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Network's failure: why Italian companies have difficulties to cooperate

Supervisor
Prof. Anna
Cabigiosu

Graduand
Stefano Rossi
Matriculation Number 842175

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Introduction

Networks started their diffusion from the ’80 with firms that are increasingly adopting this form of cooperation. These agreements among firms aimed to develop and innovate their businesses responding to market changes; indeed, the need to innovate represented for many years an important issue for Italian companies. Local districts and clusters were an answer to this new necessity, Italian companies characterised by small-medium dimensions were unable to focus on disruptive innovations. In 2008 the expenses on research and development were 1,2% respect to the PIL in Italy, with the mean of 1,8% in Europe, the 2,6% in Germany, and 3,7% - 3,8% respectively for Sweden and Finland (Bugamelli et al., 2014). Even though Italian companies were innovating, the main focus was on incremental innovations, to acquire new machines or to accomplish other short-term objectives. Indeed, also the lack of financial resources and organisational capabilities impede firms to reach greater objectives. To respond to this lack of knowledge and resources, clusters, districts, and networks were the solution presented to firms in order to intensify the information flow and to collaborate for investments on a global perspective. During the years it increased also the necessity to regulate and control ties inside these systems made by different firms, which can also belong to different sectors or geographic areas. In Italy, there was initially a diffusion of clusters, which are districts of companies collaborating for production or sales processes, or to develop a common project, obtaining advantages in terms of costs, and share of knowledge and information. They were characterized by having their business in a common geographic area. Indeed, in this period, it started the research for the correct industrial localization, i.e. the geographical distribution of firms that together were composing a single production’s chain. At that period, the combination of specialisation on particular functions with the strategic geographical location represented a vital decision for the overall group of firms. Companies’ aggregations represented a way to innovate rapidly and to present more competitive products to Italian and International markets. Specialisation and focusing only on products quality were no more sufficient for the Italian small-medium companies in front of giants that were much more competitive on costs, marketing, advertising, communication, international extension. Moreover, Italian firms and local entrepreneurial activities were

often characterised by a component of individualism and distrust, which made more difficult this process of aggregation.

For these reasons, in the past years geographical proximity was a necessary variable in order to communicate, control and build trust among members. Indeed, firms had bigger difficulties to communicate and coordinate rapidly when they were distant rather than nowadays.

Classification of production systems

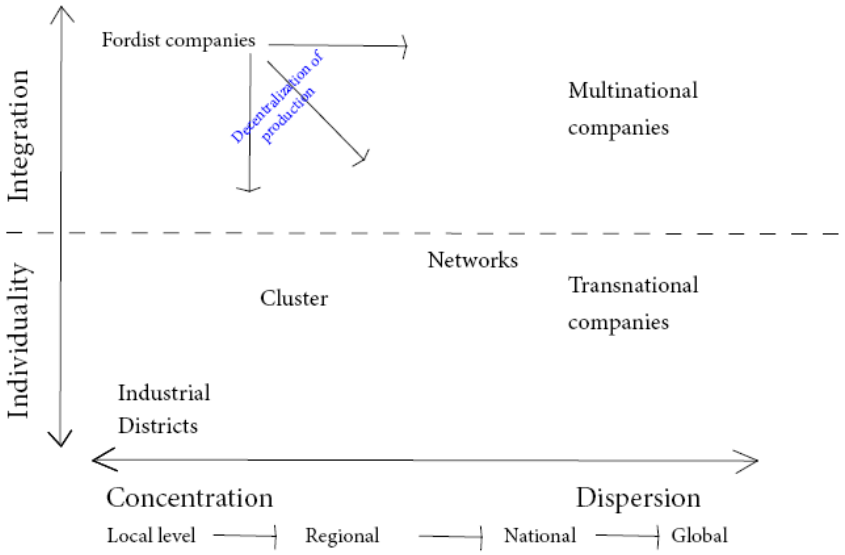


Figure1
Source: Celata F., (2006), "Sistemi di produzione, reti di imprese e cluster"

From the success of the Fordism during the XX sec., different changes in market dynamics, with globalization as one of the principal variable, influenced the way companies managed their business and how they interact with the surrounding environment. Two main variables can synthetize the directions in which firms have to find their *equilibrium*: Concentration vs. Dispersion and Individualism vs. Integration. The first indicator has different degrees of distance, with mechanisms involved to reach flexibility, direct control, trust and coordination mechanisms. In case of Individualism vs.

Integration, there are some constant variables present also in the first indicator, but with the main issue about verticalization vs. horizontal specialisation.

In case of high dispersion degree, two main forms can be distinguished: multinational and transnational enterprises. In the first case, there is one central unit that coordinate all other integrated companies distributed in the world, maintaining its central role on strategic decisions and leaving to business sub-units the role to implement them. In case of transnational enterprises, there is a mix of coordination between different units in the world that play a vital role with the final objective to keep each one of them as independent as possible.

Networks, instead, transform ties that are usually present between units of the same multinational company into relationships among individual firms. Clusters and districts are forms of network with relationships even more intensified and they are characterised by firms placed in the same local area. Networks and cluster are responding to market changes in the post-fordism era, in which specialisation of work became fundamental, giving a new scenario of more firms of small-medium dimension focused on few and specific processes.
Moreover, new technologies and an international perspective made possible (for some theories it is also suggested) to build networks with companies that were already operating on different areas.

Networks, therefore, can lead to many benefits. On a theoretical point of view, many authors underlined the advantages taken by these types of collaborations during the last decades. Anyway, there were different theories on the variables that were determinant to increase the overall network system; but the majority of the literature continuously stressed the point that different kinds of networks structure lead to great benefits. The *first chapter* analyses the theories that support system, the expected advantages and different ways to adopt it.

Networks' diffusion made the scenario complex: the lack of any rule for firms to coordinate these collaborations left them to personalise the agreement as they want, but also without any guideline to help them to organise their structure. The establishment of a contract to regulate different kind of co-operations had a double objective.

The first was to permit firms to specialise on specific functions and processes. The result was to foster the creation of networks as aggregators of diverse specializations that all together can obtain a product of higher quality and more efficient in terms of costs.
As second, firms can develop new products combining complementary resources and knowledge thanks to their different experiences.

For these reasons, network contracts represent an important innovation for European and Italian markets, which was the first country to adopt a contract regulating this type of co-operations. The introduction of this legislation in 2009 determined the establishment of a completely new structural form able to coordinate firms that belong to different geographical areas and business sectors. The contract, as will be analysed, is still showing some issues that need to be adjusted; anyway, its formation was important in order to regulate its increasing adoption, and, for this reason, it merits a deep analysis to create future guidelines for firms.
In the *second chapter* of the thesis it is analysed the legislation that creates network contracts, which are regulating nowadays all network's forms of collaborations.

The main targets of the legislation are small-medium firms and mostly the PMIs (small and medium firms in the Italian scenario). Their importance is so evident for the legislator during the creation of contracts that they are explicitly cited and some acts are targeting these firms that are numerous in Italy. Networks represent a great opportunity for PMIs to react after the crisis of 2007; this form of companies suffered after that period to innovate and participate on public contracts. Those difficulties made evident the need for those firms to collect their resources, exploiting knowledge and information of other PMIs. Moreover, the internationalisation phenomenon made even more difficult for them to cope with bigger and better furnished competitors.
This trend could suggest the need for complementary skills, new perspectives and the research for innovation. In this case, the contract legislated in 2009 seems to correctly incentivise Italian firms, usually characterised by small dimensions and geographically closed business, to *open their constraints* towards different markets, (disruptive) innovations and more flexible relationships. Indeed, the integration of different skills and capabilities thanks to networks of firms that operate in different sectors, can be seen as one of the main objective of the network contract, when it was created in 2009.
As this analysis will show, the two main purposes by which network contracts try to

stimulate Italian firms are a greater degree of innovation and to increase their relevance in international markets. The way these contracts were ideated is to foster these two points and to formalise those agreements, reducing the uncertainty given by relationships management.

In the *third chapter*, I will examine the cases of network failure. Given the complex scenario, market uncertainties and its dynamisms, it is suggested that there are many cases and issues to consider when a network is built. If they are underestimated by firms, networks could represent an anchor for members, leading to failures or underperformances. Indeed, there are no evident research which can demonstrate the superiority of networks forms respect to other forms of governance.

Moreover, there is also a small part of the literature which criticises certain forms of networks and the lack of guidelines that could help companies to create forms of collaboration that could lead to improve performances in the overall system. These authors considered the *dark side of networks*: there are many issues that a firm has to consider in order to improve its business through these systems. Indeed, nowadays it is still missing an empirical demonstration on a quantitative point of view that network contracts could lead to concrete benefits, improving the performances of the firms that are participating to the system. Therefore, there is a space for future analysis, and this research will try to cope also with these issues: it aims to individuate those variables that determine a successful or negative network's performance.

During the analysis, I considered firms participating to networks from 2010 to 2013. In terms of revenues from sales, only the 55% of firms being part of a networks had trend of growth greater than a referral benchmark (the sector growth of firms operating in the Italian market for the same period).

Variation of revenues from sales in periods 2008-2011 and 2011-2013

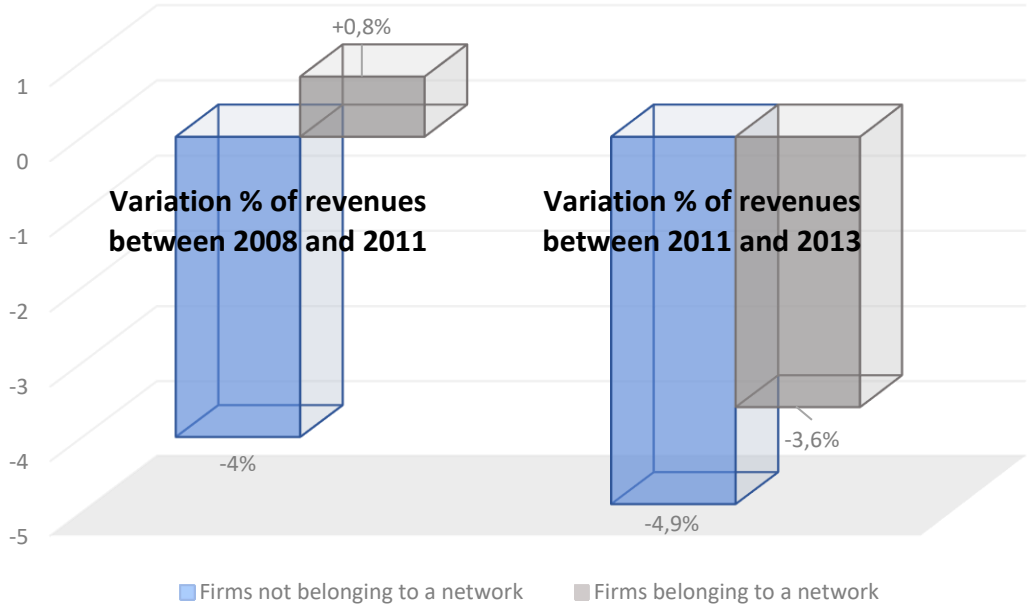


Figure 2
Source: Intesa Sanpaolo-Mediocratico from ISID data

The Intesa Sanpaolo's data elaboration compared in 2014 the difference on revenues between firms belonging to networks and those which are not part of it. In the first three years there is a loss of the 4% by those companies not part of a network, while for those companies which are part of a system had a +0,8% on their revenues. Even though the difference is huge, in those years the contract was still in the creation phase and there were few firms adopting it.

On the other hand, the second category represents the variation on revenues in the period between 2011 and 2013. This period can be considered much more significant than the previous one, where firms were already building many networks in Italy and they were exploiting the contract legislation. As a result, we can observe that the difference between firms belonging to a network and those which are not is very small and the difference cannot be considered significant. Both of them had a loss on variation of revenues; even though, companies into networks had a slightly better performance, the difference is not significant to determine that these new types of collaboration are delivering real benefits for firms. Indeed, the lack of empirical data that confirm the benefits of networks motivated my work on discovering when a network could turn into a disadvantage and which are the variables that could determine a network's failure. For many reasons that will be listed, systems of firms could represent a unique resource for

members to grow and develop; anyway, this system could take many structures and to possess many different ways to manage relationships inside it, therefore it is fundamental to discover which are the variable that have an influence on networks' structural, contractual, relational decisions.

The data collected and showed before suggests that there are spaces to continue the research. In the third chapter, after a presentation of the main area of analysis to understand dynamics that lead to network failures, those variables that will be analysed deeply through a statistical regression are presented.

The dataset which is the base for the quantitative analysis of my research was given by Info Camere and it studied all the firms participating to a network in Italy, classifying them according to many indicators. The dataset was previously elaborated and integrated by the Doctor Balzarin L. with financial variables at the firm level taken from the AIDA dataset. The result was a rich dataset with data about network's structural factors, the objectives stated and the members which were composing them; but also, information at individual level for each firm deepening the knowledge of each component in order to study how much is relevant the network's influence on their performances. In the *fourth chapter* the dataset is presented through some descriptive statistics. Afterwards, it reports all the processes of data elaboration made in order to obtain the final dataset, ready for the regression analysis. Among the variables I have chosen, there were four of them which are dependent variables (Revenues from sales, ROE, ROA, ROS). They represent the determinant for the good or bad influence of networks on firms. Part of the data analysis therefore was to construct a benchmark to understand if those indicators could be interpreted as positive or negative at the individual firm level. The benchmark was calculated in order to compare performances of firms with a referral trend of companies operating in Italy in the same sector.

On a financial point view the analysis showed that there is a consistent probability for network failure in the Italian market. The failure was determined in base of a comparison between individual firms performance after network's entry and a referral benchmark.

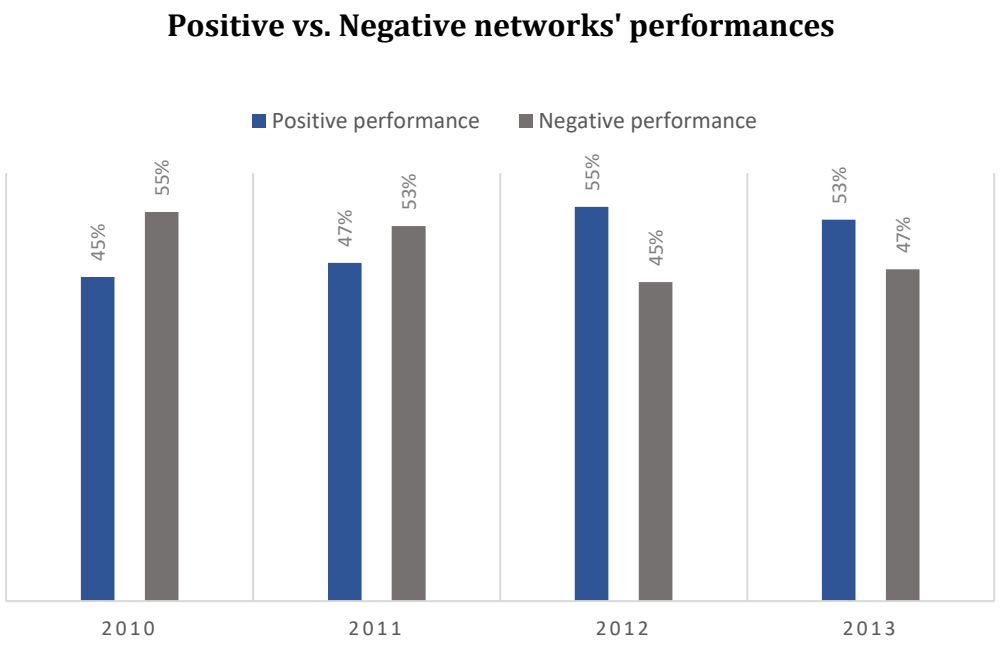


Figure3 - Own elaboration
Source: Info Camere network contracts' dataset, 2016

The graph shows the slight difference between positive and negative performance on a financial point view (the dependent variable in this case is the revenue from sales). It appears that the trend is increasingly positive for companies; but it remains evident that there is a necessity to guide firms to build system that can really exploit their resources and knowledge.

This complex scenario is well represented by the dataset that present a great variety of network forms and contractual decisions to conduct these collaborations. As a result, lack of evidences in past theoretical works on which variables play an important and positive role for networks gave no determined structure and relationship management of networks. The research will try to state when a network could be considered successful or there is a case of network failure. Moreover, through the analysis I will propose and test some variables that are considered fundamental to determine if a system of firms is successful or not.

This side of the study about network performance is focusing on a financial point of view because I evaluated fundamental as a first approach on this dataset. Indeed, financial objectives could represent the most fundamental goals in a profit-oriented company; moreover, they can help to understand which are those variables that are influencing

their measures. Anyway, this research leaves important space for future analysis on other dependent variables, as those elements that regulate ties and relationships, and informal variables which are fundamental for day by day communication and to reinforce trustworthiness.

In the *fifth chapter*, is presented the regression analysis with a description of the referral benchmarks, which are the elements included in the intercept, but also the variables that are composing the regression analysis. In case of benchmark studies, it is presented the referral market and the main objective from which all the other results will be compared. The analysis used the logit type regression, and it was based on dummy variables. Therefore, in order to avoid multicollinearity issues some variables have been excluded from the model. The second part of the chapter shows statistical results and it comments the regression outcome, trying to interpret data.

In the *sixth chapter*, it is reported a second step analysis that shows a second model with both dependent and independent variables that are interpreted in a different way. The results are interesting compared with the previous ones, presenting important differences on variables' relevance between the two models.

Finally, in the *seventh chapter*, I conclude the thesis reporting most relevant results and interpreting this analysis in order to foster new spaces of research.

Chapter 1

Networks evolution and historical background

1.1 Network's characterizing elements

1.1.1 Network's establishment and different types of organization

The network is a set of actors connected by a set of ties that constitutes a binary social relation. Each relation is considered a network, in which actors, or "nodes" can be persons, teams, organizations, concepts, etc. (Borgatti and Foster, 2003). Actors and ties are the principle elements of networks' structure. For these reasons, much of the theoretical wealth of network analysis consists of characterizing network structures, and node positions and relating these to group and node outcomes (Borgatti and Halgin). These relationships are made directly by actors, who are free to create, destroy and manage them in a discretionary way.

This perspective differs from traditional ones in organizational studies that examine individual actors in isolation. The difference is the focus on relations rather than attributes, on structured patterns of interaction rather than isolated individual actors. It is the intersection of relationships that defines an individual's centrality in a group, a group's role in an organization (White, Boorman and Breiger, 1976), or an organization niche in a market (McPherson, 1983). From these concepts, it emerges the fundamental and vital role of relationships and ties in the network structure.

There are three main types of network at first: interpersonal, interunit and interorganizational ones. Even though many dynamics are similar among these three types, it is evident as time, costs and resources' mechanisms can be different. One of the main differential element to consider and evaluate, according to the type analysed, is the cultural atmosphere: the "longer" are the ties, the more difficult it is to integrate

different thoughts and ways to conduct business. The three level of analysis possess different main elements that characterise them, in which one of the most important is a structural element of networks: the actors. In interpersonal networks, people are actors, and similarity is thought to ease communication, increase the predictability of behaviour, and foster trust and reciprocity. The main indicators which can affect this network level are personality, proximity and organizational structure, and environmental factors. The second level analyses interunit networks, in which units are nodes interacting formally or informally one with each other. The elements that can input this type of relationships are interpersonal ties, functional ties, organizational processes and control mechanisms. Finally, the last level is represented by interorganizational networks, as long-term cooperative relationships established between different organizational actors. The formation of this complex structure has usually different reasons and variables. Galaskiewicz (1985) cited four main motives behind organizational cooperation: acquire resources, reduce uncertainty, enhance legitimacy, and attain collective goals. Then, the other elements that facilitate and stimulate this kind of network are learning, trust, norms and monitoring, equity, and context (Brass et al., 2004).

