objectives.

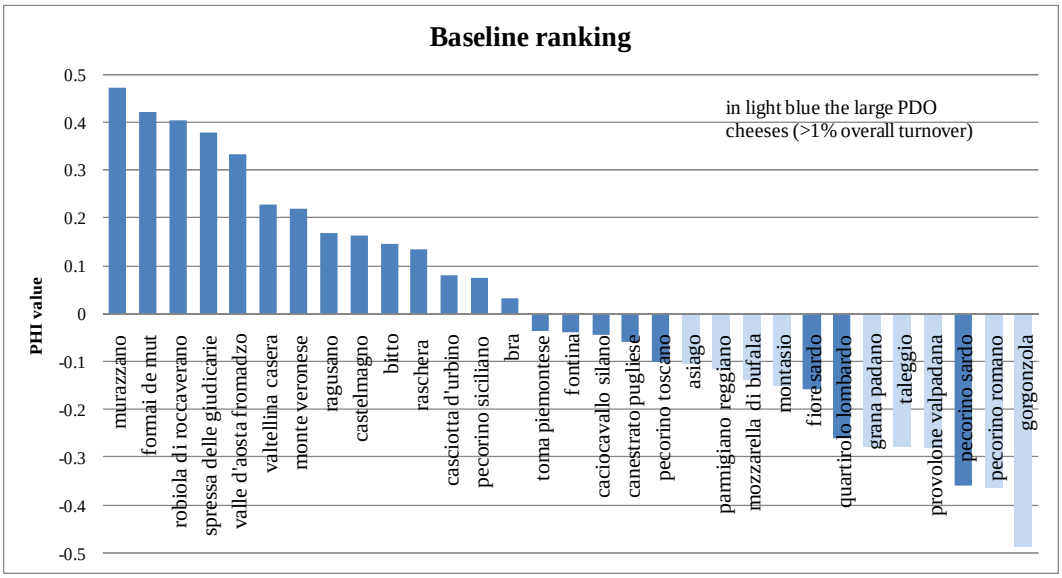
It is worth pointing that, within each objective, the weight assigned is equally shared between the indicators for that objective. This implies that the weight of a single indicator toward the achievement of each objective is equal and inversely proportional to the number of indicators assigned to that objective. For example, the bargaining power objective is measured by 4 indicators so each indicator has a 5% weight in the baseline scenario.

5.3.4.1 Baseline Scenario: the Policy Maker perspective

Figure 5.1 and Table 5.4 show the scores obtained by the 31 Italian cheese PDOs under the baseline scenario and their relative ranking, based on the *net flows.* For each of the five objectives the *partial net flows* are also indicated. We recall that the net flow is a simple average of the partial net flows, since each objective is assigned the same weight. The ratings of the PDO cheeses range from a maximum of + 0.47 to a minimum of -0.49. The scores vary gradually from higher to lower values, without significant gaps at any point.

In the baseline scenario, the top ranked PDOs are from northern Italy. The first three are from the Langhe Cuneesi of the Piedmont Region and the Bergamo area (Alta Valle Brembana, in the Lombardy region) while the following three are from other areas of the northern mountain regions (Trentino, Valle d'Aosta, Lombardy mountain area). PDO cheeses from South and Central Italy do appear among the highest ranked PDOs. The best performing PDO among this sub-group is ranked 8th (Ragusano DOP) and the others appear in the central - bottom part of the ranking.

Figure 5.1 - Ranking and Net Flows of Italian PDO Cheeses, Baseline Scenario



Source: author's

The ranking also shows a relationship between the performance of the PDOs and other characteristics. The higher ranked PDOs in the baseline scenario are small, niche products that are not well known in wider markets. Lower ranked

PDOs tend to be larger (in terms of turnover), older and well established in the wider markets through large distribution systems. We checked out and observed the existence of a correlation between dimension of the PDO and ranking. This relationship is confirmed by the high value of the correlation coefficient (-0.80) between the ranking on PDO performance and the ranking on turnover[49].

To a certain extent this result is not surprising if one considers that it is consistent with the rationale of the European Regulation, specially targeted to the smallest traditional production chains and those chains where small firms are prevalent. Nevertheless, larger PDOs form an important and diversified sub-group. Among the 31 cheese PDOs, there is a small number of very large ones, while the great majority are much smaller[50]. As noted earlier, we will distinguish between the large PDOs (the top 9) and the smaller PDOs (the remaining 22).

The Spearman coefficient allows to examine the correlation between the general ranking obtained on the basis of the net flow and the rankings obtained on the basis of the partial net flows to gain further insights into the ranking and performance profile. Table 5.3 indicates the Spearman coefficient, calculated on the rankings based on the partial net flows shown in Table 5.4, between the general ranking and the ranking according to each single objective.

Table 5.3 - Spearman coefficient between ranking in Baseline Scenario and ranking according to each objective

Spearman Coefficient		
General Ranking	BP ranking	0.73
	INFO ranking	0.76
	DIFF ranking	0.89
	MP ranking	0.46
	LD ranking	0.78

Source: authors

The first thing to notice is that the highest correlation is between general ranking and the Differentiation objective (0.89): the nature of the indicators

[49] The option to make a separate MCA for big and small PDOs wouldn't produce different results because the output is a relative ranking. Each product has a position relative to the others: the ranking changes neither within the small PDOs nor within the large ones.

[50] Here the group of big PDOs includes only those with a share of the total turnover bigger than 1%: Parmigiano Reggiano, Grana Padano, Mozzarella di Bufala Campana, Gorgonzola, Pecorino Romano, Asiago, Montasio, Provolone Valpadana, Taleggio.

assigned this objective (DIM and AVGQUANT) helps explaining the relationship between the ranking and the dimension of the PDO in terms of value. Secondly, other significant correlations appear with Local Development, Information and Bargaining Power (varying between 0.78 and 0.73). The lowest correlation (0.46) is between the general ranking and the Market Performance objective.

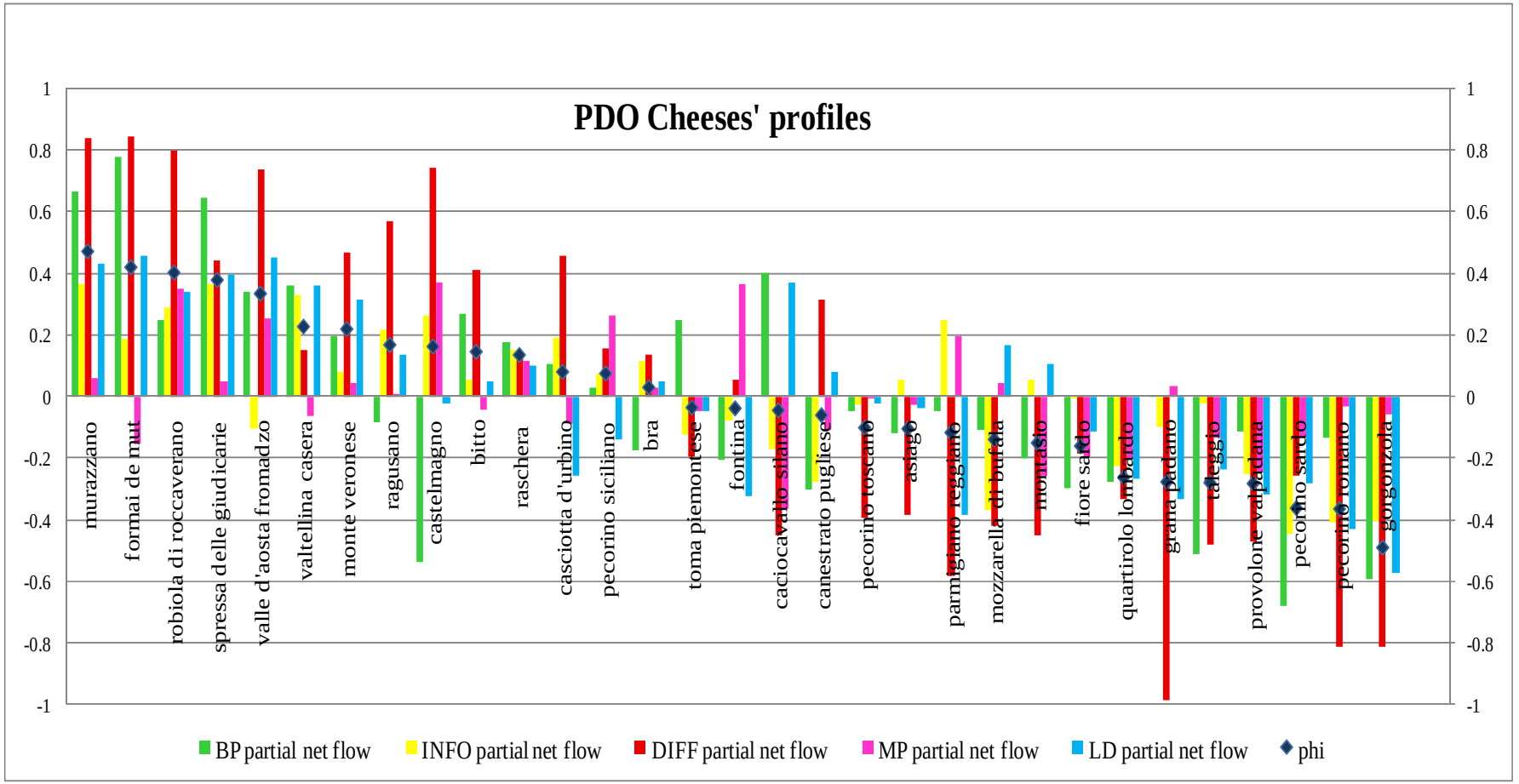
Figure 5.2 gives a graphical representation of the general ranking (secondary axis) with respect to the performance on each single objective (primary axis). We report the representations of the performance on each single objective, according to the general ranking. We generally confirm the highest alignment of the overall PDOs performance with the Differentiation objective and the lowest with the Market Performance objective.

Table 5.4 - Ranking of Italian PDO Cheeses, Net Flows, and Partial Net Flows (Baseline Scenario)

BASELINE RANKING	NET FLOW	PARTIAL NET FLOW				
PDO Cheeses	Average (Phi)	BP	INFO	DIFF	MP	LD
Murazzano	0.47	0.66	0.36	0.84	0.06	0.43
Formai de Mut	0.42	0.78	0.18	0.84	-0.16	0.46
Robiola di Roccaverano	0.40	0.25	0.29	0.80	0.35	0.34
Spressa delle Giudicarie	0.38	0.65	0.36	0.44	0.05	0.39
Valle d'Aosta Fromadzo	0.33	0.34	-0.10	0.73	0.25	0.45
Valtellina Casera	0.23	0.36	0.33	0.15	-0.06	0.36
Monte Veronese	0.22	0.19	0.08	0.47	0.04	0.32
Ragusano	0.17	-0.09	0.22	0.57	0.01	0.14
Castelmagno	0.16	-0.54	0.26	0.74	0.37	-0.02
Bitto	0.15	0.27	0.05	0.41	-0.05	0.05
Raschera	0.14	0.18	0.15	0.13	0.12	0.10
Casciotta d'urbino	0.08	0.11	0.19	0.46	-0.09	-0.26
Pecorino Siciliano	0.08	0.03	0.08	0.15	0.26	-0.14
Bra	0.03	-0.17	0.11	0.14	0.03	0.05
Toma Piemontese	-0.04	0.25	-0.13	-0.20	-0.05	-0.05
Fontina	-0.04	-0.21	-0.08	0.05	0.37	-0.32
Caciocavallo Silano	-0.04	0.40	-0.17	-0.45	-0.36	0.37
Canestrato Pugliese	-0.06	-0.30	-0.28	0.31	-0.11	0.08
Pecorino Toscano	-0.10	-0.05	-0.03	-0.40	-0.01	-0.02
Asiago	-0.10	-0.12	0.05	-0.38	-0.03	-0.04
Parmigiano Reggiano	-0.12	-0.05	0.25	-0.58	0.20	-0.39
Mozzarella di Bufala	-0.14	-0.11	-0.37	-0.42	0.05	0.17
Montasio	-0.15	-0.20	0.06	-0.45	-0.26	0.10
Fiore Sardo	-0.16	-0.30	0.00	-0.19	-0.19	-0.11
Quartirolo Lombardo	-0.26	-0.28	-0.23	-0.33	-0.20	-0.27
Grana Padano	-0.28	0.00	-0.10	-0.99	0.03	-0.33
Taleggio	-0.28	-0.51	-0.02	-0.48	-0.13	-0.24
Provolone Valpadana	-0.28	-0.12	-0.25	-0.47	-0.25	-0.32
Pecorino Sardo	-0.36	-0.68	-0.45	-0.26	-0.14	-0.28
Pecorino Romano	-0.36	-0.13	-0.41	-0.81	-0.03	-0.43
Gorgonzola	-0.49	-0.59	-0.41	-0.81	-0.06	-0.58

Source: author's

Figure 5.2 - Product profiles: partial net flows relative to the objectives



Source: author's elaboration (software: Decision Lab)

The partial net flows in Table 5.4 (presented graphically in Figure 5.2), show that the highest ranked PDOs perform very well with respect to all five objectives and the lowest ranked PDOs show very poor performance on all objectives. Other PDOs show mixes of performance on different objectives. There are a some exceptions to the general statement: Market Performance is not consistent with the ranking in the case of Formai de Mut, Valtellina Casera, Bitto and Casciotta d'Urbino, although these still gain an overall positive performance. The same applies to Bargaining Power: Ragusano, Castelmagno and Pecorino Siciliano: all occupy places in the first half of the ranking but show a negative performance on this objective (very accentuated in the case of Castelmagno). At the bottom of the ranking, negative performances on all objectives are partially compensated by positive (in the case of Fontina, Parmigiano Reggiano, Grana Padano and Mozzarella di Bufala) or less negative (for Pecorino Toscano, Asiago, Pecorino Romano and Gorgonzola) market performances.

It is to be noticed that the three largest and most famous PDOs (Parmigiano Reggiano, Grana Padano, and Fontina) do not rank in the top 10 PDOs under the baseline scenario. The Fontina PDO ranks 16th, due to its poor performance with respect to all objectives except Market Performance, where it performs well. The Grana Padano PDO ranks well behind, in 26th position. It is also interesting to compare the performance of Grana Padano and Parmigiano Reggiano, as the two major Italian PDOs are very close substitutes. The latter ranks a bit higher (21th), with a better score on information and market performance than the former.

