Economies of Scale and Structural Settings as Key Determinants for Economic Sustainability in the Agricultural Sector: A Comparative Analysis between Italy and Germany

Masterarbeit

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Table of Contents

List of Figures

List of Tables

Nomenclature: Abbreviations and Definitions

Holding	Agricultural holding: a single unit both technically and economically, which has single management and which produces agricultural products. Other supplementary (non-agricultural) products and services may also be provided by the holding. The smallest farms (less than 1% of national agricultural activity) do not have to be surveyed. (EUROSTAT definition).
Farm	We will use the word ‘farm’ as a synonim of ‘holding’
ISTAT	National Institute of Statistics (Italy)
Ha	Hectares
SO= Standard Output	Referred to an agricultural product (crop or livestock), it is the average monetary value of the agricultural output at farm-gate price, in euro per hectare or per head of livestock. There is a regional SO coefficient for each product, as an average value over a reference period (5 years, except for the SO 2004 coefficient calculated using the average of 3 years). The sum of all the SO per hectare of crop and per head of livestock in a farm is a measure of its overall economic size, expressed in euro. (EUROSTAT definition).
GFCF= Gross fixed capital formation	Resident producers’ investments, deducting disposals, in fixed assets during a given period. It also includes certain additions to the value of non-produced assets realized by producers or institutional units. Fixed assets are tangible or intangible assets produced as outputs from production processes that are used repeatedly, or continuously, for more than one year. (EUROSTAT definition).
Intermediate Consumption	It is an accounting concept which measures the value of the goods and services consumed as inputs by a process of production. It excludes fixed assets whose consumption is recorded as consumption of fixed capital. The goods and services may be either transformed or used up by the production process. (EUROSTAT definition).
CFC= Consumption of fixed capital	It reflects the decline in the value of the fixed assets of enterprises, governments and owners of dwellings in the household sector (it is the decline in the future benefits of the assets due to their use in the production process). Fixed assets decline in value due to normal wear and tear, foreseeable ageing (obsolescence) and a normal rate of accidental damage. Unforeseen obsolescence, major catastrophes and the depletion of natural resources, however, are not included. (EUROSTAT definition).
SGM= standard gross margin	It is a measure of the production or the business size of an agricultural holding. It is based on the separate activities or 'enterprises' of a farm and their relative contribution to overall revenue. (EUROSTAT definition).
ESU= European size unit	It is a standard gross margin of EUR 1 200 that is used to express the economic size of an agricultural holding or farm. For each activity (or 'enterprise') on a farm (for example wheat production, dairy cows or the output from a vineyard), the standard gross margin (SGM) is estimated based on the area used for the particular activity

	(or the number of heads of livestock) and a regional coefficient. The sum of all such margins derived from activities on a particular farm is its economic size, which is then expressed in European size units (by dividing the total SGM in euro by 1200, thus converting it to ESU).
BW	Baden-Württemberg
GDP	Gross Domestic Product
MES	Minimum Efficient Scale
USA	United States of America

Abstract

The aim of this paper is to investigate the role of Economies of Scale in Agriculture, through a comparative analysis between Italy and Germany. Agriculture is a fascinating field to be studied: it still constitutes the basis for the economic development and competitiveness of many countries and, although being depicted as a relatively stable sector, structural changes and organizational innovations still have a great magnitude of action. We will thus investigate the impact of scale on the functioning of agricultural holdings, their structural change along time and the potential effects of different control variables on the economic-structural features of the agricultural sector. We will introduce the concepts of Network Economies of Scale and Multifunctionality, through which we will interpret the logics of pure Economies of Scale in a broader perspective, entailing organizational settings and networking effects.

The first part of the paper is outlining the theory of Economies of Scale and its sources, as well as investigating the peculiarities arising once the general theory is applied to the agricultural sector.
The second part describes the scale differences among agricultural holdings in Italy and Germany and investigates the relationship between scale and the spread of overheads in Agriculture: to a certain extent, data confirm the existence and validity of Economies of Scale.
Nonetheless, some inconsistencies at regional level will lead us to consider other sources of Economies of scale and new organizational settings, entailing stronger networking mechanisms. The third part, in fact, will focus on Network Economies of Scale and Purchasing, Advertising, Managerial Economies of Scale, as well as Machinery Cooperatives.
At the end of the paper, we will have a comprehensive view of the numerous dynamic aspects interacting and influencing structural settings in Agriculture. We will be acquainted of the major structural peculiarities in Germany and Italy, and we will briefly describe some successful case studies.
The Appendix at the end of the paper contains numerous tables and data, most of which were directly rielaborated from row data sets, to support our analysis with real-world evidence.

1. Introduction: Definition and Sources of Economies of scale

Our analysis is investigating the role of Economies of Scale in Agriculture. This sector has a great importance from an economic, social and environmental point of view, but a deep understanding of its structural economic functioning is still lacking. What is the specific role and impact of scale in Agricutlrue? Are larger farms actually more efficient than smaller ones? How is scale to be conceived, in terms of geographical or economic size? Are single farms proper units where to test Economies of Scale? Can structural settings influence agricultural efficiency so much as to boost the country competitiveness abroad, and which other organizational dynamics can play a role in Agriculture? Many issues are to be investigated and questioned. The reasoning underlying our research will be gradually developed addressing intermediate research questions through data and figures.

We will start with a theoretical outline of the concept of Economies of Scale. I will make clear the meaning and implications of scale, and the different potential sources of Economies of Scale will be presented.

1.1 Definition and Implications of Economies of scale

Economies of scale arise when average cost declines as output increases[1]. They are graphically depicted by a decreasing average cost curve, which can be U-shaped or L-shaped.

Figure 1. U-shaped Economies of Scale

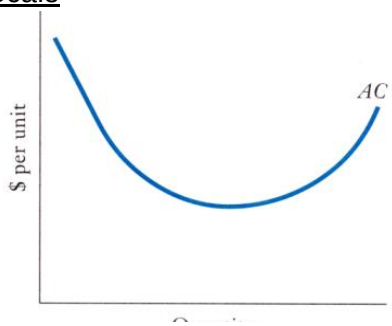
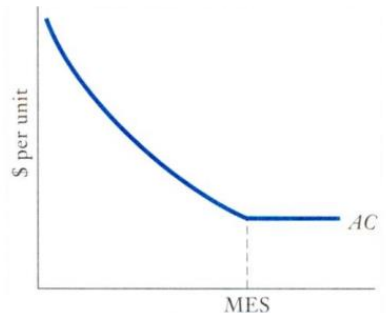


Figure 2. L-shaped Economies of scale



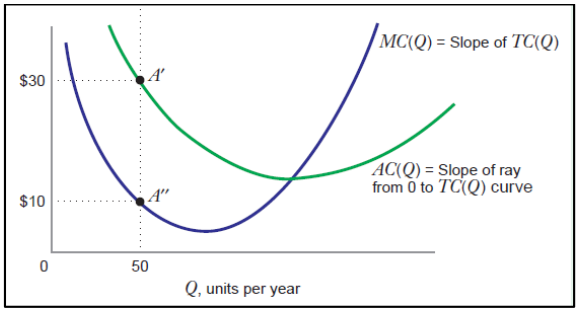
Source Fig.1-2: Ernst (2013), pag. 64.

In presence of U-shaped Economies of Scale, there is a Minimum Efficient Scale (output level) at which average cost is minimized, and beyond which the curve starts increasing, entering the area of Diseconomies of Scale. This means that scale should not be increased beyond a certain threshold, otherwise contrasting

[1] C.f Ernst (2013), pag. 64.

effects arise. On the contrary, if the curve is L-shaped, the positive effects of Economies of Scale ideally don't expire and scale can be increased without a limit. The larger the MES, the greater the magnitude of Economies of Scale[2].

Figure 3. Average and Marginal Cost curves



Source: Besanko and Braeutigam (2012), pag. 293.

Figure 3 depicts the relation between average (green curve) and marginal (blue curve) cost curves: when the average cost is decreasing, then marginal cost is smaller (the blue curve lies below the green one); when average cost is increasing, marginal cost is higher (the blue curve lies below the green one). Average and marginal costs are equal at the Minimum Efficient Scale, representing an equilibrium point[3].

The average cost curve depicting Economies of Scale refers to one point in time, and this is the main feature distinguishing it from that of Economies of Experience. Economies of Experience indicates that average costs decrease as more output is produced thanks to 'learning by doing' effects. Nonetheless, learning occurs along time. Thus, the curve depicting Economies of Experience is the result of the cost-minimizing points of multiple cost curves, referred to different points in time.

Another concept connected to Economies of Scale is that of returns to scale. The difference is subtle: while Economies of Scale considers the relationship between production costs and output volumes, returns to scale relate quantities of inputs to output volumes. Isolating prices' influences, in presence of a decreasing average cost curve, returns to scale are increasing. Returns to scale measure the percentage change in output brought about by a given percentage change in inputs, as the formula shows[4]:

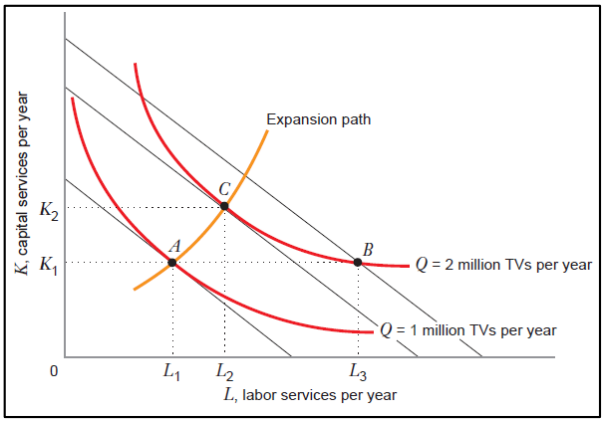
$$\text{Returns to scale} = \frac{\%\,\Delta\ (\text{quantity of output})}{\%\,\Delta\ (\text{quantity of } \textit{all} \text{ inputs})}$$

[2] C.f. Besanko and Braeutigam (2012), pag. 298.
[3] C.f. Besanko and Braeutigam (2012), pag. 293.
[4] Besanko and Braeutigam (2012), pag. 230.

Increasing returns to scale happen when Economies of Scale are present, but if the price of inputs increases, then increasing or constant returns to scale could result in Diseconomies of Scale. With the same logic, decreasing returns to scale occur when Diseconomies of Scale are present, but if the price of inputs decreases, then decreasing or constant returns to scale could result in Economies of Scale[5].

Economies of scale consider the long-run, not the short-run cost curve: in the long-run, the firm can adjust all its inputs, so that we can say that in the long-run, all inputs are variable. In the short-run, instead, at least one input is fixed so that the firm is subjected to constraints.

Figure 4. Short- versus Long-run cost curves



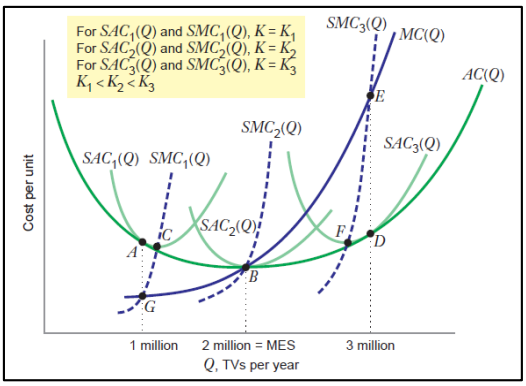
Source: Besanko and Braeutigam (2012), pag.304.

The upper red curve depicts a long-run situation, when the firm can move along its expansion path and optimally change the combination of inputs (thus changing production technology), so that at point B it can reach a higher production level (Q=2). This is instead not possible in the short run, where the production technology cannot be modified because some inputs are fixed, thus preventing to shift to a higher production quantity[6].

Another implication of such time consideration is that the long-run cost minimizing output doesn't always coincide with the short-run cost minimizing one. As represented in Figure 5, "only at Point B the short-run average cost curve reaches its minimum at the output where short-run and long-run average costs are equal"[7].

[5] Beggs (w.y.), pag. 6, website.
[6] C.f. Besanko and Braeutigam (2012), pag. 303 f.
[7] Besanko and Braeutigam (2012), pag. 307.

Figure 5. Discrepancy between short- and long-run MES.



Source: Besanko and Braeutigam (2012), pag. 307.

At point A, in fact, the long-run MES is smaller (on the left) than the short-run MES (point C). At point D, the opposite occurs: the long-run MES is higher (on the right) than what it would have been in the short-run (point F).

These theoretical principles are actually connected to our findings. We will see that farms resemble a short-run situation, where inputs cannot be optimally adjusted due to internal constraints; cooperatives and larger farms, instead, resemble a long-run situation, because they can better combine inputs and create internal synergies, thus modifying the production technology and increasing efficiency. From a theoretical point of view, we can derive that the MES of a small farm alone is not the same as the MES it would have once inserted in a cooperative framework. Cooperatives act as a 'virtual' extension of the farm's size, allowing small farms to overcome short-run constraints.

In our research, we will then see that cost analysis at farm-level entails some weaknesses and limitations that can be overcome shifting to an upper level analysis, and considering Economies of Scale at cooperatives- and consortia-level. This double analysis can be theoretically framed in the two concept of External and Internal Economies of Scale.

Internal Economies of Scale consider average costs at firm-level: decreasing average cost curve is referred to the functioning of the firm independently from the industry. External economies of scale, instead, refer to decreasing average costs at industry level, not necessarily depending on the size of the single firms. Where internal Economies of Scale occur, we would expect many large firms within an imperfectly competitive market structure; if external Economies of Scale prevail,

we would see many small firms in perfect competition[8]. In the case of the agricultural sector, we end up having a combination of both aspects: to a certain extent, internal Economies of Scale are viable, as they allow a more efficient spread of fixed costs at farm level; nonetheless, to release the full potential of Economies of Scale , we will have to overcome farms' boundaries and look at some aggregation's and networking dynamics resembling external Economies of Scale. We will name this particular combination of the two aspects 'Network Economies of Scale', whereby the research unit is neither the firm nor the industry: it is cooperatives and consortia, aggregation mechanisms which allow farms to pool resources and enlarge their scale, while still preserving their autonomy.

1.2 Sources of Economies of Scale

There are many different factors giving rise to Economies of Scale, like:

- Physical features of production:
  - Indivisibilities and the spread of fixed costs;
  - The Cube-Square rule;

- Labour inputs:
  - Managerial Economies of scale: Specialization;

- Other organizational settings and firm's functions:
  - Inventory
  - Research and Development
  - Purchasing Economies of scale
  - Advertising Economies of scale
  - Financial Economies of scale

In this section, those ones relevant for our analysis will be theoretically outlined.

Indivisibilities and the spread of fixed costs

The main source, which in fact we will highlight at first in our analysis, is the presence of indivisibilities in production, meant as inputs that cannot be reduced in scale, thus giving rise to fixed costs. Increasing scale allows to spread these costs over larger volumes of output. There are different levels of indivisibilities that can arise:

[8] C.f. Krugman et al. (2012), pag. 139.

- Product-level indivisibilities: connected to the need of specific resources and investments for a certain product (special equipment, design, specific training);
- Plant-level indivisibilities: when scale increases, a trade-off among production technologies occurs, changing inputs' combinations at plant-level; as output increases, for example, it is usually more convenient to shift from a labor-intensive (variable costs) to a capital-intensive (fixed costs) technology (increase of mechanization);
- Multi-plant-level indivisibilities: each industry has a different magnitude for Economies of Scale, so that when production is labour intensive, Economies of Scale are generally minimum, while when it is capital intensive, they are generally maximum.

Managerial Economies of Scale: Specialization

A higher specialization of the labour force allows each task to be executed faster, thus increasing productivity of variable inputs. Specialization occurs through considerable investments for specific training programs, hiring specialists and experts, whose cost is recovered increasing output volumes.

The concept of specialization of labour goes back to the theories of Adam Smith, who found that specialized labour force could not only prevent switching and setup costs, but also stimulate workers to find innovative changes and new productive solutions because they become expert and specialists in focused steps of the production process[9]. Nonetheless, "the division of labour is limited by the extent of the market"[10]. It means that specialization is worth it only if there is a powerful market, with a sufficient demand: this will,in fact, assure exchange opportunities for the surplus production that specialization originates. As regards the indivisibility of labour inputs and their productivity, Smith made a distinction between the manufacturing industry and Agriculture, stating that the former is more suitable to the applicability of labour division than the latter:

"The nature of agriculture, indeed, does not admit of so many subdivisions of labour, nor of so complete a separation of one business from another, as manufactures"[11].

[9] C.f. Lavezzi (2001), pag. 4 -5.
[10] Smith (1776), pag. 16.
[11] Smith (1776), pag. 9.

The strict interrelatedness of Agricultural activities, each requiring specific timing of execution, was seen as an obstacle to the possibility of specializing people, assuring constant flow of work to all of them at the same time. To a certain extent, switching times and job rotation could not be prevented according to this reasoning. Smith also hypothesized that the lower specialization opportunities in Agriculture could be the reason explaining the weaker development of the agricultural sector when compared to the manufacturing industry[12].

This statement is nowadays only partially valid, as mechanization in Agriculture has boosted productivity and competitiveness in the sector, making the functioning of agricultural activities more similar to the manufacturing ones. Mechanization has substituted human labour in some production steps, but it has also created new employment opportunities in other functional activities like servicing, distribution and maintenance. We have evidence of such trend both from developed countries like the USA and developing countries like India[13]. Together with mechanization, there is also a growing complexity in Agriculture in terms of cropping techniques, sustainability requirements, international exchanges and production levels and stronger concerns about environmental concerns. These aspects are boosting the demand for specialized people and experts, so that specialization is not only seen in quantitative terms, but also as a driver of qualitative improvements.

Purchasing Economies of Scale

Economies of scale in purchasing occur when big buyers manage to increase their bargaining power and contractual position towards suppliers, thus obtaining discounts and gaining cost advantage over smaller competitors. According to the transaction cost argument, price negotiation in transactions entails some fixed costs, that can be spread over higher output volumes in presence of a big buyer. Big buyers are important for suppliers, who will try to offer the best price competing with other suppliers: losing a big purchaser has relevant economic impacts. Big purchasers, in fact, are price-sensitive and will thus carefully select the dealer offering the best economic conditions.

Nonetheless, the presence of a big purchaser is not a sufficient condition for the existence of Purchasing Economies of Scale: when switching costs are high or customers' affiliation is important, big purchasers may need to stick to the same supplier even if not obtaining discounts. Besides that, in some situations small firms

[12] C.f. Smith (1776), pag. 9.
[13] C.f. Thompson and Blank (2000), pag. 51 f. as well as C.f. Verma (w.y.), pag. 135 -138.

gain more bargaining power than larger ones, because they can adopt price discrimination strategies with respect to suppliers, due to their lower variety of products or thanks to niche products. A classic example is that of pharmacies: small pharmacies, selling a limited variety of brands, must select only a few suppliers, thus discarding others: this makes them gain bargaining power and contractual strength without increasing scale[14]. A similar example applicable to the agricultural sector would be that of small farms producing niche products, like seasonal ones or typical local crops, that only a few distribution channels will be able to commercialize.

Advertising Economies of Scale

Advertising Economies of Scale occur because increasing output allows:

- to reduce the cost of advertisement per potential consumer receiving the message;
- to increase the number of actual consumers over the number of potential consumers getting the message.

This is restated in the following formula:

$$\frac{\text{Cost of sending messages}}{\text{Num. Potential consumers receiving the message}} \div \frac{\text{Num. Actual consumers}}{\text{Num. Potential consumers receiving the message}}$$

In our analysis of the agricultural sector, advertising Economies of Scale entail a deeper significance: a strongly coordinated advertising strategy not only allows to spread costs, but also to foster farms' visibility abroad, creating more opportunities for accessing international markets. The small scale of farms and the fragmentation of the agricultural sector can prevent an effective promotion: a lack of financial resources and a lack of coherence and coordination in advertisement don't allow to convey a strong image of the countr's products.

2. Economies of Scale in Agriculture: concepts and evidence

2.1 Challenges and Peculiarity of the agricultural sector

The main aim of this paper is to analyse whether and how the concept of scale is applicable to the agricultural sector. Moreover, we will identify some key differences between Germany and Italy, trying to detect how they are to be

[14] C.f. Besanko et al. (2013), pag. 41, 54.

interpreted and how farms' performance is influenced by different organizational and structural settings. Before proceeding with the analysis, it is important to consider that the agricultural sector presents some peculiarities and challenges, which make an organizational analysis particularly interesting, although complex. First of all, Agriculture entails a systematic risk factor: output is intrinsically dependent on external environmental conditions, which can be hardly predicted. Then, it is subject to a high level of specificity, both in terms of geography (importance of land, climate, different cropping options) and assets (high level of machinery required, specific equipment suited to crop types, land size, territory features, farming traditions). Besides that, the sector is characterized by an inelastic demand and by growing competitive pressures.

Moreover, at farm level, many complexities arise when considering other managerial aspects: loyalty is still an important aspect, as monitoring costs within farms are high, and this can be a potential explanation why the sector is still driven mainly by small-scale family businesses, especially in Europe. Workers' output can hardly be transparently measured, because many unaccountable aspects influence it, so that agency problems due to information asymmetries and effort-aversion of workers arise[15]. Nonetheless, keeping farms' sizes small leads to a series of disadvantages, which are challenging to be addressed. Considering the functioning of the food supply chain, in fact, many discrepancies are detectable in terms of bargaining power and competition logics: small farmers coexist with highly concentrated retailers and distributors, which can exploit their stronger economic position to introduce unfair and anti-competitive trading practices[16].

Moreover, the general inflationary wave in the prices of agricultural products that affected Europe since 2007[17], lead to deepen the investigation of potential inefficiencies and bottlenecks in the food supply chain. Increasing farms' scale may be a viable strategy to increase their competitive and bargaining position along the supply chain, even if counteracting forces, like transaction and monitoring costs, make it much more complex and challenging.

Besides that, farms also entail a social role and ecological responsibility in protecting the environment and safeguarding farming traditions.[18] Thus, their role is not only a merely economic, profit-driven one.

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[15] C.f. Vladislav (2007), pag. 59-61.
[16] C.f. European Commission (2009), pag. 4 - 6.
[17] See Table 1 in the Appendix.
[18] Galluzzo (2013), pag. 26, 31.

Our analysis mainly refers to the farming system rather that to the agribusiness one: we will consider farming holdings mostly engaged in direct production activities, rather than vertical conglomerates integrating different levels of the supply chain; we will encounter many small-scale farms in our analysis, that usually are still family-based businesses with a strong regional focus. Contrary to the majority of the agribusiness firms, these farms have no shareholders and rely on cooperative forms of aggregation. The domain of our analysis is thus a highly diversified and complex context, that still presents a big scope of research.

2.2 Control variables and Specificities

Our research is addressing the structural features of the farming system in Germany and Italy at a macro-level. Nonetheless, in order to avoid biases and a too high degree of generalization in comparing the two countries, it is necessary to take into account the following specificities:

- Country-level differences in products' composition ;
- Implications of sectorial differences;
- Historical and regional evolution of the farming sector.

We will briefly outline some major differences between Italy and Germany in such aspects, not only for descriptive purposes but also to identify potential impacts of country-based differences on structural settings in Agriculture.

2.2.1 Country-level differences in products composition

In this paragraph, we will outline some major differences in product portfolio in Agriculture between Germany and Italy. We will then outline how differing organizational settings, price dynamics and cost levels across sectors may partially drive differences in structural settings and scale in the two countries.

The German agricultural output was higher than the Italian one in 2013, not only in absolute values (€ 50.81 million versus €43.081 million) but also as a percentage of the total European Union sum (13.5% versus 11.6%). The major crop products for Germany are forage plants and cereals, the latter ones aquiring relatively more importance when compared to the EU 28 total value: although not representing an outstanding proportion on national basis, they entail more than proportional relevance in terms of EU percentage when compared to Italy. Italy's most important products are vegetables and horticultural crops: they represent 'only' 6.2% of national products' portfolio, but they occupy a proportionally high percentage in the

EU-28 (16.6%, versus only 7.7% of Germany). As regards animal output, Germany has much higher output levels, especially as regards pigs and cattle[19].

The 43% of farms in 2010 were “Futterbau” holdings, dealing with milk production and animals’ breeding. As they need big quantity of feeding inputs, their economic relevance is boosted by the high availability of green areas in Germany: forage plants, cereals and rapes are in fact the most relevant crops[20].

We will provide further evidence through time-series data derived from Eurostat analyzing cropping products, animal outputs and milk production. Table 3 provides data on crop products, both in terms of occupied agricultural area and output. From Table 3c and Table 4c in the Appendix, it is clearly visible how the crop differences are driven by cereals: in Germany, they occupy about the double agricultural area than Italy, and the average output among the four considered years is almost two and a half higher than the Italian one. Potatoes, oil seed crops, rape and turnip rape are the components driving Germany superiority, both in terms of agricultural areas and of harvested production. What instead most emerges from Italy’s products’ portfolio are vineyards, fruit trees and vegetables. Vegetables are particularly outstanding in terms of production volume, almost three times higher than in Germany. Even if our tables present some missing numbers due to non-reported data in the Eurostat database, we can assume the cross-sectional variation along time to be small (as reported data also confirm), thus not largely affecting our results.

Table 5, instead, considers cattle slaughtering (imports and exports) in both countries. Cattle-related volumes are much higher in Germany, even if both cattle imports and exports have been decreasing since 2003. Striking differences in this sector are visible: Italy mainly imports cattle products, while Germany produces enough as to export, too. While the divergence between Italy and Germany in terms of cattle import and export volumes has decreased in the last decade, the slaughtering volumes have increased even more in Germany proportionally to Italy since 2010.