This thesis will deepen the interorganisational network; but, it is important to clear that the other two types of structure can be inspirational, and they will be considered in order to conduct the principal analysis. Particularly, the failure topic of networks requires to analyse not only the main macro variable that could lead a network to fail, but to consider also the micro dynamics that could change and alter the former agreements among companies. According to this concept, a part of the analysis will consider the micro foundations principle. This line highlights the need to consider aspects related to actions of individuals and their interactions as independent variables underlying firm performance (Guerras-Martin, Madhok, Montoro-Sanchez, 2014).

1.1.2 Benefits and networks' core ideas

A network can be defined as any collection of actors (N>2) that pursue repeated, enduring exchange relations with one another and, at the same time, lack a legitimate organizational authority to arbitrate and resolve disputes that may arise during the

exchange (Podolny and Page, 1998). Therefore, the transmission of know-how and information, and the way these exchanges are administered are central for network's formation. Linked to this concept, the network's embeddedness depends on the intensity of collaboration among actors inside it. Indeed, actors are embedded within a network to the extent that they show a preference for transacting with network members or to the extent that social ties are forged, renewed, and extended through the community, rather than through actors outside the community (Granovetter, 1985). The ties' typology that determines the type of networks' structures, shapes also how the actors communicate. These elements influence the main advantages to create interfirm collaborations.

Learning is one of the greatest networks' advantages and reasons to have this type of collaborations. Indeed, the transmission of information is the main source of competitive advantage that firms can receive in uncertain and dynamic contexts, characterized by rapid changes. In this way, ties are as conduits of knowledge, promoting ideas and innovation in a faster way rather than companies alone.

Legitimation and status indicates that if a partner in a network possesses considerable legitimacy, then the actor may derive legitimacy through the affiliation. Partners' legitimacy, indeed, increase the status of other firms which are collaborating in it and the overall network's reputation. Conversely, if one of the partner has a bad reputation or a core business value that is very different, it can damage the overall network perception towards to other firms and potential clients. For this reason, the choice of right partners is a key dimension among the antecedents of inter-firms organizations' creation.

Network form of organization provide also three main economic benefits. At first, it lowers transaction costs thanks to both contractual provision and trust-based relationships. Some scholars argue that an important economic benefit is the increase quality of communication among actors. At last, adaptability to changes in the environment is facilitated by a greater coordination and dynamism given by the network's nature. In addition, following Selznick's (1949) initial insights regarding organizational co-optation, scholars posit that this type of organization can alleviate sources of external constraints or uncertainty by strengthening their relationship with the particular sources of dependence. Moreover, Perrow (1993) identifies a number of social welfare benefits with what he refers to as small firm networks. According to him,

small firm networks provide individuals with greater autonomy, lead to less inequality in the distribution to wealth, and foster a greater sense of community.

Networks foster also innovation and have a great impact on innovative capabilities of actors. The channel function of inter-organization's ties are fast conduits of information. The Granovetter's strength of weak ties and the Burt's structural holes theories that will be analysed later are supporting the concept that networks are pools for innovation thanks to their relationships; wider the number of them and the more they are diversified, greater is the chance to create novel ideas. Finally, in terms of overall network advantages, companies can individuate new partners' innovations and skills, adopting them. This type of imitation can increase rapidly the overall network's performance and, consequently, its overall competitiveness in the market. In case of geographic proximity, it is clear how this strategy leads some countries to have great competitive advantages, increasing the potential gap with other states.

1.1.3 Structural Definition

The structure of a network should be positioned between two extreme forms of organisation as market and authority. This point underlines the different role of relationships in a networks respect to others; they are repeated, enduring and, at the same time, lack a legitimate organizational authority to arbitrate and resolve disputes that may arise during the exchange (Podolny and Page, 1998). Anyway, the network has not to be considered as a hybrid form of markets or hierarchies, rather a form of organization that represents a unique alternative possessing its own logic (Powell, 1990). It can be distinguished from firms for the allocation of property rights and not on the basis of the other coordination mechanisms employed, that can be found both in inter-firm and in intra-firm governance structures. On the other hand, networks can be distinguished on the type of coordination mechanisms employed. While a real market can be coordinated through varying mixes of mechanisms, networks have contracts regulating both the terms of exchange and the governance structure of ongoing relationships among specific partners (Grandori, 1997). Indeed, networks possess distinct features and competitive advantages respect to markets and hierarchies, as the relationships built, from which it is evident the different degree of their time-horizon

and complexity respect to other forms of organisation. From them, a wide range of organizational forms can usually rise, as joint ventures, strategic alliances, franchises, outsourcing agreements etc., which build ties with different degrees of exchanges' intensity among actors.

Accordingly, the tie can be managed and controlled with different levels of regulations and rules. Trust and moral community can play a fundamental role in the agreements, and these elements are distinctive of a network's organisation. Even though interorganisational form require more rules which manage ties among different companies, values as ethics and reciprocity are fundamental for the wellbeing and future of these collaborations. Powell (1990) argues that a norm of reciprocity represents a guiding principle underlying network forms of organization. Each member of the network feels a sense of obligation to the other party or parties rather than a desire to take advantage of any trust that may have been established. In his analysis of business groups, Granovetter (1995) also points to a high level of trust and obligation among members of the group. He argues that a distinctive feature of such groups is that they constitute a moral community insofar as trustworthy behaviour can be expected, normative standards understood, and opportunism foregone. Finally, in a treatise on what he calls small firm networks, Perrow (1993) identifies trust as a critical element of small firm production networks.

As anticipated before, studying elements of interunit or interpersonal networks can help to identify core elements that maintain their importance even in inter-organisations' agreements. Indeed, dynamics as reciprocated relationships and transitive triplets (Krackhardt and Kilduff) are the basis for balanced relationships. The study that started from an interpersonal type of network can be exported to interorganisational networks, representing a constitutive element of their structure. According to Heider's (1958) explanation a good friendship relationship is established when relation is symmetric and transitive. Then, the tie between two actors can be considered balanced; this approach potentially guarantee a longer and more peaceful relationship, keeping the network to last.

Relationships are the core element of networks' management. Accordingly, the way these ties are related among actors and how their dynamics regulate the agreements. There are four main coordination alternatives to manage an organization when

authority fails, suggested by Grandori (1997): agency relations, peer group, negotiation, and institutionalization of norms and rules. Agency relations refer to networks characterized by many actors and their behaviours is unobservable. Moreover, their actions cannot be totally controlled, so competences and information are not centralized. Agents receive in their hand control rights and can directly take decisions, even though a common direction has to be clearly defined before. Peer group is a mechanism in which control is decentralized, as in authority and agency relations case. In this case, group is a governance system in which all the basic rights are equally shared among members. It is effective when know-how is not easily transferrable and when the group is not too large. Negotiation is a mechanism used when uncertainty and complexity are high. Moreover, it can be combined with the other coordination alternatives, avoiding conflicting interests thanks to clear rules and procedures. Institutionalization of norms and rules is the most structured coordination method to guarantee flow of information and collaboration. The network model created is stable and highly formalized, requiring higher complexity and costs in decision-making.

Finally, given any way to manage the relationships, all the types of networks have to two coordination properties to maintain (Grandori and Soda, 1995):

1. An inter-firm network is a mode of regulating interdependence between firms which is different from the aggregation of these units within a single firm and from coordination through market signals (prices, strategic moves, tacit collusion, etc.) and which is based on cooperative game with partner-specific communication.

2. The attributes of a network – i.e. the coordination processes and structures an inter-firm coalition may employ – are not necessarily "intermediate" with respect to those of firms and markets, but they need not be unique because they have different mixes and intensities both in firms and in markets.

1.1.4 The creation process

Relationships are what makes an inter-organisational network different from a group of companies. Ties are the main distinctive elements which characterise a network and they differentiate it from a common aggregation synergies. Anyway, even without this

organisational structure many firms build and construct agreements with other entities. Indeed, negotiation and institutionalisation of norms and rules which represent the base of each type of relationship could be present even without the existence of a network structure.

The unique element that belong only to network forms is the allocation of property rights. In order to establish a network among companies/actors, different elements are necessary in order to guarantee its formation. Usually inter-firm collaborations are needed when coordination costs are increasing. Indeed, asset specificity, context uncertainty, frequency of transactions, measurability of performance and the difficulties in detecting and controlling it, and risk aversion are predictors of network's formation because of market failure. Price system and "capitalist laissez-faire" characterise market system with no external entities' intromission, in which companies alone and inter-companies' competition are not sufficient to cooperate with these variables. Moreover, also an hierarchy system, characterised by centralization and authority based decisions, cannot be appropriate in uncertain and uncontrollable contexts.

Firms build networks when there are elements that facilitate their formation. Degree of differentiation among units that have to be coordinated is one of the major sources of coordination costs. This element causes difficulties to control resources and to create agreements; for these reasons, hierarchy with centralized way of decisions seems inadequate, and a different type of properties and resources' allocation rights are necessary.

Moreover, differentiation creates opportunity for complementarity of knowhow and it fosters innovation, which can combine properly different sources of capabilities. The second variable is the intensity of inter-firm interdependence. High intensity can arise from the elements analysed before that predict the formation of network organisations. As a consequence, this variable determines the strength of ties among actors and the mutual interest of both parties. High interdependence, usually, indicates higher probability to be trustworthy and to not behave in an opportunistic way.
Another element is represented by the number of units to be coordinated. The higher the number of sub-units, the more it is difficult to coordinate them through hierarchies (Williamson, 1970); but, with networks, firms can expand their activities beyond those limits (Vaccà, 1986). Finally, flexibility is one of the most important property for

networks' formation. It is a requirement to change the production process and company's output according to market's changing conditions. Therefore, flexibility is both an antecedent for networks' formation and a requirement during the life of an inter-organizational agreement.

Grandori and Soda (1995) identified ten basic coordination mechanisms, which give rise to three discrete network forms with different mix of dynamics employed. Those procedures are good practices in order to establish but also to maintain profitable relationships and to create a network. Therefore, these mechanisms are necessary during lives of inter-firms collaborations; moreover, the weight that companies give to them determines and shape the type of network. Communication, decision and Negotiation mechanisms are the basis for a sustainable, long-term collaboration, in order to exchange information. Then, social coordination and control are necessary for stable relationships based on group norms, reputation and peer control. The third and fourth variables are integration and Linking-pin Roles and units, and common staff. These are fundamental for inter-firm cooperation and to coordinate the main activities. These elements indicate the importance that actors change organisations' arrangements to favour network growth through cooperation. In addition, networks can make use of hierarchical and authoritarian relations between firms. Hierarchical supervision and formal planning can be helpful to coordinate distinctive actors, maintaining parity-based mechanisms, to allocate property rights and responsibilities when high uncertainty and complexity are present in the market. Linked to authority relations, planning and control systems are fundamental for cooperative behaviours, when circumstances are difficult to be observed. In addition, property rights can be important incentive systems to maintain long lasting relationships among companies. Their a priori specification over the results of the collective action can provide a particularly effective mechanism for the "fair division" of benefits. Selection systems states that the selection of partners, based on some good predictors, is one of the core decision when a network is established. Information systems, instead, guarantee horizontal integration, reduced costs of communication, and it makes easier the coordination among actors. Finally, the last element is public support and infrastructure, which can foster and support the formation of hubs, research centres and "parks".

These ten mechanisms are, in a certain mix, facilitating the formation of inter-firm organisations and to increase their cooperation. These elements stem from both firm capabilities and contextual elements that incentivize the networks formation. Therefore, there are variables which are antecedents and, at the same time, requirements to consider in order to maintain a long-term relationship. From this analysis, it emerges that are necessary distinctive elements in all the three main scenario's "characters" in order to create ties among actors: context, actors, ties. While the first two are influenced by the mechanisms described, the established relationship is managed by different variables. There, regulations and trust play a fundamental role, helped by geographical proximity, which depends by the degree of "collaboration's intensity".

From this scenario, mechanisms, antecedents and ties shape the way companies interact and exchange information. All these variables, differently combined, create interfirm networks. In order to compare different types of them, three main inter-firms organizations are individuated and considered. Network forms will be distinguished here along the following dimensions: where they are formalized or not (due to the support of exchange or associational formal contracts); whether they are centralized (there is a central coordinating firm) or parity-based; their characteristic mix of coordination mechanisms.

Social Networks are forms in which actors entertain social relations without formal agreements of any kind. Social influence can be reciprocal, and, therefore, communication is highly decentralized.

Bureaucratic Networks are inter-firm coordination modes that are formalized in exchange or associational contractual agreements. The most important forms of bureaucratic network can be grouped in the classes of symmetric and asymetric coordination structures. One complex form of bureaucratic network is the consortium, widely spread model in Italy. Finally, Proprietary Networks, in which property rights are considered as incentive systems for sustaining cooperation. This mechanism is particularly relevant when uncertainty and opportunism are prevalent. Two examples of this inter-firm organizational form are joint ventures and capital ventures.

1.2 Background theory

Networks became more popular over time, in order to cope with new environmental mechanisms that emerge in the last decades. According to this process, the research agenda grew progressively to understand and analys the new scenario and trend. In organization studies three main broad streams of research emerged. Since the 1980, scholars argue that internal networks contributed to overcome the bureaucratic era. Inspired by the post-bureaucratic/network organization perspective, various scholars pointed to seemingly new organizational forms characterized by autonomous connections between decentralized units and empowered individuals that stimulated collaboration, knowledge sharing and learning (Josserand, 2004). The second stream considers resource-based view, then developed into the knowledge-based view, at the centre of the network theoretical foundation. Therefore, inter-organisation structure is built to have a greater access on capabilities and resources. The objective is to gain a competitive advantage through collaborations and complementarity of core competencies. The third stream analyses networks as an intermediary structure between fields and actors. In this perspective, networks can be understood as the structures holding institutional fields together (Meyer and Rowan, 1983), and influencing their evolution (Powell and DiMaggio, 1983). Moreover, these types of organizations showed to diffuse practices among actors, depending on the sociometric position of an actor in the field (Burns and Wholey, 1993) and the proximity between actors (Davis, 1991).

The increase in interests towards networks' studies is due to its efficiency and learning advantages respect to other organizational forms. The research focused on different aspects of organizational networks, divided by Borgatti and Foster (2003) in several emic categories, in which different research areas differ characteristically of which role is dominant. The research streams considered are social capital, embeddedness, network organizations, board interlocks, joint ventures and inter-firm alliances, knowledge management, social cognition, and a catch-all category labelled "group processes". Among these areas, some of them are considered in depth to give a complete view and understanding of the theoretical research that will go with this network analysis.

Social capital concerns the value of connections. It is one of the topic most analysed and reviewed given its broad literature and investigation's opportunities. In management, social capital promises to bring together a variety of research relating a person's ties or network position to significant outcomes such as power (Brass, 1984; Brass & Burkhardt, 1993; Kilduff and Krackhardt, 1994), leadership (Brass & Krackhardt, 1999;

Pastor, Meindl and Mayo, 2002; Sparrowe and Liden, 1997), mobility (Boxman, De Graaf & Flap, 1991; Burt, 1997; Seibert, Kraimer and Liden, 2001; Seidel, Polzer and Stewart, 2000), employment (Fernandez, Castilla and Moore, 2000; Krackhardt and Porter, 1985, 1986), individual performance (Baldwin and Bedell, 1997; Mehra, Kilduff and Brass, 2001; Sparrowe, Liden, Wayne and Kraimer, 2001), individual creativity (Burt, 2003; Perry-Smith and Shalley, 2003), entrepreneurship (Baron and Markman, 2003; Renzulli, Aldrich & Moody, 2000; Shane and Stuart, 2002), and team performance (Hansen, 1999; Tsai, 2001).

Inside this broad research area two network theories are worth to be explained in order to proceed in the analysis. The first one is the Granovetter's (1973) strength of weak ties (SWT) theory, which is composed on a set of explicit premises and conclusions. The first premise is a kind of transitivity, which states that the stronger the tie between two people, the more likely their social worlds will overlap; so, the more likely they will have ties with the same third parties. This phenomenon is due to the homophilous human tendency, in which people tend to have stronger ties with whom is more similar to them. The second premise is that bridging ties, which links a person to someone who is not connected to his or her other friends, are a potential source of novel ideas. Given these two premises Granovetter stated that novel and innovative information cannot be gained from actors, with whom people have created strong ties. Therefore, the conclusions obtained according the SWT theory is that actors who establish weak ties among them have greater opportunities to transmit novel ideas; in addition, in a group level, communities with many strong ties have pockets of strong local cohesion but weak global cohesion, whereas communities with many weak ties have weak local cohesion but strong global cohesion.

The second theory is the Burt's (1992) structural holes theory (SHT) of social capital. Burt argued that if two people have the same number of ties but one of them has a greater number of different pools of knowledge, it is more likely that this actor receive

non-redundant and novel information. Therefore, this actor has the advantage to diversify the relationships with actors, who belong to diverse pools, increasing its opportunity to perform better. Burt in this way is suggesting to choose in a strategic and "diversified" way the partners in order to obtain a wide range of skills, capabilities and opportunities to innovate.

These two theories are strictly related for suggesting a global way to create collaborations. They both underline the importance of two strategic choice in networks building: position and structure. These two key elements reveal the main function of networks, which is the flow of information. The movement of knowledge is influenced by the two choices emerged from Burt and Granovetter, structure and position, which can facilitate or make more difficult their flow. Indeed, information take more time to move from one actor to another in a longer path. Density of structure node, as well, can shape the flow of information and it can be perceived in a different way among actors. Therefore, these elements shape the way actors behave, communicate and collaborate. The analysis of networks in the following chapters will consider these variables in order to verify if the SWT and SHT theories are "respected", and the way action and information among actors are flowed and coordinated.

1.3 Legitimacy Building

One of the most interesting aspect of the networks is its concern on both economic and social studies. This aspect gives the opportunity to understand economic and intra-companies' dynamics through a different lens. During the last decades, many economic models were pushed to their limits to understand the market's behaviour; anyway, certain economic phenomena can be better analysed through social analysis. Therefore, network theories create the opportunity to bridge market transaction with human decisions that animate the economic reality. For these reasons, studying the network dynamics can be helpful to understand better and deeper why certain processes or relationships are going to happen.

During the life process of this inter-organizational form, actors build the legitimacy of the network, which influences the reputation perceived by external communities. Indeed, there are three conceptually distinct dimensions of legitimacy: the network as

form, the network as entity, and the network as interaction. Legitimacy, or credibility, is as essential for establishing the fledgling networks, for attracting resources and opportunities, and for understanding network successes and crises (Human and Provan, 2000). Therefore, it can be considered as both a network's benefit and a mechanism that is built along the processes of inter-firm relationships' formation. Institutional theorists argue that legitimacy building is the driving force behind decisions on organizational strategies and structures (Meyer and Rowan, 1977; DiMaggio and Powell, 1983; Zucker, 1987) and that societal acceptance of the organization, and its subsequent survival, depends on its attaining the support of relevant entities in its environment (Baum and Oliver, 1992; Dacin, 1997; Ruef and Scott, 1998). Building the legitimacy of the basic network form must happen early in the evolutionary process and is similar to what Suchman (1995) called the challenge of sector building faced by individual firms in an industry or sector that has minimal external acceptance.

The second dimension of legitimacy focused on the network as entity. The network also had to develop a recognizable identity (Gioia, 1998; Whetten and Godfrey, 1998) that would allow both members and outsiders to perceive the network as a legitimate entity.