Figure 5.3 – Bargaining Power partial net flow with respect to the general ranking

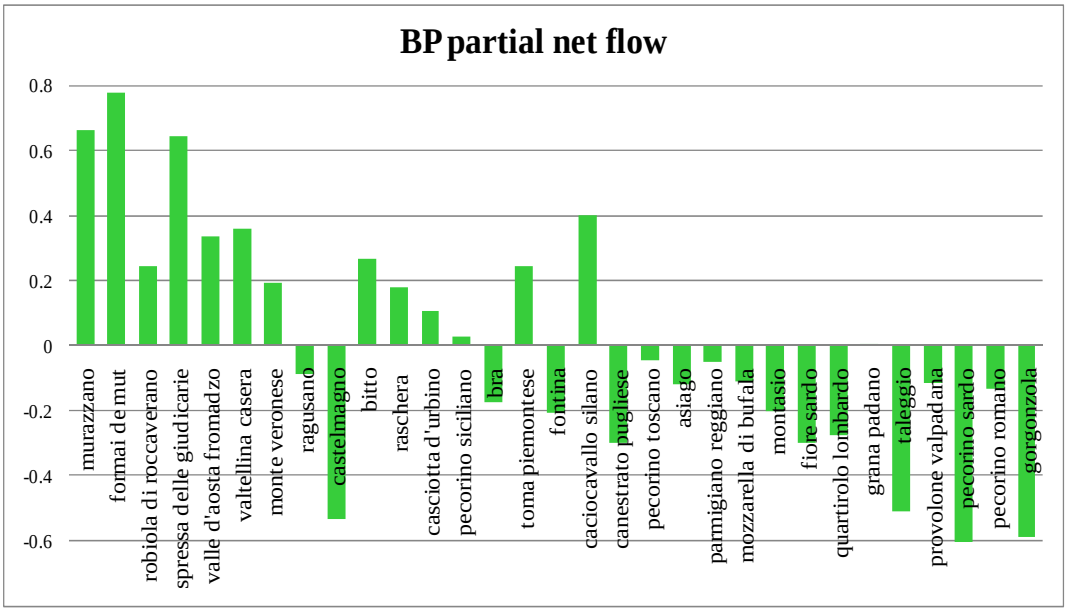
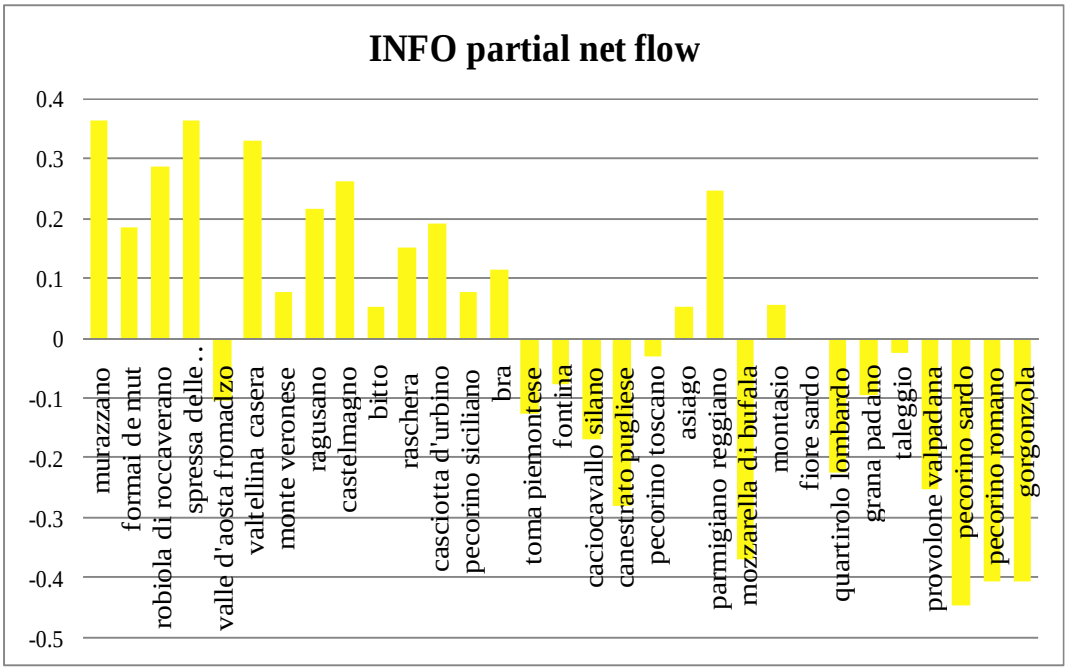


Figure 5.4 – Information partial net flow with respect to the general ranking



Source: authors' elaboration (software: Decision Lab)

Figure 5.5 – Differentiation partial net flow with respect to the general ranking

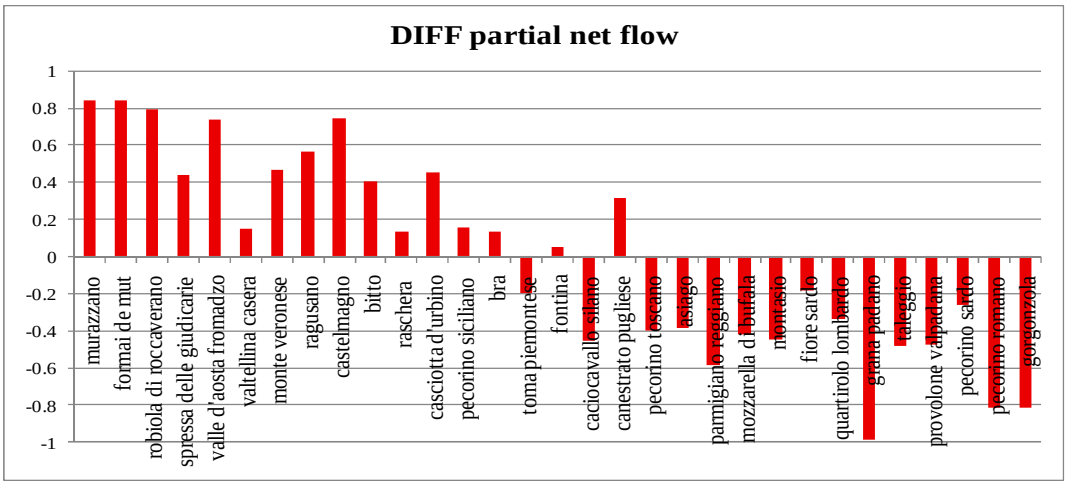


Figure 5.6 – Market Performance partial net flow with respect to the general ranking

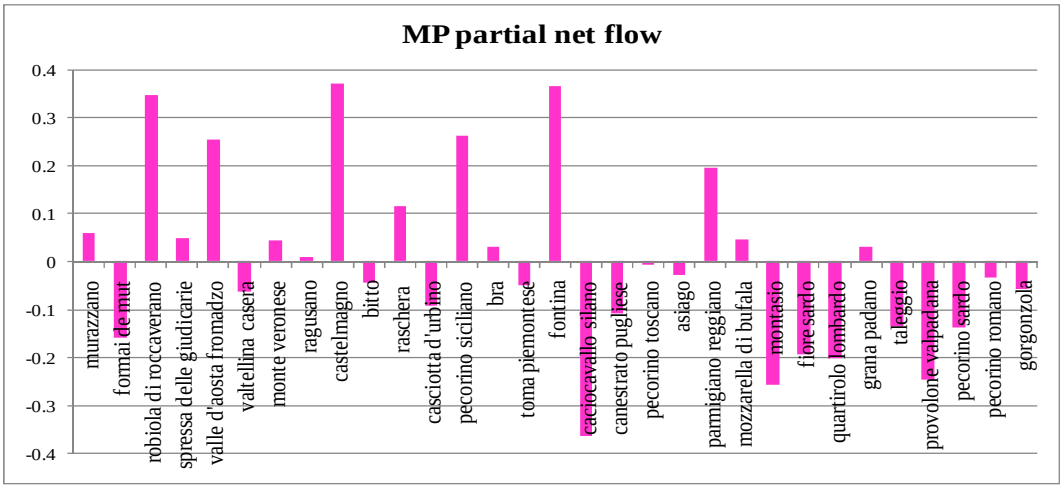
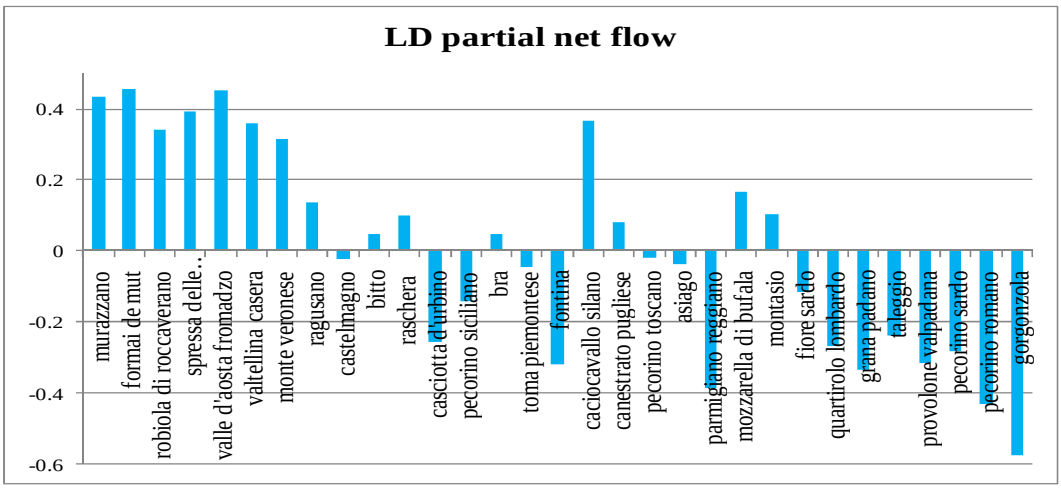


Figure 5.7 – Local Development partial net flow with respect to the general ranking



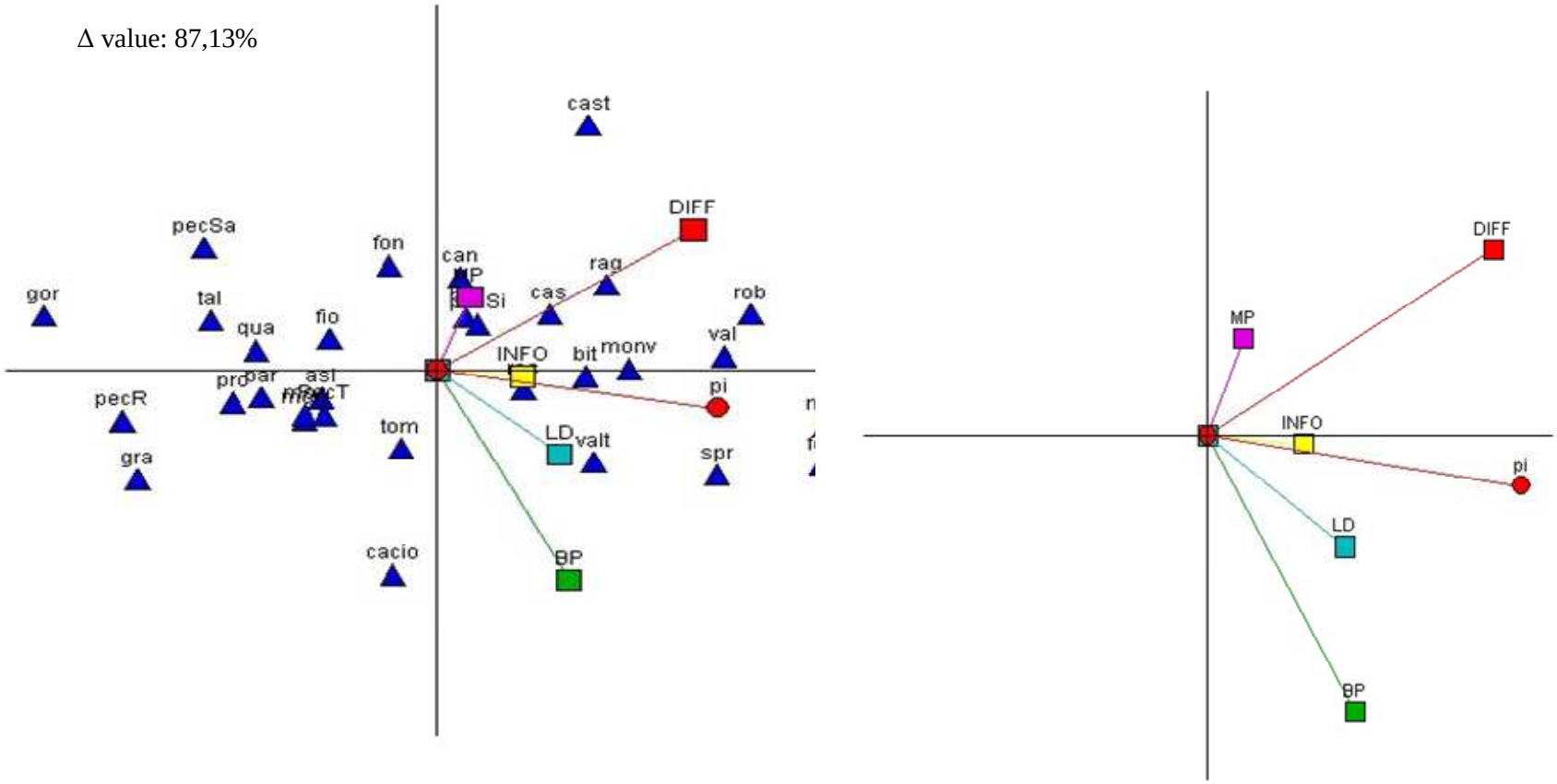
Source: authors' elaboration (software: Decision Lab)

Further support to the evidence just discussed is given by at the GAIA planes reported in Figure 5.8 (see paragraph 4.3.3.4 in chapter 4 for a detailed explanation of the meaning of the GAIA plane). The GAIA plane on the left represents the projection of the unit vectors of the coordinate-axes representing the criteria, the “decision axis” pi (in red) and the positioning of the points representing the PDO products. The closer the products to the decision axis (which represents the best compromise in the evaluation) the higher the position in the ranking. The GAIA plane on the right gives a clearer representation of the positions of objectives and the decision axis, without showing the products. The representation can be considered of good quality since more than 87% of information preserved after the projection.

Looking at the general orientation of the axes on the plane, we have a first evidence that, overall, there are no complete tradeoffs among the objectives of the policy. Such evidence indicates that the policy can, to a certain extent, partially achieve all the objectives. Moreover, the significant length of the decision axis indicates that the evaluation can be carried out unambiguously, in the sense that the criteria are not strongly conflicting and the selection of a good compromise should not be a hard problem.

Looking at the orientation and length of each single axis, we notice a closer alignment of the directions of the axis representing Bargaining power and Local Development, with the former having a stronger discriminating impact (i.e. longer length) than the latter. Market Performance points in a different direction with respect to Bargaining Power and Local Development, indicating a rather conflicting character of the objectives, while the Differentiation axis is orthogonal (i.e. objectives are independent or not related to each other), and very long, (this indicates the strong impact of the corresponding indicators on the results. The Information axis occupies a central position, but it is not a very discriminating criteria on the final result (i.e. very short).

Figure 5.8 - The GAIA Plane for the Baseline Scenario



Source: author's elaboration (software: Decision Lab)

5.3.4.2 Two Alternative Scenarios: "Producers and Local Territory PDOs" vs "Market performing PDOs"

We analyzed two additional scenarios to explore how the PDOs perform when not all five objectives are included and the weights on objectives change. These alternative weighting scenarios may better represent the perspectives of different stakeholders and/or more specific targets. Table 5.5 summarizes the weights on the objectives under the three scenarios.

Table 5.5 - Three Scenarios with differing weights on objectives

	Weights on Objectives		
Objectives	Scenario 1 Policy Maker	Scenario 2 Niche/Local market PDOs	Scenario 3 Market Performing PDOs
Information	20%	0%	0%
Differentiation	20%	20%	0%
Market Performance	20%	0%	100%
Bargaining Power	20%	40%	0%
Local Development	20%	40%	0%

Source: author's

The three scenarios are intended to move from the results obtained following the perspective of the regulator's wider goals to two particular perspectives, linked to different strategies in the development and management of PDO cheese: on one side PDO producers with bargaining power, well linked to the local territory and characterized by "niche" dimensions (second scenario); on the other side PDO producers characterized by a positive market performance (in the sense of the indicators included in the evaluation), not necessarily present on the local market but rather focused on large distribution markets. We refer to the baseline scenario as the "Policy Maker Scenario", where all five objectives are weighted equally, as previously indicated. The second scenario is labeled the "Producers and Local Territory PDOs": it retains three of the five objectives; Bargaining Power, and Local Development, with 40% weight each and Differentiation with a 20% weight. BP and LD represent the direct and indirect economic interests at the top of the production chain and on the local area. We decided to assign a lower weight to DIFF because this objective is not considered

as important as the others to these stakeholder (in fact it should concern all types of PDOs). The third scenario is labeled “Market performing PDOs” because it considers solely how well the PDOs perform on the market, while all the other objectives are dropped.

Table 5.6 shows the rankings obtained on the three scenarios on the basis of the corresponding phi values. The correlations calculated on all couples of rankings (Spearman coefficient) indicate that the ranking in the baseline scenario is highly consistent with the ranking obtained in the “Producers and Local Territory PDOs” (0.935). The correlation is much lower if we look at the correlation between baseline ranking and “Market performing PDOs” ranking (0.46) and it absolutely drops is we look at the (linear) relationship between “Producers and Local Territory PDOs” and “Market performing PDOs” (0.25).

Figure 5.9 visually summarizes the rankings of the Italian cheese PDOs under the three alternative decision-making scenarios. It clearly indicates that highly ranked PDOs in the first and second scenarios tend to have a much lower ranking in the third scenario: for example, Formai de Mut drops from second position in baseline to 26th position in “Market performing PDOs”, while Valtellina Casera moves from 6th position to 21st position. At the same time, the lower ranked PDOs gain a higher ranking moving from the first to the third scenario: Fontina upgrades from 16th position in baseline and 22nd position in “Producers and Local Territory PDOs” scenario to 2nd position in “Market performing PDOs” scenario. The same applies to other famous PDOs: Parmigiano Reggiano (from 21st to 6th), Grana Padano (from 26th to 12th) and also Pecorino Romano and Gorgonzola.