As for Eurostat data[21], Germany ranks first among the largest milk producers in the 28-EU, followed by Italy in 2013. As for March 2012, Germany was also the 6th largest milk producer globally (4.9% of global production)[22]. Comparing Italy and Germany, we can notice that milk production is more than double in Germany with

[19] See Table 3 in the Appendix.
[20] Statistische Ämter des Bundes und der Länder (2010), pag. 18.
[21] See Table 7 in the Appendix.
[22] Compassion in food business (March 2012), website.

respect to Italy (from Eurostat, some data are missing for Germany, but we can use cows milk production as a good approximation for total milk production). Although the big difference, milk production is relevant also in the Italian market, amounting 11% of the total agricultural output as for 2013 data[23]. Milk production in Italy doesn't cover the internal demand, so that the country has to import milk even if it has the potential for producing much more. This apparent contradiction is to be connected to the implemetation of the EU milk quota policy, aimed at sustaining milk prices for producers by fixing yearly national-based production thresholds for all member States (besides the fixed limits, production is heavily taxed and thus discouraged). In Italy, a big controversy is going on since many years regarding the counterbalancing effects of such milk quota[24].

2.2.2 Implications of sectorial differences

According to the theory of Economies of Scale, benefits from Economies of Scale are larger in capital-intensive sectors. As some agricultural sectors are indeed more capital-intensive than others, the differences in products' portfolios between Italy and Germany may be relevant in partially explaining the different organizational and structural settings in the two countries. We saw in the previous paragraph that cereals and animal products, as well as milk production, are relatively more relevant in Germany, while Italy produces more vegetables, fruits and wine. Sectors like cereals and livestock holdings are thought to be more capital intensive than vegetables, fruits and wine. In horticulture and wine production, in fact, variable costs- driven by labour costs- are higher in comparison to other sectors, like granivores[25].

Besides that, agricultural sectors vary also in terms of price dynamics and organizational settings. Analysing Economies of Scale between Italy and Germany, it is thus necessary to keep in mind that some of their structural differences in Agriculture may be merely driven by differences in product portfolios. First of all, we want to check whether there are consistent differences in capital intensity and fixed costs' levels among the agricultural sectors that characterize- and differentiate- Italy and Germany. As sectorial non-aggregated data, especially at farm-level, are hard to find, we will rely on some researches conducted at European level. Comparing the cost structures in Euro per tonne for cereals, milk and pig production, fixed costs represent in fact a significant share in such

[23] See Table 2 in the Appendix.
[24] C.f. Cassandro (2003), pag. 66-68.
[25] C.f. European Commission (2012d), pag.18.

agricultural sectors. Overheads, depreciation and other fixed costs have been a consistent share of total wheat production costs in most European countries, even if their levels differed quite a lot among them. In the milk sector, too, fixed items are generally a consistent cost component, even if with some exceptions: in Italy and Spain, feed costs prevail. Also in livestock (pig) production, fixed costs' components are significant in most European countries, although Spain and Italy still present some divergences[26]. Some evidence related to scale settings partially confirm the theory of Economies of Scale.

In the cereal sector, for example, many European countries registered a trend of decreasing costs with increasing holdings' size in the time range 1999-2007. In Germany, there were less costs in medium than smaller farms, even if they increased for larger farms: this could be explained by a U-shape cost curve. The fact that in smaller farms the burden of fixed costs (overheads, energy costs and other specific costs) was higher, is a further confirmation that scale is important to spread overheads. Margins confirm costs trend: they were higher in the middle-range farms and lower in the smallest and largest holdings. In Italy, the decreasing costs for durum wheat with holdings' size seems to suit an L-shape average cost curve. In 2007, the combination between cost reductions and output levels allowed large farms to register the double net value added compared to the smaller ones[27].

Also in the milk sector, there was evidence that scale matters. Both in Germany and Italy, margins are higher in medium farms, while smaller farms registered higher costs' burdens and lower prices. For pigs' breeding, instead, coesistence of small and high farms, with different degree of specialization, made the costs' trend according to scale less clear[28].

Regarding organizational settings and strategic choices at farm level, a recent research conducted in the UK highlighted the impact of the degree of farm specialization on costs' allocation. They documented a great variability in the level of fixed costs not only across sectors, but also among sub-sectors, and they correlated these differences in cost allocation to the diversification level of the farm. Regarding winter wheat, for example, they found that the specialization degree of the farm is significantly affecting the spread of fixed costs: in the cereal sector, fixed costs were lower for specialized farms than for general cropping farms and

[26] C.f. Kleinhanss, W. Et all. (2011), pag. 11- 18.
[27] C.f. Kleinhanss, W. et all. (2011), pag. 18- 20.
[28] C.f. Kleinhanss, W. et all. (2011), pag. 21- 23

for mixed farms (having more fixed costs but lower variable ones). Nonetheless, for other cereal types (sub-sectors within the cereal industry, like spring/winter barley), cost allocations were significantly different depending on the farm type, even within the same geographic area[29].
This highlights that differences in products portfolio (even in sub-sectors), combined with a plurality of organizational variables at farm-level, indeed influence cost allocation and thus structural settings among countries.

Another clear example of how scale settings can be highly sensitive to subtle organizational variables, is the scale difference between “Haupterwerbsbetriebe” and “Nebenerwerbsbetriebe” in Germany. The former ones are those holdings were agricultural activities constitute the main income source, while the latter ones are holdings where the major incomes derive from parallel activities, not directly pertaining to agricultural ones. This difference has a great impact on scale: “Haupterwerbsbetriebe” accounted for 49.9% of total agricultural hectares in Germany in 2010 (average holdings size was about 60 hectares); “Nebenerwerbsbetriebe”, instead, accounted for 17% of total agricultural hectares and their average size was ‘only’ around 20 hectares[30].

Besides that, price variations across sectors and countries make changes in cost allocations hard to evaluate. Since the mid-2000s, agricultural inputs’ and output’s prices have changed significantly, affecting also the relative value of farms and their relative fixed input costs[31]. In 2007, for example, prices of wheat and milk peaked in the European Union, after having decreased until 2006. In Germany, for example, soft wheat crop specific costs were the highest agricultural cost items in that year. Italy registered the highest price level among the European countries for dorum wheat in 2007 and also for dairy products in 2011. Feed costs related to livestock outputs, instead, increased in most European countries, except Spain and Italy, where, on the contrary, income levels increased, sustained by higher prices[32]. Again, these different price changes across sectors and countries can influence structural settings in many ways. Nonetheless, given the complexity of such dynamics, these aspects are not to be addressed by the current research. We will try to limit the impact of price fluctuations looking at real prices and considering other European standardized production indexes.

[29] C.f. Wilson (2014), pag. 12- 15.
[30] Statistische Ämter des Bundes und der Länder (2010), pag. 14.
[31] C.f. Wilson (2014), pag. 7f.
[32] C.f. Kleinhanss, W. et all. (2011), pag. ii, 8f.

2.2.3 Historical and regional evolution of the farming sector

Another aspect that may mislead our comparative analysis of Economies of Scale is the influence of farms' past evolution and farming traditions. In Germany, in fact, geographical variability in farms' dimension is strong, due to historical and political reasons: farms are much larger in Eastern and Northern regions, while in the West and South of Germany small farms constitute the majority.

The traditional juridical form of farms in Germany has been the sole proprietorship. After the Second World War, and especially after the German reunification in 1990, Eastern structures tried to adapt to the free-market logics undertaking a restructuring process and entailing new juridical forms. Even if they converted into private-owned structures or cooperatives, their structural adjustment requires more efforts and time: scale in these regions is, in some cases, the double in comparison to other Eastern farms. Many South-Germany small-scale farms take advantage of their smaller size to specialize in 'niche' products, like wine for example[33]. Their small scale is in any case higher than the EU average of 14 ha (as for 2010)[34]. Besides that, a recent transformation process to increase farms' scale has started in Germany, not only due to political changes, but also for better exploiting technical and breeding innovations[35]. This signals that large scales in some regions are not only to be interpreted as a heritage from past managerial and political circumstances, but also as a strategy to drive future performance.

In our research, we will perform a regional-level scale analysis to see how scale is connected to products' differentiation and farm historical evolution, trying to identify impacts on productivity. Regarding the evolution of the Italian farming system, regional differences are less striking. Nonetheless, we can anyway identify some recent structural changes with different regional impacts. Farms' size has increased between 2000 and 2010 in all Italian regional areas, as registered by the 2010 Agriculture Census by the Italian National Statistics Institute. The number of farms has been decreasing more than the decrease of cultivated area, leading to higher average farm size: in fact, in all geographical regions, more cultivated area is allocated to farms with higher size classes. Farms in Northern Italy were still the largest in terms of absolute size (14.4 ha/utilized agricultural area in North-Eastern Italy) in 2010, even if farms in Insular and Central Italy have registered the highest growth rates in average size (respectively, +79.8% and +51.1% between 2000 and 2010). This trend is thus boosting the divergence against South Italy farms, which

[33] C.f. Statistische Aemter des Bundes und der Laender (2011), pag. 18.
[34] C.f. Age- Agrarheute.com (2010), pag. 2, website.
[35] C.f. Statistische Aemter des Bundes und der Laender (2011), pag. 10.

keep being the smallest ones (average farm size was 5.1ha in 2010). Land consolidation emerges in all Italian Regions, index of a general change in some structural dynamics[36].

3. Scale and Structural Trends in Agriculture: Italy and Germany

3.1 Descriptive Analysis

We will now start to describe some structural settings in Agriculture, looking at the size of farms and their distribution in Italy and Germany. Interestingly, Italy and Germany represent exactly two examples for different economic structural settings in the agricultural sector, Italy being characterized by many smaller farms when traditionally local producers also directly sell their products (farmer markets), while in Germany scale effects are much stronger. The following data and graphs confirm these clear differences between the two countries, in terms of both the number of holdings and their distribution across scale classes.

As highlighted in Figure 6 below, farms are comparatively larger in Germany, where the number of holdings follow a U-shaped distribution across size classes. A structural change seems to have been enacted in 2010: a higher concentration of holdings in the upper size classes may be a significant signal of a consolidation in the sector, even if the decrease of holdings in the lowest size classes is to be explained also by a change in the sampling selection criteria[37].

Such structural change since 2010 can also be partially explained by some normative changes: in 2007, Germany approved a new set of regulations aimed at attracting capital investors in the land market. The aim was to make the agricultural sector closer to the free market competitive logics. As a consequence of the new regulations, new capital flowed into the sector, land demand boomed and land prices abruptly increased. This led to a big structural transformation of the sector: small producers could not afford land prices anymore and many could not renew their leasing contracts. The dominance of big investors acquiring big portions of land and diversifying their production and risks, converted the land market into a more capital-intensive sector. Some researches stated that this occurred at the

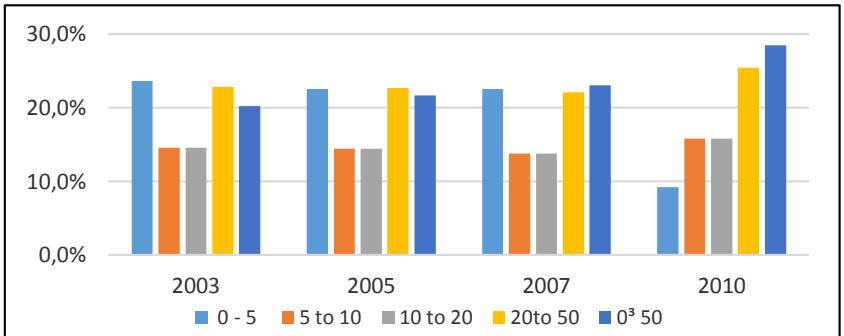
[36] C.f. ISTAT (2012), pag. 13.
[37] C.f. European Commission (2013), pag. 1f.

expenses of local small farmers, who did not manage to compete within this framework anymore[38].

Nonetheless, the evidence that this consolidation process in Germany went on also in 2011 and 2012, is a clear proof that it has some long-term structural drivers. In fact, from 2007 to 2012, the number of holdings in Germany has decreased by 2.2% yearly on average. This trend has also been accompanied by a structural shift towards larger farms: holdings with more than 100ha increased by 2.400 to 34.100 units between 2007 and 2011. The geographical size of the average holding increased from 54 ha in 2007 to 58 ha in 2012[39].

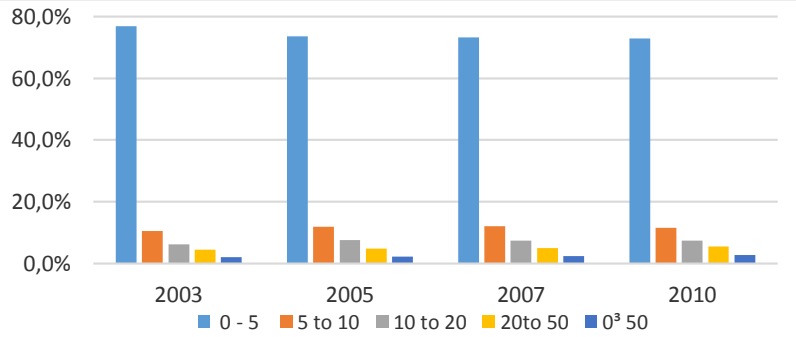
In Italy, the great majority of holdings has a size lower than 5 ha and no striking restructuring process is identifiable from Figure 7. Only 2.8% of holdings were higher than 50 ha in 2010 in Italy, compared to almost 10 times more in Germany (28.5%). On the contrary, in Italy more than 73% of holdings were smaller than 5 ha in 2007, compared to only slightly more than 22% in Germany[40].

Figure 6. Holdings distribution according to geographical size (ha) - Germany



Source: Self-elaboration, European Commission (2013)

Figure 7. Holdings distribution according to geographical size (ha) - Italy



Source: Self-elaboration, European Commission (2013)

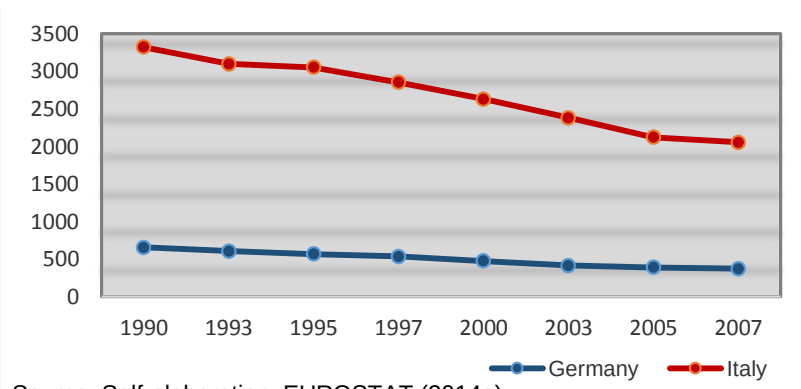
[38] C.f. Herre (2013), pag. 62 - 65.
[39] C.f. Deutscher Bauernverband (w.y.), pag. 1f.
[40] See Table 8 in the Appendix for the computation of percentages.

Besides being distributed differently, farms are also much more fragmented and numerous in Italy, as highlighted in Table 1. Even taking into account that utilized agricultural area is larger in Germany, Italian holdings are many more and thus much smaller on average than their German counterparts. In both countries, utilized agricultural area and the number of holdings have been decreasing from 2000 to 2007. As confirmed by Figure 8, in Germany the consolidation process was stronger: the number of holdings have decreased much more abruptly than in Italy since 1990.

Table 1. Agricultural Area and Number of Holdings: Germany and Italy

Germany					
HOLD_HA/TIME	2000	2003	2005	2007	2010
Total number of holdings	471.960	412.300	389.880	370.480	299.130
ha: Utilised agricultural area	17.151.560	16.981.750	17.035.220	16.931.900	16.704.040
Average utilised agricultural area per holding	**36,34**	**41,19**	**43,69**	**45,70**	**55,84**
Italy					
HOLD_HA/TIME	**2000**	**2003**	**2005**	**2007**	**2010**
Total number of holdings	2.153.720	1.963.820	1.728.530	1.679.440	1.620.880
ha: Utilised agricultural area	13.062.260	13.115.810	12.707.850	12.744.200	12.856.050
Average utilised agricultural area per holding	**6,06**	**6,68**	**7,35**	**7,59**	**7,93**
Source: Self-elaboration, EUROSTAT (2014b)					

Figure 8. Number of Agricultural holdings: Germany and Italy



Source: Self-elaboration, EUROSTAT (2014a)

A partial explanation of such difference may be connected to the differences in crop specialization between Italy and Germany (see paragraph 2.2.1). In fact,

looking at some more detailed data from Istat, we confirm that the distribution mean of farm holdings in Italy is the lowest size class (less than 1ha). Nonetheless, cereal and forage farms are relatively more spread over middle-high size classes (between 1ha and 20ha). On the contrary, horticulture farms are highly concentrated in the lowest size farms class and their distribution is highly skewed to the left. Doing some computations, we derived that in the smallest size class (less than 1 ha), around 7% of total horticulture farms were concentrated in 2010 (versus 1.75% for cereals farms), while in the larger size classes (5ha- 50ha) only about 28% of horticulture farms were present (versus 53.90% for cereal farms)[41]. Anyway, also in Italy a similar- even if weaker- trend is identifiable. Holdings equal to or larger than 30ha have increased from 3.1% in 2000 to 5.3% in 2010 compared to the total number of national holdings (cultivated areas by these holdings also augmented). On the other side, the smallest holdings like those ones with less than 2ha diminished by about 44% representing the 50.6% of all national holdings in 2010, against a percentage of more than 60% in 2000. Holdings between 2ha and 29ha also diminished in quantity, signalling a structural shift towards larger dimensional classes, similar to the German one[42]. Anyway, we should keep in mind that, even if a consolidation trend is on the way in both countries, German farms keep being much larger compared to the Italian ones, as highlighted in Table 2: the average agricultural area per holding is much higher in Germany (about 8 times higher than Italy in 2010); also the consolidation trend along time is much stronger in Germany (average holding dimension: from 36ha in 2000 to 55ha in 2010) than in Italy (average holding dimension: from 6ha in 2000 to less than 8ha in 2010).

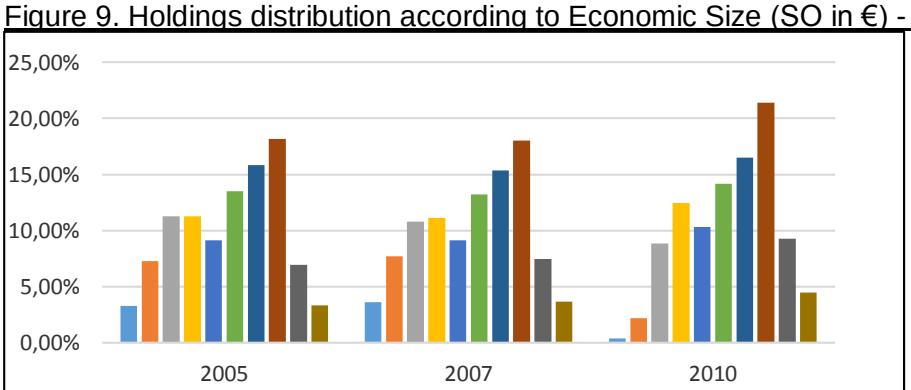
So far, we analysed farms' distribution according to geographical size. As a last step of analysis, we want to check their distribution in terms of economic size, thus considering output classes in Euro value instead of hectares. For both countries, holdings' distribution is now more spread out, even if it roughly follows the same trend of geographical settings. In Germany, rather than being concentrated on the extreme values (either very small or very large) like in Figure 6, farms are distributed following a roughly step-like distribution with two maxima: the mean class of holdings is that of 100.000 – 249.999€, followed by a second peak of holdings with 8.000 – 14.999€ (see Figure 9). This analysis is in line with the structural change in geographical distribution we saw before: the more pronounced

[41]C.f. ISTAT (2000), pag. 75.
[42]C.f. ISTAT (2012), pag. 6, 14.

peak on the 100.000-249.999€ class in 2010 is to be connected to the increase in geographical size, anticipating a potential strong relationship between scale and economic value.

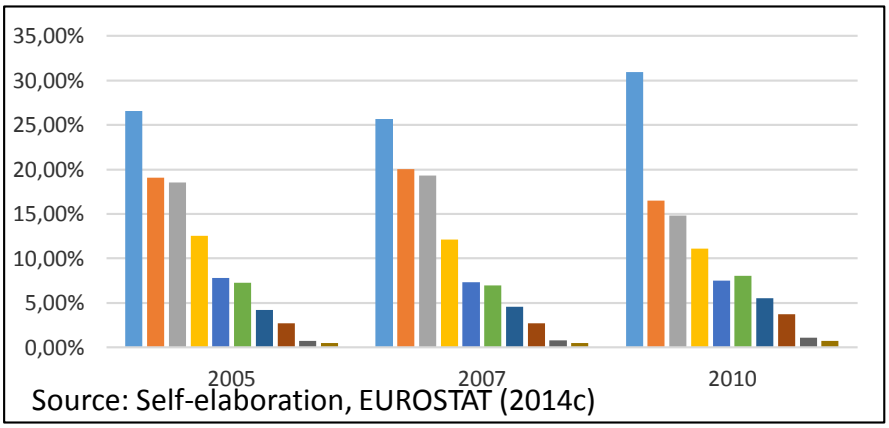
Figure 10 shows that the holdings' distribution according to economic size in Italy peaks at the lowest levels but, when compared to Figure 7, skewness is less pronounced. This can suggest that some relatively small farms in terms of geographical extension are producing more than proportional value in Euro, as can be the case of specialized intensive crops, like floriculture. Another possible explanation for this shift of the distribution among economic size classes to the right with respect to geographical classes can be that the highest economic values are boosted by the geographically largest farms: although being only a minority, they may entail a proportionally higher potential in economic terms as to produce more value relative to the smaller farms. This last hypothesis is confirmed by some data, highlighting that in 2011 in Italy, for example, farms with a turnover larger than € 100.000, tough amounting only 4.9% of total holdings, realized more than 50% of added value in the Agricultural sector[43].

Figure 9. Holdings distribution according to Economic Size (SO in €) - Germany



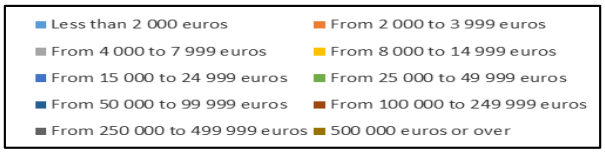
Source: Self-elaboration, EUROSTAT (2014c)

Figure 10. Holdings distribution according to Economic Size (SO in €) - Italy



Source: Self-elaboration, EUROSTAT (2014c)

[43] C.f. ISTAT (2013), pag.1, 4.



Our evidence so far: Scale in Agriculture – Italy and Germany

- In Italy, agricultural holdings are on average much smaller than in Germany
- The great majority of Italian holdings has a size lower than 5ha
- A structural consolidation process in on the way in both countries, signalling that scale matters
- Nonetheless, this restructuring process seems much stronger in Germany: holdings with more than 100ha increased by 2.400 to 34.100 units between 2007 and 2011
- Especially in Italy, small geographical scale doesn't always mean small economic size (inequality between geographical extension and output)

3.2 Conceptual Meaning of Scale in Agriculture

Our descriptive analysis so far highlighted some recent structural changes towards consolidation in the agricultural sector, both in Italy and Germany - although with remarkable differences. Anyway, before concluding that Economies of Scale were the key driver of such a trend, we have to perform a much more comprehensive analysis to see whether the implications of scale described by theory (see Paragraph 1) are viable in our research context.

Research Questions:

- What do we really conceive as 'scale' in Agriculture?
- Are scale's features and trends in Agriculture explicable through the theory of Economies of Scale? In which aspects and to which extent?

Starting from the first research question about the meaning of 'scale', it is necessary to take into account that there are two options to interpret such concept: geographical size in hectares and economic size in ESU (European size unit). The two measures are not perfectly overlapping, thus we will have to specify to which measure we are referring, as sometimes not both of them are available.

Even if the concept of scale is normally connected to the physical extension of the firm, in Agriculture the economic size of the holding can be considered a more

correct and informative indicator of scale. In fact, the physical extension is much more dependent on the type of crop (intensive versus extensive one), thus not properly taking into account that smaller farms specialized in intensive products can yield proportionally higher incomes, thus overcoming the physical constraint[44]. In our analysis, we will then try to refer to the economic size of the farm, even if for some aspects we will have to consider geographical size due to lack of data in ESU. To measure farm-level productivity and the spread of fixed costs, we will then use Standard Output (SO) or the total agricultural output as referred to in the Eurostat database[45].

Moreover, I would like to mention the subtle conceptual difference between returns to scale and returns to size. Some American researchers pointed out that the two terms are erroneously used interchangeably, confusing their distinction: returns to scale is connected to the use of a production or profit function, while returns to size relate costs to output levels. The authors conclude that returns to size may be more realistic as they overcome the artificial derivation of a production function, which is in any case a (somehow unrealistic) abstraction[46]. Taken into account this theoretical interpretation, and given that the computation of production functions is not in the domain of the current research, we will stick to the concept of returns to size, relating costs to output levels. This will be respected in the entire analysis, even when 'returns to size' is formulated as 'returns to scale'.
In the next sections, we will analyse various determinants of costs, starting from an analysis of costs' components in Agriculture, and then looking at the incidence of fixed costs on outputs and on overall costs. We will consider the influence of crop differentiation and organizational variables of farms to interpret such differences. We will then relate fixed costs to scale, trying to identify potential connections, both nationally and regionally, in Italy and in Germany.

4. Scale implications on overheads and productivity at farm-level

4.1 Cost components in Agriculture between Italy and Germany

Before analysing the connections between scale and costs, I will briefly outline the different cost structures in Italy and Germany in the agricultural sector. As we are particularly interested in the fixed costs' components, we will start looking at the

[44] C.f. Povellato (2009), pag. 1.
[45] See "Nomenclature: Abbreviations and Definitions", pag.V – VI.
[46] C.f. McClelland et al. (1986), pag. 132.

gross fixed capital formation (GFCF) level, by elaborating Eurostat data. This parameter measures those investments in long-term assets and in fixed components like equipment and machinery, as well as investments to expand or build factories[47]. Table 2 highlights the level of GFCF over total production costs[48] and over agricultural output.