The final dimension of legitimacy focused on the network as interaction. Although effective interactions are essential to the development of all types of interorganizational relationships, they are especially critical to multilateral networks. Relationships must be established and sustained, not just with one or two firms but sometimes with 10, 20, or more firms, in which many of them may be competitors (Human and Provan, 2000). The legitimacy building process requires time and it is a long-term objective in networks' establishments. Therefore, even if it represents a fundamental component for good network's performance, legitimacy is difficult to acquire and create. Anyway, companies inside the inter-firm organization have to establish it both for internal growth and external communities. Given the legitimacy's role, network failures could be caused by the lack of this element; and part of the analysis will try to understand and focus whether credibility was built and if it took a decisive role.

Chapter 2

Network contracts

2.1 Network contracts and its historic context

Ties and the way relationships are managed play a fundamental role for firms' coexistence into a network. All these relationships contain a different degree of formality, which depends on members' conducts and trustworthiness.

To regulate a complex scenario rich of different types of collaborations, a regulated network contract was introduced. The network contracts have the role to coordinate a collaboration between two or more firms, granting at the same time individual independence to each part. The expected objective is to help firms to share common projects and research, maintaining the independence of their individual business and increasing their knowledge and competitiveness in the market (http://contrattidirete.registroimprese.it/reti/).

Network contracts were created by the legislative law l. n. 33/2009 with the objective to regulate the intra-firm collaborations, helping them to constitute a stable structure in which information and knowledge could flow in the most efficient way. This contract was ideated because there was a huge necessity to control a trend that was beginning from the '80. Indeed, these types of collaborations among firms increasingly were becoming a new opportunity for the strategic growth of Pmi; not only when it facilitates economies of scale through costs sharing, but also in those collaboration in which there is a share of knowledge and capabilities, and the possession of complementary information. Even though there was already some structured systems of companies that did not need any additive contract, there were a complex set of relationships among different firms with the objective of innovation and to organise distribution processes, but with few control and regulations. Those objectives many times were continually monitored in itinere and, in many cases, these systems where not real networks, because hierarchy in practice was substituting the deficiency on contractual instruments

to coordinate them. Moreover, the scenario was full of collaboration forms along companies in the local production process or on the international perspective. The trend was an increasing specialization on functions, leading firms to specialize only on few components respect to the entire production process. The consequence of this division in this period led firms to change their relationships with partners, but mostly with the supply and distribution chains; the phenomena turned to modify also networks' structure and the way their ties were managed. At the same time, the globalization process had an influence in the entire market, redefining networks and incentivizing the formation of medium–big enterprises able to control and coordinate these systems of firms. These changes exerted a big influence on the way territoriality was perceived and the determinant role of countries and regions could promote new productive systems, helping actual and networks to grow. The innovation led by networks is the lack of any vinculum with the territoriality, as it was with clusters (Iamiceli & Cafaggi, 2009).

These trends made more evident the necessity to create a legislation able to help system of firms to formalise their collaborations, specifying the network's objectives and its main structural issues.

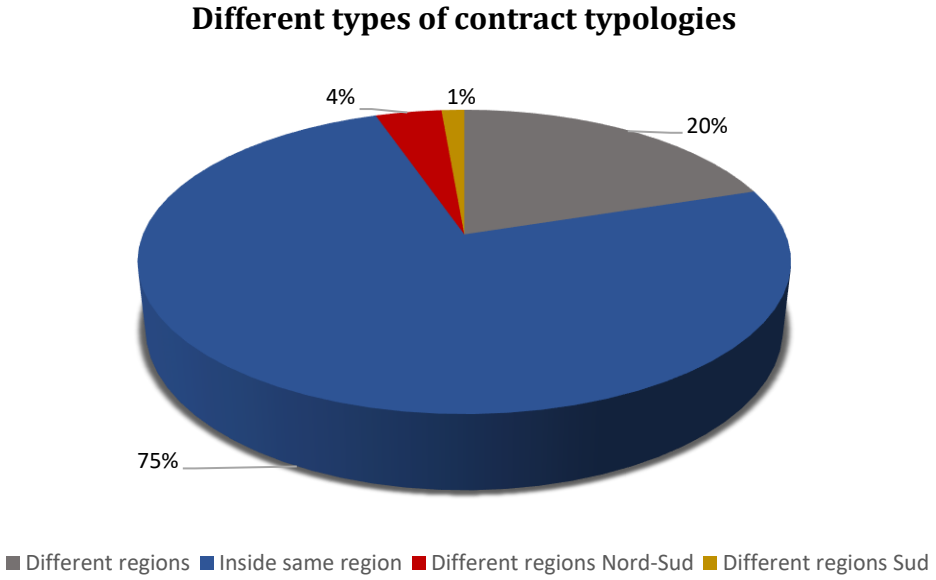


Figure4

Source: Elaboration MISE from Info Camere network's dataset, June 2014

As can been seen from the figure, the Italian scenario in 2014 still present a preference to build networks with firms closed to each other. The reason is represented also by the dimension of firms and their market perspective. Many firms and PMIs do not have an

international perspective; therefore, they need to create network more specialised on intense communication and share of knowledge, product specialisation, and direct control of members behaviours. Anyway, the dynamic trends of market in the last years incentivised firms to create system of companies with complementary skills and knowledge, even when those companies are not operating in the same local area.

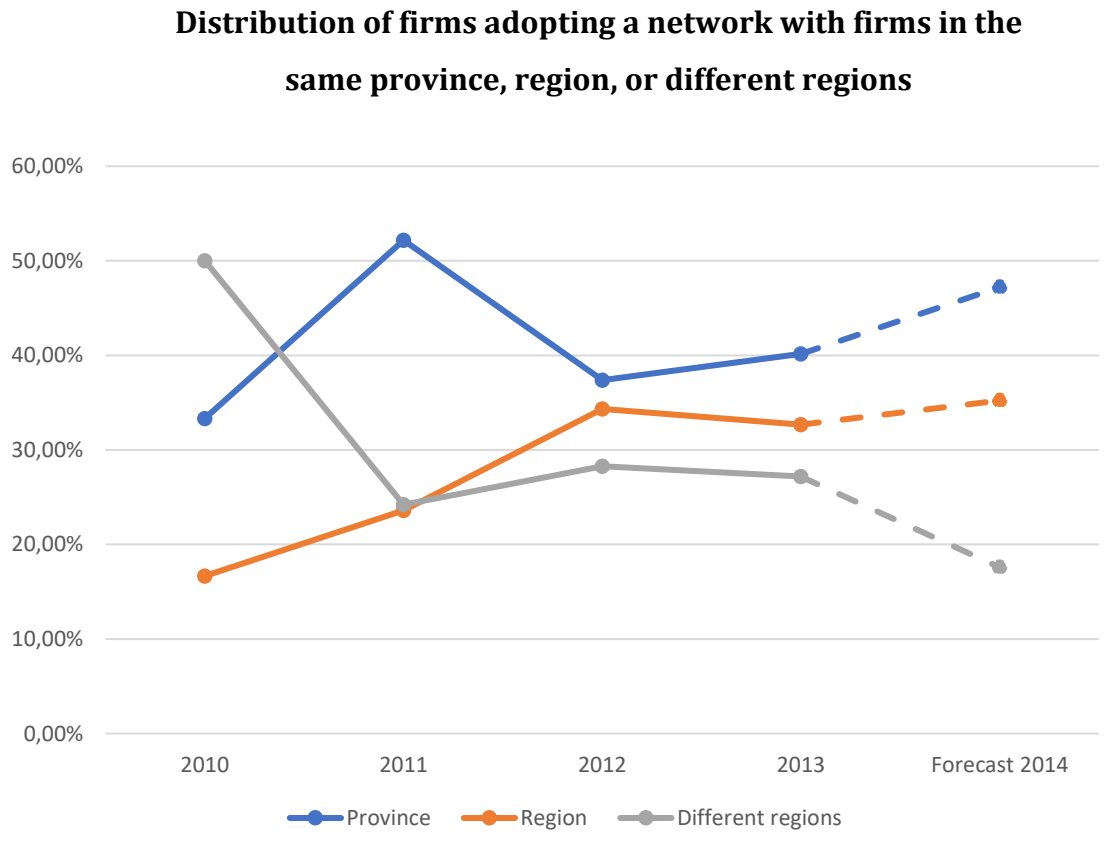


Fig. 5 – Own elaboration.
Source: Info Camere network contracts dataset, 2016

Looking further to this data, in the figure 5 it is evident how networks' geographical locations developed during the first years, when network contracts were issued. In this graph, there is a division per year: in each period, there are only those firms that entered in that specific period. Each line represents a percentage of overall networks created in that year. Given the scenario in 2014 of Fig.4 and the data available until the 2013 by the dataset of Info Camere, it was possible to create a forecast of the following year. The trend given by the forecast in 2014 shows a growth of networks geographically closed; therefore, a tendency by firms to aggregate with partners close to each other, facilitating communication and direct controls. This is a negative result given the general objectives of the legislation to foster aggregation and integration.

The graph is representing the different adoption by firms to networks with all members belonging to the same province; part of the same region but different provinces; or when they were part of different regions. The focus is on first years when network contract was issued and available to use. From 2010 to 2011 it is evident that firms (the 50% of all companies participating in a network) were researching for members all belonging to the same province. Indeed, 460 companies of 949 that entered in the network in 2011, were part of a network with all firms having the registered office in the same province. Afterwards, the trend changed rapidly with companies being equally distributed among networks with members of the same province, region, or part of different regions in the following years. The difference of this trend underlines the important role that network contracts play among Italian companies fostering them to search also for distant collaborators with probably complementary skills.
Anyway, as fig.4 showed, the integration between Nord and Sud companies is still difficult to reach and it needs more time and confidence by firms with these contracts to see an increase of this trend.

This type of contract has to incentivise Italian firms, which are usually of small or medium dimensions, to collaborate and share their information and knowledge in order to be more relevant also towards the international market. In this way, it is expected a firm-level growth of its performances and relevance, but also an overall benefit for collaborators in the same network and for the Italian market itself.

Indeed, networks through the regulation of contracts can aggregate individual firms specialised in a specific function into one main interface that will manage all the different collaborators as *suppliers* of the final service or product. Moreover, the research and development budget is much greater in case of networks' collaborations, which permit more financial resources and knowledge to develop quickly new technologies or processes. Indeed, the potentiality to test an innovation is more rapid and efficient whit co-operations among firms, thanks to a greater use of human resources and more rapid collection of data. This will give back a greater flexibility to innovation and greater capabilities to respond effectively on market changes. In addition, firms can also increase their production capabilities, reaching economies of scale and learning new efficient processes to produce. Towards an international market,

the opportunity to reduce costs in production processes and increasing the number of products could represent a determinant variable.

2.2 Network contract's modalities

In these contracts all the companies with any dimension, juridical forms, belonging to different sectors and that are at least operating in Italy can build a network. The only mandatory rule is that a network exists only when it contains at least two firms, otherwise it does not exist any external relationship.

As said, network contracts were introduced in 2009 to respond to these new firms' necessities; these are the main steps that involved the network contract formation:

- The article 3, co. 4 ter, d.l. n. 5/2009, turned into the legislation 33/2009: it introduced network contracts stating when a system of firms could be considered a network.
- Act n. 78/2010 turned into the Act n. 122/2010: it gave to firms the right to obtain fiscal, managerial and financial advantages; moreover, the opportunity to obtain conventions with ABI.
- Decree MEF, in February 2011: The legislator individuated the requirements for the public offices in charged to evaluate which network could receive financial and fiscal concessions.
- Decree MEF, in Abril 2011: Official start for all the fiscal and financial concessions.
- Act n. 180/2011: the 60% of all the economic incentives have been reserved to MPMI and to network of firms. The 25% of this quote was reserved exclusively for micro and small companies. Moreover, this Act declared the inclusion of networks among the juridical subjects that can participate on public contracts.
- *Fondo di Garanzia* Decree, 26 June 2012: MPMIs that are part of a network have not to pay any commission to get access on the Fund.
- Decree n. 83/2012, turned into the Act n. 134/2012: Network contracts can have juridical subjects if the network is possessing its own fund and a common administrative body.

Before the opportunity to have a separate juridical subject, networks were ideated as systems of firms in which owners of goods, rights, duties were the firms themselves. Even though it could be created a regulatory body representing all members, the responsibilities of juridical effects were directly in charge of each individual company. Therefore, from a fiscal point view, costs and revenues that come from networks' activities are considered and separated for each member inside the system.

On the other side, networks contracts are characterised by a structural freedom. Firms can shape the contract according members' necessities and networks' objectives, with the opportunity to mix different knowledge and experiences. Indeed, the possibility for networks to establish a contract with foreign firms operating in Italy, or with companies which belong to different Italian industrial areas, could represent a great potential to learn very quickly and in a more effective way. Avoiding the limit of geographical closeness could represent a difficulty in terms of coordination, but at the same time networks with a stable structure and a clear contract can benefit these new situations.

Share (%) of networks with firms that belong to different sectors of specialization on a macro or microlevel

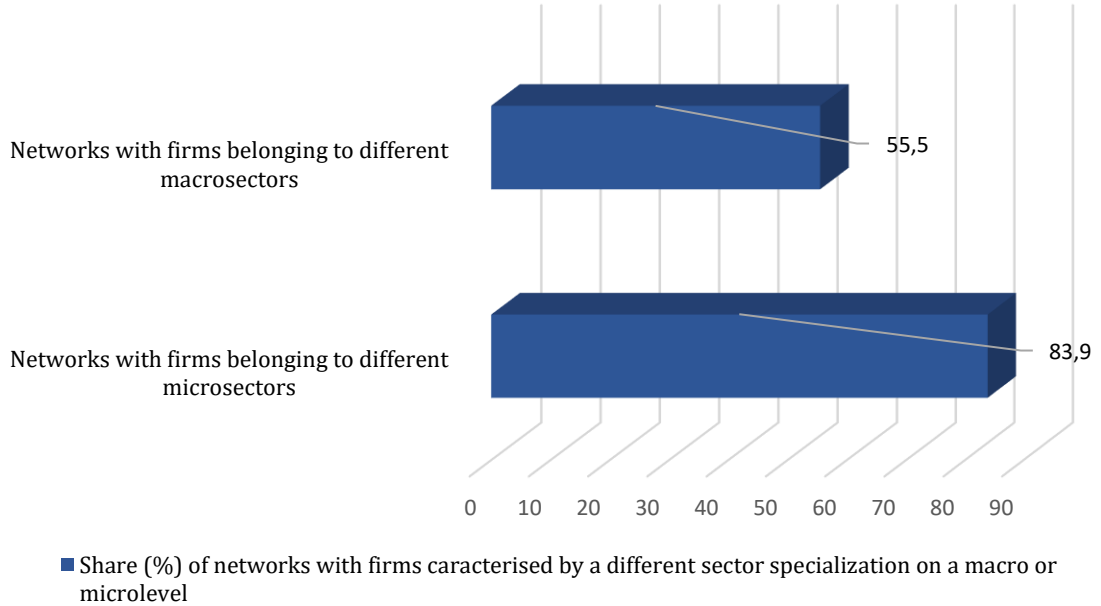


Figure 6
Source: Intesa Sanpaolo-Mediocredito from InfoCamere data – June 2014

One of the advantage presented by the contract is the possibility to mix different sector knowledge in the same network. From the data of June 2014 of Info Camere and elaborated by Intesa Sanpaolo-Mediocredito, the 83,9% of network contracts contain at least two companies that belong to different micro sector; therefore, they belong to the same business but they are specialized towards different products processes. Meanwhile, the 55,5% is represented by networks with at least two firms belonging to different macro sectors. In the first 4 years of network contract establishment, this percentage gives an impressive indication: in few years companies developed quickly systems of firms that were possessing different skills and experiences.

Accordingly, the possibility through these contracts to collaborate with firms belonging to different businesses, classified in the Info Camere's dataset by ATECO codes (2007), is an important resource to innovate. Moreover, the mix of firms in the same network which developed different market strategies accordingly to different sectors could represent the main variable to shape new disruptive innovations. For these reasons, the richness of geographical locations and sectors of business is possible to be coordinated only by a contract.

The regulation made by a contract can also routinize certain processes and to increase the intensity of communication among companies. Consequently, trustworthiness will increase and sharing of information too; for this reason, contract networks are expecting to guarantee a continuous growth for firms inside the network, giving an expected increment of share of knowledge, intensity of reciprocal help and, finally, a greater value of products.

2.2.1 The structure

Each contract has to indicate its members, the objectives of the collaboration and how results will be measured; the role taken by members and how each one of them will cooperate to contribute to reach the objectives; rules about the way decisions are made and managed. Given these requirements, there are other facultative elements that firms are not forced to express in the contract: the creation of a common body, an entity controlling that all members are respecting the contracts; a common fund with information about name of the network, its legal entity, the investments that each member has to make in order to create and keep alive this third entity; when this

contract can be receded before its time of duration; and how to make common decisions in the network.

Moreover, the contract has always to express a time horizon. These elements are important in order to fix real objectives with concrete deadlines and results. For these reasons, it is fundamental in a contract to state the objectives clearly but also the way they will be measured with the expectation to create goal-oriented networks.

The other important element is represented by the third regulatory body that has the role to coordinate and guarantee the well-conduction of the network's contract and its members. In case of its creation, there are five main elements that have to be stated: company name, business name, companies they are working with, name of the people are composing the regulatory body; duration of their contract in the regulatory body; the way decisions are taken, i.e. simple majority, qualified majority, or unanimity; which roles of coordination and management the regulatory body has towards network's members; rules to govern, recede or substitute the people composing this common body.

From the legislation, different types of networks on a fiscal and accounting point of views can be extracted. First of all, it could be distinguished "lightweight networks" and "heavy networks" for the availability of a common fund and for network's financial needs.
Lightweight networks do not need a common fund, independently of their adoption to a third regulatory body. All the accounting activities related to the network are made only for the control and the management of common projects, diffusing to members information and results of their overall performance.
Heavy network is a system of firms without any juridical subject, but with a fund common for all members inside it. This fund has the scope to pursue overall network's objectives; anyway, all goods and financial resources put in common are still properties of members, which will create this fund through a "destination vinculum".

Networks with special regimes have an autonomous fund without a juridical subject. This autonomy is given by the creation of a third entity common for all members which have the role to regulate and control this fund. This special form of networks was created in order to satisfy a double condition that apparently seemed not possible to

coincide. With this type of networks firms are receiving a fiscal tax breaks because of their form without juridical subject; but at the same time, creating a third regulatory body, firms are partially protecting themselves thanks to limited responsibility. Therefore, external companies that are working with these networks can exert their rights only to the common fund, without any possibility to have financial rights on individual members.

Networks with juridical subject were legislated initially by the art.3 comma 4-quarter of the DL n. 5/2009 turned into the L. n 33/2009; then it was modified by the L. n. 134/2012 and the L. n. 221/2012 that understated the necessity for these types of networks to have a common fund and third regulatory body common for all members. This form represents the most independent type of network, in which there is the creation of an entity representing all firms inside it and it detached from fiscal activities of individual companies.
This form could be divided into networks with juridical subjects and networks with juridical subjects with a special regime. The second form has the same properties of the first case but with a limited responsibility as the network of special regime described before.
To resume all these forms, networks are specifically separated into different sub-types from a fiscal point of view, on the way a system of firms manages a third regulatory body, a common fund, and the responsibilities it has in front of its individual members.

Contract main components	Lightweight Network contract	Heavy Network contract	Lightweight Network contract	Network contract with Juridical subject	Network contract with Juridical subject (special regime)
Common Fund	No	Yes	Yes	Yes	Yes
Juridical personality	No	No	No	No	No
Juridical Subject	No	No	No	Yes	Yes
Tributary subject	No	No	No	Yes	Yes
Networks' Fiscal Code	Yes	Yes	Yes	Yes	Yes
IVA	No	No	No	Yes	Yes
Fiscal tax break	No	Yes	Yes	No	No

Accounting duties	No	No	No	Yes, if there is a commercial activity	Yes
Reporting of economic situation	No	No	Yes	No	Yes

Table 1

The legislation had worked a lot from 2009 to 2012 to create a clear separation between different networks by the way they have accounting duties. The main objectives of the legislator were to clarify their responsibilities on reporting financial activities of networks and how members could reach fiscal tax break.