There are some exceptions to this trend: some highly ranked PDOs (ex. Murazzano, Robiola di Roccaverano and Valle d’Aosta Fromadzo) maintain a high position in the three rankings. This very positive results indicates that the performance is stable with respect to all the policy objectives (i.e. the evaluation does not change if the perspective is changed). Besides, some “niche” PDOs, such as Raschera (ranked 11th in the baseline and 7th in Market performing PDOs) loose positions on the second scenario but gain in the “Market performing PDOs”

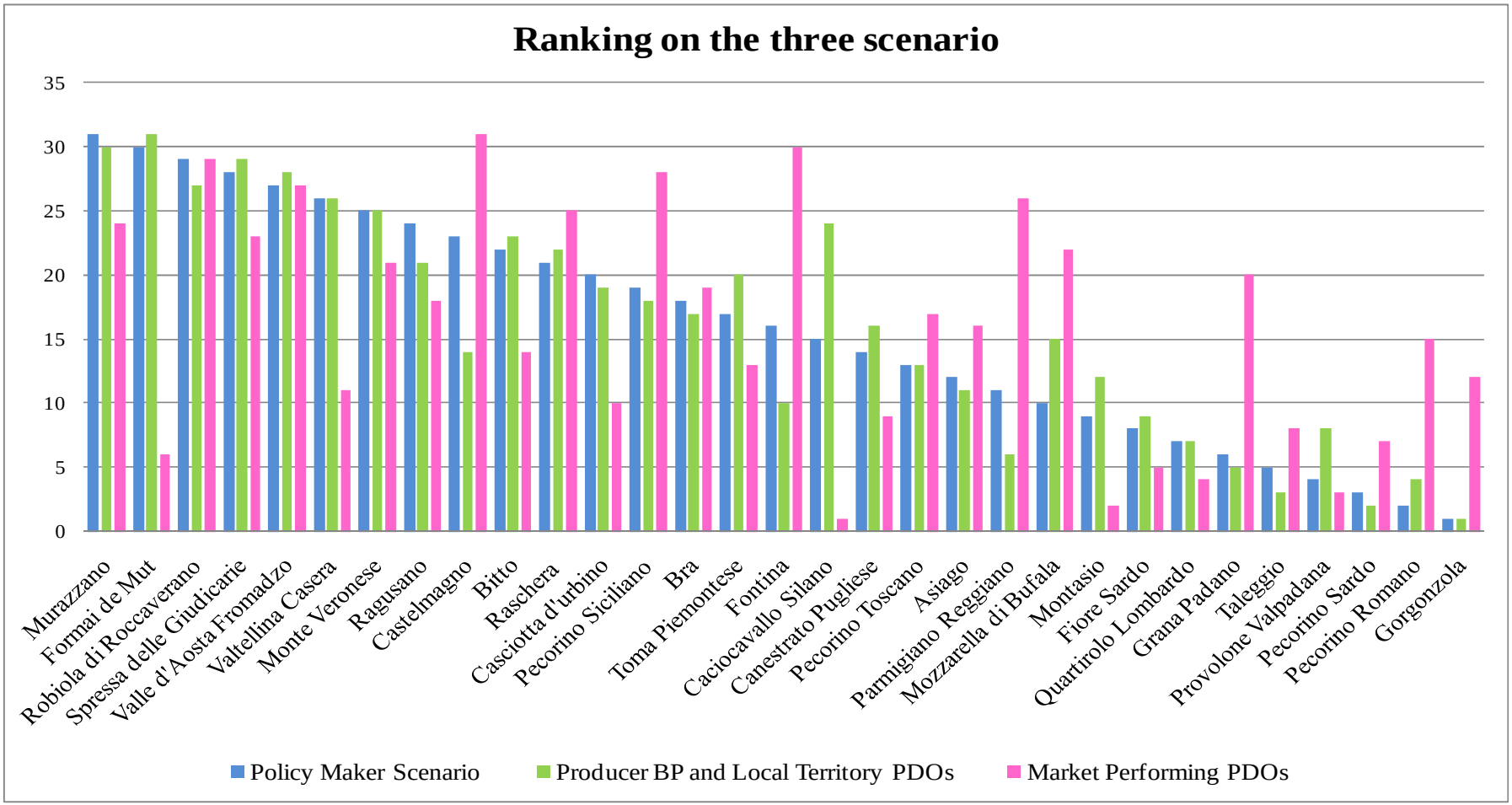
scenario. Other large PDOs, such as Montasio and Provolone Valpadana, have a low ranking in the baseline scenario but show an even lower ranking in the third scenario.

Table 5.6 - Rankings and Phi values of the PDOs in three scenarios

PDO cheese	Policy maker scenario	PHI1	Producers and Local Territory PDOs	PHI 2	Market performing PDOs	PHI 3
Murazzano	1	0.47	2	0.61	8	0.06
Formai de Mut	2	0.42	1	0.66	26	-0.16
Robiola di Roccaverano	3	0.40	5	0.39	3	0.35
Spressa delle Giudicarie	4	0.38	3	0.50	9	0.05
Valle d'Aosta Fromadzo	5	0.33	4	0.46	5	0.25
Valtellina Casera	6	0.23	6	0.32	21	-0.06
Monte Veronese	7	0.22	7	0.30	11	0.04
Ragusano	8	0.17	11	0.13	14	0.01
Castelmagno	9	0.16	18	-0.07	1	0.37
Bitto	10	0.15	9	0.21	18	-0.05
Raschera	11	0.14	10	0.14	7	0.12
Casciotta d'urbino	12	0.08	13	0.03	22	-0.09
Pecorino Siciliano	13	0.08	14	-0.02	4	0.26
Bra	14	0.03	15	-0.02	13	0.03
Toma Piemontese	15	-0.04	12	0.04	19	-0.05
Fontina	16	-0.04	22	-0.20	2	0.37
Caciocavallo Silano	17	-0.04	8	0.22	31	-0.36
Canestrato Pugliese	18	-0.06	16	-0.03	23	-0.11
Pecorino Toscano	19	-0.10	19	-0.11	15	-0.01
Asiago	20	-0.10	21	-0.14	16	-0.03
Parmigiano Reggiano	21	-0.12	26	-0.29	6	0.20
Mozzarella di Bufala	22	-0.14	17	-0.06	10	0.05
Montasio	23	-0.15	20	-0.13	30	-0.26
Fiore Sardo	24	-0.16	23	-0.20	27	-0.19
Quartirolo Lombardo	25	-0.26	25	-0.29	28	-0.20
Grana Padano	26	-0.28	27	-0.33	12	0.03
Taleggio	27	-0.28	29	-0.40	24	-0.13
Provolone Valpadana	28	-0.28	24	-0.27	29	-0.25
Pecorino Sardo	29	-0.36	30	-0.44	25	-0.14
Pecorino Romano	30	-0.36	28	-0.39	17	-0.03
Gorgonzola	31	-0.49	31	-0.63	20	-0.06
Spearman coefficient (1 vs 2)	***0.935***					
Spearman coefficient (1 vs 3)	***0.463***					
Spearman coefficient (2 vs 3)	***0.2540***					

Source: author's.

Figure 5.9 - Comparison of three weighting scenarios in terms of ranking



Source: authors' elaboration (Software: Decision Lab)

Summarizing, the multi-criteria analysis for the assessment of the cheese PDOs in Italy allowed us to gain insights on the performance with respect to the five policy objectives. Performance on these objectives was measured with several indicators. The comparison of PDOs performances has generated rankings based on alternative weightings of the five objectives to reflect different perspectives and interests of actors involved. The baseline ranking, analyzed with the aid of the GAIA plane, showed a relevant (although not complete) *tradeoff* between the performance on Bargaining Power and the Local Development objectives on one side and Market Performance objective on the other side. This motivated the choice to explore two alternative scenarios, one focused on Bargaining Power, Local Development objectives and, to a lower extent Differentiation ("Producers and Local Territory PDOs" scenario) and the other focused on "Market Performing PDOs". According to the results obtained through the simulations with respect to the choice of different sets of weights, it possible to detect four different types of performance profiles:

i) cheese PDOs with a high profile, in the sense of a good performance with respect to all the policy maker's objective. These confirm a high ranking in all scenarios and according to all the different perspectives explored;

ii) cheese PDOs with a high profile with respect to bargaining power of producers, relevance on the local territory and differentiation of the product but with a poorer market performance;

iii) cheese PDOs with a good market performance profile but with a poorer performance on bargaining power of producers, local territory and differentiation;

iv) cheese PDOs with a low profile, in the sense of a low ranking with respect to all policy makers' objectives. From the perspective of both bargaining power of local producers and market performance results are scarce.

While the first and the last typology give indications on the characteristics of the "best" and "worst" PDO performances, the intermediate cases evidence a *tradeoff* which is of some interest for the policy itself, and it suggests a possible

underlying contradiction. We will look for further evidence on this tradeoff by extending the analysis to another sector: the PDOs extra virgin olive oil in Italy.

5.4 Evaluation of the Performance of PDO/PGI Extra Virgin Olive Oils in Italy

5.4.1 Why the PDO/PGI Olive Oil sector: brief descriptive analysis

Given the results of the Multi Criteria analysis on the cheese sector, we decided to extend the approach to another sector where PDO/PGI schemes are widely present, in terms of increasing number of recognitions in the last years. Olive oil production represents an important sector of Italian agriculture since the olive tree is the most common tree species (8% of UAA, INEA 2009). Olive cultivation is distributed throughout the national landscape according to the specific pedo-climatic conditions and therefore is in a strong connection with the territory of origin. Moreover olive oil represents a central component of the Mediterranean diet and is strongly associated with the image of “made in Italy” throughout the world.

However there are some relevant differences, in comparison to the PDO cheese sector, that are worth discussing. One first characteristic of olive oil is a higher degree of product homogeneity, with respect to the extremely different cheese types available on the market. Differences in olive oils are related to chemical attributes (for example acidity or polyphenols) and flavor characteristics, but in general we can say that the product doesn’t change radically as it does for cheeses, also in terms of variety of aims and conditions of consumption. This will enable us (as we will see when indicators will be presented) to distinguish PDO/PGI olive oils in relation to attributes that can be interpreted in terms of higher and lower quality (i.e. vertical differentiation).

Another relevant difference is in terms of value. ISMEA (2010) shows that extra virgin olive oils (from now on “e-v”) represent 19% of total number of PDO/PGI products (38 registrations in total in 2008), following fruits and vegetables (38%). However, unlike the cheese sector, the significant number of recognitions, increased over the years, does not correspond to an equally

significant value in sales. In terms of estimated turnover, PDO e-v olive oils represent only 2% of total PDO/PGI turnover (ISMEA, 2010) and 0,05% of total turnover in olive and seed oil in Italy.

The e-v olive oils registrations are all PDOs, with the exception of a single PGI, the Toscano oil, which is the e-v olive oil with the largest number of operators and surface cultivated. The sector encounters 19,589 workers, of which 1,537 processors (with 2,329 plants) and 18,708 producers who grow 92,981 hectares planted with olive trees to produce olive oil, with an average of 5.0 hectares per farm (ISTAT, 2010). Also in terms of turnover, Toscano PGI oil is extremely larger than the others with an average turnover of more than 36 million euro. The other PDOs range from 15 thousands euro (Pretuziano delle Colline Teramane) to 7,5 million euro (Terra di Bari).

In terms of regional location, 69.6% of olive oil producers are located in the center, 17.8% in the South and the remaining 12.6% in the North. In particular, in Tuscany there are 10,852 companies and 54,153 hectares, which are, respectively, 58% of Italian production units and 58.2% of the cultivated surface in the country. In the South, the most represented regions are Puglia, with 1,458 farms and 14,928 hectares and Sicily, respectively, 913 businesses and 6,700 acres. Processors are present mainly in Tuscany, Puglia and Sicily, with, respectively 626, 199 and 109 units (ISTAT, 2010).

The following table summarizes the major characteristics of the PDO/PGI e-v olive oils on which we focused our analysis. We decided to exclude 8 PDO oils of recent establishment (from 2004 onward) to reduce the differences in terms of age of existence and allow a better comparison among the PDO/PGIs in the sample. Therefore we concentrate on 29 PDO e-v oil oils and 1 PGI (the Toscano oil). The Toscano PGI oil is comparable to a PDO because all stages of the chain occur within the region and the reasons that led to establishment of a PGI, a not a PDO, have a political and not a substantial motivation: this is the reason why we decided to treat it without distinctions. The table shows the year of establishment of the PDO/PGIs (5 in 1996, 14 in 1997, and steadily increasing by 2 to 4 per year up to 2008), the geographic location (18 in the South, 6 in the Center and 6 in the

North), the extension of the production area, the turnover of the PDO/PGI (averaged over the time interval 2008-2009) and the number of authorized additional mentions, if any, within (usually broad) PDO/PGI area of production.

Table 5.7 - Major Characteristics of Italian PDO/PGI Extra Virgin Olive Oils

PDO/PGI e-v olive oil	Turnover (avg. 2008-2009, mln euro)	Dimension of area of production (ha)	Year	Geographic area	No. of additional mentions within the PDO/PGI
Toscano (PGI)	36836	49899.72	1998	Center	8
Terra di Bari	7500	12717.64	1997	South	3
Riviera Ligure	5200	2153.44	1997	North	3
Umbria	4450	4677.77	1997	Center	5
Sabina	1850	1653.92	1996	Center	
Garda	1345	1040.92	1997	North	
Chianti Classico	1260	3208.03	2000	Center	
Val di Mazara	1195	3289.33	2001	South	
Dauno	1000	473.32	1997	South	4
Monti Iblei	938	1271.06	1997	South	8
Terre di Siena	900	964.71	2000	Center	
Canino	895	1783.14	1996	Center	
Bruzio	800	1020.96	1997	South	4
Veneto	525	654.24	2001	North	3
Valli Trapanesi	500	1314	1997	South	
Aprutino Pescarese	494	615.57	1996	South	
Collina di Brindisi	300	551.2	1996	South	
Brisighella	227.5	125.07	1996	North	
Colline Teatine	222.5	259.9	1997	South	2
Molise	197	806.63	2003	South	
Monte Etna	165.5	142.57	2003	South	
Colline di Romagna	155	138.41	2003	North	
Laghi Lombardi	131.5	51.74	1997	North	2
Cilento	105	325.01	1997	South	
Colline Salernitane	95	196.59	1997	South	
Terra d'Otranto	90	581.01	1997	South	
Penisola Sorrentina	85	94.44	1997	South	
Alto Crotonese	71	NA	2003	South	
Pretuziano delle Colline teramane	19	61.14	2003	South	
Lametia	15	NA	1999	South	
Total	*67,567*	*90071*		*North: 18*	*42*
Mean	*2,252*	*3217*		*Center: 6*	
Standard deviation	*6,637*	*9305*		*South: 6*	
CV	*2.95*	*2.89*			

Source: authors' elaboration on ISTAT, ISMEA and Qualivita

5.4.2 Indicators of performance: differences with respect to the cheese case

The selection on the indicators was done based on two sets of reasons: i) the need to make the analysis on PDO/PGI olive oils comparable to the analysis of

PDO cheeses; ii) the need to adapt the indicators to the features of the sector analyzed. The next table shows the indicators used in the olive oil case in comparison to the cheese case, and descriptive statistics. We will limit the discussion to the indicators that differ in the olive oil case. The complete values for the indicators in the performance matrix are reported in appendix 4. The indicators per objective, that differ in the two cases are:

Enhancing producers' bargaining power:

- No differences, same indicators used.

Providing reliable information for consumers on the origin and other quality attributes of typical products

- PRECINFO: although the same acronym as in the PDO cheese case is used, the construction of the indicator (1/0 values) is adapted to the olive oil sector characteristics. The precision of the information conveyed through the PDO/PGI is related to the extension of the area covered and to the existence of additional mentions within the PDO/PGI.
- 3 SF OLIVES: The "Extra-virgin olive oil guide" published by Slow Food, assigns the "Three Olives", a prestigious prize awarded each year to the best Italian extra-virgin olive oils. This indicator considers the number of Three Olive Slow Food Awards obtained in 2009 and 2010 and is considered as a proxy of the resonance and visibility of the PDO/PGI oil.

Promoting differentiation of production

- DAYSPICKPROC: this indicator considers simultaneously two parameters that are determinant for the final quality of the olive oil. The first is the amplitude of the harvest period (in terms of number of days available for harvesting, indicated in the specifications): certainly it depends on the climatic conditions of the area, but generally, the longer the time available, the worse the quality of the olives gathered. The other parameter is the number of days permitted between picking and processing: the longer the time between collection and processing, the higher the risk of a deterioration of the raw material.