Table 2. Gross Fixed Capital Formation over total production costs and output: Germany and Italy

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Germany (in %)												
TOT. GFCF/ tot. product. costs	18,1	17,9	16,5	20,3	18,5	20,1	21,5	24,1	20,1	18,2	16,5	16,3
TOT. GFCF / output	13,0	14,0	13,4	15,0	15,9	17,1	17,4	19,7	17,7	15,8	14,3	13,9
Italy (in %)												
TOT. GFCF/ tot. product. costs	33,2	33,2	35,0	34,7	37,5	37,6	36,2	33,1	33,6	28,1	28,2	27,6
TOT. GFCF / output	20,2	20,5	21,7	21,6	25,4	26,3	26,1	24,4	26,3	22,1	21,8	21,5

Source: Self-Elaboration, data from Table 11 in the Appendix.

In Germany, the stock of fixed capital is lower than in Italy, both with respect to total production costs and to total agricultural output. This difference in fixed costs' components may be connected to the fact that, when the agricultural sector is more fragmented like in Italy (holdings are much more numerous and smaller), there is a multiplication of fixed investments. On the contrary, in Germany such fixed costs appear to have a less heavy burden both on total costs and on total output. It makes sense to hypothesize that the different structural settings in Germany, characterized by fewer holdings with larger size, plays a role in driving such results. These data at macro-level (national-based) are thus in line with the theory of economies of scale; nonetheless, much deeper analysis will be necessary to strengthen our evidence. From Table 2, we can also observe that the trend of GFCF/output is increasing slightly more in Italy than in Germany, another hint that a better spread of fixed costs over agricultural output occurs in Germany.

We also look at the impact of fixed capital consumption over total intermediate consumption (variable inputs in production)[49], thus highlighting the burden of some fixed components on total variable costs. From Table 3, we can notice a

[47] C.f. Economicsgelp.org (2014), website.
[48] We derived total production costs summing the fixed components (Consumption of Fixed capital, from Eurostat) and the variable components (Total Intermediate Consumption, from Eurostat); for further data, see Table 11 in the Appendix.
[49] See "Nomenclature: Abbreviations and Definitions', pag. V - VI.

striking difference between the two countries: in Italy, the incidence of the consumption of fixed capital on variable inputs is more than the double than in Germany (almost three times higher in 2013). Still, the burden of fixed cost is decreasing in Germany, while it increases in Italy.

Table 3. Burden of fixed capital consumption on total production costs

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Germany (in %)													
FIXED CAP.CON SUMP./tot. interm.con sump.	27,84	27,27	27,02	27,42	27,23	26,11	23,87	23,30	26,14	25,45	22,12	21,87	21,56
Italy (in %)													
FIXED CAP.CON SUMP./tot. interm.con sump.	55,85	58,09	59,19	58,73	63,86	65,22	62,84	58,94	63,67	62,86	59,77	58,86	58,84
Source: Self-elaboration, EUROSTAT, See Tables 9-10 in the Appendix.													

Analysing the Gross Fixed Capital Formation more in details, thus looking at its components (machinery, equipment and buildings), we reach the same conclusion: fixed costs are still higher in Italy, both with respect to total agricultural output and total production costs[50].

Besides analysing the cost structure itself, we want to focus on how it is related to output, as this is the major focal point for later testing Economies of Scale. We thus computed some productivity ratios, intended as the ratios of agricultural output to costs' components. Table 12 in the Appendix highlights that the volume of agricultural production valued at basic prices has increased more in Germany since 2005. We will then try to relate some fixed and variable costs' components to output, calculating the ratios of total output to intermediate consumption and to gross fixed capital formation. These ratios give the proportion of output obtained from one cost unit, so that we labelled them 'productivity ratios'. Our results show that the productivity of both intermediate consumption and gross fixed capital formation is higher in Germany: higher ratios signify that more output can be attained from the same cost level, or -rephrasing- that costs are more spread over the same output volumes. If such data are informative, these results at national level suggest that the average larger scale of German farms leads to efficiencies in terms of costs, both in fixed and variable components.

[50] See Table 11 in the Appendix for deriving these additional components.

Our Evidence so far: Fixed capital components

- The burden of fixed costs in Agriculture at national level is higher in Italy: total Gross Fixed Capital Formation both over total production costs and over output is much higher in Italy
- The burden of Fixed Capital Consumption over total costs is higher and increasing in Italy, while it decreases in Germany
- This may be connected to inefficiencies due to small scale of farms and multiplication of fixed assets in Italy

Anyway, analysing costs' differences between Italy and Germany, we should take into account, among other variables[51], the different cost structures at national level and the fact that the same input costs can have different relevance and weight across countries. Besides that, we also have to bear in mind that the burden of costs may be driven by either volumes or prices, as well as by the interaction of the two factors.

In this last section related to the cost structure at national level, I selected some agricultural cost items related to both variable and fixed components: they highlight not only some major differences between Italy and Germany, but also some dissimilarities between volumes' and prices' trends.

Energy costs, as depicted in Figure 6, represent one of the highest cost item in Italy (about 70% more than the European average[52]), where energy prices have increased -diverging from the decreasing prices in Germany- since 2008. It is reported for Italy to have registered an increase in agricultural costs for producers of more than 6% in only one year, between 2012 and 2013, driven by costs for energy and lubrificants (+11,4%)[53]. Volumes follow the opposite trend, which would make sense if we could interpret this as a reaction to price changes (nonetheless, we have no information about cause-effect relationship). The value of intermediate consumption presents a similar logic, with increasing prices in Italy and increasing volumes in Germany.

[51] Our analysis is not intended to adress the whole complexity of the interactions among all potential variables affecting scale in agriculture, so we will stick to our line of reasoning supported by the available data.
[52] C.f. Bono (2014b), pag. 1.
[53] C.f. Capparelli (2013), pag. 1-3.

Figure 11. Value of intermediate consumption

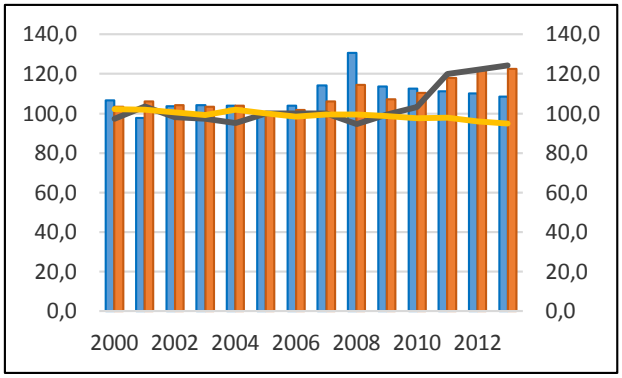
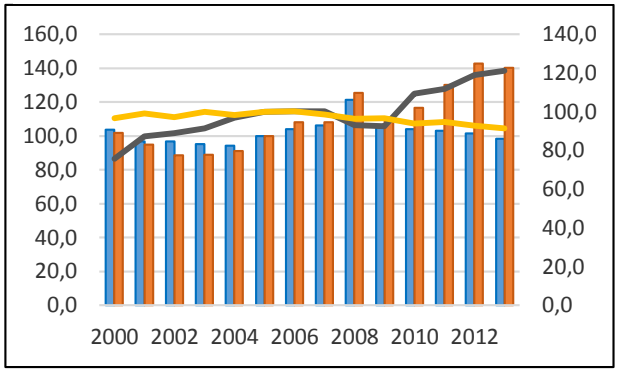


Figure 12. Consumption of Energy inputs



Costs for agricultural services in terms of price are higher in Italy and are increasing more, relative to the German ones. On the contrary, volumes of agricultural services are larger and faster increasing in Germany: this is connected to the practice of subcontracting part of the agricultural tasks to a third party, due to lack of machinery, specialized equipment or knowledge. Decreasing costs may thus be interpreted as a good signal, as more collaborations and exchange of means of production will be possible. We will see later in our analysis that the practice of subcontracting and of pooling resources from other producers has a key importance in fostering new organizational settings in Agriculture. Finally, also the higher burden of fixed capital expenditure in Italy compared to Germany is mostly driven by price logics, while volumes are much higher in Germany.

Figure 13. Fixed capital expenditure

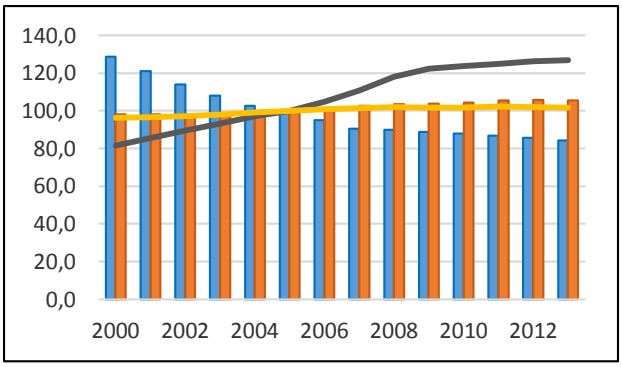
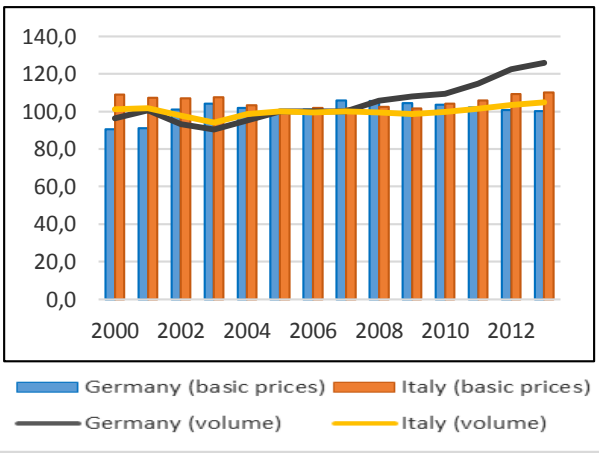


Figure 14. Cost of Agricultural services



Source Fig. 11- 14: EUROSTAT (2014d).

Our evidence so far: Cost items at national level – Prices and Volumes

- In Italy cost factors in Agriculture, both variable and fixed, are increasing and mostly driven by increases in price
- In Germany, the general trend of such cost items is a slight decrease in price and an increase in volumes
- Differences are remarkable especially for fixed capital expenditure and energy inputs

4.2 Scale and Economic size across different types of holding

After having considered the cost structures in Agriculture at national level and having highlighted some differences in the stock and spread of cost items between Italy and Germany, we will now try to focus more closely on the relationship between costs and scale. As data at farm level are difficult to obtain, or they are collected for small samples of farms, we will proceed through a hypothesis-like reasoning, trying to identify some variables' combinations that can help us to indirectly derive some signals of Economies of Scale.

In this section, I will present cross-sectional data, comparing economic size and scale of holdings, according to their agricultural sector (grazing livestock, field crops, permanent crops, horticulture and granivores) and to their level of specialization (mixed versus specialized farms). This stratified analysis is intended to offset some 'noisy effects' derived from sectorial and organizational differences at national level: segmenting holdings according to their specialization level and their crop productions, we can more clearly identify the relationship between scale and economic size within each subsection. Table 13 in the Appendix shows such data[54].

In terms of total ESU (European Size Unit), Italy overcame Germany in 2005, even if the geographic average size of the holdings were much lower in all the sub-sections. For holdings specialized in permanent crops, horticulture or producing mixed cropping, Italy had an advantage in terms of Standard Gross Margin (thus, economic size) even if holdings were always smaller than Germany. Farms with specialist granivores (since 2005) and specialist field crops holdings (since 2007) have also been higher in economic size in Italy. In general, we can observe that some types of farms have relatively high standard gross margins in Italy, although being characterized by a small scale: they are farms - both specialised and mixed

[54] See Table 13 in the Appendix.

- focused on cropping and horticulture, and more recently also farms specialized in granivores. In Germany, livestock holdings (both specialist and mixed) and mixed crop-livestock holdings have a higher economic size in terms of standard gross margin. This highlights, on one side, the dis-match between the economic and the physical size of agricultural holdings, as already explained in Paragraph 3.2; on the other hand, it confirms that identifying a clear relationship between scale and cost efficiency is challenging, as many organizational settings at farm level are interacting and influencing holdings' size.

Our Evidence so far: Farms' specialization and crop differentiation

- Geographic scale is not always a clear determinant of the economic size of the farm: small farms can have high gross margins;
- The degree of specialization and crop choices at farm level interact, influencing the role of scale;
- We did not find evidence that economic size is always smaller in Italy than in Germany, even if in Italy farms are much smaller in geography.

4.3 Scale and crop differentiation across regional areas

In this section, connected to the previous one, we will look at the agricultural holdings' scale at regional level as another 'trick' to offset the effect of differences in crop production.

Our expectation is to find some evidence that regional crop differentiation actually has a significant impact on scale settings and dynamics. We thus expect regions with a higher proportion of relatively more capital-intensive crops- like cereals or forage plants- to present agricultural holdings with larger scale. Nonetheless, we will have to take into account also that there exists many other aspects adding more complexity to the linear relationship we would like to see (for example, the regional and historical evolution of farms, as explained in Paragraphs 2.2.2 - 2.2.3). The results of this analysis at regional level are relevant for our research because, in case a trend is identifiable, we could then use regional differences in scale settings as a proxy for testing whether regions with larger farms are also more efficient and can actually better spread fixed costs. In fact, although not having data at farm-level, we have data about costs at regional level. Finally, a comparison between regional differences in Italy and Germany will add new value and highlight important differences.

Research Questions

- What's the relationship between regional sectorial differences and scale settings in Agriculture? Are some crops actually favoring larger scale at farm-level?
- Are there clear regional differences that can be used as proxies for further analysis?
- Are there significant differences between Italy and Germany?

For performing the analysis, I selected 13 regions, which I chose as representative for Germany and Italy, spread in all the national territories:

Germany		Italy	
Baden-Württemberg	South	**Sicilia**	South
Bayern		**Puglia**	
Mecklenburg-Vorpommern	North- East	**Campania**	
Brandeburg		**Toscana**	Centre
Schleswig-Holstein	North	**Veneto**	North-east
Niedersachsen		**Lombardia**	North
		Piemonte	

Figures 1-12 in the Appendix[55] highlight some considerable differences in the scale distribution of farms regionally. A quite coherent connection to crop and livestock differentiation is actually identifiable, even if sectorial differences of course do not fully explain scale settings.

Crop differentiation and Farms' scale in Germany

In South Germany (as represented by Baden-Württemberg and Bayern), we find more product variety as climate conditions allow also for production of wine, fresh vegetables, melons and strawberries, while in all other German regions these products are not present. Nonetheless, some strong differences are even identifiable between these two southern federal States. In BW, vineyards and fresh crops are comparatively more relevant, and agricultural holdings are much more spread among smaller scale classes in terms of hectares. In Bayern, instead,

[55] See Figures 1-12 in the Appendix.

around 70% of holdings produce cereals, about 50% are engaged in forage plants' cropping and the importance of root crops and dairy cows is significant, too[56]. Scale distribution clearly depicts a different pattern: it resembles a normal distribution, with the holdings' mean being in the 10 to 19.9 ha range, and the majority of the remaining holdings being sized between 20 and 99.9 ha. Taking into account the opposite scale distribution in BW (especially until 2007), where the majority of holdings were instead smaller than 19.9 ha, we can hypothesize that in this case crop differentiation has a strong influence on scale, to some extent stronger than historical evolution (which is often thought to be similar within southern Germany federal States).

A common consolidation trend is identifiable in both States since 2010: in 2010 only around 4% (18%) of holdings were included in size classes smaller than 5ha, compared to more than 17% (32%) in 2007, respectively in Bayern (Baden-Württemberg).

Moving to the northern regions, crop specialization in cereals and forage plants becomes a common feature for all the selected federal States. Nonetheless, strong differences in scale settings emerge. In Schleswig-Holstein, around 50% of agricultural holdings were larger than 50ha in 2010, and most of the remaining ones were concentrated in the central-size classes. A very similar holdings' distribution is viable in Niedersachsen, with a bigger gap between the low number of smaller farms and the majority of them in the central- and upper-size classes. Some crop differences are identifiable: Schleswig-Holstein has relatively more dairy cows, while Niedersachsen has more cereals. Nonetheless, the different products' composition in Niedersachsen is strong enough compared to Bayern as to justify the differences in scale between the two States. This seems to confirm that regional differences and other organizational settings consolidated through different evolutionary trends play a role in explaining different structural settings between North and South Germany. This is further confirmed when looking at the scale distribution of holdings in the North-East regions of Germany (where stronger effects from the peculiar historical-political influence are expected). In fact, in Brandeburg and in Mecklenburg-Vorpommern, agricultural holdings are clustered in the largest scale class, even if the products' portfolios are similar to those ones of other German federal States. A shift towards upper-size classes is still visible,

[56] Notice that the sum of the percentages of holdings in the various sectors is larger than 100%: some holdings are producing more than one type of product, thus being counted more than once.

especially affecting the size class 2 to 4.9 ha, where number of holdings drastically decreased (this is to be observed also for other federal States).

Crop differentiation and Farms' scale in Italy

As regards Italy, we will now proceed with a similar analysis, referring to Tables 13 – 24 in the Appendix.

We can observe that, as already expected and anticipated in Paragraph 2.2.1, products are very different. Especially, wine emerges to be the first or second most important product across Italian Regions in terms of number of holdings devoted to that business. Cereals are still important in all examined Regions[57], although being more relevant in the North of Italy. In Piemonte, Lombardia, Veneto and Sicily, cereals represent the sector where the majority of agricultural holdings are engaged (so, except Sicily, almost in the North of Italy). In Tuscany, Puglia and Campania (Central and Southern Italy), vineyards are instead the agricultural sector occupying more holdings. Holdings with fresh vegetables, melons and strawberries are also present in all Italian Regions, especially in the South, reaching a staggering high percentage in Campania. Campania is also the Region with braoder products' variety, followed by Tuscany and Lombardia. When looking at the holdings' distribution according to size, we find a clear persistent pattern: the majority of holdings is included in the less-than-2 ha category. A unique difference is identifiable: farms in some northern Regions (Lombardia and Piemonte) are more uniformly distributed: in Lombardia around 20% of holdings (the biggest percentage among our selected Italian Regions) had more than 20 ha.

Comparison Germany - Italy

Comparing Italy and Germany, we confirm the big disparity in terms of holdings' distribution according to scale: in Germany, we found many more larger holdings than in Italy. On one side, we found some evidence that crop differentiation has an impact: regions with more capital-intensive sectors like cereals, forage plants or livestock are sometimes connected to higher propensity for larger farms. This larger scale may thus be motivated by the goal of being more efficient, thus confirming the logics of economies of scale: such a structural setting is prompted from the necessity of better spreading overheads, through an increase of the farm's scale.

[57] 'Region' with a capital letter is referred to the political partition of Italy, while 'region' refers to a geographical area.

On the other side, we saw that in Germany regional differences persist even where products are similar, partially contradicting the previous reasoning and calling for other explanations. We thus conclude that crop differentiation has to be combined with local traditions and past regional evolution of the farming system to explain current scale settings. The structural difference is in fact much more evident between Italy and Germany than within national borders, confirming that also history and politics play a crucial role.

The direct usefulness of this analysis for our research purpose derives from the identification of some regional differences in terms of scale settings that, even if caused by many interconnected factors, which we cannot clearly detect, can be used to test whether regions with larger farms on average, actually are better at spreading overheads. This would be an evidence confirming the theory of economies of scale.

4.4 Scale and spread of overheads regionally: some contradicting evidence?

As already anticipated, we will proceed in this section using the previous data on regional scale settings to see whether regions with bigger farms are better at spreading fixed costs over output. This indirect analysis is necessary, as data about costs at farm level are very difficult- nearly impossible- to be found, so we will have to accept the assumption that regional data are a good proxy for average farm-level data. We expect to see that fixed costs are better spread over output in those regions with relatively more farms with larger scale. I computed the spread of fixed costs as the ratio of total farming overheads to total agricultural output, in the period 2000-2009 referring to the previously selected Italian and German regions[58]. Given the big difference in scale between Germany and Italy, we would also expect our computed ratios to be lower in Germany, given that fixed costs would be spread over higher output.

[58] Row data were derived from the dynamic FADN (Farm Accounting Data Network) public database, See Tables 14 – 15 in the Appendix.

Research Questions:

Assuming we can use regional scale structure as a proxy for the average farm-level scale structure:

- Is there a clear relationship between scale and the spread of farming overheads over output?
- Are regions with larger farms better able to spread fixed costs, thus confirming the theory of Economies of Scale?
- Are there some remarkable differences between Germany and Italy?

In Germany, the ratios of farming overheads over output are roughly included in the range 25% - 33%. Regions are all quite similar and a general trend of increasing overheads over output is identifiable. The federal States with the lowest ratios on average were Niedersachsen and Schleswig-Holstein: they were the only ones with ratios below 30% in all the examined years (2000-2009). The fact that both of them pertain to Northern regions, where farms are actually larger, may confirm that scale matters, but this evidence is too weak, especially taking into account that other Northern federal States like Brandeburg and Mecklenburg-Vorpommern have higher ratios than those of Bayern and BW, although their respective holdings' distribution according to scale is very different. Our results are thus not totally in line with the theory of Economies of Scale.

In Italy, data are more variable across regions, ranging roughly from 8% to 20%: in general, ratios are lower when compared to Germany. A coherent trend is not identifiable: in Northern regions like Veneto, Lombardia and Piemonte, ratios of fixed costs over output are higher than in Sicily and Campania (South Italy), with the striking exception of Puglia, which presents the highest ratios' levels, although being in the South of Italy. Tuscany, in the Centre, has also higher levels than the Northern regions. A clear relationship between scale settings and the spread of fixed costs is not derivable from our data. Besides that, in Italy fixed costs over output are now smaller than in Germany.

Our evidence: Intermediate Resume

- From data on fixed costs comparing Italy and Germany regionally: no evidence that productivity of fixed costs is higher in Germany and no evidence that productivity of fixed costs within the same country is higher in regions with bigger farms;
- To limit the bias introduced by different crop production (affecting capital intensity and thus changing the incidence of fixed costs) between Italy and Germany, we considered subsamples according to crops and we analysed for each sector the average holding size and the economic unit size;
- We found no evidence that economic size is smaller in Italy than in Germany, even if in Italy farms are much smaller. This leads us to conclude that Economies of Scale when strictly considered as spread of fixed costs at farm levels don't totally hold in farming, at least as regards our data.

This lack of evidence, together with the uncertainty deriving from not being able to control all potential variables affecting scale, may lead to doubt about the real concretization of Economies of Scale.

Research Questions

- Is the significance of Economies of Scale weak?
- Are there any conceptual weaknesses in the concept of Economies of Scale once applied in its strict meaning to the agricultural sector?

Nonetheless, also referring to all the researches quoted so far, we cannot disregard that the process of consolidation, which is currently going on in both Germany and Italy in the agricultural sector, is aimed at increasing efficiency, spreading costs over larger outputs' volumes. We also had clear evidence that at national level, fixed costs over agricultural output were actually much lower in Germany and that German holdings were not only higher in terms of hectares, but also in terms of economic size. We should also take into account that, in this last step of analysis, we considered the physical size of holdings (in hectares), but that economic size in output values would have been more informative[59]. This may have introduced

[59] This is justified by data constraint: regional level Economic size data were not available or were not matching our aggregation level.

some bias in our last conclusions, because the distribution of holdings according to economic size is slightly more shifted to the right when compared to the distribution of holdings according to geographic size, both in Germany[60] and in Italy[61].

Nonetheless, a major difficulty of such an analysis is to identify the reference point where the fixed costs level are minimized -and thus scale is optimal- to maximize efficiency, the so-called 'Minimum Efficient Scale'. We tried to perform some stratified analysis relating costs to geographical and economic scale, connecting them to crop differentiation and studying the differences between the two countries' systems. The main issue we investigated so far was the spread of fixed costs, as indivisibility of fixed costs like machinery and equipment are thought to be one major source of economies of scale, also in agriculture. Nonetheless, better investigating the issue, crucial questions arise:

Research Questions: Relationship investments – size: who moves first?

- Are there really increasing returns to scale in Agriculture? Or is there a progressive adjustment between investment and scale leading to constant returns to scale?
- Is larger scale influencing capital investments, thus inducing jumps to different production technologies?
- Or is it the other way around: the size of machines and the type of technology required are affecting scale settings?

Even if these questions are still open issues to be researched, I will partially deal with them in the following sections, proposing an interpretation framework.

5. A new concept: Network Economies of scale and the role of Cooperatives

Some researchers challenged the applicability of the theory of Economies of Scale to the agricultural sector. They stated that indivisibilities at farm level do not exist in the long run, because equipment, machinery, structures and land are just selected and adjusted according to the farms' size. Tractors, for example, as well

[60] See Figures 27-30 in the Appendix.
[61] See Figures 31-34 in the Appendix.

as irrigation systems, are available at different magnitudes, capacities and power levels. Thus, the production technology can be better adapted to the specific structural settings of the holding, so that fixed costs seem to be continuous instead of lumpy inputs. In the long-run, we would then see optimal adjustments between holdings' scale and the production technology (giving the proper level and combination of fixed costs). In such a context, we can conclude that the benefits of scale's increase are only temporary and that, in the long-run, the agricultural sector presents constant returns to scale. Consequently, also small farms can be expected to be efficient, as they adopted that production technology minimizing costs at their peculiar scale[62].

Should we conclude that scale in Agriculture has a not so determining role and that Economies of Scale are a temporary phenomenon?

I will support the reasoning that indivisibilities do not persist in Agriculture, as production means can be adjusted and optimal inputs combinations also in the short-run exist. This is in fact in line with the big amount of small farms still existing. Nonetheless, this does not make us conclude that there are constant returns to scale in Agriculture. I would actually state the contrary: constant returns to scale are temporary and only occurs at the equilibrium point (MES), but this equilibrium is changing, because machinery endowments can vary, inputs' combinations are reviewed and the farm's size is adjusted. These reciprocal changes and adjustments actually boost the magnitude of Economies of Scale: adjustments are possible, new opportunities and combinations among technologies are viable, so there is new margin for scale to be increased and new phases of increasing returns to scale are expected. Even if this will not continue forever, and the threshold of diseconomies of scale will be reached, we still can't conclude that there are constant returns to scale.