On an economic and organizational point of view, it does not exist such a separation of networks' structure and the ways relationships are managed. Indeed, these sub-types are not indicative to help managers on building the most correct system of firms to reach their objectives on a structural point of view. Indeed, even though the legislation divided very precisely the opportunities to adhere on a common fund and a third entity, giving to firms the opportunity to personalise the way they will conduct networks' business, there are no classification available on the organisation of day by day communication and project development. Moreover, firms have to state the way they will measure performances of networks' objectives, but there are no determined formed or mandatory rules other than accounting responsibilities, which are common to other organizational forms.

2.2.2 Functionalities and expected advantages

The network contract was built to take these actions:

- Coordinate the amount of investments: the contract has the objective to regulate a common fund used for specific network objectives. Stating a common fund permits to firms to know the amount of investments that each member has to contribute and it guarantees an equal effort.
- Take decisions: Coordinating decisions is one of the most complex issues that necessitates control, and regulations. The rules that regulate the ways decisions are taken are: simple majority, qualified majority, and unanimity on all or some key decisions.

- Modality: Network contracts have the role to help members to state a common objective and to measure it through time. Moreover, it states legal duties that each member has to respect to other participants.
- A common regulatory body: The possibility to create a third entity or regulatory body can facilitate the daily management of all the common activities among networks' members.
- Time, adhesion and recess: The contract regulates how much the collaboration lasts, the way members adhere to the network and how a firm can recede from the contract.

As described, the network contract has multiple functionalities with the main objective to overcome to all the potential difficulties on communication. Moreover, the synergy that network contract helps to coordinate take also many other advantages listed by the *Registro Imprese* of Italy:

- Increasing relevance and dimensions in order to be more competitive in the Italian and foreign markets.
- Increase horizontal and vertical differentiation.
- Share costs.
- Get access to public financial resources.
- Fiscal tax break.
- Being competitive for races on public contracts.
- Maintaining a clear separation between individual member's business and networks' duties.

It appears also evident the first orientation on network contracts towards external dimension and market competitiveness. This type of contract was built for network with the objective *to be stronger working together on common projects* from a fiscal point of view and exerting a greater influence on the market. To these objectives listed by Registro Imprese, there are also others oriented on a long-term point of view, and on marketing and research.

An investigation made by Intesa-Sanpaolo (2013) on network contracts discovered that half of the companies is researching production efficiency, to reinforce promotion and distribution channels, and improve their business through research and innovation from

network contracts. Afterwards, the other most diffused objectives are: creating a common brand (31,9%), to implement projects on environmental sustainability (21,4%), to increase production volumes in foreign markets (3,9%), and in Italy (2,8%). For the majority of these companies it is possible to reach those objectives exploiting share of knowledge and limiting financial investments for the network. Finally, the 50% of firms is expecting to have financial returns in terms of profitability entering in a network.

2.2.3 The juridical subject

The network contract is still a pure agreement among firms to create a network, in which their participations do not lead to modify the tributary subject of individual firms. Instead, the network contract with juridical subject acquired relevance also from a tributary point of view.

A juridical subject is an opportunity that each group of firms through a network contract can exploit. The result is a third entity regulating the cooperation among members, which has to be considered separated from all the other members of a network. Indeed, it could fail as a company, it has responsibility towards other external entities (ex d.lgs. 231/2001), and it is a tributary subject (Agenzia delle Entrate n. 20/E, 18th of June, 2013).

As said, to define a juridical subject, firms participating to the network contract have to create a common fund; establish a unit responsible to represent the entire network; request a different IVA number only for this entity; to carry out tributary and accounting duties, and rules. The difference between juridical subject and simple forms of network contracts is that both companies and regulatory body have to be enrolled in the *Registro Imprese* in case of contract with juridical subject.

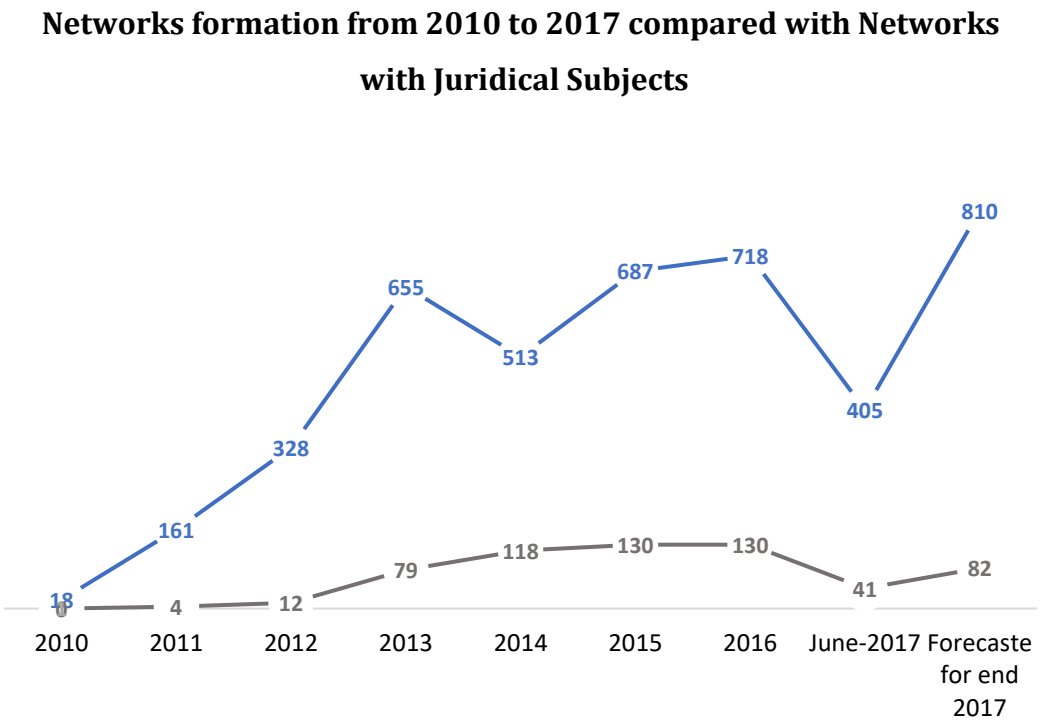


Fig.7 – Own elaboration.

Source: Info Camere network's dataset, 2017

Juridical subject is still a small part of the overall sample of networks. This form is still not widespread and during the years it follows the overall trend of networks' adoption.

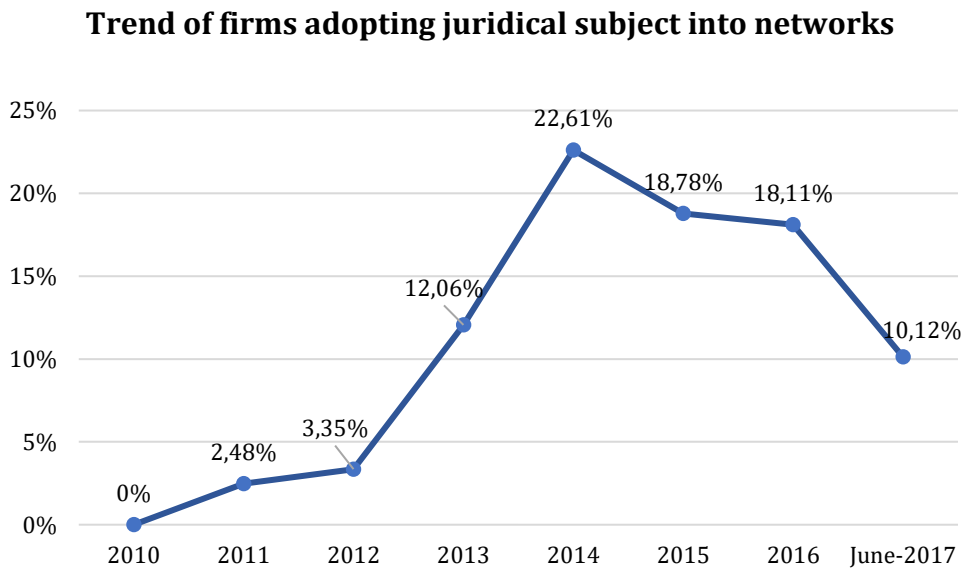


Figure 8 - Own elaboration.
Source: Info Camere network's dataset, 3th of June, 2017

The graph is showing the number of networks adopting a juridical subject. Each year is treated separately showing the proportion of networks with juridical subject entered in a specific year respect to the total number of networks created in the same year. Years were treated separately in order to show the trend of adoptions and diffusion in each period. It suggested that this format had a growth of adoptions until the 2014, while in the last 2 years and the beginning of 2017 is showing a rapid percental loss of firms that are using networks with juridical subject.

2.3 Towards a new panorama

In conclusion, the legislation issued a network contract highly specialised on a fiscal point of view. There are many sub-types that permit managers to shape their coordination mechanism preferred in terms of aggregating financial resources, reporting results and separated responsibilities. Even though firms are free to choose the form they prefer, they also know that for each form there are specific requirements, rules to follow and different expected benefits. Even though the legislation appeared very clear on these points, it does not seem that it gave the same importance on other issues.

The flexibility given to choose objectives, the internal composition with members from different geographic areas and businesses is a great opportunity to foster the growth of firms and the overall Italian market. The expected advantage by which the contract was created are in line with the modalities the legislation was created; for these reasons, the establishment of the contract and a way to regulate networks was a necessary step to foster growth.

Anyway, as already underlined there are some points which lacks regulation and proper guidelines. Networks' contracts are still giving a freedom that can turn into confusion on building networks' projects from an economic point of view and the adoption of the right governance structure. The actual scenario is full of new networks forming each year, as I showed in the figure 7. This increasing trend is given by the expected and evident advantages that cooperation could lead; but few firms had already experienced organised forms of cooperation with many other collaborators. Moreover, in case of networks with juridical subjects or with the creation of a common fund to reach overall objectives the scenario and the possibility to create a proper economic project is

furtherly more difficult. At the same it is the network form that does not permit clear forecast on projects' successes, its economic return and the potential duration needed to reach them, mainly in case of Research & Development objectives.

The second aspect relates to proper structures and governances. Even though successful coordination mechanisms have to be developed *in itinere* given their need of flexibility and depending on partners behaviours, the network contract has few rules (or suggestions) about how networks could be managed. Structures are very dependent on firms and which types of objectives are stated; moreover, their experience as coordination mechanisms has a great role in this type of decisions. Anyway, considered the main dimension of firms in Italy and given PMIs as the main target of the legislation, it is likely that these companies need some guidelines to start new approaches on closer collaborations with firms of big dimensions.

Actors and employees in networks with juridical subjects and not

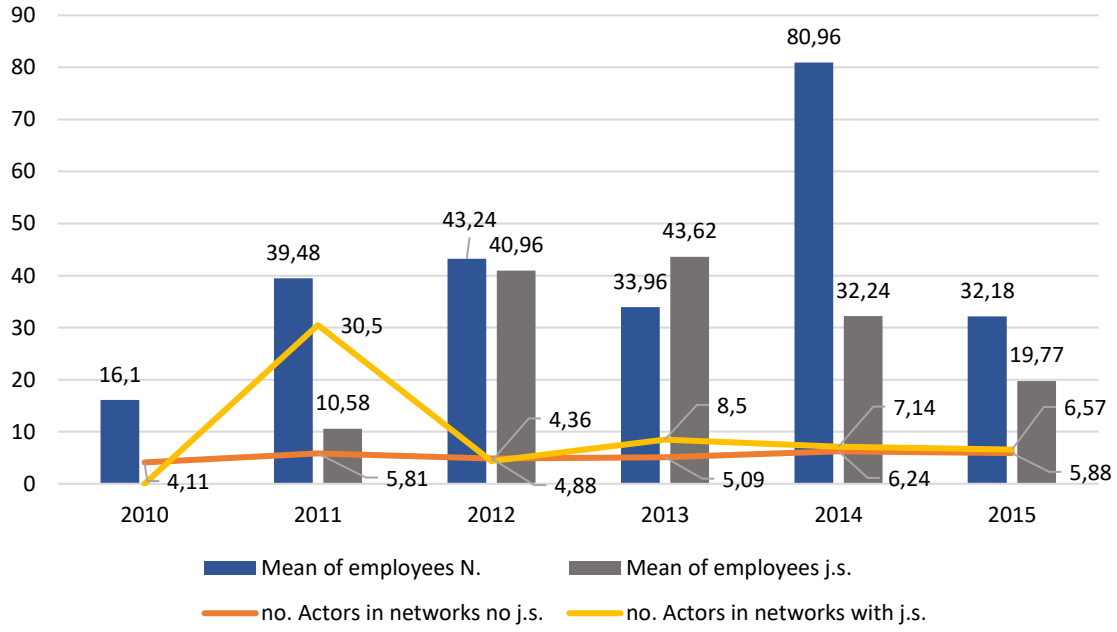


Figure 9 – Own Elaboration.

Source: Info Camere network's dataset, 2016.

In the graph are represented with the bars the average of employees per firm that entered into a network for a specific year. The blue bar is representing the average of employees of those firms that are part of networks without a juridical subject; the orange one is indicating the mean of employees for firms participating into networks with a juridical subject. As can been seen from 2011 the orange bar is more volatile and

for all the periods, except for 2013, the average of employees for firms into network with juridical subject is lower than those networks without it.

The lines are representing the mean of networks' dimensions per year. The yellow line represents all networks with juridical subjects, and it has always greater value than the mean of networks' dimensions, indicated with the grey line. The result suggests that from the dataset data that juridical subjects is used more by firms with small dimension and with greater number of elements inside the networks. This is in line with the aims that the network's contract and the juridical subjects have: helping small firms to coordinate among themselves. Usually small firms are those companies specialised in a part of the overall production; they need to be more relevant to the market offering the entire product or service, and aggregation through networks could help them to increase their influence on the market. At the same time, they need also to find correct coordination mechanisms. The juridical subject, through the creation of an external regulatory body, has the objective to help members on coordinating common action to reach overall objectives.

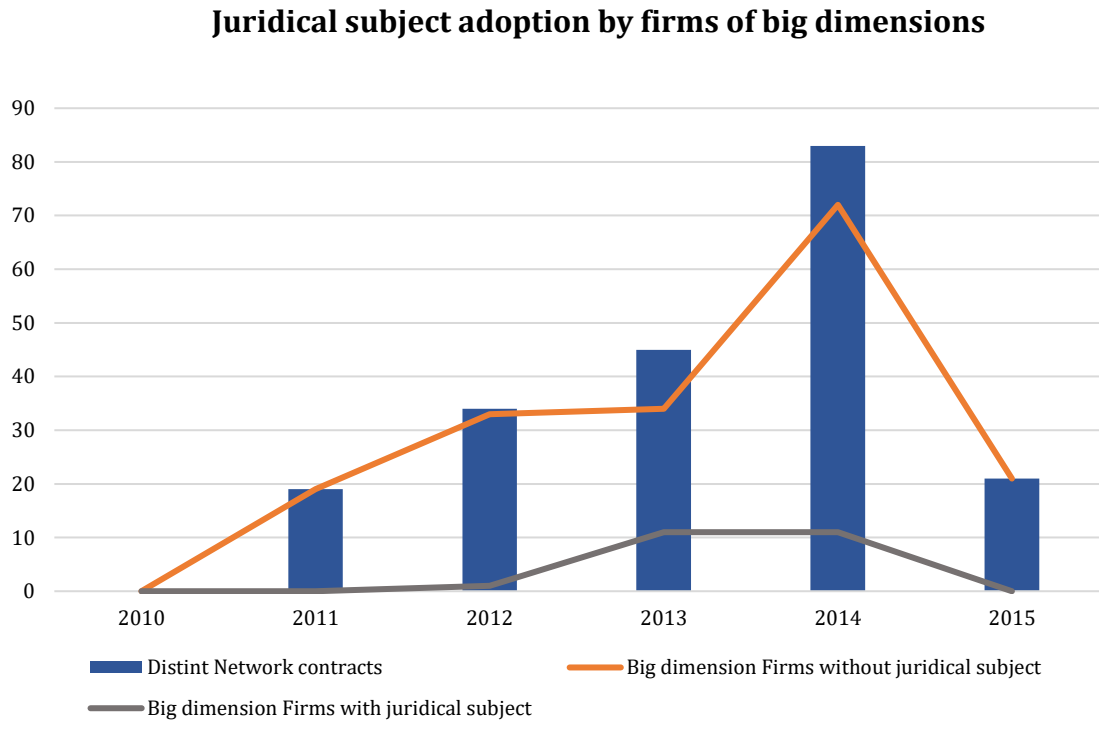


Figure 10 – Own Elaboration.

Source: Info Camere network's dataset, 2016

Given the first indication of figure 9, figure 10 analyses which type of networks firms of big dimensions (with more than 250 employees in the year the firm entered into the network) adopted during the years and which is the trend for the future. From the figure, it is evident the majority of big firms are using the network without a juridical subject: the blue bar indicates the total number of firms of big dimensions that entered into a network, while the two lines (the grey relative to network with juridical subject and the orange without it) indicates the percentage per year of firms adopting one of the two networks' types. The result indicates that firms of big dimension from 2011 to 2015 are using much more the networks without a juridical subject with the main difference reached in 2015 (no big firm adopted the juridical subject system).

Juridical subject form suggested a more controlled and formal way to reach networks' objectives. Its importance seemed to be more relevant when these collaborations involved a higher commitment of resources or its objective are vital also for individual businesses. Combining the data obtained from the dataset, its legal indications, and the historic scenario in Italy, juridical subject form seemed more suggested for networks composed by small firms and when coordination could result difficult for the number of members composing the networks. Indeed, the presence of many firms of small dimension could not evocate a central leader which can coordinate operations among different members, integrating procedures and translating individual short-term objectives into greater long-term ones. Therefore, a juridical subject has also the role to prevent this problem of coordination among many firms, substituting the role of a leader. Indeed, it is easy to imagine that networks composed by many firms of same importance for the final product want to have equal rights and the same willingness to participate on overall networks decisions; this could lead to take strategic decision very slowly and, consequently, to not respond rapidly to market changes. Moreover, objectives of networks composed by small firms could have a greater importance for their business than firms of big dimensions which more often are sharing only a part of their financial resource and not for core processes.

If the actual trend is reflecting the initial considerations of the legislation and the juridical subject establishment, I suggest successive steps to regulate much more the juridical subject format, not only on a fiscal point of view, but also regarding the economic and organizational aspects.

In conclusion, network contracts were appreciated and criticized because of the freedom that each system of firms could exploit forming the network. On one hand, these contracts make possible for companies to shape the agreements according to their preferences. This could represent an opportunity for firms to adhere to networks in a more comfortable way and personalizing the way they will manage ties with other members. On the other hand, this freedom is not guaranteeing that companies will be able to find the best contract and modalities of control in order to reach their objectives. The lack of specific rules on how relationships have to be and fixed categories in which different ties' management could be classified are representing a potential weakness for the overall network performance. Moreover, this problem could be even stronger in case of networks composed by inhomogeneous companies, i.e. with different dimensions, financial resources and international perspectives.

Even though the contract has to specify how companies inside the same system will take decision (simple majority, qualified majority or unanimity), there are no rules that coordinate and formalize the everyday relationships and the informal ones. These types of relationships are the most representative and fundamental inside a network: they are guaranteeing a day by day communication, which in turn will facilitate flows of information when firms share their knowledge. Indeed, an increase of communication among members makes easier the way firms build trust among them and cooperate for the overall network performance and not only their individual one.