Table 5.8 – Indicators used in the two applications (in italics, the different indicators used for the olive oil case)

PDO CHEESES	PDO/PGI E-V OLIVE OILS	Construction of the indicator	Preference	Obs	Mean	St. Dev.	Min	Max
AVG TURN PROD	AVG TURN PROD	producer turnover/consumer turnover %	MAX	29	64%	15%	28%	97%
VAR TURN PROD	VAR TURN PROD	absolute variation (2004-2008, percentage points)	MAX	29	-12.63	21.48	-67.97	42.30
CONS	CONS	firms participating to Consotium/total no. of PDO firms %	MAX	24	70%	33%	9%	100%
DIRSALE	DIRSALE	direct sales/total sales %	MAX	28	20%	22%	0%	80%
VERINFO	PRECINFO	indicator 0 = area less precisely identified; 1 = area more precisely identified or added mentions within the PDO/PGI	MAX	30	0.70	0.47	0	1
PRECINFO	CONS	firms participating to Consotium/total PDO firms %	MAX	24	70%	33%	9%	100%
CONS	*3 SF OLIVES*	*number of 3olives SF award won in 2009 and 2010*	*MAX*	30	0.7	0.7	0	2
INVPROMO	INVPROMO	Investments in promotion and advertising in the last five years declared by the Consortium (euro)	MAX	16	262229	714134	250	2853663
AVGQUANT	AVGQUANT	average quantity certified (2004-2008, kg)	MIN	30	248,331	539,653	1083	2,709,739
DIM	*DAYSPICKPROC*	*no. days for harvesting/max no. for harvesting + days allowed between picking and processing/max no. days allowed between picking and processing*	*MIN*	30	1.3	0.3	0.8	1.8
	PANEL TEST	*minimum grade to be obtained in the panel test*	*MAX*	30	6.7	0.4	6.5	8.0
	ACIDITY	*maximum level of acidity allowed*	*MIN*	30	0.6	0.1	0.5	0.8
	POLIPEROX	*no. peroxides/max no. of peroxides + no. polyphenols/min no. Polyphenols*	*MIN*	30	1.21	0.18	0.97	1.66
VARQUANT	VARQUANT	variation between 2004-2008 %	MAX	29	11%	37%	-23%	181%
ACTVSPOT	ACTVSPOT	of actual vs potential use of PDO (Qualivita data, %)	MAX	30	13%	15%	0%	52%
AVGMS	AVGMS	avg PDO turnover/avg sector turnover %	MAX	30	0.038%	0.062%	0.000%	0.287%
VARTURN	VARTURN	% variation between 2004-2008	MAX	30	-13%	67%	-168%	113%
AVGEXP	AVGEXP	exports over total sales %	MAX	30	20%	22%	0%	80%
VAREXP	AVGPP	premium price relative to price of a comparable product (avg 2004-2008, %)	MAX	30	88%	87%	-9%	340%
AVGPP	*VARPP*	*variation of premium price relative to price of a comparable product (percentage points 2004-2008, %)*	*MAX*	30	0.0243	0.4035	-1.3200	0.9100
TRAD	TRAD	indicator 1=traditional varieties among the main varieties included (<30%); 2=traditional varieties (30%<x<70%); 3=traditional varieties (>70%)	MAX	30	2.1	0.5	1	3
LOCREG	LOCREG	% of production sold on the local and regional market (average percentage, 2004-2008)	MAX	26	51%	24%	10%	100%
DIRSALE	DIRSALE	direct sales/total sales %	MAX	28	20%	22%	0%	80%
PROMLOCSF	*DENS*	*no. PDO/PGI businesses per 100 ha of territory within the boundaries of the specifications*	*MAX*	28	3.5	2.7	0.8	12

- PANEL TEST: the panel tests on olive oil is used to detect whether an oil, that has chemical qualities necessary to be considered extra-virgin, can also be considered appropriate from the organoleptic point of view. The specifications indicate the minimum grade that must be obtained to be considered a PDO/PGI product.
- ACIDITY. This is another indicator useful to evaluate the good quality of olive oil, indicated in the specifications (the maximum level allowed is indicated): the lower the better the quality of the product.
- POLIPEROX: this indicator considers simultaneously the number of polyphenols and the number of peroxides. Polyphenols are natural antioxidants and can have positive health effects. Their minimum presence is a guarantee of quality. Similarly, the determination of the number of peroxides is a good measure of olive oil quality, in the early stages of its preservation. The lower the peroxide value, the better the quality of olive oil and its state of preservation.

Enhancing market performance of PDO products

- VARPP: variation of price premium of the PDO cheese with respect to a corresponding generic product (in percentage, averaged over the time interval 2004-2008).

Promoting local development

- TRAD. differently from the PDO cheese case this indicator considers the percentage of traditional olive tree cultivar (typical of the territory of origin) that must be present among the main varieties (i.e. main and secondary varieties need to be indicated in the specifications). The indicator is based on three classes of percentages (1=<30%; 2=30%<traditional varieties<70%; 3=>70%).
- DENS: the number of PDO/PGI businesses per 100 ha of area of production indicates the intensity of presence of PDO/PGI operators interested in the PDO/PGI.

For the same reasons discussed in the previous case, the final choice of indicators was made following an analysis of significant correlations (95% confidence level) among the indicators initially hypothesized (see the correlation

matrix, showing correlations between the indicators that were finally included, in appendix 5). None of the indicators initially included resulted (significantly and) negatively correlated within the same objective. Other indicators were excluded for paucity of data: "variation of exports" within the Market Performance objective and "number of farms that produce and transform raw material" (which had been included in the Bargaining Power objective because olive growers that participate in a production process are more likely to be able to gain the value added related to the sale of the final product).

Finally, the criteria used for the choice of the preference functions adopted for each indicator is the same we used for the PDO cheese case (see paragraph 5.3.3).

5.4.3 Results of Multi-Criteria Analysis

Similarly to the PDO cheese case we follow analogous steps also for the PDO/PGI e-v olive oil case: i) we simulate a baseline "policy maker's" scenario; ii) we compare the results obtained in the baseline scenario with the results obtained in two alternative scenarios. The choice of the alternative scenarios, with different sets of weights assigned to the objectives, will be coherent with the results obtained in the policy makers' scenario.

5.4.3.1 Baseline Scenario: the Policy maker perspective

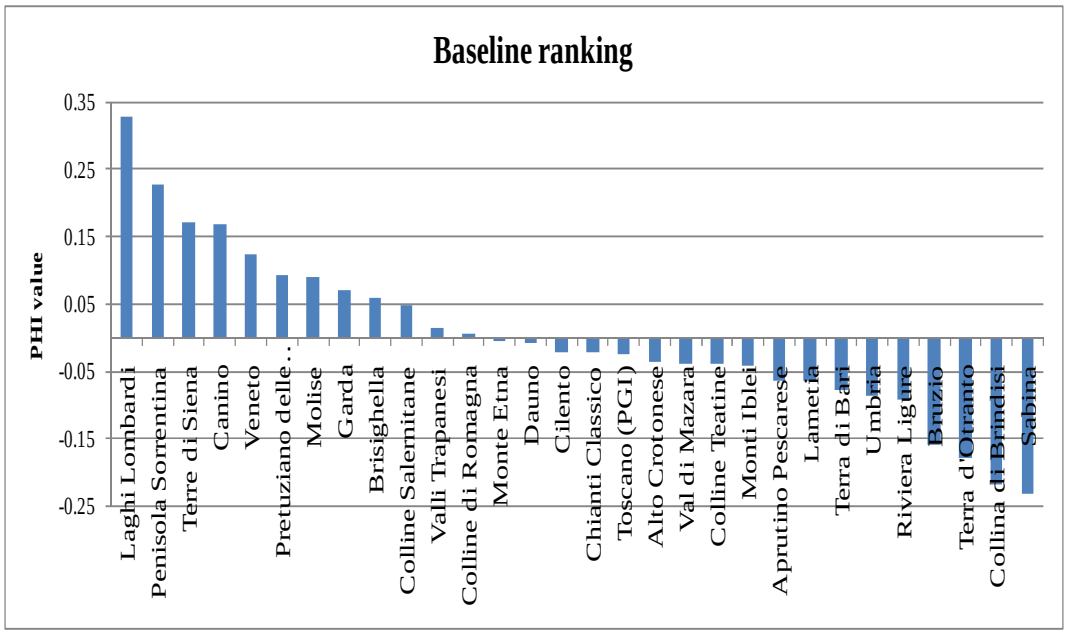
Figure 5.10 and Table 5.9 show the scores obtained by the 30 PDO/PGI Italian e-v olive oils under the baseline scenario and their relative ranking, based on the net flows and the partial net flows. The ratings of the PDO/PGI olive oils range from a maximum of +0.33 to a minimum of -0.23: this indicates a lower variability of performances among the different PDO/PGI olive oils, with respect to the PDO cheese case.

In the baseline scenario, the top ranked PDOs are not from a specific geographical area. The first three are respectively from North (Laghi Lombardi), South (Penisola Sorrentina) and Center (Terre di Siena). Overall, the highest average ranking (calculated as the sum of rankings divided by the number of PDOs in the geographical area) belongs to Northern PDO olive oils (10.2 average ranking), an intermediate average ranking belongs to PDO/PGIs from the Center

(15.8 average ranking) and the lowest belongs to PDOs from the South (17 average ranking).

In terms of value, excluding Toscano PGI because of the great disparity with the others, the average ranking of large PDOs (turnover values between 4,4 million euro and 7,5 million euro) is 25, that of medium sized PDOs (turnover values between 490 thousand euro and 1,9 million euro) is 15 and the average ranking of small sized PDOs (between zero and 300 thousands euro) is 14. Again the primacy in the ranking belongs to the small denominations (in terms of economic size), although not as clearly as in the PDO cheeses (the Spearman coefficient between baseline ranking and ranking in terms of turnover is only -0,29, while for PDO cheeses it was up to -0,80), probably due to the smaller size of all the units in the sample.

Figure 5.10 - Ranking and Net Flows of Italian PDO/PGI E-V Olive Oils, Baseline Scenario



Source: author's elaboration on results obtained in Decision Lab

Table 5.9 - Ranking of Italian PDO/PGI E-V Olive Oils, Net Flows, and Partial Net Flows, Baseline Scenario

BASELINE RANKING	NET FLOW	PARTIAL NET FLOW				
PDO E-V Olive Oil	Average (Phi)	BP	INFO	DIFF	MP	LD
Laghi Lombardi	0.33	0.42	0.04	0.39	0.18	0.62
Penisola Sorrentina	0.23	0.53	0.06	0.10	-0.01	0.47
Terre di Siena	0.17	0.25	-0.09	0.04	0.52	0.15
Canino	0.17	0.15	-0.02	0.14	0.13	0.44
Veneto	0.12	-0.31	0.22	0.17	0.33	0.20
Pretuziano delle Colline Teramane	0.09	0.06	0.10	0.28	0.18	-0.15
Molise	0.09	0.39	-0.23	0.18	-0.15	0.27
Garda	0.07	-0.09	0.24	-0.11	0.16	0.15
Brisighella	0.06	-0.13	0.10	0.25	-0.05	0.13
Colline Salernitane	0.05	0.41	-0.20	0.02	-0.24	0.24
Valli Trapanesi	0.02	-0.17	0.03	-0.05	0.49	-0.22
Colline di Romagna	0.01	-0.15	0.06	0.40	-0.18	-0.10
Monte Etna	0.00	-0.27	-0.04	0.11	-0.02	0.19
Dauno	-0.01	0.31	0.15	-0.17	-0.21	-0.12
Cilento	-0.02	0.06	-0.23	0.11	-0.20	0.15
Chianti Classico	-0.02	-0.01	0.10	-0.06	-0.04	-0.10
Toscano (PGI)	-0.02	-0.03	0.27	-0.29	0.07	-0.13
Alto Crotonese	-0.04	0.07	0.13	0.10	-0.37	-0.11
Val di Mazara	-0.04	-0.05	-0.08	-0.02	0.39	-0.44
Colline Teatine	-0.04	-0.18	0.09	-0.05	-0.21	0.16
Monti Iblei	-0.04	-0.14	0.10	-0.06	0.15	-0.26
Aprutino Pescarese	-0.06	-0.05	-0.39	-0.02	0.19	-0.05
Lametia	-0.06	0.03	0.13	0.00	-0.44	-0.04
Terra di Bari	-0.08	0.02	0.17	-0.09	0.00	-0.48
Umbria	-0.09	0.04	-0.04	-0.29	-0.10	-0.05
Riviera Ligure	-0.09	-0.30	0.14	-0.16	0.02	-0.16
Bruzio	-0.16	-0.16	0.09	-0.30	-0.12	-0.30
Terra d'Otranto	-0.18	-0.25	-0.26	-0.16	0.05	-0.28
Collina di Brindisi	-0.22	-0.02	-0.28	-0.24	-0.48	-0.07
Sabina	-0.23	-0.45	-0.37	-0.21	-0.03	-0.10

Source: author's elaboration (software: Decision Lab).

The analysis of the Spearman coefficient (Table 5.10) indicates the highest correlation between the general ranking and the ranking according to the Differentiation objective (0.73). Notice that this time the indicators of Differentiation do not only reflect the size of the PDO (in terms of quantities certified) but also the vertically differentiated quality of the different e-v olive

oils, according to the indicators constructed on the basis of a comparative reading of the content of specifications. The second most significant correlation is observed between the general ranking and Local Development (0.63) then with Bargaining Power (0.49). The lowest correlations this time are with the Market Performance (0.35) and the Information objectives (0.16).

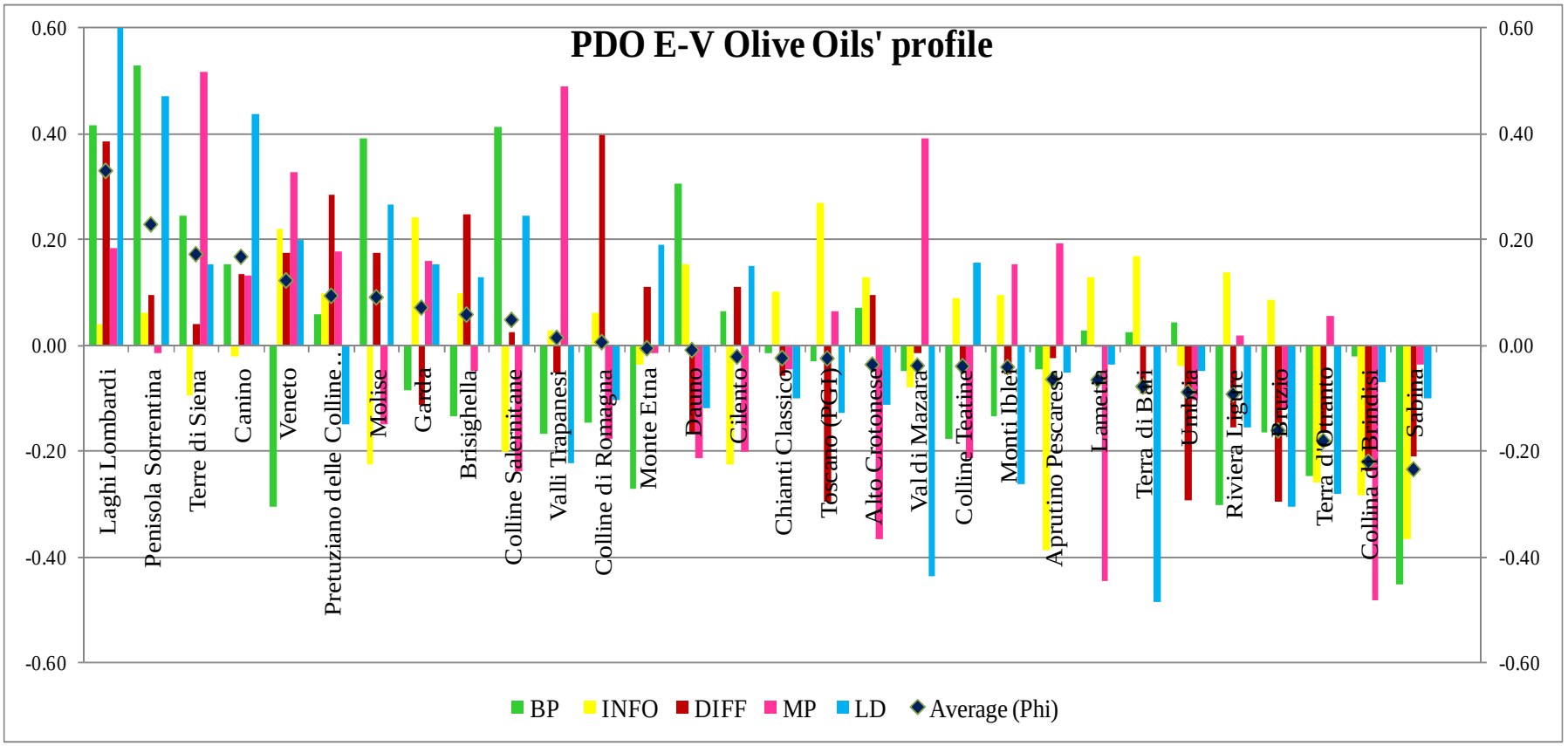
Table 5.10 - Spearman coefficient between ranking in Baseline Scenario and ranking according to each objective

Spearman Coefficient		
General Ranking	BP ranking	0.49
	INFO ranking	0.16
	DIFF ranking	0.73
	MP ranking	0.35
	LD ranking	0.63

Source: author's.