Moreover, the potential for these adjustments is not only driven by the indivisibility of fixed costs: organizational adjustments can also influence the production technology. Land, for example, although remaining a fixed component, change its 'indivisibility degree' depending on which crop is selected, how crop is combined, which mechanization level is chosen and which degree of expertise the managers of the farm have. New variables must be considered except the mere geographical extension and the spread of fixed costs.

[62] C.f. Kislev and Peterson (1991), pag. 1-5.

Such reasoning is, in fact, not intended to nullify the existence of Economies of Scale in Agriculture: our analysis shows that scale can have important benefits on efficiency and the current consolidation process going on in both Germany and Italy witnesses that an increase in scale is deemed as necessary for many farms. Besides that, the fact that at national level, productivity of fixed costs in Germany is actually higher, provides some evidence that- to a certain extent - the logics of 'pure' Economies of Scale are applicable and that they are working.
What instead I will derive is a new line of reasoning to interpret Economies of Scale in Agriculture. Agreeing to the above stated reasoning according to which:

- Indivisibilities in Agriculture actually don't exist, as adjustments between fixed costs and scale are taking place;
- Increasing returns to scale are anyway viable.

The following lines of reasoning arise:

a. <u>New parameters and sources of Economies of Scale must be investigated, besides the spread of overheads.</u>

Other crucial sources of Economies of Scale connected more with organizational settings besides structural ones may better highlight the benefits of increasing scale and pooling resources: managerial Economies of Scale, increased productivity of variable inputs, purchasing Economies of Ecale, advertising and financial Economies of Scale can reveal powerful results.

b. <u>Farm-level (or regional level) analysis may not be informative enough: we need a different approach to capture the potential of Economies of Scale.</u>

Assuming that every farm tries to adjust its investments and scale parameters reaching a local equilibrium, we may expect a series of short-term U-shaped cost curves at farm level, representing that each farm reached its minimum efficient scale, thus expiring the increasing returns to scale. Nonetheless, these equilibria may be not optimal, because farms, adjusting technology with size, may miss the possibility of shifting to a more efficient production technology (which requires an effortful scale restructuring). That is why we need to study Economies of Scale at an upper organizational level, combining more farms and creating synergies.

Combining our considerations from point "a" and "b", we will develop a new concept: Network Economies of Scale. Network Economies of Scale combine the collaborative logics and communication efficiency of networks with the necessity of spreading some fixed costs and of pooling resources of Economies of Scale. I

saw the materialization of such a concept in the functioning of agricultural cooperatives.

5.1 Agricultural Cooperatives in Italy and Germany: Descriptive analysis

The differences in cooperative structures between Italy and Germany may be partially connected to a general European tendency: in northern European countries, Cooperatives are larger and more integrated; while in the South of Europe small scale is still dominant. This is to be explained also as a cultural factor: southern countries appear to be more reluctant to mergers, even if a concentration process has been initiated here, too[63].

Agricultural cooperatives in Italy

In Italy, cooperatives have a traditionally relevant role, especially in the agricultural sector, which represents the 13% of the whole cooperative system: as for 2013, 24% of total revenues in Agriculture were managed within cooperatives[64], whose contribution to the sector's GDP was more than 40%[65]. The cooperative is seen as an instrument to preserve producers' autonomy while strengthening their competitiveness. Differently from any capital firms, cooperatives are based on mechanisms of mutual exchange and social protection, which not only strengthen collaboration among members, but also provide alternative solutions to economic pressures and supply chain inefficiencies. For example, cooperatives guarantee to their members the allocation of products in the market and the purchase of a relatively constant amount of output from them. In such a way, cooperatives act as catalysts of market fluctuations, protecting producers from shifts in demand and from abrupt price decreases. Employment and economic sustainability are thus preserved[66].

Some data related to the Italian cooperative system show that this mechanism works: in 2011, cooperatives production increased by 8.2% and investments by more than 10%. Employment also increased by around 8% between 2007 and 2011, contrasting the negative employment trend in the non-cooperative systems: this highlights the anti-cyclical effects of cooperative system [67].

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[63] C.f. COGECA (2010), pag. 29.
[64] C.f. Giacomini (2011), pag. 1 – 3.
[65] C.f. Borzaga from Euricse (2014), pag.5.
[66] C.f. Sforzi et al. from Euricse (2014), pag. 138 – 141.
[67] C.f. Borzaga from Euricse (2014), pag.5.

Italian cooperatives in Agriculture have increased their turnover in 2013, following the positive trend of the previous year. Even if employment has decreased by 1.8% in 2013, output is not expected to diminish: operative margins are mostly stable and 82% of agricultural cooperatives in Italy registered a stable or growing net profit by the end of 2013[68]. The triggering agricultural sectors in terms of turnover growing rates were dairy sector, wine production and forestry, growing more than 5% between 2012 and 2013[69].

In Italy, cooperatives have a key role in agriculture: according to some Euricse ri-elaborated data[70], in 2011 more than 10% of all cooperatives were devoted to agriculture. In absolute terms, this means 5591 units. Nonetheless, one major limit is inaccessibility to official data, so that different percentages are found when looking at different sources and samples[71].

As you can see from table 16 in the Appendix, employment levels are quite low in agricultural cooperatives, employing slightly more than 7% of all the cooperatives' employees in 2011. We can also notice that the sector is dominated by relatively old workers (workers older than 35 years are almost 70%) and by men (only 35% are women)[72].

Agricultural cooperatives in Germany

In Germany, cooperatives have also a crucial role: 25% of the population is member of a cooperative. German cooperatives were grounded on the thoughts of Mr. Friedrich Wilhelm Raiffeisen in the 19th century and the German law on cooperatives, dating back to 1889, was taken as an example for other countries in Europe. Differently from Italy, the economic function of cooperatives is stronger than the social one in Germany, although economic relationships have to reflect principles of solidarity, democracy and responsibility[73].

Cooperatives are large economic institutions, and in Agriculture great majority of German farmers, gardeners and winegrowers are included in one. Although the number of cooperatives have been decreasing because a consolidation trend has occurred through mergers, their economic relevance has increased. In 2008, German cooperatives included more than 7.000 members, almost 3.000 of which

[68] C.f. Di Tullio (2014), pag. 4 – 5.
[69] C.f. Di Tullio (2014), pag. 10.
[70] C.f. Carini, C. et al. from Euricse (2014), pag. 11-12.
[71] See Table 16 in the Appendix.
[72] See Table 17 in the Appendix.
[73] C.f. German Cooperative and Raiffeisen Confederation (w.y.), pag. 1 f.

were part of rural cooperatives. Rural cooperatives are one of the five cooperative typologies in Germany (the other ones being marketing and purchasing-, service-, consumer- and housing cooperatives)[74].

Cooperatives are thought to be effective tools for favoring both outputs sale and inputs supplying activities, increasing the value added and the economic position of their members. The consolidation process in cooperatives is particularly important in the food supply chain, assuring the sustain to local producers and the traceability of products. Nonetheless, too big cooperatives have difficulty in actively including all the members to preserve their social and collaborative vocation[75].

As highlighted in Table 18 in the Appendix, the cooperatives in Agriculture (2008 data) responsible for most of the turnover (53.9%) are Multipurpose cooperatives, with an absolute turnover value of €22.9 bill. These are followed by Milk&Dairy cooperatives (24.3%), with a turnover of €10.8 bill[76]. The economic significance of these data reflect the importance of cooperatives networks.

Cooperatives and scale between Italy and Germany

The big difference between the Italian cooperative structure and the German one is clearly identifiable comparing the 25 top bigger cooperatives in Italy and Germany in 2008 in terms of turnover[77]. The difference in turnover levels is striking: the average turnover difference between the top ten German cooperatives and the Italian ones is about € 2billion. Germany is relevant in terms of scale not only compared to Italy: it appears six times among the top ten cooperatives in the EU in 2008 (while Italy appears only once) [78]. Other data highlighting the structural differences between Italy and Germany in their Cooperatives system are contained in the following table:

Table 4. Cooperatives' data between Italy and Germany

	Country	1998	2003	2006	2008
Num. of cooperatives	Italy	4278	4262	3863	3620
	Germany	4221	3286	3188	2994
Num. Members (x 1000)	Italy	571	615,4	536,2	497,5

[74] C.f. German Cooperatives and Raiffeisen Confederation (w.y.), pag. 3 f.
[75] C.f. Cogeca (2010), pag. 97 f.
[76] See Table 18 in the Appendix.
[77] See Table 19 in the Appendix.
[78] See Table 20 in the Appendix.

	Germany	2964	2405	2147	1807
Num. Salaried workers (x 1000)	Italy	44	52,77	64,01	65,54
	Germany	140,9	115,4	104,44	101,5
Turnover (billion €)	Italy	12,72	14,81	20,83	25,5
	Germany	37,7	35,3	36,5	44,5
Data from: German Raiffeisen Association / Deutscher Raiffeisenverband (Germany) Data from: National Association Of Agricultural And Agrifood Cooperatives / Federazione Nazionale Delle Cooperative Agricole Ed Agroalimentari - Fedagri-Confcooperative, (Italy)					
Source: COGECA (2010), pag.51, 63.					

In Germany, there are less cooperatives but their higher scale is reflected in the higher levels of employment and turnover. This is even clearer when looking at Table 5, comparing the turnover level in 2008 of the top 10 agricultural cooperatives in Italy and Germany.

Table 5. Top 10 Cooperatives in Italy and Germany - 2008

	Country	Name	Sector	Turnover (bill.€)
1	Italy	Agriciola tre Valli	Animal products	2,332
1	Germany	Bay Wa	Supplies	8,795
2	Italy	Gesco	Poultry	1,154
2	Germany	Agravis	Supplies	5,811
3	Italy	Gruppo Conserve Italia	Fruit&Vegetables	0,963
3	Germany	Nordmilch	Dairy	2,5
4	Italy	Consorzio Latterie Sociali Mantovane	Dairy	0,414
4	Germany	Humana Milchunion	Dairy	2,2
5	Italy	UNIPEG	Slaughtering	0,394
5	Germany	RWZ Rhein-Mainz	Supplies	2,119
6	Italy	Agrintesa	Fruit&Vegetables	0,25
6	Germany	westfleisch	Meats	2,008
7	Italy	Consorzio Melinda	Fruit&Vegetables	0,244
7	Germany	Landgard	Fruit&Vegetables&Plants	1,269
8	Italy	APOFRUIT GROUP	Fruit&Vegetables	0,243
8	Germany	Hochwald Nahrungsmittelwerke	Dairy, Cheese, Sausage	1
9	Italy	Consorzio Granlatte	Dairy	0,237
9	Germany	Bayernland	Dairy	1
10	Italy	AVI.COOP	Slaughtering	0,165
10	Germany	ZG Karlsruhe	Supplies	0,959
Data from: Fedagri, Confcooperative (Italy), German Raiffeisen Association (Germany)				
Source: Cogeca (2010), pag. 52, 64.				

5.2 The potential of Cooperatives and Consortia in Italy

In this paragraph, we focus on Italy because the fragmentation of the agricultural sector is much higher and thus a structural and organizational change would be more impactful and significant. There is some evidence confirming the crucial role of economies of scale at cooperatives' level and the potential advantages they can bring to the Italian environment. In the whole EU, strengthening efforts to increase cooperatives' scale have started with the common goal of making cooperatives more efficient and competitive[79]. Scale effects seem more meaningful when derivable from networking mechanisms aggregating single units, instead of farm-level size extensions. Besides that, aggregation levels are compounding not only farms are aggregated into cooperatives, but attempts to gather cooperatives have been made through the creation of 'Consortia'. Consortia are systems to pool resources and create synergies among cooperatives. Especially in Agriculture, they are important to help producers share costs and spread fixed costs. Consortia in Agriculture and in the Agri-food sectors employed more than 50% of workers active in the whole consortia system in 2011, signalling that coordination activities among cooperatives are crucial in the agriculture organizational framework[80]. Nonetheless, their size keeps being quite small: the majority of consortia is below € 5 million production value as for 2011, and almost 23% of them have production values less than € 50,000[81].

But do we have evidence that an increase in scale is advisable within this kind of structural settings?

A comparison between the consolidated balance sheet at consortium level and the sum of the single cooperatives' Balance Sheets, shows that the former is significantly higher than the latter in terms of production value and employment. This means that consortia add new value by increasing efficiency or through expansion outside the consortium[82]. Taking into account that the foreign turnover for those agricultural cooperatives exporting abroad have increased by 7.4% between 2012 and 2013[83], the role of Consortia is getting more and more important also to acquire visibility on foreign markets, as we will highlight later. Despite that, Consortia still have relatively low scale, so more effective measures to exploit their

[79] COGECA (2010), pag.31-34.
[80] See Table 21 in the Appendix.
[81] See Table 22 in the Appendix.
[82] C.f. Linguiti from Euricse (2014), pag. 66-67.
[83] C.f. Di Tullio, (2014), pag. 6.

important aggregation power would be crucial to stimulate innovative developments in the agricultural sector.

Besides that, other indicators suggest that there are promising organizational settings for the development of scale economies.

As reported in Table 23 in the Appendix, invested capital appears to be more rigid (less liquid, so more mobilized) in Agriculture than in other sectors: the Cooperatives distribution according to the AFCI index[84] is more shifted to higher values[85]. In 2011, 25% of Agricultural cooperatives had an AFCI index lower than 6% (meaning that capital is mostly elastic and liquid), but the 33.5% of them had a very high index (AFCI larger than 45%), signalling high rigidity of capital and mobilization of resources. In presence of higher capital rigidity, Network Economies of Scale can provide interconnection possibilities allowing to mobilize resources, to pool means of productions and to create operational synergies, besides spreading fixed costs. Besides that, Table 23 also shows the VCPC index, measuring the distance between production costs and production value[86]. Although being in line with the other sectors' average, the VCPC values for agricultural cooperatives are highly skewed to the left: for 40% of the registered agricultural cooperatives, the index is lower than or equal to 1, meaning that production values are not even covering costs. This depicts a non-sustainable economic situation. Around 50% of the cases then, have an Index only slighter larger than 1 (1 to 1,2): so, even if they recover their costs, their earnings are still fairly low. High production costs are partially due to an excess burden of overheads, which are in fact higher in Italy than in Germany, as we saw in Paragraph 4.1[87]: this could be improved pooling resources among cooperatives in a more consolidated way. Besides that, low margins to producers may be connected to inefficiencies in the supply chain, as we will see later: also for this, a concentration at cooperatives' level is crucial to boost the bargaining power of the producers in Agriculture.

The role of Network Economies of Scale

In line with our previous argumentation highlighting higher productivity of fixed costs in Germany at national level, but lacking sensible conclusions at farm-level

[84] The AFCI index measures the incidence of fixed assets on invested capital, interpretable as the degree of capital rigidity and immobilization of resources.
[85] See Table 23 in the Appendix.
[86] Values of the VCPC index lower than 1 indicate economic situations non-sustainable in the long-run.
[87] See Paragraph 4.1 and Tables 11-12 in the Appendix.

or at regional-level, we decided to focus on cooperatives and consortia as key sources of Network Economies of Scale. A gap in terms of scale and turnover still persists between Italy and Germany. As already stated, the current European trend of importing the issue of optimal scale into Agriculture, thought to be a crucial component for boosting performance, confirms the relevance of scale effects. The evidence that Italian consortia are trying to increase scale is another confirmation that scale matters. Nonetheless, the concept of Network Economies of Scale allows us to capture new organizational aspects besides the mere spread of fixed costs, which is anyway important but not the only determinant for efficiency. The following analysis is to be seen as a development rather than a contradiction to the pure concept of economies of scale.

6. Other sources of Economies of Scale: organizational settings and Multifunctionality

Cooperatives and Consortia, by pooling together farms, are creating scale benefits in many aspects, connected not only to the sharing of fixed costs but also to the introduction of other operational efficiencies and process innovations.

Organizational Design and Multifunctionality

Cooperatives and consortia provide single farms with a virtual extension of their activities, resources and market opportunities through their access to a business network, without affecting farms' autonomy and internal functioning. Thus, they constitute a key framework for combining the scale advantages of big farms with some other valuable aspects better exploited in small farms.

In fact, some researches analysing the crucial role of the farms' dimension in Agriculture, concluded that size is important also in Agriculture: it allows to increase economic and technical efficiency, thus shifting to more efficient technology designs and better spreading fixed costs over outputs. Larger farms are more efficient as regards invested agrarian capital and land capital, they can better sustain higher income levels and are better candidates for obtaining financial resources. Smaller farms, on the other side, are better at minimizing production costs and combining production inputs, exploiting complementarities through differentiation and using more efficiently labour force (allocative efficiency)[88]. This

[88] Galluzzo (2013), pag. 29-31.

seems to be confirmed by the peculiar trend of the labour force productivity[89], that I computed from Eurostat data, as depicted in the following graphs:

Figure 15. Labour productivity in Germany in 2010

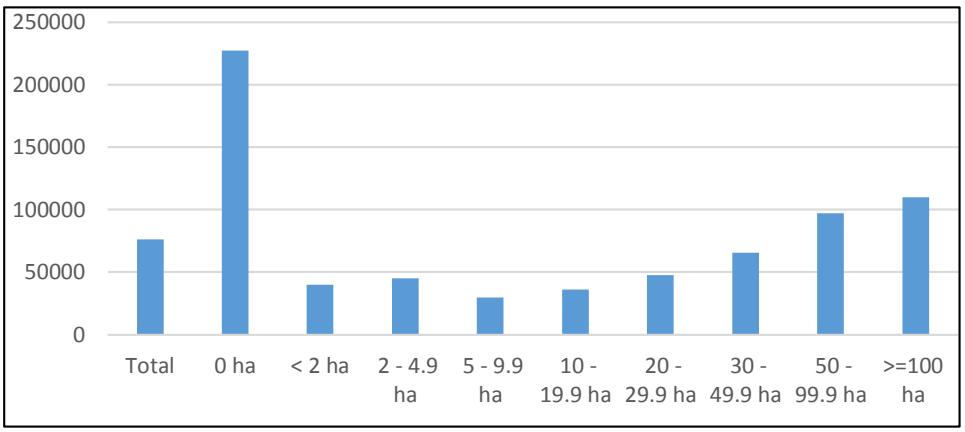
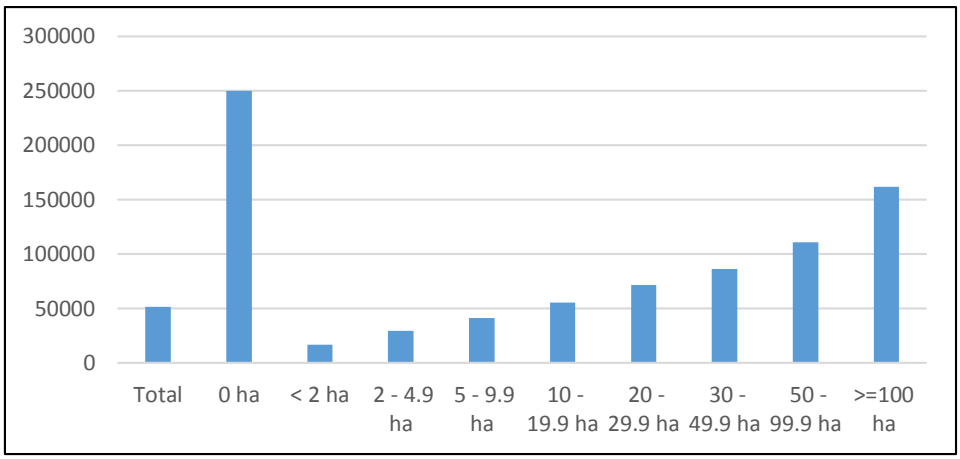


Figure 16. Labour productivity in Italy in 2010



Source Fig. 10-11: Self-Elaboration, EUROSTAT (2014e)

From the graphs, we can see that productivity of labour reaches the highest levels in the smallest farms, those ones with less than 1ha, both in Germany and in Italy, confirming the previous theory that smaller farms can better combine labour inputs. Nonetheless, the following increasing trend along larger geographical sizes suggest increasing returns to scale. This is a crucial evidence that scale matters, and that a trade-off between advantages of small and large scale actually exists.

Another aspect I would like to include is multifunctionality. Small farms are thought to be important because they preserve agricultural traditions, biodiversity and local

[89] I derived productivity of labor by: Standard Output/ Labour force directly employed by the holding.

identity, also favouring agro-tourism and shirking depopulation in rural areas[90]. This is fostered by carrying on 'parallel' activities besides market-oriented agricultural production: Agritourism, recreational social activities, craftmanship, production of renewable energy, natural park maintenance, fostering of cultural activities with schools and citizens, subcontracting, transformation of vegetal and animal products, wood craftsmanship[91].

Multifunctionality is introducing innovative conceptual changes regarding the agricultural sector: its goal is not only to provide products to people, but also to provide services for the environment, through logics of economic and social sustainability.

Some OECD's researches investigated the meaning and interpretation of multifunctionality, both in general and once specifically applied to Agriculture. The basic definition states that:

"Multifunctionality refers to the fact that an economic activity may have multiple outputs and, by virtue of this, may contribute to several societal objectives at once. Multifunctionality is thus an activity-oriented concept that refers to specific properties of the production process and its multiple outputs. The concept of sustainability is essentially goal-oriented, implying that resources should be used"[92].

Nonetheless, once applied specifically to Agriculture, it entails a slightly different meaning, as Agriculture entails multiple roles and output and non-output activities are strictly jointed and have a direct impact on the environment and on society. In this context, multifunctionality is not only a feature of the production process, but entails a value itself and can be translated into policy goals[93].

According to ISTAT, multi-functional farms, although being only 12.7% of total farms in 2011 in Italy, gave significant contributions to the agricultural sector in terms of employment, production value and added-values. They were more productive and profitable in average absolute values compared to farms with only direct market activities and registered the highest level of average turnover in 2011[94].

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[90] C.f. Galluzzo (2013), pag. 26 f., 29.
[91] C.f. ISTAT (2012), pag. 38 f.
[92] C.f. OECD (2001), pag. 11.
[93] C.f. OECD (2001), pag. 14, 16.
[94] ISTAT (2013), pag. 1, 10.

Multifunctional units can better combine inputs, increasing diversification and functional bounds among their activities, and fostering social and environmental protection. Multifunctionality in Agriculture affects: (1) space, through practices of environmental protection and sustainability; (2) output, assuring quality and safety of products and fostering biological crops; (3) services, reconverting rural areas through the involvement of citizens and tourists and by encouraging biodiversity[95]. Multifunctionality in Agriculture is tracing an evolutionary pattern towards a new concept and trajectory of modern Agriculture, which is expected to combine commodity and non-commoditiy production or, as formulated by Wilson (2008), to interact "productivist" and "non-productivist action and thought"[96]. Strong multifunctional farms have higher levels of non-commodity production and non-productivist action, meaning that their activities are not only oriented to market outputs, but also to the creation of positive externalities to the society. This is achieved through a strong diversification strategy into activities aimed at: revaluating the environment, favouring local farming traditions and biodiversity over intensive production; involving the local community and young people; strengthening trust and fostering collaboration among stakeholders; shorten agro-food chains sustaining local production; creating new income and employment opportunities developing new interconnections among producers and agricultural activities[97].

Research questions:

- What does multifunctionality have to do with our analysis?
- How is it connected to Economies of Scale and to cooperatives?

Multifunctionality is a key concept in our analysis mainly for two reasons:

- Multifunctionality better releases its potential in the framework of cooperative systems.

The diversification strategy implied by multifunctionality aimed at embracing new social and environmental sustainable activities. To implement this, it is necessary to overcome farm-level constraints, exploiting synergies among producers and pooling resources at an upper-level. Long-term relationships based on mutual trust and common goals, and encouraging new economically sustainable settings can

[95] C.f. Henke and Salvioni (2010), pag. 1.
[96] C.f. Wilson (2008), pag. 367.
[97] C.f. Wilson (2008), pag. 368.

better occur in a cooperative framework. Systemic actions need to be carried on to strengthen the fragmented agricultural sector, especially in Italy[98].

- Multifunctionality is connected to some organizational restructuring variables, which are conceived also as other sources of economies of scale.

Multifunctional farms, in order to foster not only environmental and social sustainability, but also economic endurance, need to take into account that a successful diversification strategy demands more flexible production technologies, availability of different types of machinery and equipment, higher visibility abroad and strong connections to the various actors in the supply chain. These aspects are best implemented in Agriculture at cooperative level through:

- Purchasing Economies of scale
- Increased productivity of variable inputs
- Economies of scale in advertising
- Machinery Cooperatives

These aspects are conceived as other sources of Economies of Scale: combining the scale effects they originate with their importance to foster multifunctionality once analysed at cooperative level, we go back to the concept of Network Economies of Scale, which is in fact combining all these logics to give rise to a stronger and economically sustainable concept of scale in Agriculture.

6.1 Purchasing Economies of Scale

We think that cooperatives are a good tool for creating purchasing Economies of Scale in Agriculture, filling the gap in terms of bargaining power between producers and the other actors in the supply-chain. The food-supply chain connects producers, retailers and distributors: very different economic actors, jointly contributing 5% of value added in the European economy and 7% of the employment, as for 2009[99].

[98] C.f. ISPRA (2010), pag. 12 f.
[99] European Commission (2009), pag. 2.

The lack of a well-developed “Country-System” creating synergies among producers and allowing them to pool resources is one of the major structural weaknesses in Agriculture, especially in Italy[100].
Fragmentation at producers’ level leads to highly unbalanced bargaining powers with respect to industry manufacturers and wholesalers, thus increasing supply chain inefficiencies. In fact, the supply chain structure in Agriculture is characterized by big discrepancies between relatively concentrated distribution channels and relatively fragmented producers[101]. In fact, in the European Union, a big concentration process in retailing has occurred, so that now we find a few big retailers trading with about 13.4 million farmers and 310 thousand food industry enterprises across the EU. This, of course, leads to increasing pressures for lower prices at farmers-level[102]. The unbalances in terms of scale and bargaining power deriving from the coexistence of big multinationals and small firms, create inefficiencies along the various nodes of the supply chain and may lead to unfair practices[103].