The freedom in which firms are communicating among them gave a complex number of different coordination mechanisms employed. Different models that *categorise* networks and ways to manage and administer these agreements will help to properly control this freedom, according to network's overall objectives.

Chapter 3

Conditions for networks' failures

3.1 network failure

A network is an ecosystem in which complex and different dynamics take place. Its complex composition foster companies to cope with unpredictability and the necessity to create flexible strategies according to different potential scenarios. Notwithstanding the multiple advantages and opportunities that firms' cooperation present, there are many cases in which these collaborations fail or do not take any expected advantage. Indeed, even though the literature has focused for decades on reasons to build network systems listing their potential benefits, there are many cases of failure in relative or absolute terms. For this reason, the analysis of internal dynamics that lead to a network failure, present many spaces for future studies and research.

Network failure is a formalized collaboration built among two or more firms, which gave an unexpected and negative result. Accordingly, the result is defined negative when the overall business performance of participants worse or remain equal after network's formation, or networks' objectives are not satisfied and do not justify the initial investment.

As already introduced, there are two types of failure: absolute and relative one. Failure in *absolute terms* verifies when networks disappear or fail to form, even in the presence of the ideal environmental factors. Network failing in *relative terms* persists in a condition of underperformance, without devolving necessarily to markets or hierarchies (Schrank & Whitford, 2011). In the first case, networks can collapse for wrong governance or structure mechanisms, or failures could be caused by market and demand changes. On the other hand, networks failure in relative terms it does not mean that firms recede from their contracts; they could continue the business together in conditions of constant underperformance. In this case, causes are more difficult to individuate and measure, as opportunism, ignorance, lack of trustworthiness, general competencies shortfalls.

Therefore, failures or underperformance scenarios are caused by firms' incompetency, bad management of inter-firms' relationships, or external factors, like competitors in the market or environmental conditions.

Meanwhile the literature provided many cases and alternative points of views about network's positive effects, it is still poor of clear statements about its potential failure and when it can be defined as such. Consequently, its definition still appears poor and it does not state any determined variable that play a negative effect on network formation and survival. Anyway, it is enough to consider a failure any case of unsuccessful commitment of formation, which do not provide an economical return, in case of profit-oriented cooperation, or when member do not achieve stated objective. Indeed, there are internal dynamics that could lead unpredicted benefits among members, or during relationships' building processes companies could discover new directions for they research.

Given this consideration, it has to be considered a failure when objectives are realized by the network, but they give any return whose value is below the initial investment. It is probable and foreseeable that during initial steps of a network formation, participants cannot foresee the magnitude of the investment and, moreover, the contribute that each firm, which is part of the system, has to give. Therefore, starting a project made by a number of firms greater than two gives unpredictable scenarios, because it understates a level of cooperation, trust and personal effort greater than those simply stated in the contract.

Finally, there are cases when only some firms in a network have a profitable return at the expense of others. The determinants of this scenario are different, difficult or impossible to predict. Part of the analysis of this thesis will try to analyze if a leader or group of stronger firms can benefit more than the rest of the network. Consequently, it will be interesting to see if an homogeneous group of firms that are cooperating among them could perform better than an inhomogeneous one, and, in the case of an inhomogeneous group, which part of the network is more able to absorb a potential failure. There are different variables that lead a network to fail. In this analysis are individuated three main dynamics that can lead to a negative result:

- Environmental and Social conditions

- Network's organizational structure
- Opportunism, Competency Shortfalls and unsatisfactory intra-companies relationships management

Given their fundamental role, it is expected that they are vital to determine a case of failure when one or more of them is not working.

In this chapter, these three forms will be analysed and considered in order to give a satisfactory response to why and when networks fail. Moreover, the analysis will continue with a dataset that try to individuate which are the variables that can lead to failures in the Italian market and if these three main fields (translated into different variables) will be indicative for the final result.

3.2 Environmental and social Conditions

Environmental and social conditions represent uncontrollable, and often contingent and unpredictable factors which have a determinant role for the business of a firm. Consequently, a system of companies can be highly influenced by these conditions. Indeed, it has to be considered the impact of environmental factors greater to a group of firms respect to a company at the individual level.

In this analysis, "Environmental uncertainty" (also called "state uncertainty") refers to the inability of an individual or organization to predict future events (Milliken, 1987). The source of this uncertainty can come from suppliers, customers, competitors, regulatory agencies, unions, or financial markets (Miles & Snow, 1978).

In case of network contracts, there is another component to take in account: uncertainty given by members belonging to the same network. Members could be competitors, with networks as a tool to pool together part of companies' resources, developing only a common project that it is not part of the core production process; suppliers, with network that are integrating vertically firms which belong to the same production process without occurring to mergers & acquisitions, but maintaining a direct control at the all chain level. Therefore, all networks have to afford different kinds of difficulties

regarding environmental uncertainties that depend also by partners that firms are collaborating with.

Moreover, collaborators' uncertainty is related also to geographical proximity: the closer firms are one with each other, the easier it is for them to control reciprocally and to avoid cases of opportunism. Anyway, at the same time it represents a threat also for those networks which are integrating the value chain inside the same network. Indeed, if the collaboration is based by strict geographical proximity and intense communication flow, the result could be a network unable to change rapidly according to the demand. Firms which are too closed with each other and they share capabilities and knowledge only among them could limit their general skills to predict changes in the market. In this way they are also losing their capability to innovate radically. As I will analyse later, the structural holes theory of Burt appears meaningful and important to follow in order to cope with external uncertainties, foremost when networks represent a vertical value chain,

A second important component of uncertainty in the market is represented by the market demand. Demand uncertainty is generated by unknown and rapid shifts in consumer preferences, or by rapid changes in knowledge or technology, which results in short product life cycles and makes the rapid dissemination of information critical (Barley, Freeman, & Hybels, 1992; Garud & Kumaraswamy, 1993; Powell & Brantley, 1992; Robertson & Langlois, 1995). Firms and networks unable to predict the market and their consumer base are risking to lose a big share of their market. Financial performances represent one of the first indicators which are showing the effects of incapacities to move according the market demand. For this reason, networks rich of members and companies belonging to different sectors or regions could be a fundamental resource to help on this direction.

Therefore, it was important to include in the analysis the type of business firms were belonging to. In this way it is possible to understand the volatility of financial performance according to types of sectors, but also to consider financial measures independently sector by sector.

Indeed, in order to consider performances of firms that are part of a network, it was fundamental to include sector general trends in Italy for the same period of analysis. It

was important to represent firms considering their contexts in which they were competing in. Environment difficulties and market changes are common for all firms playing in the same business; therefore, firms' performances are affected equally from these factors. In this way, I had a real comparison between firms' performances belonging to a network and all companies operating in Italy that are part or not of a system of firms. The result is an evaluation that is not influenced by environmental changes and, therefore, I can really observe effects of networks on firms at individual level, without any external condition that could exert different influences on different sectors.

Indeed, each market has to be considered into its context, among performances of other firms in the same temporal period, competing for the same sector. The reference for business interpretation were **ATECO codes** made by AIDA classification. This variable is used to consider which type of business each member is competing in, and to evaluate their performance with a common benchmark.

h1: ATECO codes represent an important indicator to individuate which financial performances were more sensible to the type of sector a firm is belonging to. It is expected that networks influence firms' financial performance according to the business they are belonging to.

As said, environment could change year by year and companies have to be rapid to change accordingly. Indeed there are temporal periods, as the crisis of 2007 in Europe, that influenced a great amount of businesses and markets. For these reasons it is important to include a temporal variable, called **years**, into the analysis. The research is based on a dataset of few years because of the only recent introduction of network contract's legislation in 2009; therefore, a longer period could be more meaningful to understand the influence of different periods on networks' overall performances. Anyway, this period is sufficient to have important indications about years' relevance to financial outcome. Given also the exponential increase of networks' adoptions by Italian firms, the variable "year" already represents an interesting measure to evaluate future spaces of research and analysis.

h2: Year of entry by firms into networks by firms is an indicative measure to understand the volatility of financial measures among networks created from 2010 to 2013.

3.3 Organizational structure

3.3.1 The research for a networks' internal equilibrium

The governance system plays a crucial role for long-lasting network's advantages. In chapter 1 many advantages and requirements for networks' formations were individuated; anyway, in order to guarantee networks' survivals, a coordination mechanism, a third regulatory body, or an independent leader is necessary to control and take vital business decisions in the system. As at the individual firm level, two main processes to take decisions emerge. At first, a bottom-up process is fundamental to interpret and understand the changes led by an inter-organizational collaboration, through constant cooperation and mutual trust. At the same time, the top-down process gives guidelines, it develops strategies and it states main network's objectives. The blurred line that separate these processes is represented by *trustworthiness* leading to a good coexistence with potential obstacles as opportunism, which many times it threats the network's survival. On one side, this process represents the easiest way to implement strategy's actions given its strictly similarity with business management at the individual firm level. Indeed, familiarity on managerial processes are important to consider for firms which have few experiences on networks dynamics.

Anyway, there are other coordination mechanisms which could be adopted by networks, in which their utility depends on internal networks' structure.
Regulatory body, or a central leader, replicates the classical hierarchal form which guarantee rapidity on actions, it clarifies disputes, it facilitates information and knowledge flow, and it states clear objectives and overall strategies. On the other side, it could be damaged by members' opportunism or internal competitiveness; moreover, the body or firm that is concentrating the decisional power has to possess sufficiently capabilities to coordinate and guarantee equal commitments by members. Indeed, the *internal equilibrium* is a component difficult to reach by members and it can represent an important cause for networks' failures.

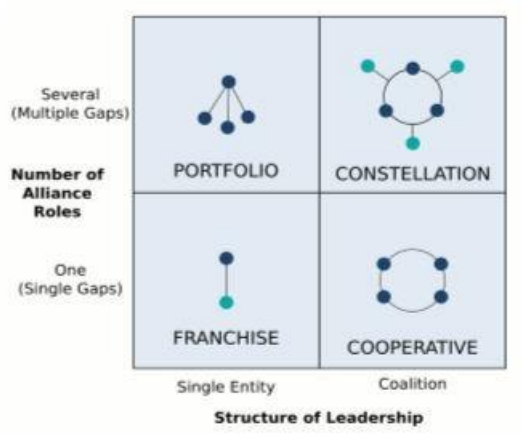
On the other side, a form of coordination could be an open collaboration in which all participants take ahead the common project without a hierarchical command, with all companies responsible equally to objectives' achievement. This democratic behaviour reflects more a market approach that presents an automatic coordination given by the common willingness to reach objectives. In this sense, it appears more difficult the coordination process respect to other mechanisms described before, mainly when there are many actors inside the network or when the project has a great relevance for business' members on their conduits.

As seen before among many different mechanisms to coordinate members inside the network, there are two main ideal scenarios considered in all the theoretical works: the market and hierarchy. From these two specific scenarios, the network has not to be considered a hybrid form but a unique way of collaboration and cooperation. For these reasons, network has a broad definition and their member can shape differently the organizing principles that will govern the canvas of firms. Organizing principles represent a way of solving the problem of interdependence and uncertainty. An organizing principle is the logic by which work is coordinated and information is gathered, disseminated, and processed within and between organizations (Zander & Kogut, 1995). Therefore, when a network is built the organizing principles that coordinate the relationships among members are fundamental for long-time cooperation and to shape the way knowledge and capabilities are communicated through time.

According to these considerations, network contract's legislation issued the possibility by members to create a network with juridical subject. As described in chapter 2, many advantage are expected by this new form on a fiscal and managerial point of view. Therefore, it is important to taking into account in the analysis the presence or not of juridical subject and its influence on firms' financial performances.

h3: Networks with juridical subject affect firms performances and they influence financial measures, given the expected advantage to organise better and more efficiently actions among members inside the same network.

Considering intra-firms relationships and researching in depth dynamics that could be used to coordinate different actors, there is a necessity to individuate concrete forms of collaboration that explain the management of knowledge flows.
Network, as described before, is a new form emerged in the decades, which is completely different from ideal theoretical models of market and hierarchy. For this reason, there are different types of network and unique solutions to manage relationships among their members. Looking for network's structure, Harbison, et al., (2000) individuated four main models of alliances made by the type of leadership (single entity or coalition) and the number of alliance roles: franchise, portfolio, cooperative and constellation model.
These four types examined the way firms use to collaborate with external companies. Moreover, these models are suggested to be controlled by a double process top-down and buttom-up.



Source: Harbison, et al., 2000

Franchise Model is used to fill a functional gap and to facilitate business growth, because it is characterized by a single alliance role that can be refined and quickly replicated to create a very quick scale effect, thereby producing an alliance growth corridor for the alliance initiator. *Portfolio Model* is used by firms that aim at adding value maximization, controlling every needed competence to reach a sustainable competitive advantage. This alliance model is built around relationships created by a focal firms, that can achieve meaningful strategic actions to build innovative capabilities, while keeping under control the network of relationships. With the *Cooperative Model*, the attention focuses more on a cooperative role: in the center there is the alliance itself, rather than one partner. Even customer relationships are often entitled to the alliance itself rather than

to each partner. In this model, partners are considered as equal at the point of intersection even when their relative size differ; all firms work together towards the same goal. Finally, in the *Constellation Model*, firms develop breakout strategies which leapfrog the competition and put industry competitors on the defensive. The model stems from the need to compete on a global scale through standardization and players' substantial capital (Della Corte, 2009).
As Harbison described main cooperation models, it is evident the complexity and variety of inter-firms' organizational structures. All these types of structure are characterised by different ways to build and manage interrelationships, but also on how they co-work and allocate the property rights.

From these observations, the structural part of firms depends also on networks' dimensions, its homogeneity among members, and the individual dimension of each actor. These variables are an indicator about the *equilibrium* inside the network, which influence the structural organization of it. Internal network equilibrium depends on many variables as firms' capabilities to coordinate actions and strategies, the presence of opportunism or egoistic behaviours, inter-relationships' management. Anyway, the objective of my research is to measure the ability of firms to co-work together and their efficiency on creating an equilibrium between them. In this sense, one of the principal variable is represented by number of **actors** in the same network. The variable indicates the dimension of networks made by number of firms that are included.

h4: Number of actors in a system of companies plays a determinant role to improve or worse financial performances at both networks and firms individual level. Indeed, it is expected that companies will underperform with certain networks dimensions given mayor difficult to manage relationships and coordinate common actions and objectives.

As the next chapter will figure out, this variable as great relevance not only for financial measure, but foremost for other variables as geographical proximity.

Dimensional factors remain an important component for networks' businesses. As said, they are determinant to coordinate actions, but they also have important consequences on firm's productivity, to build legitimacy in the market and to have more resources. For these reasons, when considering networks and firms' dimensions it is important to

counterbalance the potential complication represented by coordination and integration with potential advantages. Therefore, number of **employees** inside the same firm were a variable considered in order to evaluate the effects of networks on different dimensional firms. Indeed, with this analysis at the firm level, it will be evident the consequences of networks on firms' performance. It is more difficult to evaluate the opposite process, i.e. firms' influence on overall collaborators performance. Anyway, the second point opens spaces for future research about ideal partners inside networks and the influence that companies have to other members.
Therefore in this research the factor analysed is the ideal dimension of firms to optimise proper financial measures.

h5: Different firms' dimensions are relevant to exploit networks' advantages on a financial point of view. While small firms have greater flexibility and capabilities to change according to the market, big dimensional companies can exploit greater amount of resources, economies of scale, relevance in the market, and, therefore, greater financial returns.

Related to this concept, there are other two variables that are calculated and considered during the analysis: relevance of **firms of big dimensions**, with more than 250 employees, and the **Hirschman Index**. The second variables indicates the equilibrium inside the network among firms; indeed, it calculates the distribution of employees among different members inside the same system. The scope is to understand if firms are researching for companies with different or similar dimensions, and how the company's performance is influenced according to homogeneous networks respect to inhomogeneous ones.

h6: Firms of big dimensions have great advantages on availability of resources and production processes. It is expected that firms with more than 250 employees will receive great benefits or disadvantages from network's formation given their huge dimensions; therefore they can exert a great influence on overall network's performance and, accordingly, their financial outcomes will vary too after the entry into a network respect to their precedent performance.

h7: The Hirschman Index will represent an interesting variable to understand the influence of internal network equilibrium on financial performances. The analysis aims to determine if revenues from sales, ROS, ROA, and ROE are sensible to different "networks' concentrations".

Considered these hypothesis, it is expected that number of actors, firms' dimensions, and concentration of employees among members of the same system are influenced by networks' forms of collaboration.

3.3.2 New necessities: from vertical integration to network contracts

Network formation is a phenomenon that is increasing between firms. Indeed, it is progressively replacing the vertical integration trend, which was widely diffused in the past. The dynamic environment and continuous market changes forced firms to start new ways of cooperation and entrust more on alters. Indeed, to govern these collaborations it was no more possible to control directly other firms through acquisition or incorporating them in a unique multinational company. Research and development requirements, as money, time, and capabilities investments, were no more sufficient for a single firm, giving the phenomena of internationalization and higher market competitiveness. As already analysed, the need of networks and other forms of *clan* gave also the necessity to create contracts able to control reciprocally members and facilitate flows of information equally. This trend rose the possibilities of opportunism and the problem to direct control the amount of effort that each firm contribute to the overall network's performance.

Indeed, given risks of opportunism, producers today recognize that they cannot themselves maintain cutting-edge technology in every field required for the success of their products. Accordingly, companies are increasingly electing to acquire by contract components what in the past they would have made themselves. Put otherwise, instead of vertical integration, we observe *vertical disintegration* in a significant number of industries. Moreover, in vertically disintegrating processes, firms are developing forms of contracting beyond the reach of existing contract theory models (Gilson R. J., Sabel C. F., Scott R. E., 2009).

Gilson et al. called this new way of contracts as *contracting for innovation*. They represent agreement born form the necessity to collaborate and develop without a clear stated objective. Members embrace the uncertainty given by the market, but also by collaborators' themselves: they know they need the support of other firms to grow individually, anyway, without being fully conscientious about the real direction of the research. This concept is intrinsically linked to the new dynamic environment in which firms have to compete. Therefore, these new contracts focus first to clarify the way firms cooperate and communicate, without stating objectives and expected results. The dataset of Info Camere, in which the analysis of this thesis is based on, clearly exemplifies this new concept. A big majority of Italian networks state general objectives as Research & Development or "improve Marketing activities" without stating clear results that are expecting from the network creation. The unpredictability of network results is also given by the lack of contracts of clear guidelines.
The inability by parties to specify ex ante the nature of the product to be produced or its performance characteristics means that the terms of performance will be determined by the very governance process the contract creates. (Gilson R. J., Sabel C. F., Scott R. E., 2009).

Network contracts also have always to specify members common objectives and expectations by networks. Scopes determine the purpose by which networks were built. Therefore, strategies and common actions are coordinated in order to reach these purposes. It is fundamental to understand how objectives influence networks strategies and, therefore, how they will affect financial performances at the end. It has to be considered that this analysis is based on a short-term period and it cannot measure properly objectives based more on a long-term point of view. Anyway, the scope of the study of this variable is to analyse the correlation between financial performances and type of objectives.

h8: Networks' objectives are related to overall network performances and financial measures at the individual firm level. Moreover, different returns are expected according to different types of objectives, further classified into categories by their affinity.

From this concept, it has to be considered two ways of network relationships that condition the way firms collaborate among them: a network where members collaborate to gain one of each other knowledge, information and new processes/products, and a

network in which one central firm is collaborating with potential suppliers or distributors. In the first case the level of uncertainty and risk is even higher and the greater the level of efforts, more firms will accept to depend on their performance or project one of each other.