Figure 5.11 gives a graphical representation of the general ranking (secondary axis) with respect to the performance on each single objective (primary axis). Following, we report the representations of the performance on each single objective, according to the general ranking. The partial net flows, show the highest degree of consistency between DIFF, LD and the baseline ranking. BP shows some degree of inconsistency (ex. Veneto and Brisighella) but MP e INFO are not in line with the general ranking. To be noticed that the second in the ranking (Penisola Sorrentina) has a negative market performance, while the 28th (Terra d'Otranto) has a positive Market Performance. The same applies to the 3rd in ranking (Terra di Siena) and the 27th (Bruzio) for what concerns performance on Information. The PGI Toscano oil (ranked 17th with a phi value just below zero) ranks behind the other Tuscan oil (Chianti Classico, ranked 16th) because it is penalized by a negative performance on Differentiation, Bargaining Power and Local Development. Other famous e-v olive oils from Puglia region (Terra di Bari, Terra d'Otranto, Colline di Brindisi and Dauno) occupy positions from the middle to the bottom of the ranking. Better ranking for Sicilian PDO olive oils (Val di Mazara, Monti Iblei, Valli Trapanesi and Monte Etna), positioned in the central section of the ranking.

Figure 5.11 - Product profiles: partial net flows relative to the objectives



Source: authors

Figure 5.12 – Bargaining Power partial net flow with respect to the general ranking

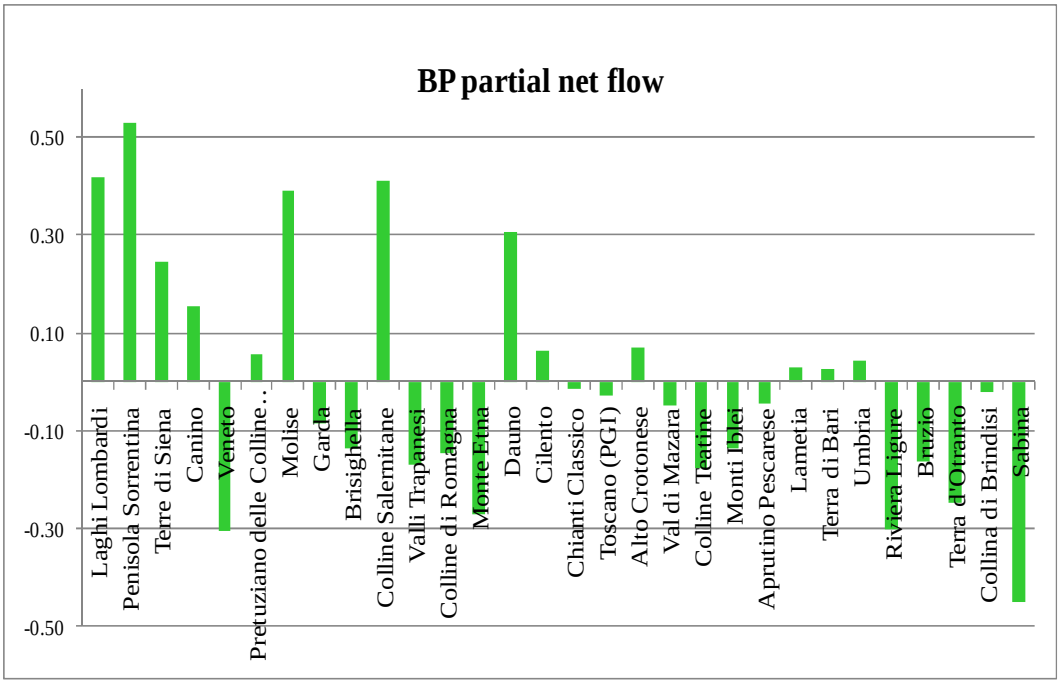
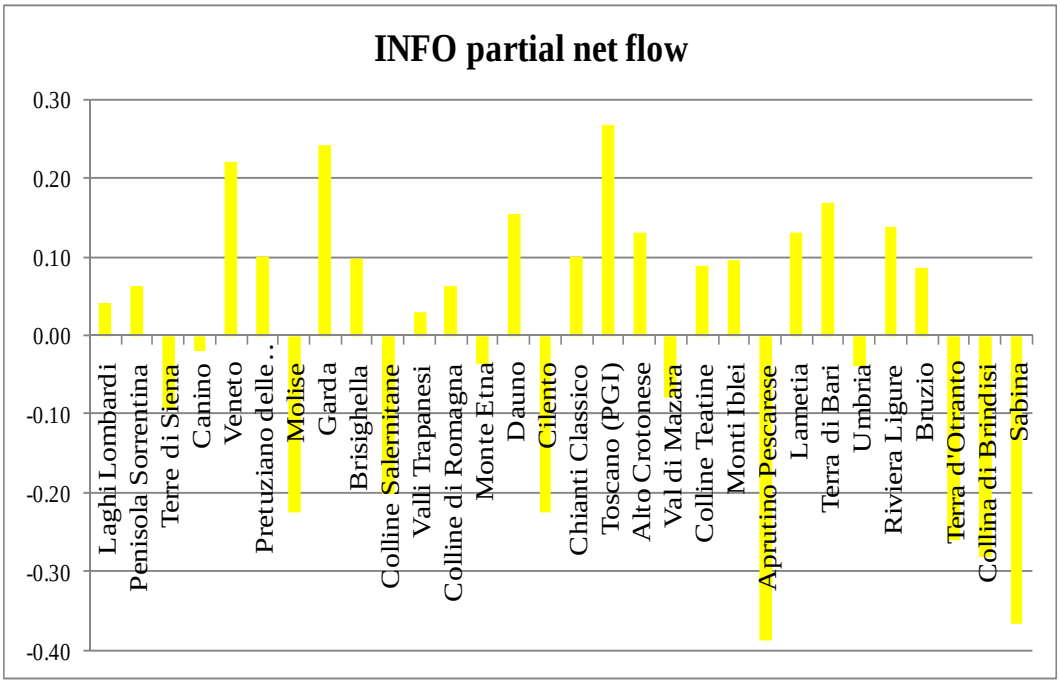


Figure 5.13 – Information partial net flow with respect to the general ranking



Source: authors

Figure 5.14 – Differentiation partial net flow with respect to the general ranking

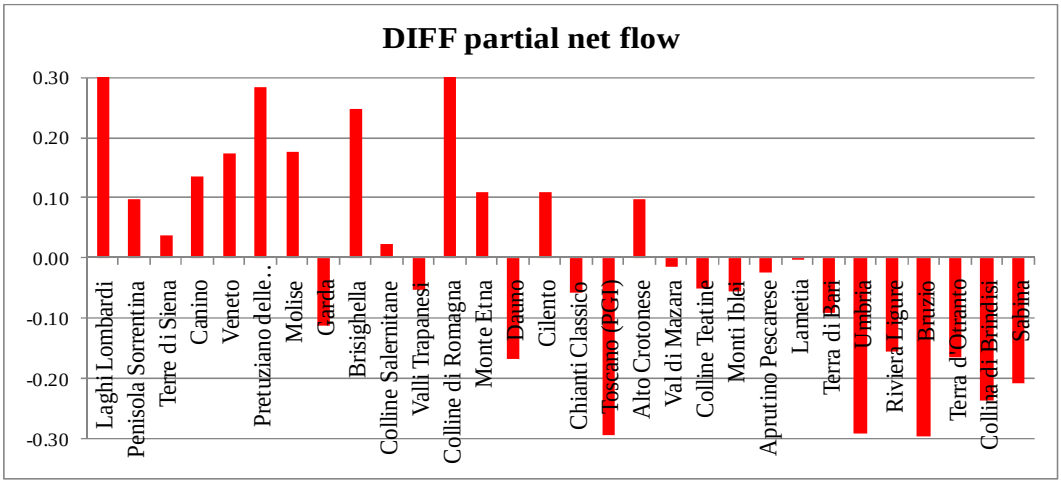


Figure 5.15 – Market Performance partial net flow with respect to the general ranking

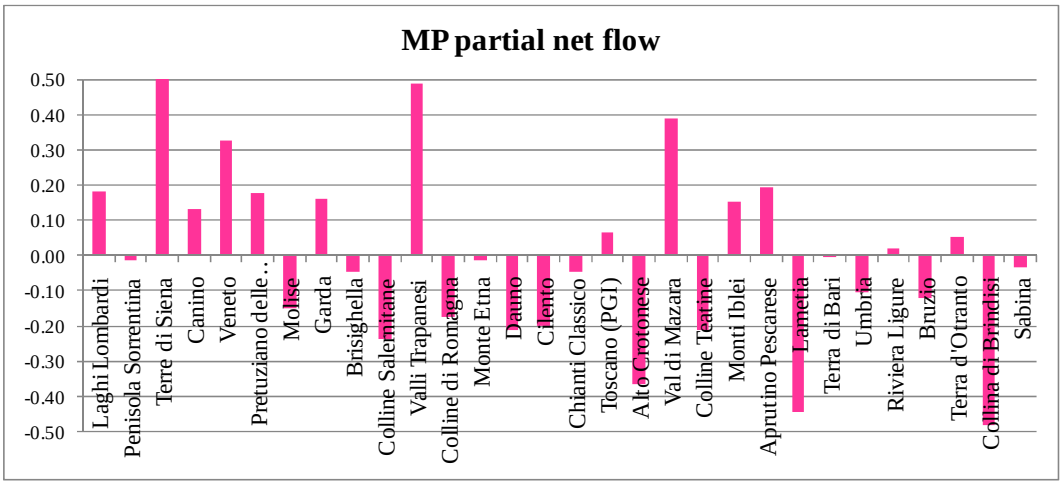
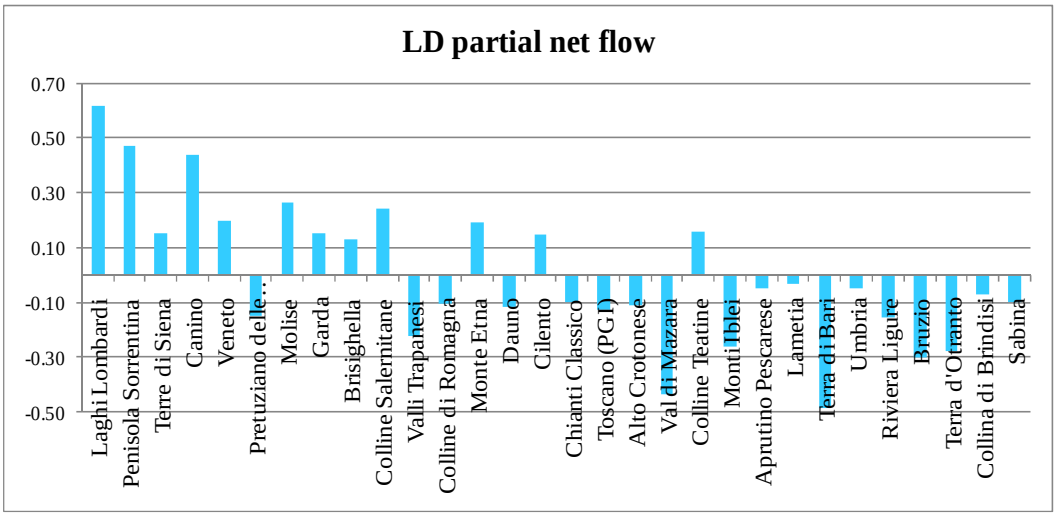


Figure 5.16 – Local Development partial net flow with respect to the general ranking



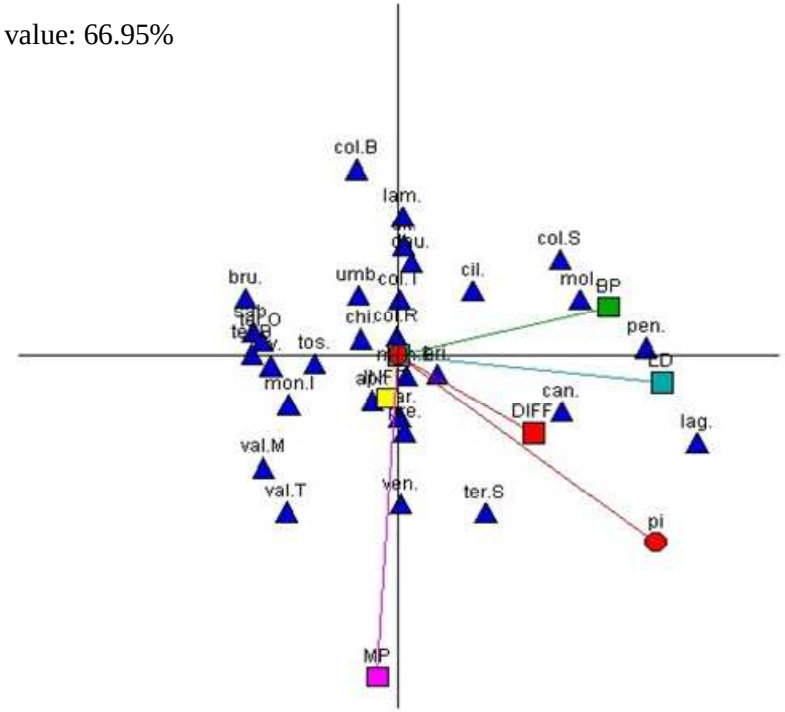
Source: authors

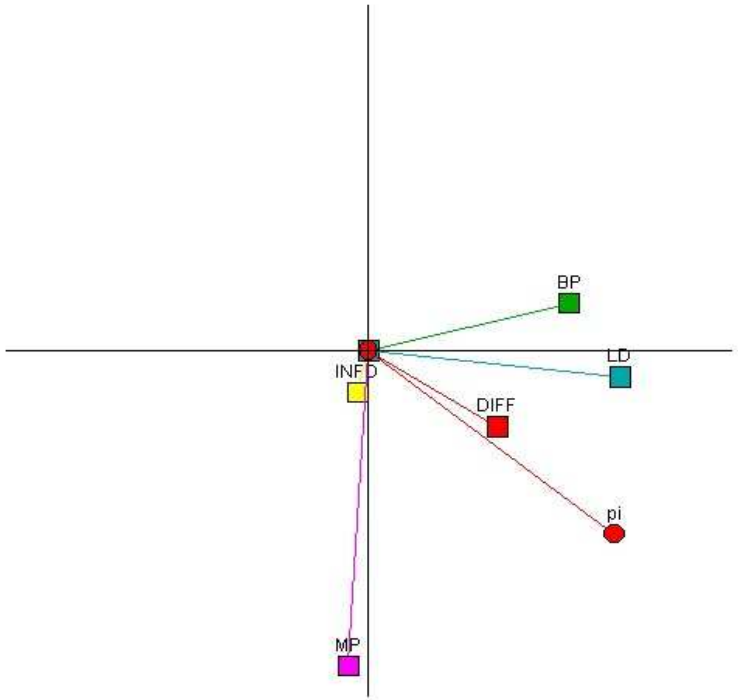
The GAIA planes (Figure 5.17) represented for the PDO/PGI olive oil case represents a lower amount of information, with respect to the cheese case, probably because of the higher number of indicators included in the performance matrix: only 67% of the information is preserved after the projection. However, the authors of the PROMETHEE method indicate that a value between 60% and 70% is sufficient for a representation to be reliable (Brans and Mareschal, 2005).

Similarly to the PDO cheese case, the general orientation of the axes on the plane doesn't show complete tradeoffs among the objectives of the policy, so the policy (again in this case) can partially achieve all the objectives, (as it is confirmed by the length of the decision axis).