According to an Antitrust Authority investigation of the Italian Agribusiness market in 2013, the large-scale retail channel has further increased its influence and due to its strong bargaining power, it is imposing anticompetitive conditions both to suppliers and to consumers, to the extent of piloting final prices and arbitrarily asking new fees to producers[104]. In particular, big concerns arise around the role of Purchasing Centres, through which wholesalers buy in bulk from suppliers and distribute to retailers: in 2012, only seven ‘Super-purchasing centres’ in Italy commanded 21 distribution chains covering the 76% of sales in the national territory[105]. The increased upward (towards producers) and downward (towards consumers) pressure exercised by these large-scale retailers is creating tensions, not only in Italy but also in other European countries.
In Germany, a similar trend has been witnessed: since the 1980s, a series of horizontal acquisitions has led to a greater concentration in food large retailing[106]. In fact, among Europe’s countries with the largest distribution dealers, Germany

[100] A ‘country system’ is a group of spokesmen (physical persons, entities, institutional representatives), giving their contribution to a specific process within a territory.
Source: Italian Chamber of Commerce (2013a), pag. 1.
[101] C.f. Pezzoli (2011), pag. 8-14.
[102] C.f. COGECA (2010), pag. 25.
[103] European Commission (2009), pag. 5 f.
[104] C.f. AGCOM (2013), pag. 4-12.
[105] C.f. AGCOM (2013), pag. 89.
[106] C.f. Marfels (1992), pag. 1f.

ranks third according to data from the Nielsen European Universe of 2010: the three top distributors (Edeka, Rewe and Aldi) serve the 60% of the market. Italy, instead, ranks fifth, with a much lower market coverage (35%)[107]. The length of the food supply chain is another relevant aspect: the more interfaces (intermediations), the higher the disaggregation and the more costly the coordination through all the steps.

According to this, we may identify two possible solutions that may both contribute to improve the supply chain's efficiency:

a. Scale increase in farm structure: concentration of farmers can counterbalance the strong bargaining power of distributors, as well as pooling resources and increasing efficiency (connected to economies of scale logic);
b. Farmer markets: producers selling directly to customers on the spot of production, as to shorten the supply chain (connected to multifunctionality).

According to some Italian researches, the gradual increase of cooperatives' scale through consolidation and integration processes, allowed agricultural producers to strengthen their competitive position in foreign markets and their bargaining power along the supply chain, acquiring a better positioning in the market[108].

Case Study: Fruitlogistics

A successful example of the importance of networking activities in creating purchasing economies of scale is the coordination efforts contributed by Italian institutions and thirty-nine agricultural subjects to enter the German market. The entry channel was provided by Fruitlogistics, "The Leading Trade Fair for the International Fresh Produce Trade"[109]. One of the interesting aspects is that most of the 39 Italian enterprises chosen for participating at this international fair, were cooperatives or consortia: single farms hardly could access such a big channel. It was reported that this action was key for giving more visibility to the Italian producers and attract German buyers[110]. This shows that being part of a consortium or of a cooperative, actually gives to single farms more opportunities for entering new business channels, acquiring a better positioning in the market and a stronger bargaining power, also towards suppliers. Fruitlogistics welcomed many small and medium Italian agricultural firms that managed to participate to this international event in Berlin thanks to the support of the Italian regional and

[107] C.f. Federdistribuzione (2013), pag.11.
[108] C.f. Italian Chamber of Commerce (2013a), pag. 3.
[109] C.f. Fruitlogistica (2014), website.
[110] C.f. Italian Chamber of Commerce (2013b), pag. 1 f.

sectorial institutional bodies and the help of the Italian Embassy in Germany. This creation of collaborative networks amont different bodies allowed them to attract international buyers and to promote their product in a market where almost 50% of consumers are reported to take care of products quality as one of the most important criteria for buying[111].

These are all requirements for originating also Economies of Scale in purchasing.

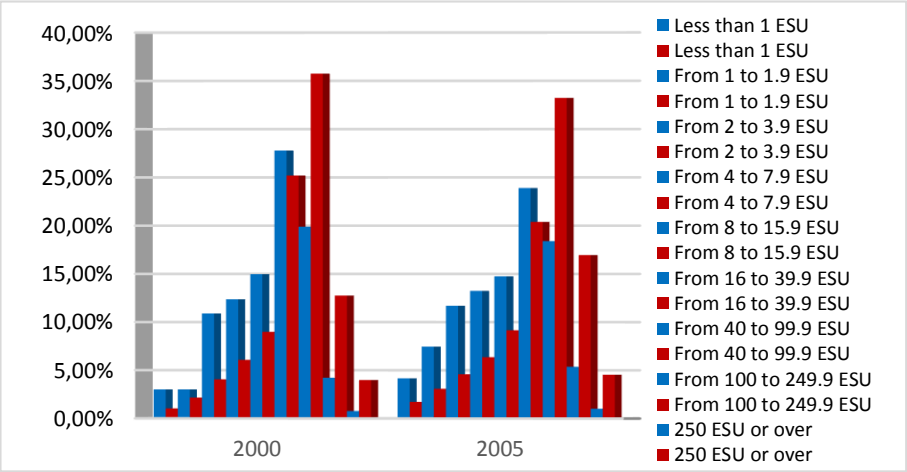
6.2 Managerial Economies of Scale: Increased productivity of variable Inputs

Increased productivity of variable inputs, also called 'Managerial Economies of Scale', refer to the fact that larger scale also allows to spread the costs of hiring specialists and experts that can qualitatively increase output. To measure the degree of specialization, we looked at the training intensity and type according to ESU of the agricultural holding. Blue columns indicate basic training, while the red ones indicate full training. We associate full training with a high level of specialization (need for expertise, tasks sophistication), while basic training reflects more operative and ordinary tasks (low specialization).

Looking at Figure 17 referred to Germany, we can notice that as the economic size of holdings (ESU) increases, the number of holdings doing both basic training and full training increases. Besides that, in larger holdings (above 40 ESU), full training gets more important relative to basic training. This seems in line with our previous analysis about increasing productivity of labour inputs[112], and confirms the thesis that economies of scale and increasing productivity of variable inputs go together. Specialization of labour seems to be crucial especially for larger farms, where experts are needed to coordinate production.

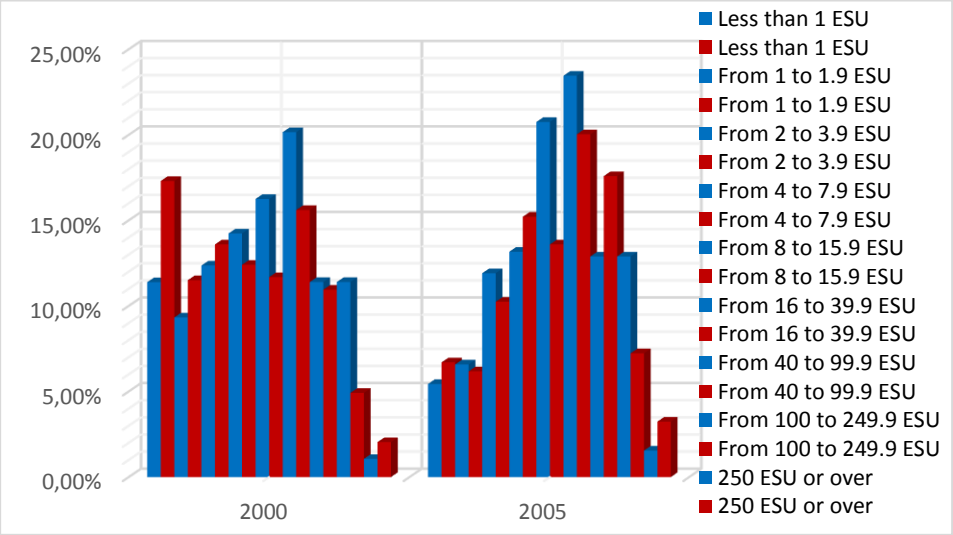
[111] C.f. Italian Chamber of Commerce (2013a), pag. 1f.
[112] See Fig. 15 – 16.

Figure 17. Basic versus Full Agricultural Training - Germany



In Italy, there is a similar trend, as depicted in Figure 18. Nonetheless, the difference between basic and full training is less sharply visible than in Germany, especially in the lower economic size classes. This may be connected to the fact that in Italy, many more holdings are small and so the coexistence of specialists and basic operators within the holding is necessary, also at small scale farms. Besides that, the stronger multifunctional character of Italian holdings probably obliges to have more specialists in different functional areas even at small farms.

Figure 18. Basic versus Full agricultural training - Italy



Source Fig. 17-18: EUROSTAT (2014f).

The risks of having specialists at small scale is that of not recovering the investments in specialization, getting stuck in fixed costs that may not be recoverable if output levels are not sustained. Small farms, in fact, often substitute internal training for external consultancy services by experts and specialists. This solution may nonetheless be very costly. In out previous analysis of agricultural cost inputs, Figure 14 highlighted that the costs for agricultural services are increasing in volumes, both in Italy and Germany, and in Italy, also their basic price is going up.

How can we exploit or create Network Economies of Scale
boosting specialization and taking advantage
of managerial Economies of Scale?

We would need a model based on networking mechanisms and thus providing a virtual scale extension to farms. This would allow them to exploit specialization creating Managerial Economies of Scale without necessarily extending their size.

Case study: Bayer CropScience in Italy

Bayer is a worldwide pharmaceuticals company founded in Barmen in 1863 and specialized in Health-care, Agriculture and high-tech Polymer Materials[113]. Among its numerous activities, Bayer has undertaken more than 240 rural projects in 30 countries collaborating with farmers, food exporters and importers to increase efficiency and yields in the agricultural processes. These projects foresee a strict collaboration between the highly specialized Bayer experts and local farmers, generating customized solutions that can best adapt to the environment on the basis of sustainable principles. Moreover, the collaborations with other actors in the food chain create synergies and make farmers gain market positioning and recognition. These projects are, in fact, called “Food Chain Partnerships”[114]. Bayer Cropscience in Italy has recently undertaken many projects to foster agricultural sustainability, deploying appropriate fertilizers and phytosanitary products to protect crops, advice proper gardening techniques and foster environmental hygiene. The idea of Bayer CropScience is to create a network of projects and experts with specialized divisions supporting farmers both at different functional

[113] C.f. Bayer (2014a), website.
[114] Bayer (2014b), website.

steps (research and development, production, sales) and on divisional basis (product-based: wine, general crops, integrated solutions for mixed cropping)[115].

Nunhems, for example, is the Bayer specialized project for seeds selection and production, researching innovative seeds variety and cropping systems through many research centers directly built in Italy. Instead of national organizations, Crop Teams lead by global experts have been created: this allows to better exploit technical knowledge introducing deeper crop-based innovations. This also creates stronger interactions along all the food supply chain, increasing producers' self-awareness and expertise and coordinating them with big suppliers and distributors. Sustainability and innovation in cropping are thus combined with a more direct access to the market, deeper expertise and synergies among local producers[116].

Magis, instead, is a project focused on vineyards' development and innovation: it is thought to be the most advanced experiment in sustainable wine production in Italy. For the first time, in fact, farmers are directly collaborating with scientific experts to find innovative and sustainable solutions of precision farming. Specialists and producers are connected through an online platform through which every member has access to best-practice production options and weather forecasts: they can also share their adopted techniques and operative results, searching for suggestions and improvements. The direct interaction of producers and researchers from different geographical regions and knowledge fields, allows continuous quality review, communication and feedback, prompting innovations and customized production solutions[117].
This creation of knowledge networks foster expertise and sustainability increasing the productivity of variable inputs through process and product innovations. This is a very suitable example of our concept of network economies of scale.

6.3 Economies of scale in advertising

Economies of scale in advertising are important in Agriculture not only as regard the pure spread of advertising costs when pooling higher output volumes. The capacity of efficiently promoting agricultural products is derectly related to the creation of a country image to emerge among competitors and to successfully enter international markets.

[115] C.f. Nova Agricultura (2014), website.
[116] C.f. Nuhnems - CropScience (2014), website.
[117] C.f. MagisVino (2014), website.

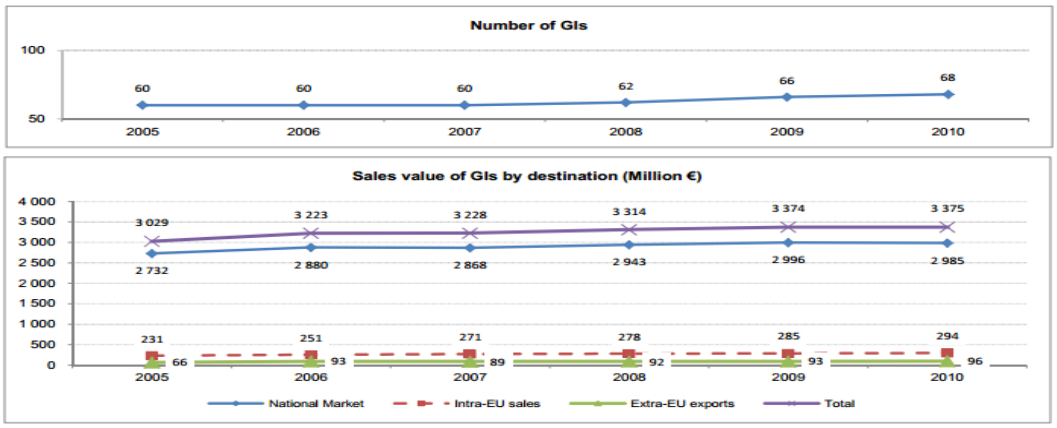
Structural and organizational settings are crucial to make the potential of local products release their economic value. This is confirmed when considering that the inherent value of the 'made in Italy' is not fully reflected in a proper internationalization of Italian products. First of all, I wanted to check up the inherent value of the 'made in Italy' brand in Agriculture. Although being difficult and subkective top measure such a concept, we can check the number of recognized typical agricultural products recognized by the European Union through special labels:

- Pdo: protected designation of origin;
- Pgi: protected geographical indication;
- Traditional speciality guaranteed (TSG)[118].

The high value of the agricultural 'made in Italy' products is reflected by the high number of products recognized and labelled at European level, as depicted in Figure 20. In Italy, 193 products were labelled as Pdo and Pgi in 2010, against 68 in Germany. In Italy, these certified products accounted for more than € 5.900 million sales (€ 30.99 million per product). Sales in Germany, instead, were around €3.370million (€ 49.63 million per product).

Quality products -as certified by such European labels- are increasing their importance in Italy, although producers' number has slightly decreased: Dop, Igp and Stg products in Italy increased from 146 in 2004 to 248 in 2012, which is almost a +70% change. Some of these labelled ones, are considered niche products[119].

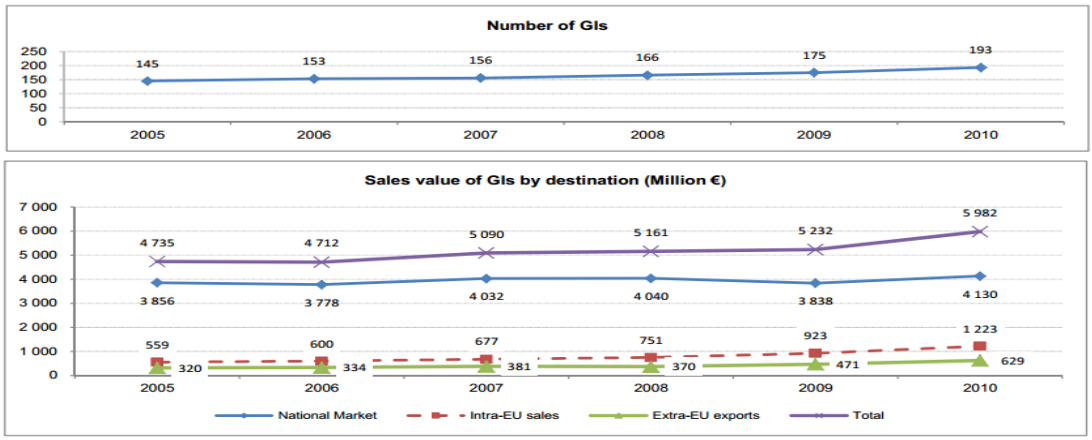
Figura 19. Pdo and Pgi products in Germany



Source: European Commission (2012b).

[118] C.f. European Commission (2012a).
[119] C.f. ISTAT (2013), pag. 3.

Figura 20. Pdo and Pgi products in Italy



Source: European Commission (2012c).

Even if the number and sales level of Italian products is relatively high, per-product sales are higher in Germany. This suggests that the 'made in Italy' value can be better exploited.

The export propensitiy of agricultural and food products is higher in Germany (more than 30% in 2012) than in Italy (more than 20%): in absolute values, German exports are almost the double tha n Itlaian ones (€ 55 billion versus € 26 billion in 2012). Nonetheless, Italy register higher added values thanks to better positioning of products and higher prices. Only Italian wine brings in not only hgher prices and added-value, but also export volumes. Such export gap is connected to some structural inefficiencies of the Italian system, making Germany more competitive although the value of the 'made in Italy' cannot be disputed. Scale undoubtedly plays a role: the 70% of Italian exports in Agriculture came from farms with more than 50 employees in 2012, which were only 1.5% of total farms in Italy (while in Germany they were around 9% of total ones). Small farms usually cannot afford the cost of entering foreign markets, also because other barriers like infrastructural problems (obscolete road system) and high energy prices, already constitute barriers to their development within Italy[120].

Besides that, Fig.19-20 indicate that sales have increased in both countries since 2005, but exports to extra-EU countries are still very low. Considering that outside-Europe countries are becoming the most relevant target countries, it is necessary to undertake more effective promotional strategies to boost sales in foreign

[120] C.f. Mangimi&Alimenti.it (2013), pag.1.

markets. Exports of agricultural products in Italy have a strategic role for the country's economy and register valus above the national average, again confirming the foreign appreciation of Italian products. Nonetheless, when compared to the international markets' trends in Agriculture, characterized by a general expansion, the magnitude of such Italian exports appears much less relevant: the market share of Italian agricultural business decreased from 4.1% in 1999 to 2.7% in 2012. The lost of competitiveness is partially due to the boom of the BRIC countries, where Italy is not present enough as the main focus markets are those within the European Union (see Fig. 20). Germany also lost market share at global level, but its percentage were almost the double than the Italian one (5.5% of global market share in agricultural products in 2012)[121]. Considering the superiority of the Italian brand in terms of image and recognition, structural and organizational aspects still must be singled-out[122].

The need to group farmers into bigger organizations to promote them abroad exists since many years. The CMA (Central Marketing Organisation of the German Agricultural Industries), for example, is an organization representing the export interests of German agricultural producers and carrying on promotional activities abroad. It is headquartered in Bonn and was istituted by a German Federal law in 1969. It has offices not only in Europe, but also in North America, Russia, Japan and China. Its goals are the promotion of German products abroad, creating trust and strenghtening their image. It provides for connections between German producers and foreign buyers, facilitates the participation to Business Fairs, promotes communication through media channels, provides technical information and market research tools for exploiting foreign opportunities[123].

This organization is providing a solution for sharing advertising and marketing costs and in shaping new channels to international trade fairs, thus keeping pace with the growing competition in the sector[124].

Similar initiatives and institutional bodies are present in Italy, too. The ICE (Italian Trade Promotion Agency) is a governmental organisation promoting the internationalisation of the Italian companies abroad in various sectors[125].

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[121] C.f. Bono (2014a), pag. 1 - 4.
[122] We will focus on structural determinants, although we are aware that other aspects are influencing the Italian exports' trends: access to capital, propensity to innovation, governance, infrustructures, institutional environment, bureaucracy.
[123] C.f. German Beer Institute (2014), website.
[124] C.f. European Commission (2004), pag. 1.
[125] C.f. ICE (2014), website.

Nonetheless, new initiatives are necessary. The availability of new channels like Internet and online platforms, the support of private firms and a more refined entrepreneurial skills are key to compete in the current environment. In fact, the problems related to Italian farms' promotion are mostly related to the lack of coordination among them, with the result of enacting many small fragmented initiatives that lack the potential for promoting a 'country system'. So, the richness of Italian products cannot be fully valued due to the lack of a strongly connected network, promoting them[126].

Case Studies: Eataly, Slowfood and Grano Armando

The examples I chose, reflect the power of networking systems, like international organizations and private entrepreneurial initiatives, baed on strong value and locl traditions to create identity and to access foreign markets.

Some networking solutions in advertising occur by creating international events that act as 'country showcases' grouping all the national masterpieces in a sector. Such channels are boosting Italian products' visibility abroad and are providing local producers with direct access to international customers. Eataly is one of the greatest example: it is a chain of food shops, made up of medium-large retailers and distributors, where the underlying goal is to restore and boost the knowledge and commercialization of Italian traditional high-quality products. Eataly has become a country brand, not only selling products, but also transmitting the value of the 'made in Italy'. Its affiliation to Italian traditions and to local products is reflected in the ownership structure: 60% belongs to its founder, Oscar Farinetti, and 40% to local Cooperatives. Eataly goal is "to demonstrate that it is possible to offer to the general people, products with high quality and reasonable prices as so as allowing productive methods, and story of the many who produce the best Italian food and wine"[127].

Another promotional channel would be the participation to widespread networks and associations promoting a certain food philosophy, like Slowfood. Slowfood is an international non-profit association founded in Italy by Carlo Petrini in 1986, with the goal of promoting "good, clean and fair" food worldwide as a reaction against the fast-food concepts and life style[128]. Sustainability and repsect for local traditions are the main pillars of the organization, nowadays present in 150 countries

[126] C.f. Italian Chamber of Commerce (2010), website.
[127] Eataly (2014), website.
[128] C.f. SlowFood (2014), Italian website.

worldwide. Through its projects, like Terramadre, and its international events, Slowfood promotes sustainable values, academic enogastronomic research and exchange opportunities among its members[129]. Being Slowfood member gives access to a powerful network and also act as a promotional device and a intangible certification to approach new clients.

Another example of a promotional channel based on a network system is the Grano Armando supply chain project. The three collaborating actors giving rise to such a structured project in Italy were the pasta manufacturing plant De Matteis, the seeds supplier Sementa and the technical and consultancy firm Syngenta: the interactions among these three initiators allowed to develop a production protocol and a managerial assistance with the goal of producing specific high quality and certified durum wheat varieties. Farmers buy Sementa seeds, follow the production protocol researched by the experts of Syngenta and then sell their output to De Matteis, being assured above-market prices. In such a system, high quality and 100% Italian origins of raw materials are certified, substituting former imports from France and Canada with local production[130]. The creation of this customized supply chain gave to Grano Armando the opportunity of signing an exclusive distribution contract with "Albert Heijn", the major supermarket chain in The Netherlands. The Dutch retailer, famous for its high quality standards, has appreciated the production philosophy of the Italian pasta and the zero-impact packaging of grano Armando products[131]. This is an example of how networking logics, combined with entrepreneurship and valorization of local products can reate themselves a great promotional potential and access foreign markets.

6.4 Machinery Cooperatives

Machinery cooperatives, as the term suggest, are created to pool and share the cost of machines, equipment and all other heavy tools necessary for agricultural production. Machinery costs are ususally high in Agricutlure: they represented the 12.3% of all cost items in 2011 in Italy, the double than energy costs[132]. This indicates a high level of mechanization, which we would expect to be high also in Germany given the gigh level of fixed costs ratios. Machinery cooperatives are

[129] C.f. SlowFood (2014), International website.
[130] C.f. Syngenta (w.y.), website.
[131] C.f. PiùEconomia Campania (2014), pag.1.
[132] C.f. ISTAT (2013), pag. 3.

based on a joint machinery ownership, whereby different farmers own different machines or machines' complements and rotation schemes allow all of them to share these production means saving lots of money.

Machinery sharing cooperatives, nonetheless, present some potential risks. Coordination problems can easily arise if the cooperatives members are too many, so that an optimal number of member must be found to allow to all of them to make use of the equipment when needed without overlapping or delays. Moreover, the specialization degree and the type of farms involved in the cooperative are also crucial: they should be similar in final outputs as to be ablòe to share machines, but they should have different degree of specialization or cropping mixture as not to create time overlapping on agricultural activities. Moreover, they should be closely located otherwise transportation costs for moving machines will just offset the benefits of sharing them. Another issue that camust be considered is that 'moral hazard' and 'free riding problems' can arise within members. Non-owners may not be incentivated to take properly care of the machines, knowing that they born no cost for their purchase and usage. Sometimes, the need for supervision, regulations and control mechanisms for preventing such moral problems nullify the collaborative nature of cooperatives and their long-term economic functioning. Joint ownership, indirectly originating dependency among cooperative's members, is only possible when trust levels are high[133]. In the case of small scale farms joining a machinery cooperative, coordfination and managerial skills are necessary to properly rotate the usage og the different machines by the different farmers and thuis require close labor relations, constant communication and planning. There exist a trade-off between the benefits and costs of such systems, which replicate the trade-off between costs and benefits of internalizing assets and activities. To a certain scale threshold, cooepratives are an effective tool; when such threshold is overcome, coordination and managerial problems arise so that diseconomies of scale lead to establish a farmer-leaser private relationship instead of a cooperative[134].

Case Study: Machinery rings

Machinery Rings are special cooperatives where small-scale farmers can mutually use machines and equipment to share costs and increase efficiency. The

[133] C.f. Istvan and Katalin (2012), pag. 328f., 334.
[134] C.f. Gifford (1992), pag. 52 – 54.

machinery ring works as a central coordinator and intermediate between the machinery oweners and farmers, bargaining prices and spreading costs among the cooperative's members[135].

They were first adopted in Germany: the first Machinery Ring was founded by Erich Geiersberger in 1958 in Neufahrn/Niederbayern. The underlying concept of sharing machinery costs, one of the heaviest burden in agricultural production, developed in time creating robust cooperatives sharing equipment, machines and knowledge as well as collaborating with banks and institutions to enlarge their 'ring'. In 2010, such cooperative system (renamed "Maschinen- und Betriebshilfsring") counted 2.555 members and reached an economic value of €10 million[136].