The roles of unpredictability and uncertainty, therefore, are crucial for networks' performances. As described before, a way to cooperate with this problem is geographical closeness among networks' members. *Clusters* are an example of this concept. **Geographical proximity** has positive potential advantages as greater and more effective communication, easier transportation and a greater way to solve problems and control each other. The closeness of firms fosters networks to react quickly to changes of the market, as change in consumer's demand. Especially in Italy and during the '80 clusters were very efficient to integrate knowledge and production capabilities as in the manufactory sector. Similarly, in Italy also the consortium is particularly diffused. This form is based on a relationship of reciprocal collaboration for research activities but also in case of large scale productions efforts. It is a parity-based and democratic organizational form governing a coalition of firms controlling and contributing different resources necessary to the realization of a collective action (Grandori, 1997). This form, given its democratic position has to be governed by a third-party that represent the overall interests and avoid potential conflicts. During its diffusion in '80, it was fundamental the closeness variable, given greater difficulties in the past to communicate efficiently.

Even though closeness seems an important ingredient for a network formation from a theoretical point of view, there are other aspects about this variable that have to be considered more in depth. Indeed, on the other hand the structural hole theory (Burt 1992, 1997) argues that network closure could represent a potential disadvantage for its members. For Burt, disperse ties are an opportunity for individual firms inside the network to follow their best business opportunities. Rather than stressing the utility of consistent norms fostered by cohesive networks, structural hole theory claims that the benefits of social capital result from the diversity of information and the brokerage opportunities created by the lack of connection between separate clusters in a social network (Gargiulo & Benassi, 2000). This theory focuses on the individuality of each firm to learn and develop their business without limiting its growth inside the network.

Therefore, the expected result is a faster growth and richer sources of information for each firm that will contribute and share its knowledge afterwards inside the partners. The scenario of this theory is flexible and dynamic networks' boundaries, avoiding that network closure represents an obstacle for adaptation. Moreover, because maintaining ties to many other actors is costly, firms that eliminate redundant ties to others will be more efficient in their use of scarce management attention (Burt, 1997; Gnyawali and Madhavan, 2001).

More generally, in contexts where the speed of new product innovation is high, and rapid response to market movements is an imperative for firms' success, it is likely that a network rich in structural holes is more beneficial than one with closure.

Conversely, Coleman's notion of social capital as closure contends that actors benefit more from maintaining a network of dense ties (Coleman, 1988, 1990). He posits that actors in a dense network are able to rely on norms and sanctions against opportunism and thereby freely share information amongst each other. In Burt's (2000) extensive summary, he observes that network closure tends to make interactions between specific actors observable to others in their network because those actors tend to have known, common contacts. In turn, the observability of their actions tends to make actors both refrain from opportunism themselves and be aware that others will be similarly restrained, again increasing trust among them. At an interfirm level, network closure and the consequent trust will allow for greater relation-specific investments to be made, and reduce costs involved in monitoring their alters (Zaheer and Venkatraman, 1995). These relation-specific investments and lowered monitoring costs will tend to enhance firm performance. Moreover, common norms of behavior develop in closed networks, which improve mutual understanding and lower the possibility of misinterpretation of a firm's actions by its network partners (Ahuja, 2000a; Dyer and Nobeoka, 2000; Gulati, 1995). In turn, this reduces the likelihood of mutually destructive competitive practices, again bolstering firm's performance.

Geographic position can play a determinant role to types of relations that firms build. Geographically closed members can communicate easily, faster and more efficiently. Anyway, this could cause relational inertia's problem firstly described. For this reason, geographical closeness is one of the variable considered into the dataset analysis. It is divide into two level: **region** and **province.** Even though I cannot state that all firms

which belong to the same network and the same region/province are communicate intensively and with inertia, it could be stated that these elements are more likely when firms are close and can control directly one of each other. Moreover, a dataset of 6155 firms is sufficient high to generalize the conditions and interpret with sufficient precision the geographical proximity as one of the determinant variable to value its positive or negative role for communication and structural hole theory.

h9: Region and province are two variables used to determines the relevance of geographical proximity among members of the same network to financial performances. It is expected that firms aggregate close to each other according to other structural variables and their objectives. Moreover, a point of research is to investigate the relevance of geographical closeness, and consequently its relative easiness to coordinate and communicate, to improve financial measures at the individual firm level.

Moreover, related to the precedent concept of geographical proximity, Gargiulo and Benassi (2000) individuated two main problems of network closure. First, cohesive ties of members could limit their opportunities, forcing managers to amplify the pressure to reciprocate past favors and exchange of information. The result is an endless vicious cycle in which each firm has to pursue exchange of ideas and to communicate continuously only with firms inside the networks. Therefore, after short time firms will communicate no more useful information that they were not possessing, but routinized and standardized knowledge and processes that impede them to innovate effectively. Second, the constraining effects of amplified reciprocity are likely to be compounded by forces of inertia without searching for problems and solutions in an effective way. Managers could lose the real perception of market changes and change their firm in a rapid way. The relational inertia is a risk to lose the relevance of networks' ties and their communicational value. On the other hand, network scholars often treat innovativeness as a function of network position. Galunic and Rodan (1998) build on the work of Hargadon and Sutton (1997), who found that a firm at the confluence of several industries was able to broker the knowledge derived from the multiple industries to create new business concepts. Becker (1970) argued that actors positioned in a preferred location in the network receive innovation-related information that other firms might miss Moreover, Zaheerr (1995) has argued that exclusive attention to

network structure as an antecedent of, or a proxy for, innovativeness obscures the role of the many intrinsic organizational characteristics that influence a firm's innovative capabilities. While connections with external knowledge sources are clearly critical to innovativeness, focal firm characteristics that operate independently of its structural position will also influence innovativeness, and in turn enhance firm performance. In sum, we argue that while innovativeness and network structure are related, they exert both independent and (as we suggest later) interactive effects on firm performance

Nahapiet and Ghoshal (1998) go a step further and argue that the process of sharing ideas with innovative alters is likely to generate new knowledge, rather than merely exchanging existing information. The more innovative alter is, the more the focal firm may learn and create from its interaction with alter. This idea complements that of March (1994), who observed that firms seeking to mimic others tend to do so imperfectly, and in the process inadvertently generate innovations. Thus, firms tied to innovative firms may try to replicate innovative ideas and in the process generate insightful new ideas themselves.

While network ties generally act as conduits of and access to knowledge, the information gathering properties of network structures and their performance implications also vary. We contend that while network structure is likely to influence firm performance in a context of knowledge transfer and use, its effects may be contingent on both the focal firm's and alter's capabilities. As we pointed out earlier, the value of a superior network structure rests on both the firm's alters possessing valuable knowledge the focal firm needs and the focal firm itself having the capability to exploit the knowledge it obtains from its contacts. Thus, enhanced firm performance is likely to be a joint result of a firm in a superior structural position accessing knowledgeable others, having the capability to utilize the knowledge it gains from the network, as well as the capability to exploit the knowledge it develops internally (Dosi, 1988). By examining together focal firm and alter capabilities, and their joint effects on the value of network structure, we can more fully understand the factors that affect access to and exploitation of knowledge flows across networks to influence firm performance.

Therefore, the dimension and ability of a firm to be productive is proportionally dependent on alters' capabilities and knowledge, but also on the firm itself skills to absorb new information. Therefore, a firm in a network which is not ready to cooperate for certain objectives or partners will damage the overall network performance and its proper one. The readiness to cooperate in a network situation could be seen strictly linked to its degree of innovativeness.

For Zaheer and Bell (2005) the innovativeness is translated into three dimensions of innovativeness by which mutual fund companies distinguish themselves from their rivals: the tendency of a fund company to lead the industry at introducing new products, new services, and adopting new technology that enables new products or services to renew services and product firms have to have a good ROE (Return on equity) and ROT (Rotation of capital), generating continuously earnings to reinvest in their business.

Firm innovativeness arises from two sources. First, the firm may possess internal characteristics (such as a strong R&D team, communication structures, and culture) that make it more innovative than its rivals. Second, from a network perspective, firms occupying preferred network positions may be better able to access information needed to be creative and innovative. It is important to separate and distinguish these effects theoretically.

In the second aspect, I analysed through structural variables the position of firms inside networks and how network's composition affect the firms individual performance. In the first case, it is more difficult to evaluate internal firm's capabilities to be able to innovate. For this purpose, I used the ROT value; therefore, the ability of firm to reinvest its yearly revenues for its business. A ROT bigger than one indicates the firm capability to reinvest at least how much it received in terms of revenues during the past year.

h10: ROT indicates firms' inclination to innovate. It is expected that financial performances are correlated with ROT. Indeed, higher revenues and ROS values could incentivise firms to reinvest more into their businesses.

The great number of possible combinations lead to a complex scenario of different types of networks. The literature still lacks to create a comprehensive view of networks formation grouping it in main categories. This structure, indeed, is composed of different

degrees of formalisation in the way communication flows among members and the way decisions are made. The result is a competitive environment in which collaborations are different one with each other and it is difficult to order it in main categories, given the high number of variables. One main difference respect to market and hierarchy theoretical models is the impossibility to re-create an ideal scenario for networks; therefore, measuring a network performance with well-stated variables could represent only a facet of the whole market scenario, given the great number of variables which have slightly different weight among them. In addition, network collaboration is highly influenced by informal relationships and soft skills that are difficult to control, measure, and standardize.

This lack of a clear governance structure for networks formation could represent one of the main responsible factors that cause networks' failure. Given the fact that informal relationships and communication have a fundamental role for its survival, it is still difficult to integrate this variable into an ideal scenario of networks formation.

Chapter 4

Dataset presentation

4.1 Dataset descriptive statistics

4.1.1 Networks' influence by different years of entry

The dataset collects 6155 companies that entered into networks from 2010 to 2013. The dataset contains information about networks structure as number of actors and declared objectives of companies. At the same time, there are information about firms at individual level as their financial performances and their dimensions.

Firms involved into a Network from 2010 to June, 2017

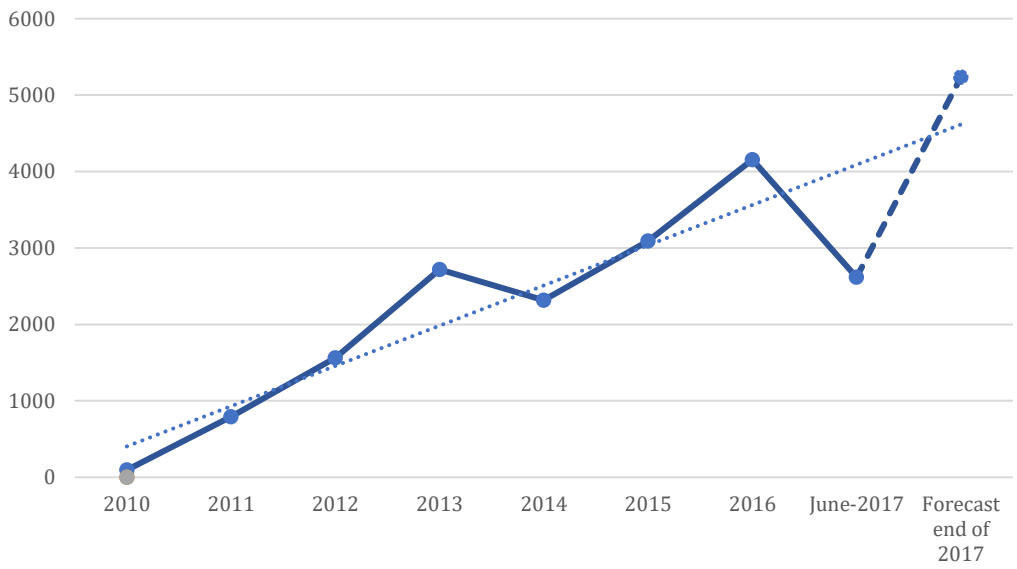


Figure 11 – Own Elaboration

Source: Info Camere network contracts dataset, 2017

As seen from figure 11, the diffusion and adoption of network contracts are increasing from its legislation in 2009. This result shows that firm are perceiving the contracts not only as an opportunity to afford the main crisis period from 2007 to 2012 but also to continue part of their business together with other members. Excepting for the passage between 2013 and 2014, the graph shows a linear growth of networks' adoption by

firms each year. This phenomenon is favoured by the huge support of literatures and the evident benefits that a correct network structure could lead.

From the year that legislation was issued firms continue to adopt this collaboration form increasingly, and it seems that this trend of growth will continue for the next period.

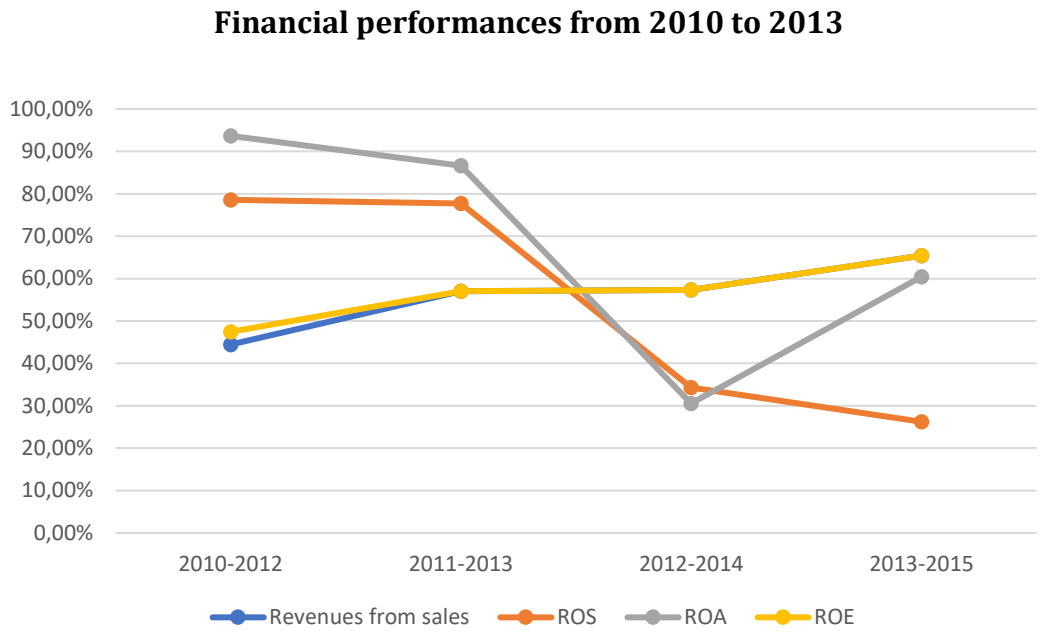


Figure 11 – Own Elaboration

Source: Info Camere network contracts dataset, 2017

The graph refers to those firms which entered into the network between 2010 and 2013 and it examines the financial performance of the three years following the year of entry. It emerges the strong decrease of financial performances in terms of efficiency (ROE, ROA, ROS). There was a deep decrease mainly in ROS that is signalling a change in the market and a preoccupant need to repair on networks structure.

It is interesting to see the difference of trends of ROA, ROS, and revenues with ROE. Indeed, these last two measures seems strictly correlated in their behaviours in the graph. Firms which entered in 2010 had a better performance in terms of ROA and ROS, therefore in efficiency of sales and on exploiting their assets and investments. Anyway, at the same time the rate of failure for revenues and ROE was more than 50%, leading therefore to a loss in business volume. As it will be analysed further, the historical context could explain these trends with firm that after the crisis had to rationalise their resources, therefore improving margins from sales, even though the total volume of them was decreasing (i.e. reducing the overall revenue from sales).

For this reason, the analysis will consider the relevance of year of entry but also the influence of temporal duration by firms inside the network. In this way, it will be evident if temporal market conditions, indicated by different years, are influence the overall performance of a network. Moreover, data will show how many years it is suggested to stay inside the network even when financial measures indicate a situation of underperformance in the first years.

On the other hand, another variable that will be studied is the temporal duration of firms inside a network. I will study the influence of time to firms' performances: it is expected that more years of permanence inside the system will improve the overall performance, mainly when networks' objectives are oriented on a long-term point of view.

Financial performances' improvement with larger duration inside the network

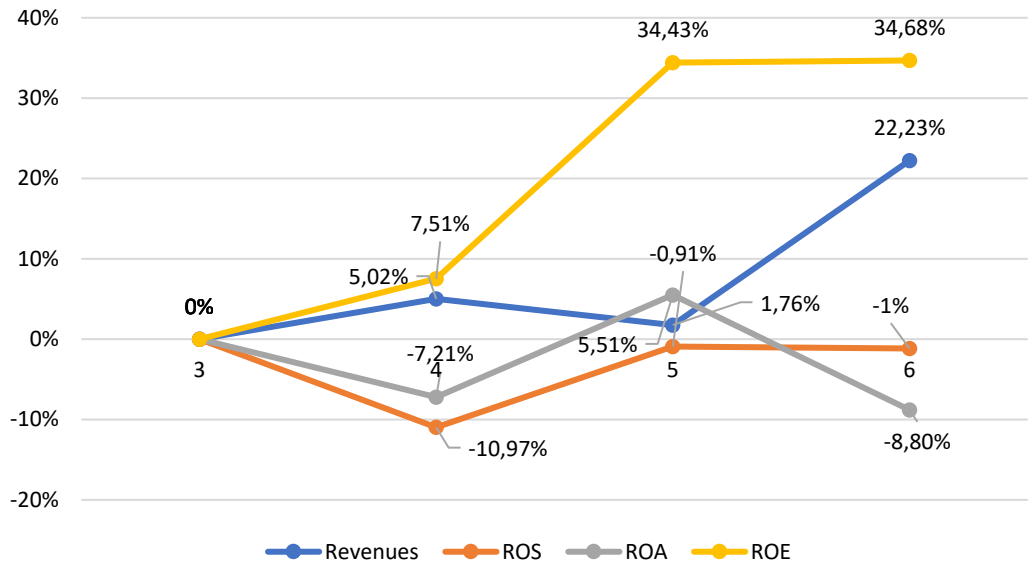


Figure 11 – Own Elaboration

Source: Info Camere network's dataset, 2017

The graph is calculating the influence of duration on financial performance. On x-axis there is a crescent order from three years of performance until six. Results showed an huge relevance for ROE performance that is improving the outcome rapidly from one year to another. Accordingly, also revenues improved a lot from three-years period. Anyway, ROS and ROA value seemed less sensible to duration variable. It has to be considered that years about duration equal to 6 reports few data because it is the first year of network's creation (2010).

Given the great mix of firms belonging to different businesses, it was important to evaluate the dataset also under the sectoral point of view. Indeed, as said in the third chapter, it is expected that firms belonging to different Ateco codes are influenced differently from networks' entry. The data actualized on the 3th of June 2017 state 3791 networks contracts (with a mean of 5 members per networks), and 514 of them with juridical subject (13,56%). The companies being part of a network are 19058 and are mainly represented by the regions Lombardia (2979), Veneto (1872), and Lazio (1831). Networks appears more widespread in big regions, mainly on central-north areas.