Looking at the orientation and length of each single axis, we confirm a close alignment of the directions of the axis representing Bargaining Power and Local Development, this time with the latter having a stronger discriminating impact (i.e. longer length) than the former. The Differentiation axis occupies a central position, although with a shorter length and accordingly, influence on the results (than the cheese case). The Information axis is again very short and not influent on the results: it occupies a different position with respect to the cheese case, in the most contrasting position with respect to all other objectives. A closer positioning of INFO to Market Performance (compared to the PDO cheese case) suggests possible synergies between these objectives, and accordingly, it indicates that a mass consumption strategy could be preferable to a niche market strategy. This is opposed to the cheese case in which a closer positioning of INFO to BP and LD could suggest a niche strategy. Finally, Market Performance is in a *tradeoff* position with respect to Bargaining Power and seems orthogonal with respect to Local Development, (i.e. independent). Recalling the PDO cheese case, in both cases there are no synergies between Market Performance and Bargaining Power of producers together with Local Development. This result suggests us the same path, followed also for the cheese case: we will now compare the results obtained in the baseline with other two alternative scenario.

Figure 5.17 - The GAIA Plane, Baseline Scenario, PDO/PGI olive oils





Source: author's elaboration (software: Decision Lab)

5.4.3.2 Two Alternative Scenarios: "Producers and Local Territory PDOs" vs "Market performing PDOs"

The two alternative scenarios are modeled according to the reasoning we followed in the PDO cheese case. See Table 5.5 for a summary of the weights assigned to the objectives under the three scenarios.

Table 5.11 shows the rankings obtained on the three scenarios on the basis of the corresponding phi values. The results reflect those of the previously analyzed case. The Spearman coefficient indicates a high correlation between the ranking of the baseline scenario and the ranking obtained in the "Producers and Local Territory PDOs" (0.83). The correlation is much lower with the "Market performing PDOs" scenario (0.37), while the relationship between "Producers and Local Territory PDOs" and "Market performing PDOs" this time is negative (-0.06). This means that the higher ranked PDOs in the second scenario have a lower ranking in the third scenario and vice versa.

Figure 5.18 graphically summarizes the rankings of the Italian e-v olive oil PDO/PGIs under the three alternative decision-making scenarios. If the ranking of PDO/PGI oils changes at all, moving from the first to the second scenario, it either improves (ex. Molise, Colline Salernitane, or Dauno) or worsens slightly (ex. Terre di Siena, Pretuziano delle Colline Teramane). More evident changes happen when moving from the policy maker to the third scenario: the first two PDOs in the baseline ranking (Laghi Lombardi and Penisola Sorrentina) move respectively to the 8th and 13th position. Instead, the 3rd ranked oil (Terre di Siena) moves to the 1st position. The last three olive oils in ranking, with the exception of Collina di Brindisi, show the same position in the first and second scenario (Terra d'Otranto, 28th and Sabina 30th) but upgrade considerably in the third scenario (11th and 17th respectively).

Overall 16 PDOs downgrade from a higher to a lower ranking, while 13 upgrade from a lower to a higher ranking (only Pretuziano maintains the same ranking in first and third scenarios). Toscano PGI, ranked 17th in the policy maker scenario has a slightly lower performance on "Producers and Local Territory PDOs" scenario (22nd in second scenario) and a better performance on the market

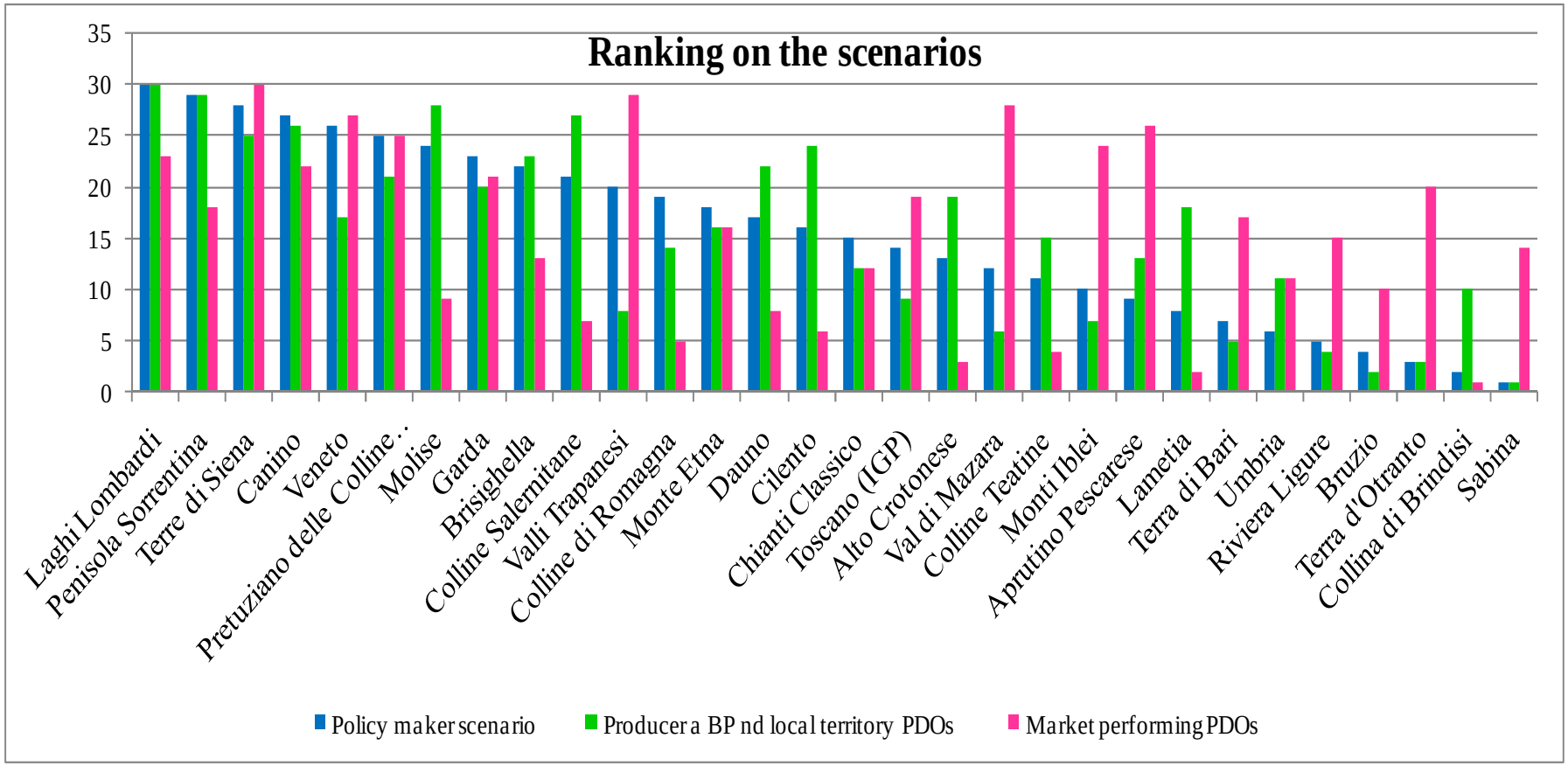
(12th in the third scenario). The PDO e-v olive oils of large economic size from Puglia (Terra di Bari and Dauno) show two opposing trends: while Terra di Bari downgrades in the second scenario and upgrades in the third, Dauno improves in the "Producers and Local Territory PDOs" scenario but shows a lower market performance. This is probably due to the good performance on BP, related to a high participation of PDO actors of the chain in the consortium and the high density of businesses on the territory. Sicilian olive oils (Monte Etna, Valli Trapanesi, Val di Mazara and Monti Iblei) all show the same trend: lower ranking in the second scenario and higher ranking in the third scenario.

Table 5.11 - Rankings of PDO/PGIs in Three Scenarios

PDO E-V Olive Oil	Policy maker scenario	PHI 1	Producers and Local Territory PDOs	PHI 2	Market performing PDOs	PHI 3
Laghi Lombardi	1	0.33	1	0.49	8	0.15
Penisola Sorrentina	2	0.23	2	0.42	13	0.01
Terre di Siena	3	0.17	6	0.17	1	0.52
Canino	4	0.17	5	0.26	9	0.13
Veneto	5	0.12	14	-0.01	4	0.30
Pretuziano delle Colline Teramane	6	0.09	10	0.02	6	0.22
Molise	7	0.09	3	0.30	22	-0.12
Garda	8	0.07	11	0.00	10	0.12
Brisighella	9	0.06	8	0.05	18	-0.06
Colline Salernitane	10	0.05	4	0.27	24	-0.18
Valli Trapanesi	11	0.02	23	-0.17	2	0.45
Colline di Romagna	12	0.01	17	-0.02	26	-0.21
Monte Etna	13	0.00	15	-0.01	15	0.00
Dauno	14	-0.01	9	0.04	23	-0.18
Cilento	15	-0.02	7	0.11	25	-0.19
Chianti Classico	16	-0.02	19	-0.06	19	-0.08
Toscano (IGP)	17	-0.02	22	-0.12	12	0.02
Alto Crotonese	18	-0.04	12	0.00	28	-0.36
Val di Mazara	19	-0.04	25	-0.20	3	0.37
Colline Teatine	20	-0.04	16	-0.02	27	-0.25
Monti Iblei	21	-0.04	24	-0.17	7	0.18
Aprutino Pescarese	22	-0.06	18	-0.04	5	0.22
Lametia	23	-0.06	13	0.00	29	-0.39
Terra di Bari	24	-0.08	26	-0.20	14	0.01
Umbria	25	-0.09	20	-0.06	20	-0.10
Riviera Ligure	26	-0.09	27	-0.21	16	-0.01
Bruzio	27	-0.16	29	-0.25	21	-0.10
Terra d'Otranto	28	-0.18	28	-0.24	11	0.07
Collina di Brindisi	29	-0.22	21	-0.08	30	-0.49
Sabina	30	-0.23	30	-0.26	17	-0.05
Spearman coefficient (1 vs 2)	***0.827***					
Spearman coefficient (1 vs 3)	***0.366***					
Spearman coefficient (2 vs 3)	***-0.0621***					

Source: author's

Figure 18 - Comparison of Three Weighting Scenarios in terms of ranking and phi value



Source: author's

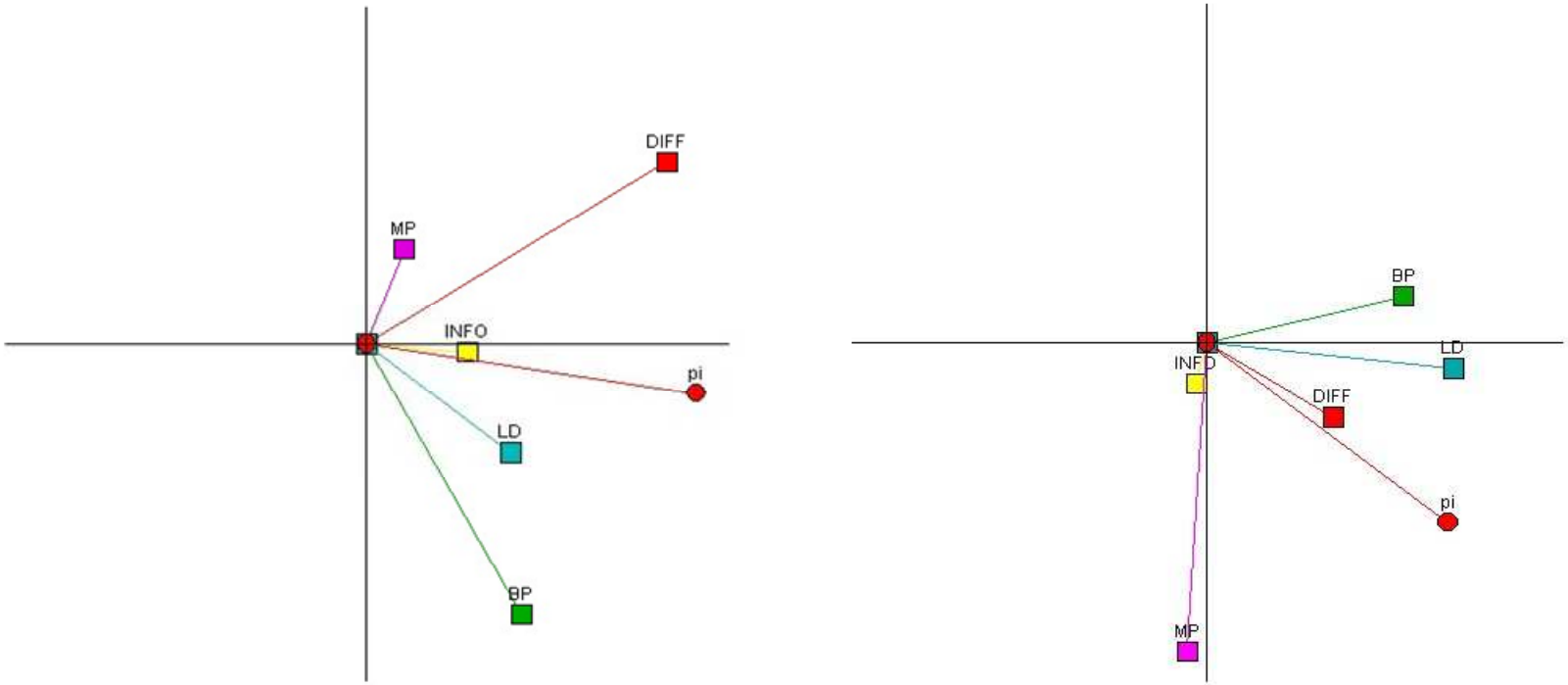
5.5 Comparison of results and concluding remarks

We developed a multi-criteria framework for the assessment of the performance of the PDOs/PGIs. The performance of PDOs/PGIs is defined with respect to five objectives set out in EU Regulation 510/2006. Performance on these objectives is measured with several indicators. The approach compares PDOs/PGIs performances and generates rankings based on alternative weightings of the five objectives to reflect different perspectives and interests of actors involved. We applied the framework to 31 Italian PDOs in the cheese sector and 30 Italian PDO/PGIs in the e-v olive oil sector. The indicators used in the two cases are chosen as uniformly as possible in order to make the results comparable, with the exception of a few adjustments related to intrinsic diversity of the sectors analyzed. The most significant difference in the two cases relates to the differentiation objective, not only in terms of different number of indicators used but also in terms of the meaning of differentiation itself. In the case of cheese we had to limit the indicators for differentiation to variables related to the size of the PDO (both in terms of quantity certified and extension of the area covered) because of the high level of heterogeneity among the cheeses, (in the sense of a "horizontal" differentiation of products). In the case of oil, the greater uniformity of the product at issue and the availability of consistent quality variables obtained through a comparative reading across the specifications, made it possible to construct quality indicators, according to a "vertical" meaning of differentiation.

Multi Criteria analysis seems to be a promising approach to evaluate the performance of PDOs/PGIs. It offers a means to systematically explore the effects of multiple objectives and weightings of those objectives on the evaluation of the performance of individual PDOs/PGIs. We evidenced a consistency in the results obtained in the two cases analyzed. From the analysis of the GAIA planes (see Figure 5.19 for a comparison[51]), which allows to visualize on the plane the relative positioning among the performance of the PDO/PGIs on the objectives, an evident alignment between Bargaining Power

[51] The different overall orientation of the axis depends on the extraction of data carried out by the software, but doesn't influence the relative position of single axes.

Figure 5.19 - The GAIA Plane for the Baseline Scenario: PDO cheese case and PDO/PGI olive oil case



Source: author's elaboration (software: Decision Lab)

and Local Development objectives emerges in both cases. There is a conflicting relationship between these objectives and the Market Performance objective, although not a complete opposition (in the olive oil context, MP and LD seem independent rather than conflicting, but this could be due to the lower amount of information preserved after the projection, with reference to the cheese case).

In fact, the policy maker scenario simulated in the two cases emphasizes an overall higher performance of smaller PDOs, well rooted on the territory of origin, targeted to niche market segments, for both the cheese sector and the olive oil sector. On the opposite, lower ranked PDOs tend to be larger (in terms of turnover, quantity and area of production covered), older and well established in the wider markets through mass distribution systems.

In particular for the PDO cheese case, the products positioned in the first half of the ranking (i.e. with positive phi value) represent only 3.2% of total PDO cheeses' turnover, (excluding Parmigiano Reggiano and Grana Padano[52]); while for the olive oil case, PDOs positioned in the first half of the ranking represent 17% of total PDO e-v olive oil (excluding the extreme value of Toscano PGI turnover, which has a phi value just below zero[53]). The evidence that smaller PDOs are performing, on the overall, better than the bigger ones, is somehow surprising and not trivial. Nevertheless a better performance of small PDOs, especially in the baseline scenario, seems to be coherent with the Policy makers perspective.