The ownership structure of the fixed assetes in such Machinery Rings can create good incentive mechanisms: when the farmers collectively make an investment to purchase machines, they become shareholders, besides customers, of the cooperative. This system allows to introduce economies of scale without increasing single farms' size, taking advantage of new organizational systems to create incentive and overcome the burden of fixed costs. These systems allowed german farmers to make use of the most modern technologies, gaining competitive advantage over isolated single farmers in other regions and countries. The SACAU (South Africa Confederation of Agricultural Unions), for example, has been considering the idea of implementing such concept to foster sustainable economic development in Agriculture[137].

As the SACAU Marketing Advisor recently declared in an interview:

"Machinery rings should be run by professional employees who operate, schedule, service, contract and work to ensure maximum utilisation of the equipment. The training of the employees to manage the machinery ring is important and must be in line with the technological advances of the equipment. The professional employees play a key role of mediating between those requiring a service from the equipment and those who own the machinery"[138].

A transparent assignment of responsibilities among owners, intermediates and the farmers' community is another key aspect to make this system properly work, avoid conflicts of interests and free-riding problems. The potential of such mechanisms would be important also to establish direct relationships between management and

[135] C.f. Maschinenringe Bundesverband (2014), pag. 1f., website.
[136] C.f. Maschinenringe Bundesverband (2010), pag. 1 – 3.
[137] C.f. SACAU (2014), pag. 1f.
[138] Bungu, Johnson - SACAU Marketing Advisor (2014).

local community, thus enacting a buttom-up long-term development and economic sustainability[139].

7. Conclusions

From a descriptive point of view, we found that agricultural holdings in Germany are on average much higher than in Italy. This is influenced by historical evolutionary patterns, especially in Germany, as reflected in the much smaller scale of German Southern farms compared to farms in the North-East. Another influential factor is crop differentiation: italian farms, much more devoted to horticulture products and wine, are most suitable to smaller scale. Taking into account that a consolidation process is going on in both countries, we assume that scale actually matters in Agriculture. Nonethetless, detecting Economies of Scale starting from real data was a challenging issue: many organizational variables interacting with scale were outlines, and their potential impacts was hypothesized.

We conclude that Network Economies of Scale are identifiable in Agriculture, and their potential is still to be fully exploited. In fact, our analysis of fixed costs revealed that scale at farm-level partially but not fully drives efficiency: we had some evidence that the average burden of fixed costs, both on output and total production costs, was much higher in Itlay than Germany at farm-level. This can signal that a better spread of fixed costs occur in Germany, where farms are actually much larger. Nonetheless, further analysis at regional level reveals a less clear relation between scale, economic size of hodlings and the spread of fixed costs.

Only embracing a more comprehensive perspective, and considering aggregational mechanisms beyond the farm boundaries, we can release the full potentail of Economies of Scale. We thus consider the role of Cooperatives and Consortia, seen as networking tools that provide farms with a ‘virtual’ scale extension, while maintaining decisional autonomy. These give rise to Economies of Scale in Purchasing and Advertising, increasing the productivity of variable inputs and allowing for the spread of machinery costs. Scale is thus conceived in a dynamic way, as a result of networking activities and cooperation, and not only in terms of geographical extension. Growing worldwide competitive pressures are obliging actors in Agriculture to develop new ideas and aggregation mechanisms to successfully emerge in the global arena, as confirmed by some successful case-studies presented in the paper.

Appendix

Table 1. Inflationary wave in agricultural prices in Europe

EU Inflation wave in Agriculture				
	2008	2009	2010	2011
Value/volume NOMINAL	125,5	107,5	119,2	134,6
Value/volume REAL	122,2	103,4	114	127,9
DELTA = inflation effect	3,3	4,1	5,2	6,7
Value/volume NOMINAL	109,7	102,6	103,7	111,7
Value/volume REAL	102,2	93,5	93,9	99,9
DELTA = inflation effect	7,5	9,1	9,8	11,8
Source: Data re-elaborated by the European Commission, 30.10.2012				

Table 2. Crop Differentiation Germany and Italy_2013

Economic account of Agriculture - Germany 2013		
Agricultural sector	Agricultural Output	% EU 28
Agricultural goods output (mill.€)	50.814	13,5%
Crop output:	50,8%	12,4%
Forage plants	16,1%	28,6%
Wheat and spelt	8,6%	16.4%
Vegetables and horticultural products	7,3%	7,7%
Animal output:	49,2%	14,9%
Milk	19,4%	17,8%
Pigs	14,6%	19,2%
Cattle	8,0%	12,5%
Source: European Commission (January 2014), Member States Factsheets – Germany, Directorate General for Agriculture and Rural Development and Eurostat. Updated: December 2013.		
Economic account of Agriculture - Italy 2013		
Agricultural sector	Agricultural Output	% EU 28
Agricultural goods output (mill.€)	43.807,9	11,6%
Crop output:	61,1%	12,8%
Forage plants	19,1%	17,5%
Wheat and spelt	14,7%	25,0%
Vegetables and horticultural products	6,2%	16,6%
Animal output:	38,9%	10,1%
Milk	11,0%	8,7%

Pigs	7,8%	10,5%
Cattle	7,0%	7,9%
Source: European Commission (January 2014), Member States Factsheets – Italy, Directorate General for Agriculture and Rural Development and Eurostat. Updated: December 2013.		

Table 3. Production Area by crop - Italy and Germany

3a.Germany Crop Production - Area (1000 ha)					3b.Italy Crop Production - Area (1000 ha)				
	2005	2008	2010	2013		2005	2008	2010	2013
Cereals (excl. rice)	6.839	7.038,5	6.595,4	6.533,7	Cereals (excluding rice)	3.778,1	3.814,3	4.058,2	3.092,5
Barley	1.946,8	1.961,7	1.641,3	1.570,4	Barley	319,9	330,5	273,5	213,3
Rice	:	:	:	:	Rice	220,9	224,2	247,7	212,5
Potatoes (including early potatoes and seed potatoes)	276,9	259,8	254,4	242,8	Potatoes (including early potatoes and seed potatoes)	69,9	70,6	62,4	38,9
Sugar beet (excluding seed)	420,1	369,3	364,1	357,4	Sugar beet (excluding seed)	253	61,8	62,7	45,3
Main oil seed crops	1.385,4	1.399,8	1.493	1.491,2	Main oil seed crops	285,7	235	280,4	265,8
Rape and turnip rape	1.343,9	1.370,7	1.461,2	1.465,6	Rape and turnip rape	3,5	12,6	20,4	24,1
Vegetables, melons and strawberries (excluding kitchen gardens)	106,2	114,4	107,8	124,6	Vegetables, melons and strawberries (excluding kitchen gardens)	494,7	456,2	487,6	3.493,1
Melons and Strawberries	13,4	13	13,6	:	Melons and Strawberries	47,8	45,3	46,3	:
Fruit trees (excluding olives and citrus fruit)	49,5	47,8	47,3	:	Fruit trees (excluding olives and citrus fruit)	448,9	439,7	:	:
Apples	32,3	31,8	31,8	31,6	Apples	61,7	59,1	54,5	53
Citrus fruits	:	:	:	:	Citrus fruits	170,4	172,3	188,5	163,6
Vineyards	:	99,7	99,9	99,5	Vineyards	792,7	788,1	777,5	702,1
Olive trees	:	:	:	:	Olive trees	1.168,6	1.180,5	:	:
Source: Self-elaboration, Eurostat – Agriculture:Crops products - annual data, extracted on 20.06.14									

3c. Differences Italy - Germany Crop Production - Area				
	2005	2008	2010	2013
Cereals (excluding rice)	-3.060,9	-3.224,2	-2.537,2	-3.441,2
Barley	-1.626,9	-1.631,2	-1.367,8	-1.357,1
Rape and turnip rape	-1.340,4	-1.358,1	-1.440,8	-1.441,5
Main oil seed crops	-1.099,7	-1.164,8	-1.212,6	-1.225,4
Potatoes (including early potatoes and seed potatoes)	-207,0	-189,2	-192,0	-203,9
Sugar beet (excluding seed)	-167,1	-307,5	-301,4	-312,1
Vineyards		688,4	677,6	602,6
Fruit trees (excluding olives and citrus fruit)	399,4	391,9		
Vegetables, melons and strawberries (excluding kitchen gardens)	388,5	341,8	379,8	3.368,5
Melons and Strawberries	34,4	32,3	32,7	
Apples	29,4	27,3	22,7	21,4
Source: Self-elaboration from table 3a and 3b: Differences between Italy and Germany data				

Table 4. Harvested Production by crop - Italy and Germany

4a.Harvested Production Germany Volume: 1000t					4b.Harvested Production Italy Volume: 1000t				
	2005	2008	2010	2013		2005	2008	2010	2013
Cereals (excluding rice)	45.980,2	50.104,9	44.038,7	47.757,2	Cereals (excluding rice)	20.092,1	20.459	20.960,3	14.932,7
Wheat (including spelt)	23.692,7	25.988,6	24.039,7	25.019,1	Wheat (including spelt)	7.717,1	8.859,4	6.777,3	7.009,9
Barley	11.613,8	11.967,1	10.326,9	10.343,6	Barley	1.214,1	1.236,7	990,7	772
Oats and mixed grain other than maslin	1.073,1	864,2	660	709	Oats and mixed grain other than maslin	429,2	356,1	279,2	238,4
Rice	:	:	:	:	Rice	1.413	1.388,9	7.602,8	:
Potatoes (including early potatoes and seed potatoes)	11.624,3	11.369	10.143,1	9.669,7	Potatoes (including early potatoes and seed potatoes)	1.753,5	1.729,8	1.558	:
Rape and turnip rape	5.051,7	5.154,7	5.697,6	5.784,3	Rape and turnip rape	6,1	28,1	50,3	:
Vegetables, melons and strawberries (excluding kitchen gardens)	:	3.476,7	3.290,7	:	Vegetables, melons and strawberries (excluding kitchen gardens)	14.419,7	13.306,3	13.972,8	12.108,4
Melons and Strawberries	146,5	150,9	156,9	:	Melons and Strawberries	1.277,8	1.233,8	1.298,1	:
Watermelons	:	:	:	:	Watermelons	519,5	434,6	477,9	445
Strawberries	146,5	150,9	156,9	149,7	Strawberries	146,8	143,2	153,9	120,2
Fruit trees (excluding olives and citrus fruit)	1.027,9	1.160,8	976,2	:	Fruit trees (excluding olives and citrus fruit)	6.034,4	5.854,4	:	:
Apples	891,4	1.047	835	803,8	Apples	2.192	2.209,2	2.205	2.217
Citrus fruits	:	:	:	:	Citrus fruits	3.518,1	3.484,3	4.294,6	3.121,4
Vineyards	:	1.351,5	953,4	1.139,5	Vineyards	8.553,1	7.813	7.787,8	8.007,8
Source: self-elaboration, Eurostat – Agriculture:Crops products, annual data, extracted on 20.06.14									

4c. Differences Italy - Germany Crop Production - Volume				
	2005	**2008**	**2010**	**2013**
Cereals (excluding rice)	-25.888,1	-29.645,9	-23.078,4	-32.824,5
Wheat (including spelt)	-15.975,6	-17.129,2	-17.262,4	-18.009,2
Barley	-10.399,7	-10.730,4	-9.336,2	-9.571,6
Potatoes (including early potatoes and seed potatoes)	-9.870,8	-9.639,2	-8.585,1	
Rape and turnip rape	-5.045,6	-5.126,6	-5.647,3	
Oats and mixed grain other than maslin	-643,9	-508,1	-380,8	-470,6
Vegetables, melons and strawberries (excluding kitchen gardens)		9.829,6	10.682,1	
Vineyards		6.461,5	6.834,4	6.868,3
Fruit trees (excluding olives and citrus fruit)	5.006,5	4.693,6		
Apples	1.300,6	1.162,2	1.370,0	1.413,2
Melons and Strawberries	1.131,3	1.082,9	1.141,2	
Source: self-elaboration from table 4a and 4b: Difference between Italy and Germany data				

Table 5. Cattle: In-house, Imports and Exports – Italy and Germany

5a.Meat of bovine animals - Germany (1000t)											
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Slaughterings	1.226,23	1.263,16	1.166,9	1.192,95	1.185,23	1.209,71	1.174,12	1.186,72	1.159	1.140	1.106
Total imports of live animals	15,7	16,24	13,36	15,59	16,39	10,95	:	:	:	:	:
Total exports of live animals	88,36	101,89	58,81	53,56	44,68	36,8	:	:	:	:	:
5b.Meat of bovine animals - Italy (1000t)											
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Slaughterings	1.127,82	1.151,36	1.114,15	1.110,63	1.126,65	1.059,24	1.055,01	1.075,41	1.009,21	981,07	855,32
Total imports of live animals	414,56	393,36	424,61	478,14	392,9	367,07	265,15	:	:	:	:
Total exports of live animals	3,73	5,26	4,23	5,23	6,21	4,75	8,66	:	:	:	:
Source: Self-elaboration, Eurostat – Agriculture: Cattle, annual data, extracted on 20.06.14											

5c.Differences in values between Italy and Germany											
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Slaughterings	-98,41	-111,80	-52,75	-82,32	-58,58	-150,47	-119,11	-111,31	-149,79	-158,9	-250,6
Total imports of live animals	398,9	377,1	411,3	462,6	376,5	356,1	Source: Self-elaboration from table 5a and 5b: Difference between Italy and Germany data				
Total exports of live animals	-84,63	-96,63	-54,58	-48,33	-38,47	-32,05					

Table 6. Milk Products – Italy and Germany

6a.Milk Production Germany (1000 t)										
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total whole milk*	28.563,32	28.279,73	28.487,95	:	:	:	:	:	:	:
Cows' milk - Total	28.533,32	28.244,73	28.452,95	27.994,97	28.402,77	28.656,26	29.198,68	29.593,88	30.301,36	30.672,15
6b.Milk Production Italy (1000t)										
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total whole milk*	11.540,40	11.565,25	11.787,00	11.811,49	11.924,84	12.115,76	12.192,59	12.161,26	12.060,14	12.253,85
Cows' milk - Total	10.750,10	10.727,58	10.975,00	10.989,11	11.061,75	11.285,91	11.364,17	11.399,44	11.298,61	11.500,00
Source: Self-elaboration, Eurostat, – Agriculture: Milk – annual data, extracted on 20.06.14										
6c.Milk Production: Difference between Italy and Germany										
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total whole milk*	-17.022,9	-16.714,4	-16.700,9							
Cows' milk - Total	-17.783,2	-17.517,1	-17.477,9	-17.005,8	-17.341,0	-17.370,3	-17.834,5	-18.194,4	-19.002,7	-19.172,1
Source: self-elaboration, from table 6a and 6b: Difference between Italy and Germany data *availabilities = utilization										

Table 7. Rank of milk producers in the EU-28

Annual Milk Production (1000t)					
2013		2011		2005	
Germany	30.314,50	Germany	*28.659,00	Germany	27.380,00

Italy	11.003,69	France	25.516,89	France	24.084,91
Poland	9.923,40	United Kingdom	13.804,50	United Kingdom	14.038,38
Turkey	8.023,20	Netherlands	11.831,90	Italy	10.875,74
Spain	6.602,72	Italy	11.115,43	Poland	8.826,56
Ireland	5.581,14	Poland	9.310,60	Spain	6.620,10
Denmark	5.025,80	Spain	6.522,50	Denmark	4.451,40
Source: Self-elaboration, Eurostat, Agriculture: Milk collection (all milks) and dairy products obtained -annual data, exctracted on 25.06.14, *Derived from http://www.compassioninfoodbusiness.com/wp-content/uploads/2013/11/Info-1-Milk-production-in-the-EU.pdf due to lack of data in Eurostat					

Table 8. Number of agricultural holdings across size classes in percentages

Germany								
class holdings	Numb. Holdings				% of total			
	2003	2005	2007	2010	2003	2005	2007	2010
0 - 5	97,50	88,00	83,60	27,40	23,6%	22,6%	22,6%	9,2%
5 to 10	60,00	56,30	51,00	47,30	14,6%	14,4%	13,8%	15,8%
10 to 20	77,30	72,50	68,70	63,20	18,7%	18,6%	18,5%	21,1%
20to 50	94,00	88,50	81,90	76,10	22,8%	22,7%	22,1%	25,4%
0³ 50	83,50	84,60	85,40	85,20	20,3%	21,7%	23,0%	28,5%
Total -	412,30	389,90	370,60	299,10	100,0%	100,0%	100,0%	100,0%
Source: Self-elaboration, Report by European Commission, January 2013								

Italy								
class holdings	Numb. Holdings				% of total			
	2003	2005	2007	2010	2003	2005	2007	2010
0 - 5	1508,9	1271,7	1230,7	1182,3	76,8%	73,6%	73,3%	72,9%
5 to 10	205,4	205,9	202,6	186,2	10,5%	11,9%	12,1%	11,5%
10 to 20	121,9	130,7	122,7	120,1	6,2%	7,6%	7,3%	7,4%
20to 50	87,3	81,6	83,4	87,6	4,4%	4,7%	5,0%	5,4%
0³ 50	40,4	38,6	40	44,7	2,1%	2,2%	2,4%	2,8%
Total	1963,9	1728,5	1679,4	1620,9	100,0%	100,0%	100,0%	100,0%
Source: Self-elaboration, Report by European Commission, January 2013								

Table 9. Agricultural Output and cost components in Mill. Euro - Germany

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
AGRICULTURAL OUTPUT	46.757,17	42.940,43	41.276,30	44.354,07	38.648,02	40.025,11	45.265,53	48.585,70	41.929,38	43.694,98	49.048,97	49.743,73
ENERGY; LUBRICANTS	2.534,37	2.587,85	2.619,42	2.743,86	3.007,30	3.133,60	3.204,75	3.394,13	2.930,29	3.424,00	3.458,55	3.629,20
MAINTENANCE OF MATERIALS	1.921,94	1.917,43	1.845,78	1.819,18	1.830,00	1.860,20	1.909,81	1.955,39	1.956,74	1.855,78	2.046,72	2.081,11
MAINTENANCE OF BUILDINGS	697,65	671,36	603,06	573,52	571,00	606,11	688,06	702,74	669,56	631,29	684,75	642,41
GFCF IN MACHINERY AND EQUIP	3.232,77	3.331,09	3.345,79	4.256,15	3.410,00	3.710,42	4.561,18	5.509,25	4.589,77	4.161,93	4.254,29	4.199,31
GFCF IN MATERIALS	4.286,03	4.379,77	3.986,47	5.242,21	4.540,00	5.185,82	6.287,56	7.582,52	5.829,80	5.303,57	5.430,03	5.358,06
GFCF IN BUILDINGS	1.762,38	1.747,80	1.566,12	1.428,78	1.590,00	1.634,90	1.657,72	1.664,46	1.596,94	1.590,12	1.575,49	1.549,94
GROSS FIXED CAPITAL FORMATION	6.094,93	6.031,53	5.522,85	6.650,88	6.138,72	6.854,39	7.895,60	9.585,71	7.436,37	6.907,03	6.993,29	6.924,69
AGRICULTURAL SERVICES	1.407,82	1.444,50	1.445,10	1.488,14	1.536,00	1.552,16	1.627,31	1.718,96	1.737,40	1.738,66	1.804,05	1.895,71
FIXED CAPITAL CONSUMPTION	7.323,80	7.220,45	7.119,72	7.052,33	7.086,00	7.065,95	7.090,42	7.501,65	7.684,57	7.695,42	7.678,04	7.645,89
TOTAL INTERMEDIATE CONSUMPTION	26.305,45	26.473,92	26.352,17	25.718,41	26.026,30	27.059,34	29.709,26	32.193,64	29.401,07	30.238,95	34.710,61	34.964,57
Ratios over total intermediate consumption:												
	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
ENERGY; LUBRICANTS	9,63%	9,78%	9,94%	10,67%	11,55%	11,58%	10,79%	10,54%	9,97%	11,32%	9,96%	10,38%
MAINTENANCE OF MATERIALS	7,31%	7,24%	7,00%	7,07%	7,03%	6,87%	6,43%	6,07%	6,66%	6,14%	5,90%	5,95%
MAINTENANCE OF BUILDINGS	2,65%	2,54%	2,29%	2,23%	2,19%	2,24%	2,32%	2,18%	2,28%	2,09%	1,97%	1,84%
GFCF IN MACHINERY AND EQUIP	12,29%	12,58%	12,70%	16,55%	13,10%	13,71%	15,35%	17,11%	15,61%	13,76%	12,26%	12,01%
GFCF IN MATERIALS	16,29%	16,54%	15,13%	20,38%	17,44%	19,16%	21,16%	23,55%	19,83%	17,54%	15,64%	15,32%
GFCF IN BUILDINGS	6,70%	6,60%	5,94%	5,56%	6,11%	6,04%	5,58%	5,17%	5,43%	5,26%	4,54%	4,43%

GROSS FIXED CAPITAL FORMATION	23,17 %	22,78 %	20,96 %	25,86%	23,59 %	25,33 %	26,58 %	29,78 %	25,29 %	22,84 %	20,15 %	19,80 %
AGRICULTURAL SERVICES	5,35%	5,46%	5,48%	5,79 %	5,90%	5,74%	5,48%	5,34%	5,91%	5,75%	5,20%	5,42%
FIXED CAPITAL CONSUMPTION	27,84 %	27,27 %	27,02 %	27,42%	27,23 %	26,11 %	23,87 %	23,30 %	26,14 %	25,45 %	22,12 %	21,87 %
Source: Self-elaboration, EUROSTAT, Economic accounts for agriculture - values at real prices, last update on 07.04.2014 , extracted on 25.06.2014 Production values at basic price, Millions Euro												

Table 10. Agricultural Output and cost components in Mill. Euro - Italy

	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
AGRICULTURAL OUTPUT	48.719,7	47.052,7	46.184,4	47.337,6	42.404,5	41.434,8	41.889,1	43.124,1	38.815,7	39.098,6	41.798,4	41.744,3
ENERGY; LUBRICANTS	1.931,4	1.772,9	1.826,9	1.843,4	2.056,0	2.225,5	2.188,2	2.486,1	2.185,9	2.250,4	2.532,3	2.731,1
MAINTENANCE OF MATERIALS	573,8	573,7	580,9	609,9	603,7	618,0	649,1	649,0	661,1	680,3	689,4	699,4
MAINTENANCE OF BUILDINGS	231,2	236,5	244,7	256,2	263,9	272,9	277,5	282,4	281,7	288,9	295,3	298,8
GFCF IN MACHINERY AND EQUIP	5.028,82	5.127,98	5.153,77	5.412,88	5.193,41	5.472,35	5.449,08	5.334,04	4.633,61	4.818,69	4.628,12	4.328,08
GFCF IN MATERIALS	3.046,40	3.135,44	3.095,77	3.312,77	3.132,42	3.394,65	3.462,55	3.359,31	2.846,53	2.917,47	2.925,54	2.765,10
GFCF IN BUILDINGS	2.541,47	2.791,07	3.037,29	3.111,30	3.095,19	2.839,44	2.564,17	2.542,85	1.943,99	2.265,06	2.288,43	2.236,58
GROSS FIXED CAPITAL FORMATION	9.822,12	9.634,50	10.020,12	10.241,80	10.781,54	10.895,13	10.915,06	10.510,66	10.206,32	8.634,35	9.114,96	8.961,30
AGRICULTURAL SERVICES	2.079,5	1.991,1	1.931,8	1.941,2	1.904,8	1.932,7	1.939,1	1.943,9	1.913,5	1.980,8	2.047,0	2.159,0
FIXED CAPITAL CONSUMPTION	10.595,4	10.665,5	10.647,5	10.917,0	11.200,5	11.452,1	11.631,9	11.784,6	11.801,0	11.871,4	12.087,2	12.035,6
TOTAL INTERMEDIATE CONSUMPTION	18.970,8	18.360,8	17.989,2	18.587,8	17.539,3	17.560,4	18.510,2	19.995,2	18.534,0	18.886,3	20.222,3	20.446,4
Ratios over total intermediate consumption:												
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
ENERGY; LUBRICANTS	10,18 %	9,66%	10,16 %	9,92%	11,72 %	12,67 %	11,82 %	12,43 %	11,79 %	11,92 %	12,52 %	13,36 %

MAINTENANCE OF MATERIALS	3,02%	3,12%	3,23%	3,28%	3,44%	3,52%	3,51%	3,25%	3,57%	3,60%	3,41%	3,42%
MAINTENANCE OF BUILDINGS	1,22%	1,29%	1,36%	1,38%	1,50%	1,55%	1,50%	1,41%	1,52%	1,53%	1,46%	1,46%
GFCF IN MACHINERY AND EQUIP	26,51%	27,93%	28,65%	29,12%	29,61%	31,16%	29,44%	26,68%	25,00%	25,51%	22,89%	21,17%
GFCF IN MATERIALS	16,06%	17,08%	17,21%	17,82%	17,86%	19,33%	18,71%	16,80%	15,36%	15,45%	14,47%	13,52%
GFCF IN BUILDINGS	13,40%	15,20%	16,88%	16,74%	17,65%	16,17%	13,85%	12,72%	10,49%	11,99%	11,32%	10,94%
GROSS FIXED CAPITAL FORMATION	51,77%	52,47%	55,70%	55,10%	61,47%	62,04%	58,97%	52,57%	55,07%	45,72%	45,07%	43,83%
AGRICULTURAL SERVICES	10,96%	10,84%	10,74%	10,44%	10,86%	11,01%	10,48%	9,72%	10,32%	10,49%	10,12%	10,56%
FIXED CAPITAL CONSUMPTION	55,85%	58,09%	59,19%	58,73%	63,86%	65,22%	62,84%	58,94%	63,67%	62,86%	59,77%	58,86%

Source: Self-elaboration, EUROSTAT, Economic accounts for agriculture - values at real prices, last update on 07.04.2014 , extracted on 25.06.2014
Production values at basic price, Millions Euro