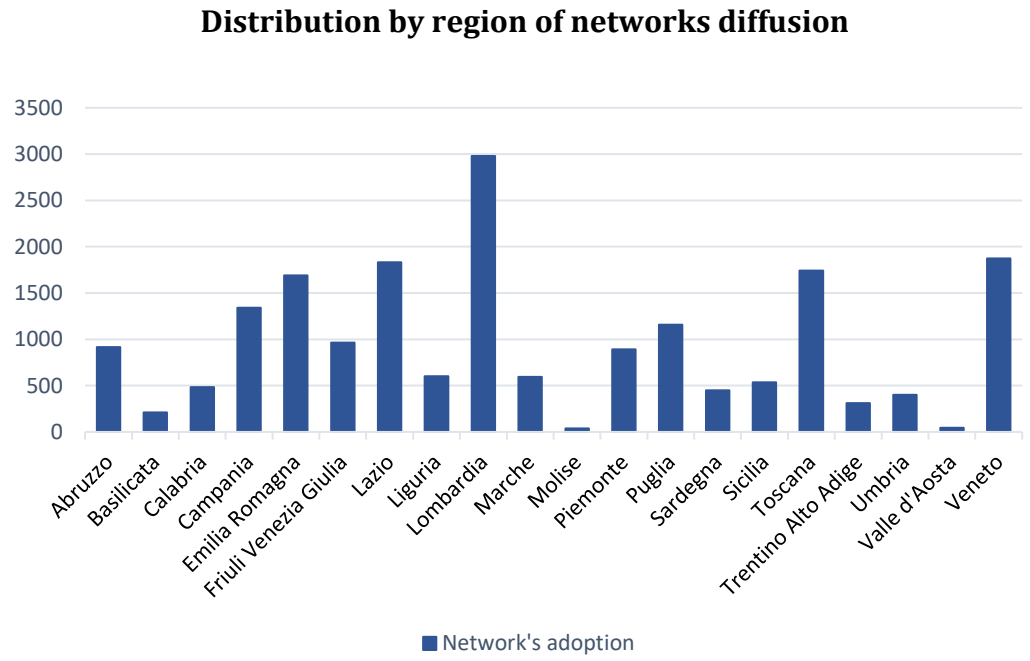


Figure 12 – Distribution by region of networks diffusion at 3th of June 2017.
Source: http://contrattidirete.registroimprese.it/reti/

Given the evident difference between northern – central area respect to the southern one on network contracts' adoption, it would be meaningful the increase on collaboration among different regions of Italy. This system could help southern firms to be more incentivised on open collaborations, improving the local but also the general Italian market.

4.1.2 Networks' influence on individual firm's performance

In case of firms' dimensions, it is confirmed the historical context in the Italian market about the huge number of small-medium firms competing in this market.

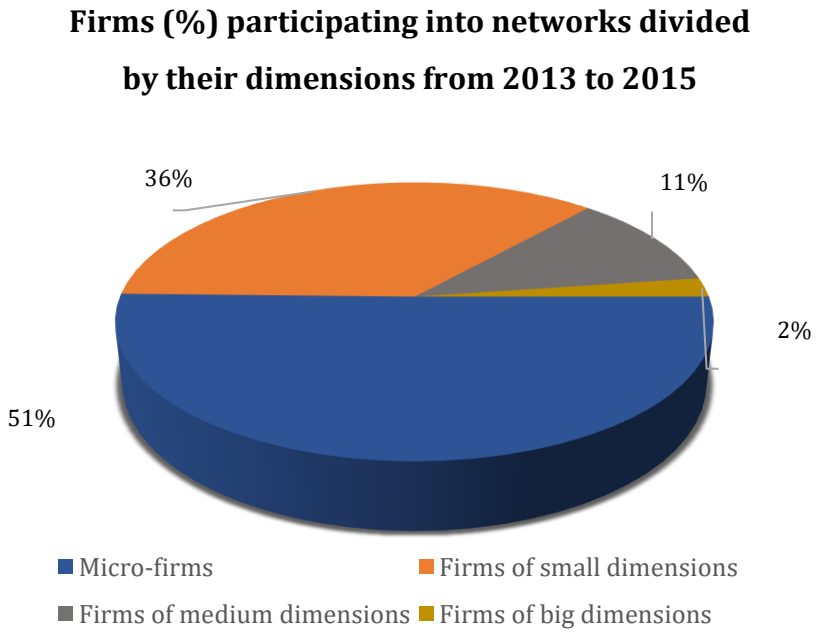


Figure 13 – Own elaboration.
Source: Info Camere network's dataset, 2016

Microfirms <= 10 employees
Firms of small dimensions 10<x<=50 employees
Firms of small dimensions 50<x<=250 employees
Firms of big dimensions >250

Firms with less than 51 employees represent the 87% of the overall dataset, showing a great difference on dimensional distribution of firms. Moreover, micro-firms made by 10 employees or less represent half of the overall dataset. Therefore, micro-firms represent the majority of companies in the networks' dataset; it is interesting to note how the dimension is correlated to distance.

Firms dimensions linked to geographical closeness from 2010 to 2013

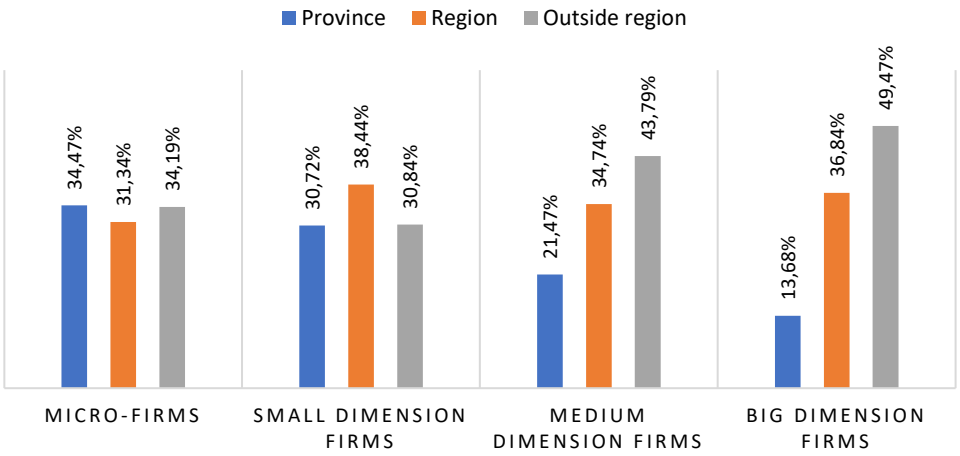


Figure 14 – Own elaboration.
Source: Info Camere network's dataset, 2016

The dataset shows a clear pattern on willingness by firms to create relationships with external firms. On one side the smallest companies with less than 50 employees are equally exploiting collaborations with other firms placed in the same province, or in the same region or in completely different areas. At the same time firms of big dimensions have a greater orientation towards enterprises that are operating on other areas. This result is in line with the theoretical background; small firms need geographical proximity in order to cope better with communication and direct control issues. Therefore, figure 14 shows clearly the orientation towards more distant members as firms have greater dimensions. The main reason can be individuated in their market direction: firms of bigger dimensions have more chances to be interested on a national or international perspective, instead of a local one. Therefore, they need support from other firms operating already on external markets or suppliers that are playing in different contexts.

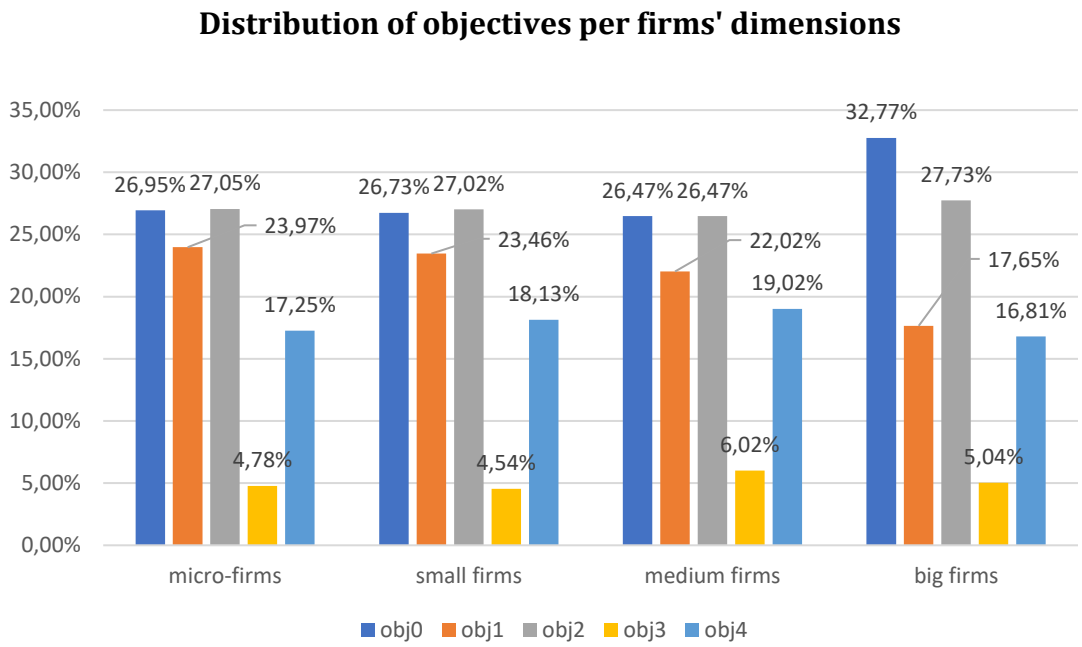


Figure 15 – Own elaboration.
Source: Info Camere network's dataset, 2016

Obj0 = Innovation and Research
Obj1 = Marketing
Obj2 = Market and reputation growth
Obj3 = Coordination and Management
Obj4 = Internal growth

As pictured in the graph, there are no evident difference among firms' dimensions to objectives adoption according to firms' dimension. The distribution is quite homogeneous, maintaining the same proportions. The only difference is represented by firms with more than 250 employees respect to the rest of the sample. Indeed, these companies are adopting more objective 0, Innovation and Research, at the expense of objective 1, Marketing. Probably, firms with bigger dimensions are less interested in commercial supports or create a wider horizontal differentiation on their offers, but they are more willing to innovate and take something new to the business in order to respond rapidly on market changes through research.

Variables	Micro-firms	Small firms	Medium firms	Big firms
Revenues from sales	51,62%	54,00%	55,61%	49,38%
ROS	36,36%	28,13%	27,90%	26,32%
ROA	28,70%	22,68%	23,82%	21,31%
ROE	30,05%	23,72%	28,90%	26,32%
Juridical subject	11,11%	9,69%	10,29%	12,50%
Average Actors	8,11	8,07	8,14	9,48
Hirschman Index	0,51	0,42	0,42	0,48
Average Rotation	1,04	1,07	1,07	1,15

Table 2 – Own elaboration. Descriptive statistic of structural variables divided per firms' dimensions from 2010 to 2013.

Source: Info Camere network's dataset, 2016

The table above resume the other structural variables related to firms' dimensions. Firms of small and medium dimensions have very similar values in all their characteristics. Instead, major differences come out considering the two extremes: firms with less or equal to 10 employees, and companies with more than 250 employees. Considering the average number of actors, firms of big dimension have usually a greater number of elements. Moreover, juridical forms of networks are more diffused, and ROT average values is also greater rather than smaller companies. These indications are aligned with the need to coordinate more actors in the same networks and the capabilities of big firms to reinvest their revenues, having a better rate of rotation of capital.

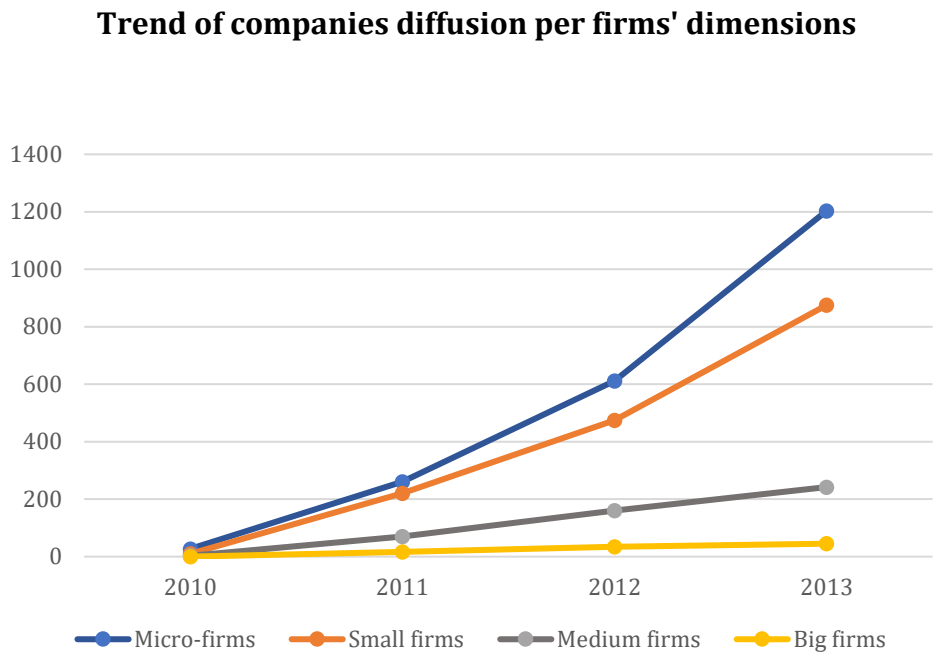


Figure 16 – Own elaboration.
Source: Info Camere network's dataset, 2016

Anyway, it is evident the different trends of networks diffusion among companies of different dimensions. Indeed, companies with less than or equal to 50 employees had an exponential increment between 2010 and 2013; even though micro-firms are increasing networks' adoption more rapidly. Meanwhile, medium firms have a linear increment during the years and firms of big dimension too, even though the last category is increasing at a lower rate.

4.1.3 Networks' influence on actors' equilibrium

Networks' dimensions are a fundamental component for coordination on intra-firms' relationships. One of the main challenge is to understand if this variable has an influence on information flows, so on their financial performance and the possibility to reach overall networks' objectives.

Variables	Direct collaborations	Networks 3-5 firms	Networks 6-10 firms	Networks 11-20 firms	Networks +20 firms
Revenues from sales	53,26%	54,81%	50,83%	51,55%	50,50
ROS	43,72%	30,86%	37,09%	34,23%	44,98%
ROA	42,40%	24,64%	30,59%	32,37%	42,98%
ROE	41,94%	27,59%	34,11%	38,87%	29,68%
Juridical subject	3,64%	5,15%	14,39%	16,25%	40,49%
Big dimension firms	1,04%	1,43%	2,14%	1,13%	1,64%
Average employees	29,60	33,31	45,06	32,26	47,14
Hirschman Index	0,70	0,50	0,30	N/A	N/A
Average Rotation	1,06	1,04	1,07	1,03	1,06

Table 3 – Own elaboration. Descriptive statistics on number of actors based on networks dimensions. Source: Info Camere network's dataset

As descriptive statistics about networks' dimension show, there are meaningful differences among systems' dimensions. Even though revenues from sales is constant among networks' dimensions, the other financial indicators vary according to number of members. In ROS and ROA measures, most efficient dimensions are direct collaboration (two firms directly collaborating among them and using a network contract) and networks that contains more than 20 firms. The result gives important indications: big dimensional networks appear more efficient than smaller ones on managing assets and on margins from sales. On the other side, ROE is not performing well for big systems; I can hypotisize that big firms are involved into important projects that need constant investments each year. Indeed, given the short time period, from 2010 to 2015 about financial results, firms involved in important and expensive projects are probably losing in terms of ROE, needing constantly new capital to invest in the first years. Moreover, their big dimensional resource can be translated into economies of scale and legitimacy to the market advantages; these resources are probably representing the main reasons for their ability to optimise resources and improving earnings.

The Hirschman Index is a value available only for the three smallest networks' dimensions, because of few data availability about 2014-2015 employments. Anyway, the value decrease linearly from networks of two components with 0,70 as Hirschman index which indicates a relative inhomogeneity about dimensions of members. For

networks from 6 to 10 members the concentration is more homogeneous with members very similar in their dimensions and an average Hirschman Index of 0,30. This trend clearly shows that as networks grow in their number of actors, they tend to create collaborations with other companies of similar dimensions.

Another important statistic to consider is the progressive use of juridical subject forms according to the increase of networks' dimensions. Indeed, systems made by 5 members or less have a juridical subject's rate of use about the 4,57%. While in networks composed from 6 to 20 members there is a rapid increment to the 15,32%. Finally, for networks of more than 20 firms the statistic reach the 40,49% of networks with juridical subjects. It is easy to interpret this result, associating the increment of juridical subject adoption with the dimension of systems and, therefore, the need to coordinate many members, integrating their strategies and actions.

Networks' dimension vs. geographical proximity vs. Juridical subject form

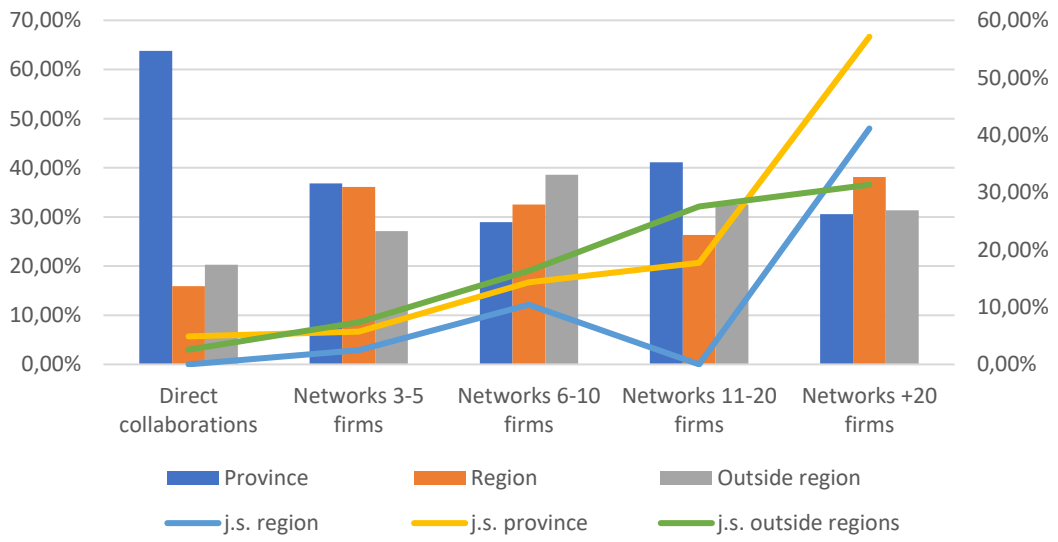


Figure 17 – Own elaboration.
Source: Info Camere network's dataset, 2016

It is evident from the chart that the adoption of direct collaboration is made between firms closed to each other. This result is in line with expactations, as the other data about dimensional firms and geographical proximity: firms which are not close to each other adopt more networks from 6 to 20. Instead, when there are networks of huge dimensions as those with more than 20 members, they need to be more geographically

closed because coordination mechanisms are more difficult to implement and problems as opportunisms are even more complicated to control.

Anyway, it is interesting to see the trend of juridical subject adoption related to networks' dimensions combined with geographical proximity variable. In case of systems with all companies belonging to the same province, as networks' dimensions grow, the adoption of juridical subject increase exponentially, until the 57,14% in case of systems with more than 20 firms. Juridical subject's adoption follows a similar trend for networks with at least two firms cooperating outside the region; anyway, its trend of adoption is increasing with networks dimensions but with a smoother rate. Instead, juridical subject's forms in case of regional cooperation is not following a clear path: it is surprising that there are not networks made by at least 11 and a maximum of 20 companies that adopted the juridical subject's form. Anyway, also in this case from the graph it is evident the growth of networks with juridical subjects in case of networks with more members to coordinate. This result shows that firms are seeing the regulatory body as an opportunity to coordinate better and control partners in an easier way. Anyway, given the apparent uncorrelation between juridical subject form and financial performances, this could also signal only the necessity by firms to have a tool to coordinate among them, which is not efficient yet.