These first results are at the heart of the choice of the alternative scenarios subsequently explored. The second scenario focuses on the Bargaining Power, Local Development and, to a lower extent, Differentiation while the third considers uniquely the performance on the market. Information was not included in any of the alternative scenarios because of the very limited incidence of this objective on the final results (in terms of length of the axis, which indicates a low variability of PDOs with respect to the indicators chosen).

[52] Their inclusion in the total turnover would make the percentage drop to 1.1%.

[53] The inclusion of Toscano makes the percentage drop to 7.8%.

Results confirm the expectations. Generally, the PDO/PGIs ranked in the first positions show a better performance, while PDO/PGIs at the bottom of the ranking show a poorer performance in all scenarios considered (with some exceptions for the olive oil case). Moving down the ranking, we gain insights on the influence of the different objectives in determining the general relative performance and a relevant *tradeoff* emerges: the PDO/PGI products show either a good performance on the "Producer and Local Territory" scenario OR a good "Market Performance".

The three scenarios presented have significant implications for how policy makers and producers evaluate PDO policy and PDO products, beyond the evidence that smaller PDOs seem to be the ones that perform better with respect to the goals of the regulator. Firstly, the Information objective, which is one of the rationales at the heart of the policy itself, doesn't show sharp positive results. Although it is certainly hardly measurable and the indicators used can be further improved, the results obtained show a limited incidence of this objective on the overall performance. Secondly, the tradeoff highlighted between BP/LD and MP is a cue of an underlying contradiction in the PDO/PGI policy: a success on the marketplace is not contributing to higher returns to producers placed upstream in the supply chain of the sector and vice versa, a stronger market power to producers, also in terms of relevance on the territory, is not consistent with a good performance on the market. Although there are exceptions to this general trend, the *tradeoff* at issue emphasizes a general ambiguity in the application of the PDO/PGI policy and it reflects two opposite feasible strategies, practicable within the different PDO/PGIs.

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Appendix 1 – Italian PDOs and PGIs per production sector

Fruits and vegetables			
Aglio Bianco Polesano	PDO	*Limone Costa d'Amalfi*	PGI
Aglio di Voghiera	PDO	*Limone di Sorrento*	PGI
Amarene Brusche di Modena	PGI	*Limone Femminello del Gargano*	PGI
Arancia del Gargano	PGI	*Limone Interdonato Messina*	PGI
Arancia Rossa di Sicilia	PGI	*Marrone del Mugello*	PGI
Asparago Bianco di Bassano	PDO	*Marrone della Valle di Susa*	PGI
Asparago bianco di Cimadolmo	PGI	*Marrone di Caprese Michelangelo*	PDO
Asparago di Badoere	PGI	*Marrone di Castel del Rio*	PGI
Asparago verde di Altedo	PGI	*Marrone di Combai*	PGI
Basilico Genovese	PDO	*Marrone di Roccadaspide*	PGI
Cappero di Pantelleria	PGI	*Marrone di San Zeno*	PDO
Carciofo di Paestum	PGI	*Marroni del Monfenera*	PGI
Carciofo Romanesco del Lazio	PGI	*Mela Alto Adige ; Südtiroler Apfel*	PGI
Carota dell'Altopiano del Fucino	PGI	*Mela di Valtellina*	PGI
Carota Novella di Ispica	PGI	*Mela Val di Non*	PDO
Castagna Cuneo	PGI	*Melannurca Campana*	PGI
Castagna del Monte Amiata	PGI	*Melanzana Rossa di Rotonda*	PDO
Castagna di Montella	PGI	*Nocciola del Piemonte ; Nocciola Piemonte*	PGI
Castagna di Vallerano	PDO	*Nocciola di Giffoni*	PGI
Ciliegia di Marostica	PGI	*Nocciola Romana*	PDO
Cipolla Rossa di Tropea Calabria	PGI	*Nocellara del Belice*	PDO
Cipollotto Nocerino	PDO	*Oliva Ascolana del Piceno*	PDO
Clementine del Golfo di Taranto	PGI	*Patata della Sila*	PGI
Clementine di Calabria	PGI	*Patata di Bologna*	PDO
Fagiolo Cannellino di Atina	PDO	*Peperone di Pontecorvo*	PDO
Fagiolo di Lamon della Vallata Bellunese	PGI	*Peperone di Senise*	PGI
Fagiolo di Sarconi	PGI	*Pera dell'Emilia Romagna*	PGI
Fagiolo di Sorana	PGI	*Pera mantovana*	PGI
Farina di Neccio della Garfagnana	PDO	*Pesca di Leonforte*	PGI
Farro della Garfagnana	PGI	*Pesca di Verona*	PGI
Farro di Monteleone di Spoleto	PDO	*Pesca e Nettarina di Romagna*	PGI
Fico Bianco del Cilento	PDO	*Pistacchio verde di Bronte*	PDO
Ficodindia dell'Etna	PDO	*Pomodorino del Piennolo del Vesuvio*	PDO
Fungo di Borgotaro	PGI	*Pomodoro di Pachino*	PGI
Insalata di Lusia	PGI	*Pomodoro S. Marzano dell'Agro Sarnese-Nocerino*	PDO
Kiwi Latina	PGI	*Radicchio di Chioggia*	PGI
La Bella della Daunia	PDO	*Radicchio di Verona*	PGI
Lenticchia di Castelluccio di Norcia	PGI	*Radicchio Rosso di Treviso*	PGI

Radicchio Variegato di Castelfranco	PGI
Riso del Delta del Po	PGI
Riso di Baraggia Biellese e Vercellese	PDO
Riso Nano Vialone Veronese	PGI
Scalogno di Romagna	PGI
Sedano Bianco di Sperlonga	PGI
Uva da tavola di Canicattì	PGI
Uva da tavola di Mazzarrone	PGI
Cheeses	
Asiago	PDO
Bitto	PDO
Bra	PDO
Caciocavallo Silano	PDO
Canestrato di Moliterno	PGI
Canestrato Pugliese	PDO
Casatella Trevigiana	PDO
Casciotta d'Urbino	PDO
Castelmagno	PDO
Fiore Sardo	PDO
Fontina	PDO
Formaggio di Fossa di Sogliano	PDO
Formai de Mut dell'Alta Valle Brembana	PDO
Gorgonzola	PDO
Grana Padano	PDO
Montasio	PDO
Monte Veronese	PDO
Mozzarella	STG
Mozzarella di Bufala Campana	PDO
Murazzano	PDO
Parmigiano Reggiano	PDO
Pecorino di Filiano	PDO
Pecorino Romano	PDO
Pecorino Sardo	PDO
Pecorino Siciliano	PDO
Pecorino Toscano	PDO
Piave	PDO
Provolone del Monaco	PDO
Provolone Valpadana	PDO
Quartirolo Lombardo	PDO
Ragusano	PDO
Raschera	PDO
Ricotta Romana	PDO
Robiola di Roccaverano	PDO
Spressa delle Giudicarie	PDO
Stelvio ; Stilfser	PDO
Taleggio	PDO
Toma Piemontese	PDO
Valle d'Aosta Fromadzo	PDO
Valtellina Casera	PDO
Vastedda della valle del Belìce	PDO
Oils and fats	
Alto Crotonese	PDO
Aprutino Pescarese	PDO
Brisighella	PDO
Bruzio	PDO
Canino	PDO
Cartoceto	PDO
Chianti Classico	PDO
Cilento	PDO
Collina di Brindisi	PDO
Colline Pontine	PDO
Colline di Romagna	PDO
Colline Salernitane	PDO
Colline Teatine	PDO
Dauno	PDO
Garda	PDO
Irpinia - Colline dell'Ufita	PDO
Laghi Lombardi	PDO
Lametia	PDO
Lucca	PDO
Molise	PDO
Monte Etna	PDO
Monti Iblei	PDO
Peninsola Sorrentina	PDO
Pretuziano delle Colline Teramane	PDO
Riviera Ligure	PDO
Sabina	PDO
Sardegna	PDO

Tergeste	PDO
Terra di Bari	PDO
Terra d'Otranto	PDO
Terre di Siena	PDO
Terre Tarentine	PDO
Toscano	PGI
Tuscia	PDO
Umbria	PDO
Val di Mazara	PDO
Valdemone	PDO
Valle del Belice	PDO
Valli Trapanesi	PDO
Veneto	PDO
Fish, molluscs and crustaceans	
Acciughe sotto sale del Mar Ligure	PGI
Tinca Gobba Dorata del Pianalto di Poirino	PDO
Other products (spicies, ecc..)	
Aceto Balsamico di Modena	PGI
Aceto balsamico tradizionale di Modena	PDO
Aceto balsamico tradizionale di Reggio Emilia	PDO
Zafferano dell'Aquila	PDO
Zafferano di San Gimignano	PDO
Zafferano di Sardegna	PDO
Bakery products and confectionery	
Coppia Ferrarese	PGI
Pagnotta del Dittaino	PDO
Pane casareccio di Genzano	PGI
Pane di Altamura	PDO
Pane di Matera	PGI
Ricciarelli di Siena	PGI
Essential oils	
Bergamotto di Reggio Calabria - Olio essenziale	PDO
Other products of animal origin	
Ricotta di Bufala Campana	PDO
Miele della Lunigiana	PDO
Fresh meat	
Abbacchio Romano	PGI
Agnello di Sardegna	PGI
Vitellone bianco dell'Appennino Centrale	PGI
Processed meats	
Bresaola della Valtellina	PGI
Capocollo di Calabria	PDO
Ciauscolo	PGI
Coppa Piacentina	PDO
Cotechino Modena	PGI
Crudo di Cuneo	PDO
Culatello di Zibello	PDO
Lardo di Colonnata	PGI
Mortadella Bologna	PGI
Pancetta di Calabria	PDO
Pancetta Piacentina	PDO
Prosciutto di Carpegna	PDO
Prosciutto di Modena	PDO
Prosciutto di Norcia	PGI
Prosciutto di Parma	PDO
Prosciutto di S. Daniele	PDO
Prosciutto di Sauris	PGI
Prosciutto Toscano	PDO
Prosciutto Veneto Berico-Euganeo	PDO
Salame Brianza	PDO
Salame Cremona	PGI
Salame di Varzi	PDO
Salame d'oca di Mortara	PGI
Salame Piacentino	PDO
Salame S. Angelo	PGI
Salamini italiani alla cacciatora	PDO
Salsiccia di Calabria	PDO
Soppressata di Calabria	PDO
Soprèssa Vicentina	PDO
Speck dell'Alto Adige	PGI
Valle d'Aosta Jambon de Bosses	PDO
Valle d'Aosta Lard d'Arnad	PDO
Zampone Modena	PGI

Source: database DOOR, accessed 2/23/2011

Appendix 2 PDO cheese Performance Matrix

	Bargaining Power						Information		Differentiation				Market Performance						Local Development			
PDO CHEESES	AVG TURN PROD	VAR TURN PROD	CONS	DIRSALE	VERINFO	PRECINFO	CONS	INVPROMO	AVGQUANT	DIM	VARQUANT	ACTVSPOT	AVGMS	VARTURN	AVGEXP	VAREXP	AVGPP	GENERIC PRODUCT	TRAD	LOCREG	VENDIR	PROMLOCSF
Asiago	65.2%	-0.04	2%	10%	1	1	2%	4,088	22,464	2.4%	-1.5%	100%	0.711%	0.2%	5.3%	0.005	19.3%	semi hard cheese (fontal)	1	25%	10%	1
Bitto	48.7%	-0.04	100%	50%	1	0	100%	114	285	0.7%	36.4%		0.018%	15.0%	1.0%	0.000	58.1%	semi hard cheese (six months matured)	1		50%	2
Bra	68.4%	-0.12	7%	7%	2	1	7%		715	1.4%	16.7%		0.029%	6.2%	11.3%	-0.025	27.1%	hard cheese	1	69%	7%	1
Caciocavallo Silano	82.2%	-0.03	19%	45%	0	0	19%		988	10.6%	-17.8%	100%	0.060%	8.1%	0%	0.000	22.0%	semi hard fresh cheese	1	75%	45%	2
Canestrato Pugliese	62.4%	-0.08	2%	7%	1	0	2%		110	2.1%	-10.8%		0.007%	-2.9%	5.0%	0.000	4.1%	local pecorino cheese	1	80%	7%	0
Casciotta d'urbino	72.2%	-0.02	33%	5%	2	1	33%	20	241	0.6%	-3.0%	100%	0.013%	-0.6%	0%	0.000	19.4%	mixed milk caciotta cheese	0	80%	5%	0
Castelmagno	33.2%	-0.19	33%	0%	2	1	33%		166	0.0%	58.4%		0.013%	20.7%	10.5%	0.090	80.6%	semi hard cheese	1	80%	0%	2
Fiore Sardo	48.1%	-0.32	32%	8%	2	0	32%		544	4.9%	24.2%		0.029%	11.5%	4.0%	-0.020	-2.5%	local pecorino cheese (30 days matured)	1	19%	8%	1
Fontina	95.1%	-0.30	15%	0%	2	0	15%		3,602	0.7%	3.1%	94%	0.186%	-10.6%	10.5%	0.090	87.9%	semi hard cheese (fontal)	1	12%	0%	1
Formai de Mut	94.5%	0.24	38%	66%	2	1	38%	13	59	0.1%	27.0%	60%	0.004%	28.6%	0%	0.000	8.8%	semi hard fresh cheese	1	100%	66%	0
Gorgonzola	41.6%	-0.06	1%	5%	0	0	1%		45,145	7.3%	6.1%		0.856%	4.5%	28.5%	0.000	8.7%	soft cheese (sweet taste)	0	0%	5%	1
Grana Padano	68.7%	0.01	4%	7%	2	0	4%	30,193	152,609	17.2%	21.2%	100%	4.993%	9.7%	26.1%	0.016	-6.5%	hard cheese	0	42%	7%	1
Montasio	70.1%	-0.22	4%	10%	2	1	4%		7,482	3.8%	-10.5%	33%	0.328%	-4.4%	4.0%	0.000	9.3%	semi hard cheese (six months matured)	1	64%	10%	1
Monte Veronese	60.4%	0.14	5%	17%	2	1	5%		530	0.3%	2.1%	75%	0.020%	7.9%	10.0%	0.000	48.6%	semi hard fresh cheese	1	81%	17%	2
Mozzarella di Bufala	78.7%	-0.18	2%	14%	0	0	2%		31,399	2.4%	16.3%		1.843%	0.4%	16.3%	-0.005	73.3%	mozzerella cheese	1	63%	14%	1
Murazzano	62.5%	0.26	100%	61%	2	1	100%		23	0.1%	-7.7%	36%	0.002%	-6.4%	0%	0.000	132.9%	mixed milk fresh cheese	1	90%	61%	1
Parmigiano Reggiano	65.2%	-0.04	11%	7%	2	1	11%	14,433	116,693	3.0%	2.3%	97%	5.806%	-1.6%	17.6%	0.059	29.1%	hard cheese	0	24%	7%	1
Pecorino Romano	56.4%	0.15	0%	8%	0	0	0%	892	30,010	9.4%	2.5%		0.393%	5.6%	83.3%	0.015	-36.7%	local pecorino cheese (six months matured)	0	2%	8%	1
Pecorino Sardo	53.2%	-0.29	0%	5%	2	0	0%	3	1,758	3.5%	21.1%	22%	0.074%	-3.3%	2.0%	0.000	-31.7%	local pecorino cheese	1	10%	5%	0
Pecorino Siciliano	56.0%	-0.44	70%	40%	2	0	70%	597	17	5.3%	87.9%	12%	0.001%	29.4%	55.5%	0.260	0.3%	local pecorino cheese	0	31%	40%	0
Pecorino Toscano	43.2%	-0.03	30%	10%	1	0	30%		2,116	4.8%	7.1%	79%	0.105%	6.3%	9.1%	0.018	-1.9%	semi hard fresh cheese	1	30%	10%	1
Provolone Valpadana	58.7%	-0.03	1%	15%	2	0	1%	1,294	9,509	3.8%	1.2%	50%	0.295%	5.3%	4.1%	0.032	-36.7%	semi hard fresh cheese	0	0%	15%	1
Quartirolo Lombardo	51.6%	0.03	3%	2%	2	0	3%		3,416	3.4%	-5.2%	100%	0.100%	-1.5%	2.0%	0.000	-12.2%	soft cheese	0	89%	2%	0
Ragusano	53.7%	-0.18	23%	15%	2	1	23%		148	0.5%	-11.2%	46%	0.008%	-16.7%	13.8%	-0.025	18.5%	semi hard fresh cheese	1	60%	15%	0
Raschera	70.1%	0.16	10%	7%	1	1	10%	729	744	1.4%	16.2%	100%	0.030%	2.9%	2.5%	0.000	23.5%	semi hard fresh cheese	1	80%	7%	1
Robiola di Roccaverano	63.1%	-0.10	87%	29%	2	1	87%	25	81	0.1%	11.6%	99%	0.006%	15.3%	8.8%	0.075	176.8%	crescenza cheese	1	78%	29%	2
Spressa delle Giudicarie	73.8%	-0.01	100%	90%	2	1	100%		89	1.3%	13.7%		0.006%	15.1%	0%	0.000	105.5%	semi hard cheese (four months matured)	1	77%	90%	0
Taleggio	46.8%	-0.17	6%	5%	0	1	6%	214	9,009	4.0%	-5.6%	100%	0.270%	8.1%	10.0%	0.000	7.5%	soft cheese, sweet, matured	0	79%	5%	1
Toma Piemontese	75.0%	0.04	8%	10%	2	0	8%		1,033	3.7%	8.2%	100%	0.046%	26.6%	10.0%	0.000	5.9%	soft cheese	0	86%	10%	1
Valle d'Aosta Fromadzo	58.8%	0.00		100%	2	0			7	0.7%	21.2%		0.000%	9.6%	0%	0.000	181.9%	semi hard cheese (fontal)	1	84%	100%	1
Valtellina Casera	65.9%	-0.06	100%	40%	2	1	100%	114	1,752	0.7%	1.2%		0.072%	-3.3%	5.0%	0.000	-20.7%	semi hard fresh cheese	1	90%	40%	0