Table 11. Components of GFCF over output and total costs

	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Germany												
TOT.GFCF/tot.production costs	18,1%	17,9%	16,5%	20,3%	18,5%	20,1%	21,5%	24,1%	20,1%	18,2%	16,5%	16,3%
TOT.GFCF/output	13,0%	14,0%	13,4%	15,0%	15,9%	17,1%	17,4%	19,7%	17,7%	15,8%	14,3%	13,9%
GFCF MACHINERY_EQUIP/tot. production costs	9,6%	9,9%	10,0%	13,0%	10,3%	10,9%	12,4%	13,9%	12,4%	11,0%	10,0%	9,9%
GFCF MACHINERY_EQUIP/agr. output	6,9%	7,8%	8,1%	9,6%	8,8%	9,3%	10,1%	11,3%	10,9%	9,5%	8,7%	8,4%
GFCF BUILDINGS/tot.production costs	5,2%	5,2%	4,7%	4,4%	4,8%	4,8%	4,5%	4,2%	4,3%	4,2%	3,7%	3,6%
GFCF BUILDINGS/agr.output	3,8%	4,1%	3,8%	3,2%	4,1%	4,1%	3,7%	3,4%	3,8%	3,6%	3,2%	3,1%
Italy												
TOT.GFCF/tot.production costs	33,2%	33,2%	35,0%	34,7%	37,5%	37,6%	36,2%	33,1%	33,6%	28,1%	28,2%	27,6%
TOT.GFCF/output	20,2%	20,5%	21,7%	21,6%	25,4%	26,3%	26,1%	24,4%	26,3%	22,1%	21,8%	21,5%
GFCF MACHINERY_EQUIP/tot. production costs	10,3%	10,8%	10,8%	11,2%	10,9%	11,7%	11,5%	10,6%	9,4%	9,5%	9,1%	8,5%

GFCF MACHINERY_EQUIP/agr. output	6,3%	6,7 %	6,7 %	7,0 %	7,4 %	8,2 %	8,3 %	7,8 %	7,3 %	7,5 %	7,0 %	6,6 %
GFCF BUILDINGS/tot.production costs	8,6%	9,6 %	10,6 %	10,5 %	10,8 %	9,8 %	8,5 %	8,0 %	6,4 %	7,4 %	7,1 %	6,9 %
GFCF BUILDINGS/agr.output	5,2%	5,9 %	6,6 %	6,6 %	7,3 %	6,9 %	6,1 %	5,9 %	5,0 %	5,8 %	5,5 %	5,4 %

Source: Self-elaboration, EUROSTAT, Economic accounts for agriculture - values at real prices, last update on 07.04.2014 , extracted on 25.06.2014
Production values at basic price, Millions Euro

Table 12. Production value and components of production costs (indexes)

PRODUCTION VALUE										
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
EU28	:	100	99	99,7	102,7	102,8	102,4	106,4	103,9	105,9
Germany	103,1	100	99,8	99,7	102,7	104,8	110,3	125,3	130,8	133
Italy	102,9	100	98,6	98,9	100,1	97,8	97,2	97,9	94,6	94,1
TOTAL INTERMEDIATE CONSUMPTION										
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
EU28	:	100	99,3	100,3	100,7	100,1	101,1	103,9	102,8	104,2
Germany	95,1	100	99,9	100	94,7	99,4	103,3	120,1	122,1	124,2
Italy	101,9	100	98,4	99,6	99,6	98,6	97,7	97,8	95,9	94,8
Productivity Germany	108,41%	100,00%	99,90%	99,70%	108,45%	105,43%	106,78%	104,33%	107,13%	107,09%
Productivity Italy	100,98%	100,00%	100,20%	99,30%	100,50%	99,19%	99,49%	100,10%	98,64%	99,26%
FIXED CAPITAL CONSUMPTION										
EU28	:	100	101,1	102,7	104,6	105,2	105,7	106,9	107,4	107,7
Germany	97	100	104,8	110,6	117,9	122,2	123,6	124,9	126,2	126,9
Italy	99	100	100,7	101,3	101,8	101,6	101,6	102,3	101,8	101,5
Productivity Germany	106,29%	100,00%	95,23%	90,14%	87,11%	85,76%	89,24%	100,32%	103,65%	104,81%
Productivity Italy	103,94%	100,00%	97,91%	97,63%	98,33%	96,26%	95,67%	95,70%	92,93%	92,71%
GROSS FIXED CAPITAL FORMATION										
EU28	:	100	101,1	102,7	104,6	105,2	105,7	106,9	107,4	107,7
Germany	97	100	104,8	110,6	117,9	122,2	123,6	124,9	126,2	126,9
Italy	99	100	100,7	101,3	101,8	101,6	101,6	102,3	101,8	101,5

Productivity Germany	106,29%	100,00%	95,23%	90,14%	87,11%	85,76%	89,24%	100,32%	103,65%	104,81%
Productivity Italy	103,94%	100,00%	97,91%	97,63%	98,33%	96,26%	95,67%	95,70%	92,93%	92,71%
*Productivity= measured as: production value/'x' variable (in volume). Values are in volumes at basic prices, 2005=100										
Source: Self-elaboration, EUROSTAT, Economic accounts for agriculture - indices: volume, price, values, last update on 7.04.14, extracted on 25.06.14										

Table 13. Economic and geographical sizes according to type of holding and agricultural sector

	2000				**2003**			
	Italy		**Germany**		**Italy**		**Germany**	
FARMTYPE +CROP	ESU: SGM of the holding	Av. holding size*	ESU: SGM of the holding	Av. holding size*	ESU: SGM of the holding	Av. holding size*	ESU: SGM of the holding	Av. holding size*
Total	19.062.110	**6,06**	19.194.300	**36,34**	19.453.390	**6,68**	21.037.300	**41,19**
Specialist grazing livestock	3.837.980	**15,65**	4.374.860	**27,43**	3.559.290	**20,26**	6.065.390	**31,82**
Specialist field crops	4.533.450	**8,45**	5.464.940	**56,72**	4.432.850	**9,04**	5.089.770	**60,26**
Mixed crops-livestock	954.300	**12,24**	4.026.690	**50,74**	834.780	**15,11**	3.901.410	**67,01**
Specialist permanent crops	5.621.500	**2,52**	1.534.900	**5,23**	6.532.820	**2,70**	1.666.980	**6,59**
Mixed livestock holdings	302.050	**9,38**	766.540	**27,45**	260.710	**18,63**	884.410	**39,87**
Mixed cropping	1.611.030	**5,61**	964.540	**39,18**	1.507.050	**6,63**	750.660	**48,22**
Specialist horticulture	1.664.260	**2,41**	1.446.140	**3,97**	1.666.800	**3,12**	1.359.560	**3,87**
Specialist granivores	537.540	**6,96**	615.690	**18,67**	659.080	**8,10**	1.319.130	**28,68**

Continuation Table 13:

	2005				**2007**			
	Italy		**Germany**		**Italy**		**Germany**	
	ESU: SGM of the holding	average holding size*	ESU:SGM of the holding	average holding size*	ESU:SGM of the holding	average holding size*	ESU:SGM of the holding	average holding size*
Total	22.196.290	**7,35**	19.392.160	**43,69**	25.000.030	**7,59**	18.328.630	**45,70**
Specialist grazing livestock	3.703.550	**23,02**	5.747.080	**33,31**	4.749.190	**22,09**	5.572.410	**35,48**
Specialist field crops	4.411.170	**9,17**	4.729.650	**65,23**	5.028.700	**9,09**	4.205.440	**68,67**
Mixed crops-livestock	956.690	**13,52**	3.629.990	**69,84**	910.520	**12,57**	2.934.970	**74,48**

Specialist permanent crops	6.949.890	**2,97**	1.462.210	**6,92**	7.707.520	**3,27**	1.445.480	**7,60**
Mixed livestock holdings	404.890	**15,13**	841.800	**43,12**	475.770	**17,43**	830.870	**48,95**
Mixed cropping	1.654.510	**7,29**	722.320	**50,26**	1.873.680	**7,14**	603.170	**52,09**
Specialist horticulture	1.735.030	**3,16**	1.206.540	**5,51**	1.972.760	**3,71**	1.258.050	**5,70**
Specialist granivores	2.380.550	**17,09**	1.052.550	**29,74**	2.281.890	**17,25**	1.478.240	**37,54**

*Average holding size is computed as: utilised agricultural area over number of holdings
Source: Self-elaboration, EUROSTAT, Key variables by type of farming (1-digit), economic size of farm (ESU), LFA status and region, last update on 06.03.2012, exctracted on 20.06.2014

Figures 1 –12. Regional crop differentiation and holdings according to scale - Germany

Figure 1. BW crop differentiation

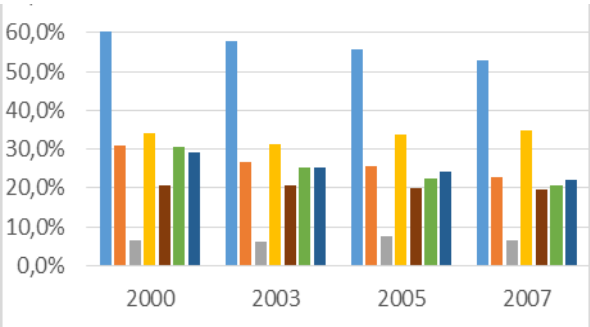


Figure 2. BW holdings according to scale

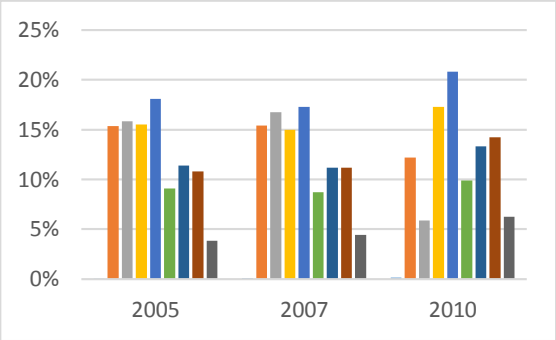


Figure 3.Bayern crop differentiation

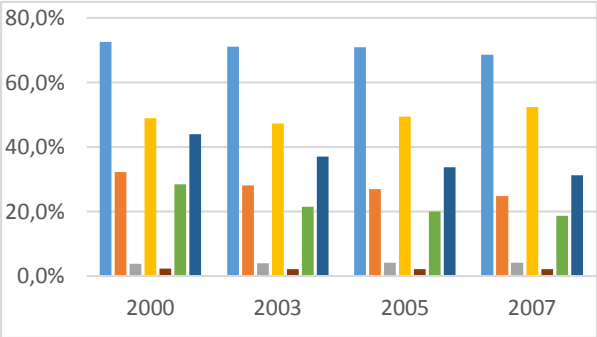


Figure 4. Bayern holdings according to scale

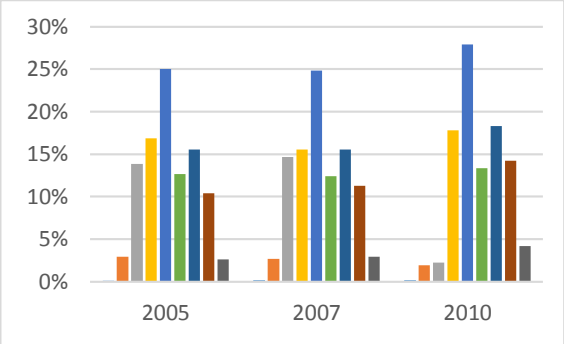


Figure 5. Schleswig-Holstein crop differentiation

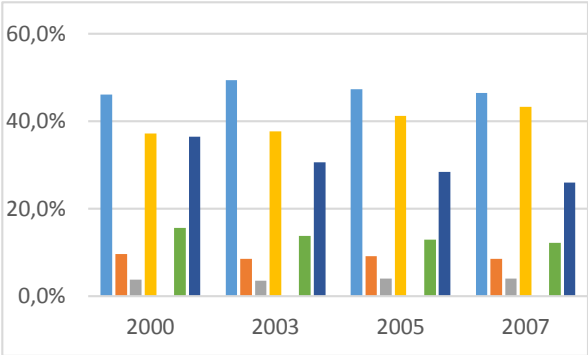


Figure 6. Schleswig-Holstein holdings according to scale

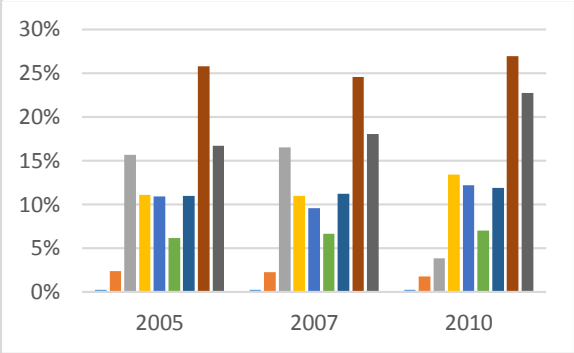


Figure 7. Niedersachsen crop differentiation

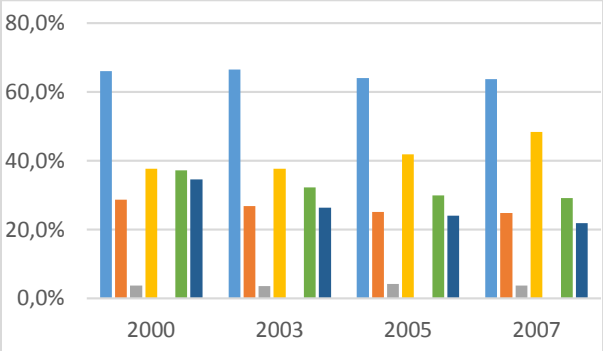


Figure 8. Niedersachsen holdings according to scale

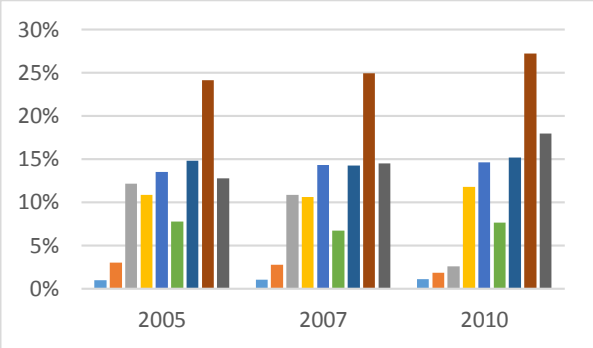


Figure 9. Mecklenburg-Vorpommern crop differentiation

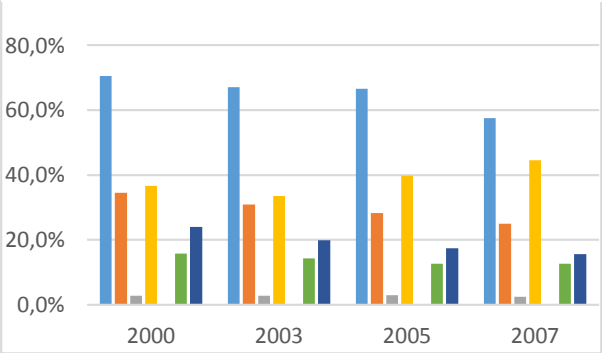


Figure 10. Mecklenburg-Vorpommern holdings' scale

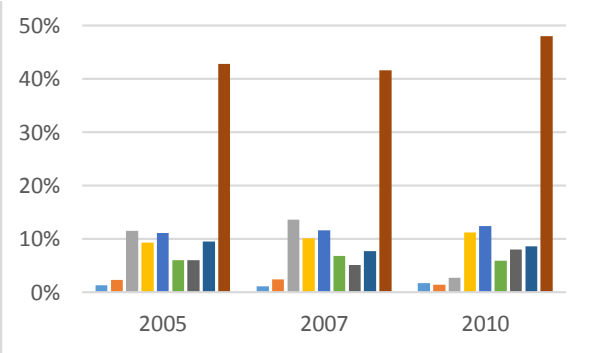


Figure 11. Brandeburg crop differentaition

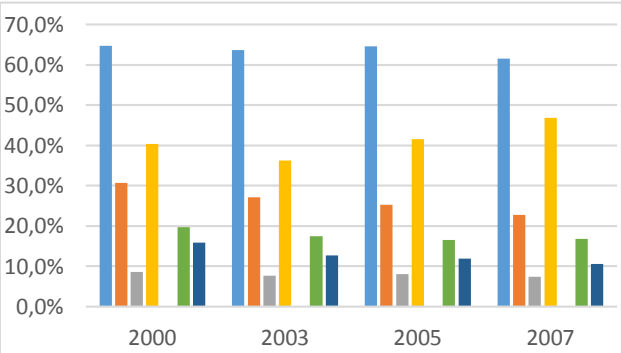
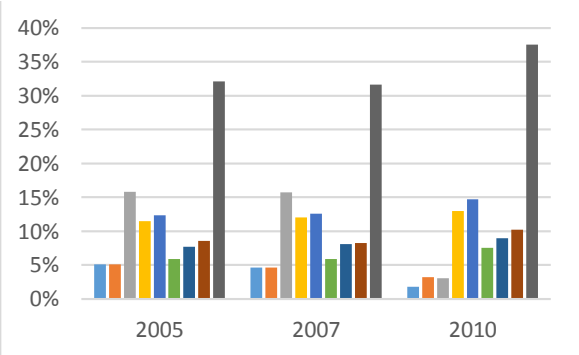


Figure 12. Brandeburg holdings according to scale



Legenda for crop differentiation:

- Number of holdings with cereals (D/01-D/08)
- Number of holdings with root crops (D/10-D/12)
- Number of holdings with fresh vegetables, melons and strawberries (D/14
- Number of holdings with forage plants (D/18)
- Number of holdings with vineyards (G/04)
- Number of holdings with pigs (J/11-J/13)
- Number of holdings with dairy cows (J/07)

Legenda for holding scale classes:

- Zero ha
- Less than 2 ha
- From 2 to 4.9 ha
- From 5 to 9.9 ha
- From 10 to 19.9 ha
- From 20 to 29.9 ha
- From 30 to 49.9 ha
- From 50 to 99.9 ha
- 100 ha or over

Source Figures 1-12: Self-elaboration, EUROSTAT, Structure of agricultural holdings by eurofarm region, main indicators [ef_r_farm], last update on 06.03.2012, extracted on 30.05.2014

Figures 13 – 24. Regional crop differentiation and holdings according to scale – Italy

Figure 13. Sicily crop differentiation

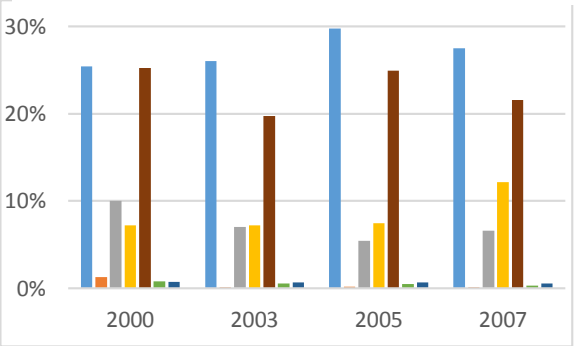


Figure 14. Sicily holdings according to scale

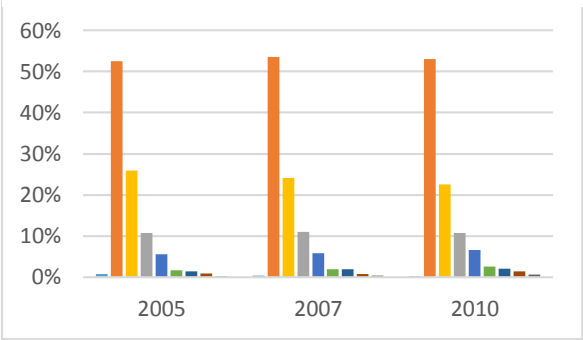


Figure 15. Puglia crop differentiation

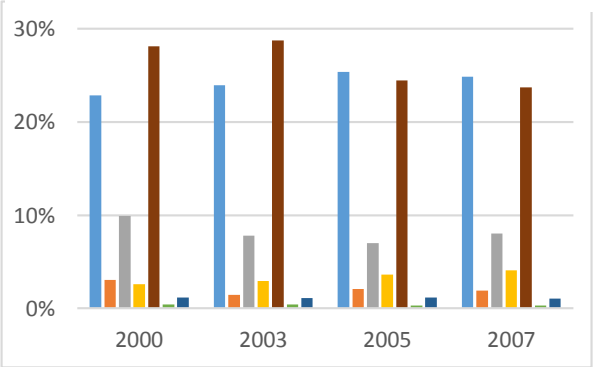


Figure 16. Puglia holdings according to scale

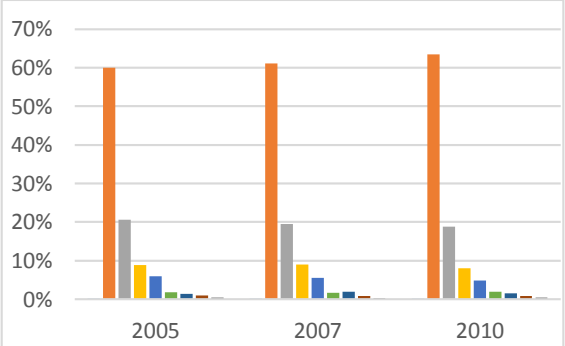


Figure 17. Campania crop differentiation

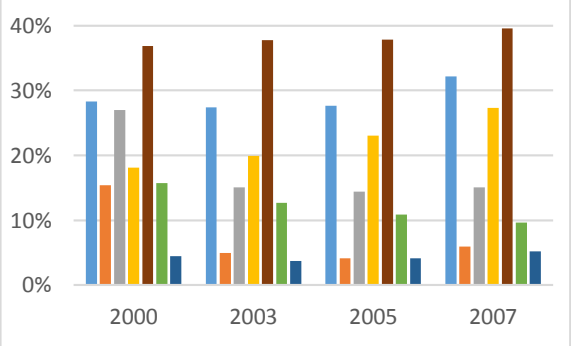


Figure 18. Puglia holdings according to scale

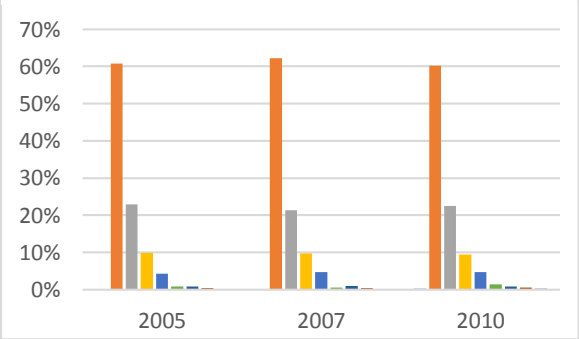


Figure 19. Tuscany crop differentaition

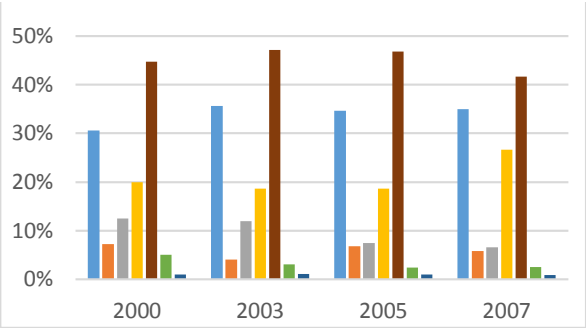


Figure 10. Tuscany holdings according to scale

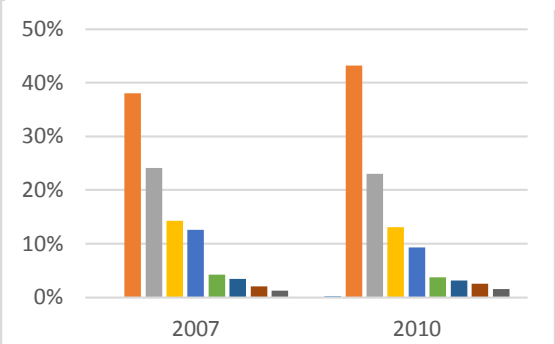


Figure 21. Veneto crop differentiation

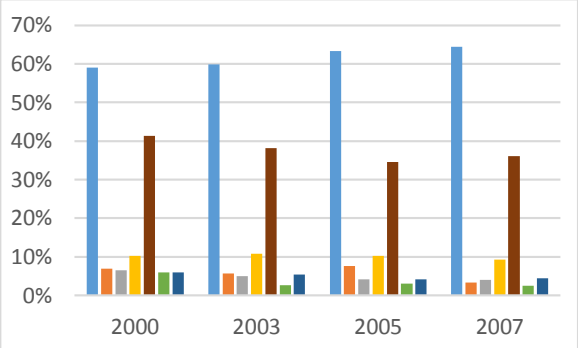


Figure 22. Veneto holdings according to scale

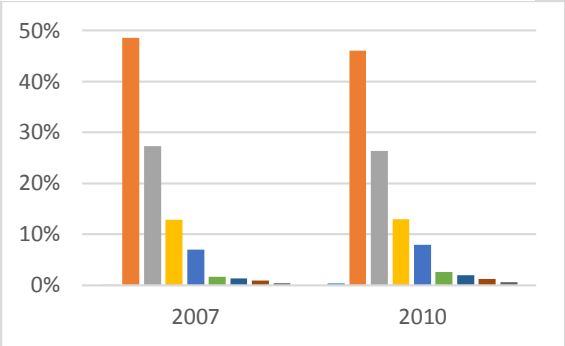


Figure 22. Lombardia crop differentiation

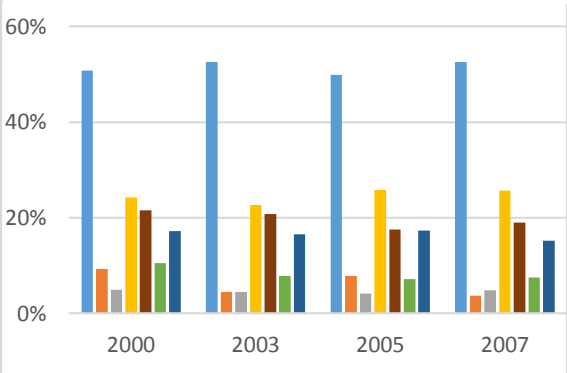


Figure 24. Lombardia holdings according to scale

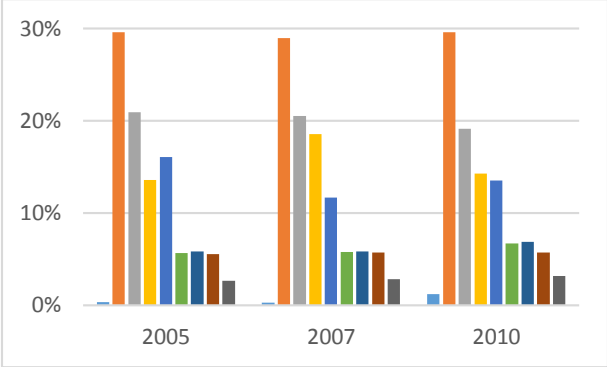


Figure 25. Piemonte crop differentiation

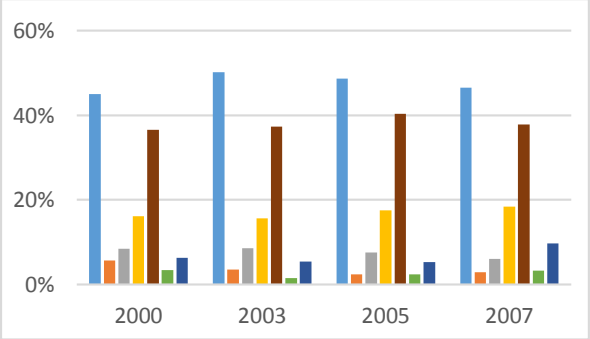
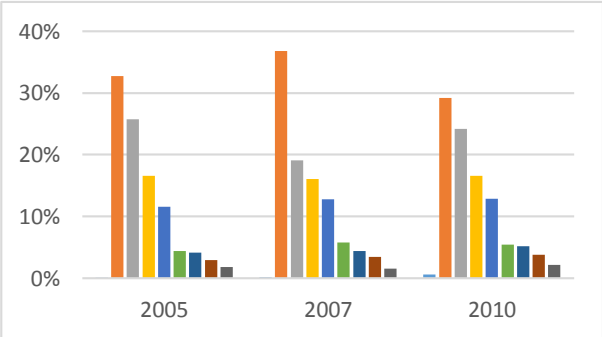