Appendix 3 Correlation matrix between PDO cheese indicators

	AVG TURN PROD	VAR TURN PROD	CONS	DIR SALE	VER INFO	PREC INFO	CONS	INV PROMO	AVG QUANT	DIM	VAR QUANT	ACT VS POT	AVGMS	VAR TURN	AVG EXP	VAR EXP	AVG PP	TRAD	LOC REG	VEN DIR	PROM LOC SF
AVG TURN PROD	1																				
VAR TURN PROD	0.21	1																			
CONS	-0.02	0.06	1																		
DIRSALE	0.23	0.29	0.7681*	1																	
VERINFO	0.12	-0.08	0.28	0.16	1																
PRECINFO	0.11	0.23	0.26	0.08	0.28	1															
CONS	-0.02	0.06	1.0000*	0.7681*	0.28	0.26	1														
INVPROMO	0.14	0.11	-0.32	-0.31	0.23	-0.18	-0.32	1													
AVGQUANT	0.04	0.09	-0.28	-0.24	-0.06	-0.10	-0.28	0.9648*	1												
DIM	-0.05	-0.02	-0.36	-0.23	-0.35	-0.5068*	-0.36	0.7702*	0.6356*	1											
VARQUANT	-0.23	-0.3693*	0.29	0.17	0.22	-0.16	0.29	-0.03	-0.02	-0.03	1										
ACTVSPOT	0.22	0.34	-0.29	-0.37	-0.39	0.07	-0.29	0.33	0.28	0.16	-0.41	1									
AVGMS	0.10	0.04	-0.25	-0.21	0.01	-0.03	-0.25	0.8964*	0.9604*	0.4776*	-0.02	0.27	1								
VARTURN	-0.03	0.06	0.25	0.32	0.06	-0.11	0.25	-0.10	-0.08	0.10	0.6739*	0.02	-0.11	1							
AVGEXP	-0.18	-0.10	-0.16	-0.21	-0.31	-0.28	-0.16	0.13	0.31	0.4738*	0.30	-0.28	0.21	0.16	1						
VAREXP	-0.06	-0.4546*	0.23	0.00	0.20	-0.13	0.23	-0.02	0.04	0.04	0.6719*	-0.31	0.07	0.3818*	0.4474*	1					
AVGPP	0.13	0.10	0.5294*	0.5449*	0.18	0.24	0.5294*	-0.09	-0.17	-0.4474*	0.09	0.16	-0.10	0.08	-0.28	0.09	1				
TRAD	0.17	-0.04	0.30	0.32	0.11	0.25	0.30	-0.37	-0.4600*	-0.4776*	-0.03	-0.20	-0.3883*	-0.16	-0.4912*	-0.25	0.4296*	1			
LOCREG	0.24	0.3841*	0.36	0.3974*	0.19	0.4772*	0.36	-0.20	-0.34	-0.4166*	-0.10	0.25	-0.28	0.18	-0.4831*	-0.24	0.3814*	0.30	1		
VENDIR	0.23	0.29	0.7681*	1.0000*	0.16	0.08	0.7681*	-0.31	-0.24	-0.23	0.17	-0.37	-0.21	0.32	-0.21	0.00	0.5449*	0.32	0.3974*	1	
PROMLOCSF	-0.16	0.10	-0.02	-0.07	-0.25	-0.01	-0.02	0.14	0.07	0.10	0.03	0.41	0.07	0.21	-0.02	0.01	0.3747*	0.18	-0.03	-0.07	1

An asterisk indicates that the coefficient is significantly different from zero with a 95% probability.

Appendix 4 – PDO/PGI E-V olive oil Performance Matrix

	BARGAINING POWER					INFORMATION			DIFFERENTIATION						MARKET PERFORMANCE							LOCAL DEVELOPMENT			
PDO/PGI E-V OLIVE OIL	AVG TURN PROD	VAR TURN PROD	CONS	DIRSALE	PRECINFO	CONS	3 SF OLIVES	INVPROMO	AVGQUANT	DAYSPICKPROC	PANEL TEST	ACIDITY	POLIPEROX	VARQUANT	ACTVSPOT	AVGMS	VARTURN	AVGEXP	AVGPP	VARPP	TRAD	LOCREG	VENDIR	DENS
Alto Crotonese	68%	-19.62	100%	15%	1	100%	0		4,582	1.18	6.6	0,7	1.30	-23.1%	1.7%	0.0014%	-168%	13%	25%	-0.09	3	28%	15%	
Aprutino Pescarese	97%	-0.06	9%	0%	0	9%	1	20,600	70,293	1.12	6.5	0,6	1.30	-6.9%	5.5%	0.0251%	-10%	16%	169%	0.42	2	70%	0%	4.0
Brisighella	85%	-25.55	85%	0%	1	85%	0		11,028	1.13	7	0.50	1.14	-1.4%	24.8%	0.0082%	-38%	10%	232%	-0.11	2	70%	0%	12.0
Bruzio	49%	-16.33		15%	1		1		149,664	1.29	6.5	0.75	1.66	15.3%	2.9%	0.0236%	6%	0%	24%	0.10	2	25%	15%	1.0
Canino	79%	-9.81	13%	50%	1	13%	1		110,125	1.03	6.5	0.50	0.97	-3.6%	51.7%	0.0309%	-30%	16%	72%	0.08	2	68%	50%	5.8
Chianti Classico	64%	-30.20	78%	25%	1	78%	1	37,500	105,578	1.54	8	0.50	1.49	2.8%	35.0%	0.0179%	-68%	58%	44%	-0.31	2	50%	25%	0.8
Cilento	61%	-10.00		20%	0		0		34,890	0.92	6.5	0,7	1.09	4.4%	1.8%	0.0046%	-46%	40%	49%	0.08	2	57%	20%	3.1
Collina di Brindisi	62%	-21.70	91%	15%	0	91%	0	3,000	59,718	1.80	6.5	0.80	1.20	-7.0%	1.8%	0.0116%	-76%	10%	-9%	-0.22	3	68%	15%	0.9
Colline di Romagna	71%	-11.73		0%	1		0	4,000	7,908	0.77	7	0.50	1.09	15.8%	7.9%	0.0035%	-12%	0%	111%	-0.36	2	50%	0%	4.3
Colline Salernitane	63%	42.30		50%	0		1		28,378	1.14	6.5	0,7	1.19	-14.1%	0.9%	0.0042%	-60%	0%	84%	0.66	2	50%	50%	3.7
Colline Teatine	56%	-67.97	82%	20%	1	82%	0		51,273	1.24	6.5	0.60	1.36	-4.2%	1.3%	0.0171%	-120%	38%	166%	-1.32	2	40%	20%	5.4
Dauno	47%	4.53	100%	41%	1	100%	1		142,319	1.56	6.5	0.60	1.19	-9.9%	1.0%	0.0190%	-60%	5%	46%	0.23	2	16%	41%	1.5
Garda	59%	-30.12	99%		1	99%	2	63,500	229,793	1.50	6.5	0.50	1.14	11.8%	40.2%	0.0957%	4%	0%	99%	-0.36	2			5.9
Laghi Lombardi	83%	-6.62	72%	78%	1	72%	1	25,000	4,244	0.87	7	0.53	1.09	27.3%	18.0%	0.0037%	57%	0%	340%	-0.22	2	100%	78%	7.9
Lametia	34%	-1.28	100%	15%	1	100%	0		5,948	1.65	6.5	0.50	1.65	-10.7%	0.6%	0.0007%	-18%	0%	0%	0.49	2	40%	15%	
Molise	65%	-0.31		80%	0		0		9,119	1.40	6.5	0.50	1.07	0.3%	5.9%	0.0016%	103%	5%	61%	0.21	2		80%	3.4
Monte Etna	58%	-33.31	51%	16%	1	51%	0	26,000	19,702	1.33	7	0.60	1.09	11.0%	3.0%	0.0037%	-8%	16%	97%	0.12	2	88%	16%	2.5
Monti Iblei	28%	-1.99	100%	3%	1	100%	2	250	150,467	0.96	6.75	0.60	1.42	10.1%	6.6%	0.0226%	-4%	35%	29%	0.39	2	51%	3%	1.1
Penisola Sorrentina	86%	34.56		35%	1		0		9,851	1.18	6.5	0.80	0.99	-6.9%	5.9%	0.0033%	-16%	14%	140%	0.24	2	80%	35%	6.8
Pretuziano delle Colline teramane	75%	-8.44	86%	3%	1	86%	0		1,083	1.03	6.5	0.50	1.29		1.0%	0.0004%	85%	30%	315%	0.91	3	38%	3%	3.3
Riviera Ligure	64%	-14.02	47%	1%	1	47%	2	85,000	366,002	1.27	6.5	0.50	1.40	-6.2%	11.2%	0.0914%	-54%	25%	46%	-0.17	2	28%	1%	5.6
Sabina	54%	-32.85	15%	10%	0	15%	1	20,000	164,805	1.69	6.5	0.60	1.20	13.6%	7.7%	0.0296%	15%	5%	16%	-0.10	2	70%	10%	1.1
Terra di Bari	55%	-8.99	57%	3%	1	57%	2	58,643	1,338,403	1.40	7	0.55	1.14	18.7%	11.4%	0.1546%	36%	9%	35%	0.10	2		3%	1.1
Terra d'Otranto	60%	-3.09	78%	8%	0	78%	0		27,380	1.40	6.5	0.80	1.20	-14.0%	0.4%	0.0064%	-107%	0%	119%	0.23	1	10%	8%	0.9
Terre di Siena			100%	35%	0	100%	0	98,000	50,149	1.47	7	0.50	1.19	25.8%	7.8%	0.0218%	66%	34%	165%	0.31	3	60%	35%	1.9
Toscano (PGI)	77%	-43.64	95%	12%	1	95%	1	2,853,663	2,709,739	1.61	6.5	0.55	1.26	3.2%	52.2%	0.2867%	-80%	63%	32%	-0.54	3	38%	12%	2.1
Umbria	67%	9.07	9%		1	9%	1		588,564	1.65	7	0.65	1.26	0.8%	14.8%	0.1448%	-4%	0%	16%	0.05	1			2.0
Val di Mazara	64%	-6.86	88%	1%	0	88%	0	750,000	346,926	1.18	6.5	0.50	1.03	65.5%	7.9%	0.0425%	94%	60%	22%	0.03	3	16%	1%	1.7
Valli Trapanesi	72%	-25.68	27%	15%	1	27%	2	25,500	611,064	1.29	6.5	0.50	0.97	180.8%	16.6%	0.0615%	113%	80%	25%	-0.08	2	28%	15%	1.4
Veneto	61%	-26.67	93%	3%	1	93%	1	125,000	40,945	1.36	7.5	0.55	1.01	22.8%	29.4%	0.0132%	20%	20%	81%	-0.04	2	83%	3%	6.2

Appendix 5 Correlation matrix between PDO/PGI E-V olive oil indicators

	AVG TURN PROD	VAR TURN PROD	CONS	DIRSALE	PRECINFO	CONS	3 SF OLIVES	INV PROMO	AVG QUANT	DAYS PICKPROC	PANEL TEST	ACIDITY	POLI PEROX	VAR QUANT	ACT VS POT	AVG MS	VAR TURN	AVG EXP	AVG PP	VAR PP	TRAD	LOC REG	DIR SALE	DENS
AVG TURN PROD	1																							
VAR TURN PROD	0.09	1																						
CONS	-0.40	-0.15	1																					
DIRSALE	0.14	0.33	-0.01	1																				
PRECINFO	-0.06	-0.25	0.11	-0.13	1																			
CONS	-0.40	-0.15	1.0000*	-0.01	0.11	1																		
3 SF OLIVES	-0.17	-0.01	-0.31	-0.09	0.33	-0.31	1																	
INVPROMO	0.22	-0.43	0.29	-0.08	0.08	0.29	-0.07	1																
AVGQUANT	0.08	-0.24	-0.03	-0.19	0.20	-0.03	0.3657*	0.8632*	1															
DAYSPICKPROC	-0.32	-0.21	0.05	-0.05	-0.12	0.05	0.08	0.24	0.30	1														
PANEL TEST	0.03	-0.18	0.08	-0.05	0.29	0.08	0.07	-0.23	-0.06	0.03	1													
ACIDITY	-0.07	0.31	0.02	-0.02	-0.29	0.02	-0.25	-0.09	-0.15	0.11	-0.29	1												
POLIPEROX	-0.4730*	-0.12	0.25	-0.25	0.18	0.25	0.08	0.05	0.00	0.25	0.02	0.09	1											
VARQUANT	0.07	-0.18	-0.21	-0.10	0.07	-0.21	0.32	-0.07	0.16	-0.08	0.02	-0.34	-0.35	1										
ACTVSPOT	0.31	-0.32	-0.10	0.08	0.36	-0.10	0.3911*	0.6118*	0.4802*	0.09	0.30	-0.4457*	-0.22	0.11	1									
AVGMS	0.08	-0.22	-0.13	-0.22	0.24	-0.13	0.4789*	0.8111*	0.9446*	0.3620*	-0.04	-0.18	0.02	0.11	0.5331*	1								
VARTURN	0.08	0.17	-0.21	0.16	-0.10	-0.21	0.17	-0.28	-0.02	-0.12	0.04	-0.4911*	-0.33	0.6521*	0.01	-0.02	1							
AVGEXP	0.10	-0.3835*	0.06	-0.24	0.04	0.06	0.12	0.46	0.3916*	-0.04	0.11	-0.30	-0.09	0.5922*	0.27	0.28	0.16	1						
AVGPP	0.5392*	0.02	0.08	0.21	0.10	0.08	-0.24	-0.19	-0.28	-0.5079*	0.10	-0.20	-0.19	-0.08	-0.02	-0.29	0.20	-0.13	1					
VARPP	-0.06	0.7439*	-0.05	0.06	-0.26	-0.05	-0.05	-0.42	-0.25	-0.11	-0.15	0.10	0.03	-0.08	-0.34	-0.29	0.36	-0.23	0.08	1				
TRAD	0.13	-0.23	0.4560*	-0.10	-0.12	0.4560*	-0.25	0.5544*	0.20	0.01	-0.14	-0.17	-0.02	0.09	0.03	0.06	0.08	0.3999*	0.05	0.00	1			
LOCREG	0.35	0.01	-0.27	0.33	0.02	-0.27	-0.07	-0.34	-0.22	-0.16	0.38	-0.05	-0.37	-0.12	0.23	-0.22	0.19	-0.25	0.3886*	-0.02	-0.06	1		
DIRSALE	0.14	0.33	-0.01	1.0000*	-0.13	-0.01	-0.09	-0.08	-0.19	-0.05	-0.05	-0.02	-0.25	-0.10	0.08	-0.22	0.16	-0.24	0.21	0.06	-0.10	0.33	1	
DENS	0.5442*	-0.01	0.05	0.15	0.31	0.05	-0.12	-0.12	-0.24	-0.4419*	0.07	-0.25	-0.31	-0.18	0.29	-0.19	-0.06	-0.25	0.6067*	-0.19	-0.10	0.4890*	0.15	1

An asterisk indicates that the coefficient is significantly different from zero with a 95% probability