Figure 26. Piemonte holdings according to scale



Legenda for crop differentiation- Italy

- Number of holdings with cereals (D/01-D/08)
- Number of holdings with root crops (D/10-D/12)
- Number of holdings with fresh vegetables, melons and strawberries (D/14 + D/15)
- Number of holdings with forage plants (D/18)
- Number of holdings with vineyards (G/04)
- Number of holdings with pigs (J/11-J/13)
- Number of holdings with dairy cows (J/07)

Legenda for holdings' scale - Italy

- Zero ha
- Less than 2 ha
- From 2 to 4.9 ha
- From 5 to 9.9 ha
- From 10 to 19.9 ha
- From 20 to 29.9 ha
- From 30 to 49.9 ha
- From 50 to 99.9 ha

Source Figures 13 - 28: Self-elaboration, EUROSTAT, Structure of agricultural holdings by eurofarm region, main indicators [ef_r_farm], last update on 06.03.2012, extracted on 06.06.2014

Table 14. Regional spread of farming overheads over output - Germany

Region	**Variable**	**2009**	**2008**	**2007**	**2006**	**2005**	**2004**	**2003**	**2002**	**2001**	**2000**
Bayern	Tot. farming overheads	35764	36412	36165	34673	32973	31740	29072	29331	27575	25326
	Tot. output	108375	118089	132472	111064	101792	99593	91527	92719	96070	96201
	Tot. farming overheads/Tot. Output	**33,0 %**	**30,8 %**	**27,3 %**	**31,2 %**	**32,4 %**	**31,9 %**	**31,8 %**	**31,6 %**	**28,7 %**	**26,3 %**
BW	Tot. farming overheads	43937	44333	48038	46154	42561	41525	38175	38004	36286	34164
	Tot. output	135909	148049	162419	145627	128678	129627	123181	117745	119855	120853
	Tot. farming overheads/Tot. Output	**32,3 %**	**29,9 %**	**29,6 %**	**31,7 %**	**33,1 %**	**32,0 %**	**31,0 %**	**32,3 %**	**30,3 %**	**28,3 %**
Niedersachsen	Tot. farming overheads	53330	54540	55520	53296	51458	49761	44187	44987	40632	38634
	Tot. output	203642	218358	233595	205227	186568	181256	164043	156894	162117	162460
	Tot. farming overheads/Tot. Output	**26,2 %**	**25,0 %**	**23,8 %**	**26,0 %**	**27,6 %**	**27,5 %**	**26,9 %**	**28,7 %**	**25,1 %**	**23,8 %**
Mecklenburg-Vorpommern	Tot. farming overheads	215975	225346	234404	204726	204857	206492	169190	115720	118718	113473
	Tot. output	665563	773799	774482	627195	593901	628808	549965	360771	376816	372791
	Tot. farming overheads/Tot. Output	**32,4 %**	**29,1 %**	**30,3 %**	**32,6 %**	**34,5 %**	**32,8 %**	**30,8 %**	**32,1 %**	**31,5 %**	**30,4 %**
Schleswig-Holstein	Tot. farming overheads	59390	61517	62696	52666	52273	46475	43800	44684	43129	41528
	Tot. output	206093	228376	251138	201634	183386	172449	165799	164077	166230	174206
	Tot. farming overheads/Tot. Output	**28,8 %**	**26,9 %**	**25,0 %**	**26,1 %**	**28,5 %**	**26,9 %**	**26,4 %**	**27,2 %**	**25,9 %**	**23,8 %**
Brandeburg	Tot. farming overheads	197117	197642	189873	176966	149866	144297	137270	149921	166125	162159
	Tot. output	572554	616196	621537	514809	459816	458999	429029	468656	556193	520974

	Tot. farming overheads/Tot. Output	**34,4 %**	**32,1 %**	**30,5 %**	**34,4 %**	**32,6 %**	**31,4 %**	**32,0 %**	**32,0 %**	**29,9 %**	**31,1 %**
Source: Self-elaboration, FADN (Farm Accounting Data Network) public database, last access on 20.06.14 from http://ec.europa.eu/agriculture/rica/database/database_en.cfm?dwh=SGM											

Table 15. Regional spread of farming overheads over output - Italy

Region	**Variable**	**2009**	**2008**	**2007**	**2006**	**2005**	**2004**	**2003**	**2002**	**2001**	**2000**
Veneto	Tot. farming overheads	11225	10295	12549	10601	10297	9060	9371	8218	4150	4134
	Tot. output	87560	95506	100175	82143	85113	82892	83084	70447	32913	35921
	Tot. farming overheads/ Tot. Output	**12,8 %**	**10,8 %**	**12,5 %**	**12,9 %**	**12,1 %**	**10,9 %**	**11,3 %**	**11,7 %**	**12,6 %**	**11,5 %**
Lombardia	Tot. farming overheads	15959	16015	16068	15767	14680	15743	15889	10368	9771	8490
	Tot. output	151483	154757	175689	164148	152520	160821	162292	121510	100640	88355
	Tot. farming overheads/ Tot. Output	**10,5 %**	**10,3 %**	**9,1%**	**9,6%**	**9,6%**	**9,8%**	**9,8%**	**8,5%**	**9,7%**	**9,6%**
Piemonte	Tot. farming overheads	9089	10137	10341	9787	8412	8137	7841	6484	5806	5939
	Tot. output	71376	73415	78207	64190	61474	65460	58811	49903	45039	43423
	Tot. farming overheads/ Tot. Output	**12,7 %**	**13,8 %**	**13,2 %**	**15,2 %**	**13,7 %**	**12,4 %**	**13,3 %**	**13,0 %**	**12,9 %**	**13,7 %**
Tuscany	Tot. farming overheads	16036	15672	13210	13001	11250	11472	11672	9329	7473	7554
	Tot. output	82265	88271	79789	77007	70656	69225	74573	69563	50619	51535
	Tot. farming overheads/ Tot. Output	**19,5 %**	**17,8 %**	**16,6 %**	**16,9 %**	**15,9 %**	**16,6 %**	**15,7 %**	**13,4 %**	**14,8 %**	**14,7 %**
Campania	Tot. farming overheads	4080	5144	3935	3828	4258	3888	3604	2442	2070	1798
	Tot. output	48075	44823	41775	42436	48122	47681	44425	32314	24811	16567
	Tot. farming overheads/ Tot. Output	**8,5%**	**11,5 %**	**9,4%**	**9,0%**	**8,8%**	**8,2%**	**8,1%**	**7,6%**	**8,3%**	**10,9 %**
Puglia	Tot. farming overheads	5710	5319	5758	5134	5137	4557	4484	4372	3133	2955
	Tot. output	33538	35574	31969	23821	24752	21846	25014	22707	16833	12707
	Tot. farming overheads/ Tot. Output	**17,0 %**	**15,0 %**	**18,0 %**	**21,6 %**	**20,8 %**	**20,9 %**	**17,9 %**	**19,3 %**	**18,6 %**	**23,3 %**

Sicily	Tot. farming overheads	3378	3062	3933	3419	3243	2647	2978	2560	1473	1553
	Tot. output	36495	39778	37546	33907	29795	26944	30916	25626	17189	17555
	Tot. farming overheads/ Tot. Output	**9,3%**	**7,7%**	**10,5%**	**10,1%**	**10,9%**	**9,8%**	**9,6%**	**10,0%**	**8,6%**	**8,8%**
Source: Self-elaboration, FADN (Farm Accounting Data Network) public database, last access on 30.07.14 from http://ec.europa.eu/agriculture/rica/database/database_en.cfm?dwh=SGM											

Figures 27-30. Geographical and economic size of holdings- Germany

Figure 27. Geographical size of holdings in 2000 - Germany

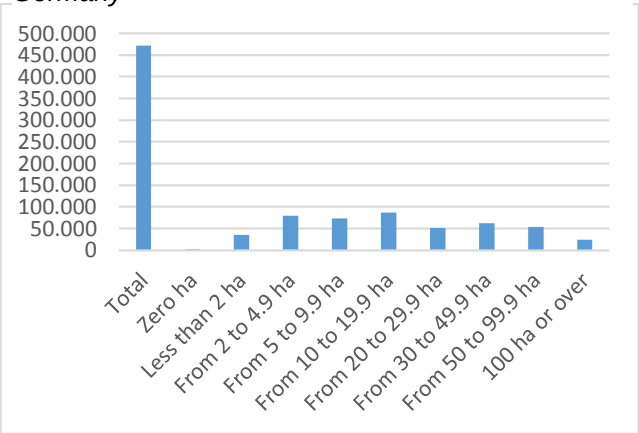
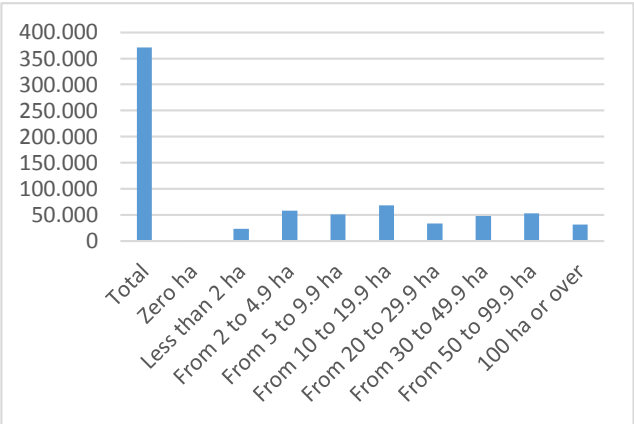


Figure 28. Geographical size of holdings in 2007 - Germany



Source Fig. 27-28: EUROSTAT (2014), Key variables by size of farm (UAA), economic size of farm (ESU) and LFA status [ef_ov_kvaaesu], last update on 06.03.2012, extracted on 30.07.2014

Figure 29. Economic size of holdings in 2000 - Germany

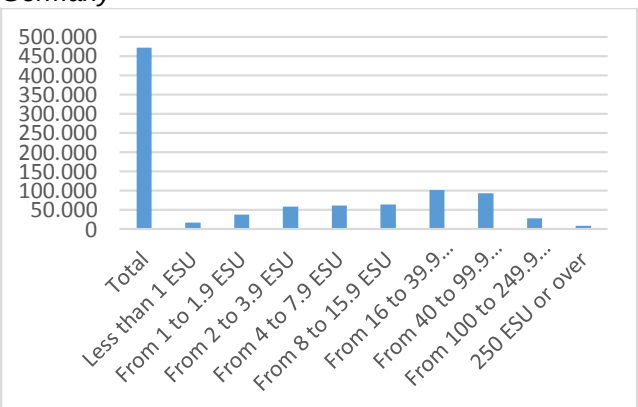
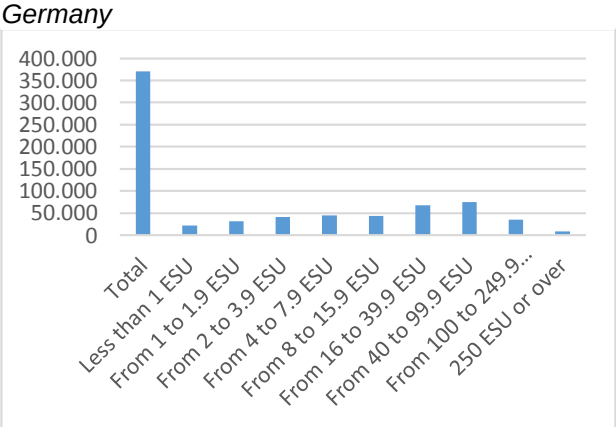


Figure 30. Economic size of holdings in 2007 - Germany



Source Fig. 29-30: EUROSTAT (2014), Key variables by size of farm (UAA), economic size of farm (ESU) and LFA status [ef_ov_kvaaesu], last update on 06.03.2012, extracted on 30.07.2014

Figures 31-34. Geographical and economic size of holdings- Italy

Figure 31. Geographical size of holdings in 2000 - Italy

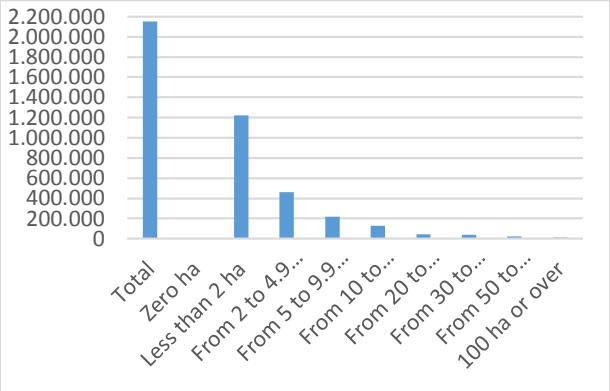
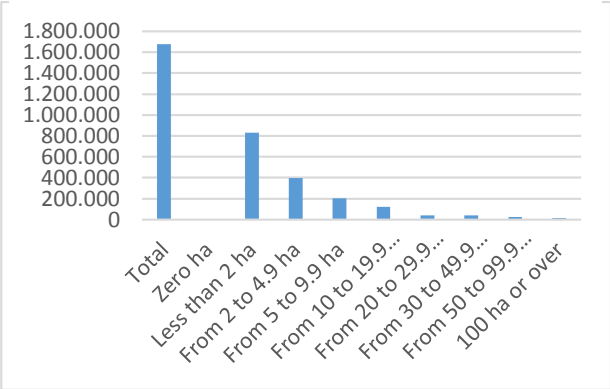


Figure 32. Geographical size of holdings in 2007 - Italy



Source Fig. 31-32: EUROSTAT (2014), Key variables by size of farm (UAA), economic size of farm (ESU) and LFA status [ef_ov_kvaaesu], last update on 06.03.2012, extracted on 30.07.2014

Figure 33. Economic size of holdings in 2000 - Italy

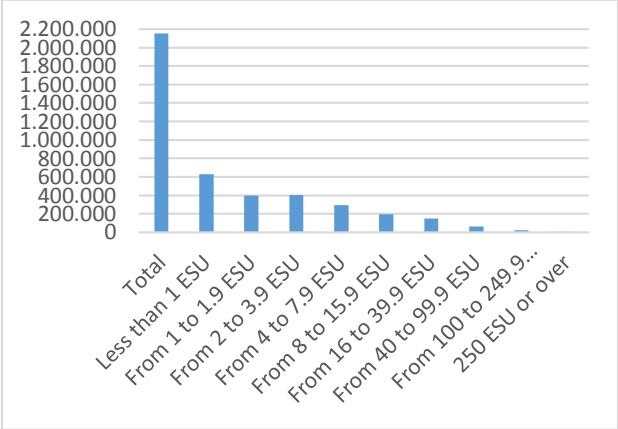
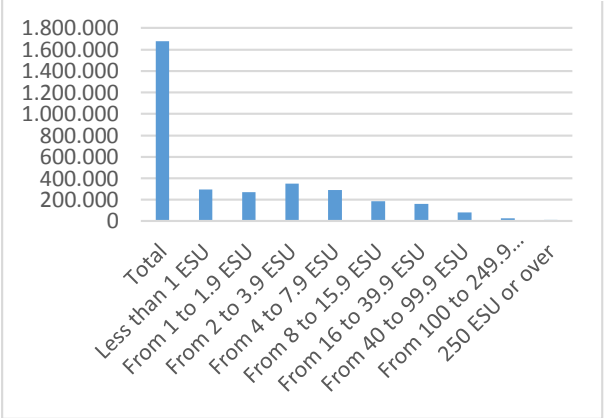


Figure 34. Economic size of holdings in 2007 - Italy



Source Fig. 33-34: EUROSTAT (2014), Key variables by size of farm (UAA), economic size of farm (ESU) and LFA status [ef_ov_kvaaesu], last update on 06.03.2012, extracted on 30.07.2014

Table 16. Cooperatives in Italy: sectorial distribution

Cooperatives in Italy - 9° Census Industry and Services - 2013		
Sector	abs.value	%
Agriculture	3,932	7,8
Industry	4,251	8,5
Construction	9,245	18,4
Services	32,696	65
Total	50,134	100
Data from: 9° Census Industry and Services (data collected from CensStat, 30.07.2013)		
Cooperatives in Italy - EURICSE ri-elaboration - 2013		

Agriculture	5,951	10,3
Industry	4,072	7,1
Construction	10,512	18,2
Services	32,918	57,1
No data	4,172	7,3
Data from: Aida-Bureau Van Dijk database (01.07.2013)		
Source: Carini et al. from Euricse (2014), pag. 11-12		

Table 17. Employment in Italian cooperatives: sectorial distribution

Employees in Italian cooperatives per sector - 2011					
Sector	Total Workers	%	% women	% < 35 years old	Change 2008 - 2011
Agriculture	124,417	7,1	35	31,6	-4
Industry	112,88	6,5	34,4	29,2	-5,6
Construction	78,286	4,5	14,6	33,9	-12
Trade	99,412	5,7	56,1	28,2	2,4
Transport	336,066	19,2	23,5	40,4	-0,9
Services	968,219	55,4	64,9	34	4,1
NO data	27,089	1,6	40,2	44,7	15,8
Total	1,746,369	100	49,7	34,6	1,1
Data from: INPS 2011 Source: Carini, C. and M. Carpita from Euricse (2014), pag. 27					

Table 18. Market share and Turnover of German cooperatives

	Market share		Turnover (bill. €)	
	2003	2008	2008	2008 in %
General (Multipurpose)	54	54	22,9	53,9%
Milk and dairy	68	70	10,8	25,4%
Beef, cattle and pig meat	35	28	4,8	11,3%
Wine	32	30	0,8	1,9%
Fruit and vegetables	45	50	2,5	5,9%
Other			0,7	1,6%
Agricultural cooperatives			42,5	
Data from: German Raiffeisen Association				
Source: Cogeca (2010), pag. 51.				

Table 19. Biggest Agricultural Cooperatives Italy and Germany

TOP AGRICULTURAL COOPERATIVES ITALY - GERMANY, 2008				
	Country	Name	Sector	Turnover (bill.€)
1	Italy	Agriciola tre Valli	Animal products	2,332
1	Germany	Bay Wa	Supplies	8,795
2	Italy	Gesco	Poultry	1,154
2	Germany	Agravis	Supplies	5,811
3	Italy	Gruppo Conserve Italia	Fruit&Vegetables	0,963
3	Germany	Nordmilch	Dairy	2,5
4	Italy	Consorzio Latterie Sociali Mantovane	Dairy	0,414
4	Germany	humana Milchunion	Dairy	2,2
5	Italy	UNIPEG	Slaughtering	0,394
5	Germany	RWZ Rhein-Mainz	Supplies	2,119
6	Italy	Agrintesa	Fruit&Vegetables	0,25
6	Germany	westfleisch	Meats	2,008
7	Italy	Consorzio Melinda	Fruit&Vegetables	0,244
7	Germany	Landgard	Fruit&Vegetables&Plants	1,269
8	Italy	APOFRUIT GROUP	Fruit&Vegetables	0,243
8	Germany	Hochwald Nahrungsmittelwerke	Dairy, Cheese, Sausage	1
9	Italy	Consorzio Granlatte	Dairy	0,237
9	Germany	Bayernland	Dairy	1
10	Italy	AVI.COOP	Slaughtering	0,165
10	Germany	ZG Karlsruhe	Supplies	0,959
Data from: German Reiffeisen Association (for Germany) Data from: Fedagri-Confcooperative (for Italy) Source: data ri-elaborated by COGECA (2010)				

Table 20. Top 25 Agricultural Cooperatives in Europe in 2008

Name - Country - Activity - Turnover - Members - Employees
1 FrieslandCampina NL Dairy 9,481 15,837 20,568
2 Bay Wa DE Supplies 8,795 : 15,540(2003)
3 VION*, Son en Breugel NL Meat 8,540 : 35,583
4 Metsäliitto FI Forestry 6,434 129,270 17,540
5 Arla Foods(2009) DK-SE Dairy 6,200 7,625 16,200
6 Danish Crown(2009) DK Meat 6,000 10,700 23,500
7 AGRAVIS DE Supplies 5,811 : 4,000(2003)
8 Union IN VIVO FR Cereals, Supplies 5,200 : 1,500

9 KERRY IE Dairy 4,700 9,700 22,300
10 DLG DK Supplies 4,600 28,000 5,000
11 FloraHolland NL Horticulture (flowers, plants) 4,074 5,124 3,555
12 TERRENA FR Multipurpose 3,900 27,500 9,900
13 TEREOS FR Sugar 3,800 9,500 9,000
14 Lantmännen SE Cereals, Feedingstuffs 3,656 37,000 10,500
15 SODIAAL FR Dairy 2,746 13,000 7,700
16 Nordmilch DE Dairy 2,500 7,989 7,989
17 DLA (Den Lokale Andel) DK Supplies 2,450 20,000 2,300
18 Agricola Tre Valli IT Meat, feedingstuffs 2,332
19 Humana Milchunion DE Dairy 2,200 5,000 5,000
20 GLANBIA IE Dairy 2,200 18,600 4,900
21 RWZ Rhein-Main DE Supplies 2,119 : :
22 Irish Dairy Board IE Dairy 2,110 0,070 3,788
23 Westfleisch DE Meat 2,008
24 RWA AT Supplies 2,000 122,000 13,000
25 Coopagri FR Multipurpose 1,950
Source: COGECA research (2010)

Table 21. Employment levels and operative margins in Italian Consortia

Active Consortia Italy, 31.11.2011	Num. of active consortia		Employment level		Operative results*
Sector	Abs.value	%	Num. employees	%	%
Agri-food	304	15,2	10,661	40,7	1,3
Agricultural	34	1,7	2,702	10,3	0,4
Industry	17	0,8	1,388	5,3	0,2
Construction	159	7,9	1,472	5,6	0,5
Trade	63	3,1	2,058	7,9	0,6
Social	452	22,6	4,033	15,4	1
Accommodation	205	10,2	342	1,3	-0,02
Service	771	38,5	3,518	13,5	0,8
Total	2,005	100	26,174	100	0,8
*operative results= Operative Income/Value of Production					
Data from: Centro Studi Legacoop, data collected by Aida-Bureau Van Dijk Source: Linguiti, F. from Euricse (2014), pag. 59, 64-65.					

Table 22. Distribution of Italian Consortia according to production value

Consortia per class of Production Value		Italy, 31.12.2011
<50,000	396	22,8%
50,0000 to 500,000	434	25,0%
500,000 to 1mil	168	9,7%
1mill to 5mill	395	22,8%
5mill to 10mill	129	7,4%
10mill to 50mill	148	8,5%

50mill to 100mill	29	1,7%
100mill to 1 bill	32	1,8%
> 1bill	3	0,2%
Total	1734	100,0%
Data from: Lega coop studies on Aida Bureau Van Dijk Source: Linguiti, F. from Euricse (2014), pag. 61.		

Table 23. Capital rigidity and Economic sustainability in Italian agricultural cooperatives

AFCI	**Rigidity of invested Capital**		**VPCP**	**Economic Sustainability**	
AFCI*	% Cooperatives Agriculture	% Cooperatives other Sectors^	VPCP*	% Cooperatives Agriculture	% Cooperatives other Sectors^
<=0,06	25,1	38,57	<=1	40,5	43,5
0,06-0,02	18	21,9	1-1,2	53,5	48,5
0,2-0,45	23,4	18,07	1,2-1,4	3,2	3,8
>0,45	33,5	21,47	>1,4	2,8	4,2
Total	100	100	Total	100	100
***AFCI index indicates degree of capital rigidity, immobilization of resources, difficulty of having back liquidity**			*CPCP is an index measuring distance btw production costs and production values		
^ I computed the average of the percentages of Industry, Construction, Services					
Data from: Aida Bureau van Dijk database Source: Carini et al. from Euricse (2014), pag. 15-19.					

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