Variables	Direct collaborations	Networks 3-5 firms	Networks 6-10 firms	Networks 11-20 firms	Networks +20 firms
Obj.0	41,55%	41,38%	37,36%	31,90%	16,57%
Obj.1	34,81%	36,79%	32,64%	22,82%	22,60%
Obj.2	38,02%	40,97%	36,16%	35,31%	26,30%
Obj.3	3,39%	6,92%	6,16%	15,64%	4,11%
Obj.4	26,82%	24,57%	27,80%	16,14%	25,61%
Average obj. per Network	1,46	1,51	1,40	1,22	1,05

Table 3 – Own elaboration. Descriptive statistics on number of actors based on objectives' categories.
Source: Info Camere network's dataset

Table 3 represents the objectives most adopted by firms according to network's dimensions. At first, it is evident that smaller networks, with less than 11 actors, have more general objectives with an average of 1,46 objectives per network. Moreover,

objective 2, market growth and reputation, is more relevant for networks made by at least 11 companies. The result is aligned with the expected scope of many firms to create new collaboration in order to increase their relevance in the market. Co-working with many firms could represent a problem in terms of coordination, therefore a common R&D department or developing internal processes, but firms can exploit their numerous partners in order to reach more markets.

4.2 Presentation of variables

The analysis started from a dataset of 16.737 Italian companies that formed a network from the 2010 to the 2015. The dataset contained relevant information about the network as: its name, date of formation and its tracking number, objective/scope of the networks, number of members, members' ATECO code (2007), the presence of juridical subject. Moreover, to this initial dataset there are some individual data at firm level as: fiscal code, province, region, number of employees, and finally its financial performances as Revenues, ROE, ROA, ROS, and ROT.

To this Dataset, I selected 6.155 companies, which represent all firms in the dataset that formed a network between 2010 and 2013. Indeed, the choice of this subset is due to have enough time to analyse how networks affected individual company's performance. Therefore, I determined the fixed period of 3 years after the entry in a network to evaluate the influence of the participation of a network to companies' performances.

The result is the formation of four main periods that will be evaluated:

- 70 Italian companies that enter in a network in 2010 and observation of its performance from 2010 to 2012
- 949 Italian companies that enter in 2011, with performance observed 2011 – 2013
- 1.700 Italian companies that enter in 2012, with performance observed 2012 – 2014
- 3.436 Italian companies that enter in 2013, with performance observed 2013 – 2015

From the number of companies considered, it can be seen as the trend of network formation in Italy is growing rapidly.

Given this new dataset there was a selection of the variables interesting for the objective of the analysis. According to the purposes stated, the variables considered as relevant were: *networks' names, companies' names, year of network's formations, number of network's components, network's objective, existence of a juridical subject, province, region, revenues from sales, ROE, ROA, ROS, rotation of capital investment, number of employees*, *Ateco code.*

These data were transformed into dummy variables to start the statistical analysis. After that, they were elaborated to prepare them for the analysis with the program R.

The **year of network's formation** was converted into a variable from 0 to 3, in which each number represented a specific year: 3 for 2010, 2 for 2011, 1 for 2012, and 0 for 2013.

Therefore, the youngest networks in the dataset, which born in 2013, are associated to the variable 0. In this way, an ascendant order of variable indicates the passage from youngest to oldest networks.

Years	Variable
2013	0
2012	1
2011	2
2010	3

Table 4 – Own elaboration. Years of network's formations with associated numeric variables.

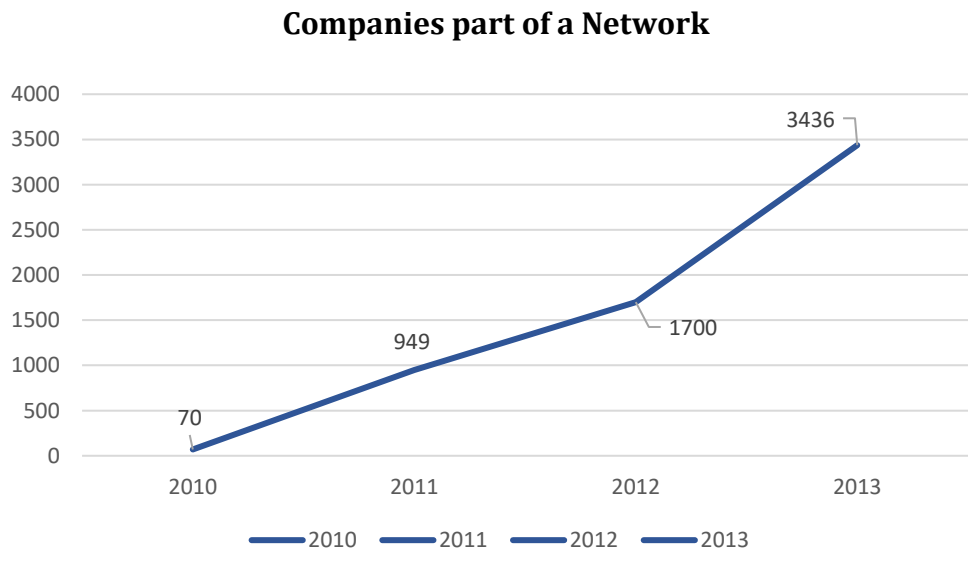


Figure 18 – Own elaboration. Distribution of companies that are part of a network in the dataset from 2010 to 2013. Source: Info Camere network's dataset, 2016.

The pie shows the dominance of 2013 networks' presence which is 56%. It is clear the increasing trend to build a network by Italian companies in the last years; therefore, as already showed in the previous chapter, it appears that Italian firms increasingly are considering networks as an useful resource to cooperate and improve their individual performances.

The **number of network's components** was not changed and indicates how many distinct members a network possesses.

Networks' objectives were classified into 25 different objectives by the Doctor Balzarin Lisa. Afterwards, they were further distributed into 5 main categories: *Research and Innovation (obj0)*, *Marketing (obj1)*, *Market and reputation growth (obj2)*, *Coordination and Management (obj3)*, *Internal growth (obj4)*.

Research and Innovation group focuses on activities based on cooperation in a long-term perspective. The reasons to use a network to accomplish this objective is given by scarse individual financial resources or the necessity to integrate new capabilities efficiently, obtaining new knowledge directly from other firms.

Marketing group includes all the actions aimed to improve market activities on a qualitative point of view. Therefore, these companies focus to give a greater product to the market or launching it in a more effective way.

Market and reputation growth indicates all the objectives oriented to the market from a quantitative point of view. Therefore, the stated proposals of networks aimed to improve their presence in the market exploiting greater financial resources and a new dimensional relevance. As objective of group 1 both are market oriented, but "Market and reputation growth" group is more oriented to a dimensional perspective and to have relevance in front of clients, investors and suppliers.

Coordination and Management group includes all the activities aimed to organise better routines, share activities or departments, as for example a common department of HR to find new talents in a more efficient way.

Internal growth is the purpose grouping all the initiatives oriented to internal growth, increasing production quantity or exploiting potential economies of scale. It represents the group "Market and reputation growth" but internally oriented.

Here, there are the 25 objectives used by Doctor Balzarin to classify networks' objects. I put each one of them in one of the 5 categories presented before. This resume could help to know better which types of goals are characterizing each group and which are the main aims that firms are researching from a network:

Objective Description	Dummy Variable
Not stated	Missing value
Innovation on product and services	0
Innovation on internal procedures	0
Share and Development of knowledge/resources/capabilities	0
Research and development	0
Valuing products / contracting firms	1
Improve market prenetration	1
Sharing commercial activities and increase commercial capabilities	1
Products diversification	1
Increase contractual strenght	2
Increase competitiveness	2
Access to new financial resources	2
Promoting a common brand	2
Internationalisation	2
Partecipation on contracts and races	2
Exploitation of new market opportunities	2
Corporate Social Responsibility	3
HR	3
Develop common rules and procedures	3
Improve and share managerial activities	3
Generic collaboration/formalisation	3
Offer and produce together	4
Improvement of quality/quantity	4
Increase production capabilities	4
Economies of scale/resources' optimisation	4
Internal economic development	4

Table 5 – Own Elaboration - Networks' objectives with associated numeric dummy variable.

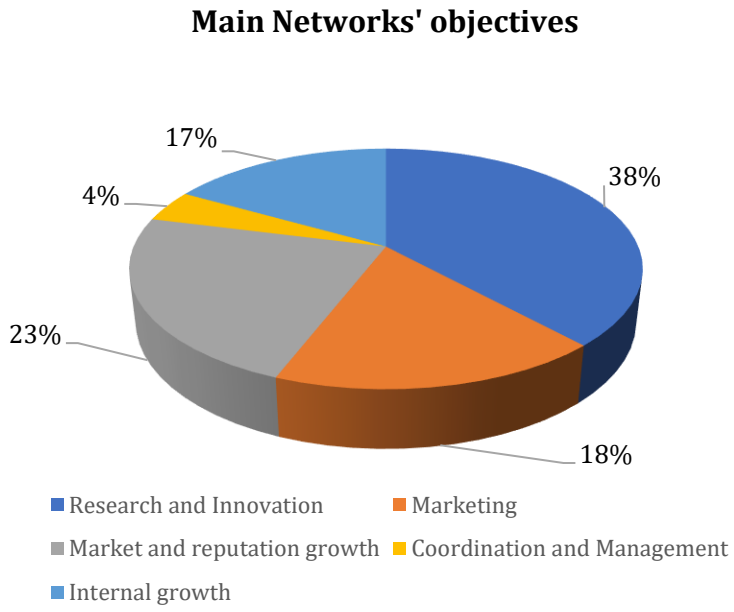


Figure 19 – Own elaboration.
Source: Info Camere network's dataset, 2016.

From these data, network's purposes most spread are "Research and Innovation" and, then, "Market and reputation growth".

In the regression analysis with R the dummy variables will be the four groups. The "not stated" variable, which is only for few firms, is counted as a missing value. It was indicated as "not stated" an objective that was not possible to classify, because in the dataset it was not clearly described or not complete.

Moreover, many networks were established with more than one objective; therefore, there are networks that belong to one or more groups, giving their broad purposes. Indeed, many times networks' objectives does not belong only to one category; some of them have broad proposals and do not focus only in one specific area.

Another variable considered the existence of networks with **juridical subject**, which determines when the network assumes its own juridical identity with a third regulatory body, with its common fund and independent decisions. When a network possess juridical subject is marked with 1, otherwise 0.

Data of **province** and **region** were transformed into two level of closeness among members of the same network. If all the participants were part of the same province they were marked with the number 1, otherwise 0. If their businesses have the registered office in the same region but different provinces they were marked with 1, otherwise 0.

The **Ateco code** is an alphanumeric code, that is composed of 6 digits. From 2008, it is used this classification, which is called ATECO 2007 and it was developed by different public entities and entrepreneurial associations. The code has the objective to indicate and classify economic activities under the same coherent approach for statistical, fiscal and legal scopes.
In order to analyse different categories of business of network's members, it was collected according the first two digits. The two digits Ateco classification had a category's range from 0 to 96, which were grouped into 17 macro categories for sector affinity criteria. Indeed, each category represented a unique category of business, avoiding any possibilities of intersection.

Ateco description	Ateco category
Agricolture, silvicolture and fishing	0
Extraction of minerals from caves and mines	1
Manufacturing	2
Electricity, gas, vapor and air conditioning supply	3
Water supply; drainage system control, waste management activities and retreating	4
Constructions	5
Wholesale and retail trade; repair of vehicles and motorcycles	6
Transportation, shipping and storage	7
Activities of accommodation and restaurants	8
Information and communication services	9
Financial and insurance activities	10
Real estate activities	11
Professional, scientific and technical activities	12
Rental, travel agencies, business supply services	13
Education	14
Health and social assistance	15
Artistic, sports and entertainment activities	16
Other services	17
Not stated	Missing value

Table 6 – Own Elaboration – Business sectors at firms level with associated numeric dummy variable.
Source: AIDA classification

In the dataset are represented all the ATECO codes classified by two digits, except category 84 (Public administration and defence), because there were not firms belonging to this sector.

As the objective classification case, the variable "not stated" was counted as a "missing value" during the regression analysis with R.

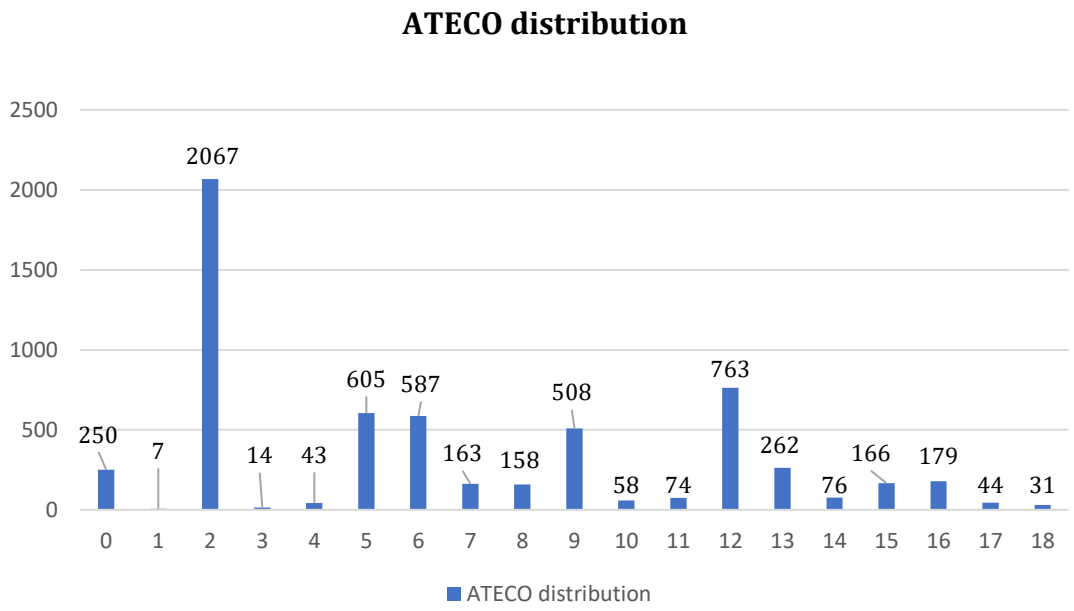


Figure 20 – Own elaboration.
Source: Info Camere network's dataset, 2016.

From this graph, it is evident that the manufacturing sector (2067 firms – 34%) is the most spread ATECO category in the dataset, followed by groups 12 (professional, scientific and technical activities), 5 (constructions), 6 (wholesale and retail trade; repair of vehicles and motorcycles) and 9 (information and communication services).

Revenues from sales, ROE, ROA, and **ROS**. These four measures were elaborated further and they represent the dependent variables of the model. For each one of them, I have calculated the arithmetic mean of the revenues among the different period of 3 years considered. For example, if a company entered in a network in 2010, it was considered its revenues between 2010 and 2012 and I made an average of these three values at the firm level. The average of the three years after the entry into a network was compared with the performance of that firm regarding the three years before (in this example 2008-2010). The difference between the average of the

performance after and before the entry in a system of firms gave me an indication about network's influence on companies' business. Afterwards, each company's value was compared with a referral benchmark, in order to see if its performance was positive respect to the market trend in those years. The benchmark value was a general mean of companies' performances of the same ATECO code (therefore competing in the same type of business) and in the same years considered for the initial company. If the difference between the firms' performance and its referral benchmark was positive, it was considered a positive trend given by the network formation and it was marked with a value of 1, otherwise 0.

Rotation of capital investment (ROT) represents how much of the capital invested is converted into sales. It measures the efficiency of an individual firm; a greater coefficient indicates a more efficient way of doing business. This variable is strictly related with other variables as ROS and ROI. Indeed, ROI = ROS x ROT.
This value was taken by AIDA data and I kept it unchanged.

Number of employees is an indicator of companies' dimensions. This value was important to generate other variables relevant for the study in R: **presence of firms of big dimensions** and **dimensional homogeneity**.

In this analysis, the firms of big dimensions are companies with more than 250 employees. In case that they satisfy this condition, they are marked with 1, otherwise 0.

The dimensional homogeneity value is represented by the **Hirschman index**, which represents the distribution of employees among members of the same network. A value close to 1 indicates that the distribution of dependent is highly disproportioned. Therefore, in the same network companies have high differences on dimensional aspects.

It was calculated as H (Hirschman value) = [ai1/n]^2 + [ai2/n]^2 + [ai3/n]^2

Where ai1, ai2, and ai3 represent the number of employees in each firm.
N = the sum of employees present in each company = a + b + c

ix represent the firms inside the same network; with x = number of firms in the network

This calculations has to be interpreted as greater the inhomogeneity of firms' dimensions, given by number of employees, higher the Hirschman Index is. Moreover, if firms that are part of the same network are generally bigger, the Hirschman value tends to increase.

Finally, the dataset was ready to the analysis with a linear regression. There were four different types of *Y* (Revenues from sales, ROE, ROA, ROS) expressed as 0/1 variables and the other 34 values were categorised as *X*.

5.2 Resume of the regression analysis' variables

To analyse those variables described before that I have individuated as relevant to determine a network success or failure, I used the logit regression analysis through R programme. The final dataset is resumed with these variables:

Dependent Variables	Variables	Name in the regression	Condition		Value
Y1	Revenue from sales	Revenues	Trend firm's revenues >	trend referral sector's revenues	1
			Trend firm's revenues <=	trend referral sector's revenues	0
Y2	ROE	ROE	Trend firm's ROE >	trend referral sector's ROE	1
			Trend firm's ROE<=	trend referral sector's ROE	0
Y3	ROA	ROA	Trend firm's ROA >	trend referral sector's ROA	1
			Trend firm's ROA<=	trend referral sector's ROA	0
Y4	ROS	ROS	Trend firm's ROS >	trend referral sector's ROS	1
			Trend firm's ROS<=	trend referral sector's ROS	0

Indipendent Variables	Variables	Name in the regression	Condition	Value
X1	Year when firms entered into a network	year	year = 2010	3
			year = 2011	2
			year = 2012	1
			year = 2013	0
X2	Number of firms inside the same network	actors	actors = Number of firms inside the same network	Any numeric value that indicates the number of firms inside the same network
X3	Network's objective of group 0	obj0	Group 0 is indicating the objective of that network, i.e. Research and Innovation	1
			Group 0 is not the objective of that network, i.e. Research and Innovation	0
X4	Network's objective of group 1	obj1	Group 1 is indicating the objective of that network, i.e. Marketing	1
			Group 1 is not the objective of that network, i.e. Marketing	0
X5	Network's objective of group 2	obj2	Group 2 is indicating the objective of that network, i.e. Market and reputation growth	1
			Group 2 is not the objective of that network, i.e. Market and reputation growth	0
X6	Network's objective of group 3	obj3	Group 3 is indicating the objective of that network, i.e. Coordination and Management	1
			Group 3 is not the objective of that network, i.e. Coordination and Management	0

Indipendent Variables	Variables	Name in the regression	Condition	Value
X7	Network's objective of group 4	obj4	Group 4 is indicating the objective of that network, i.e. Internal growth	1
			Group 4 is not the objective of that network, i.e. Internal growth	0
X8	Networks have juridical subject	subject	Networks with juridical subject	1
			Networks without juridical subject	0
X9	Network composed by firms belonging to the same region but different provinces	reg	Network composed by firms belonging to the same region but different provinces	1
			Network composed by some firms not belonging to the same region or belonging to the same province	0
X10	Network composed by firms belonging to the same province	pv	Network composed by firms belonging to the same province	1
			Network not composed by all firms belonging to the same province	0
X11	Rotation of capital value	ROT	Value of rotation of capital	Any value which indicates the ROT value for each firm
X12	Number of employees for each firm	employees	Number of employees the firm has	Any value which indicates the number of employees for each firm

Indipendent Variables	Variables	Name in the regression	Condition	Value
X13	Firms of big dimension, i.e. >250 employees	big	Firms employees > 250	1
			Firms employees <= 250	0
X14	Hirschman value for each network	hirschman	Hirschman value for each network	Any value which indicates the Hirschman value
ATECO from X15 to X34	ATECO codes	ATECOx (with x from 1 to 17)	Firms belonging to that specific ATECO code (first two digital number of AIDA classification)	1
			Firms not belonging to that specific ATECO code (first two digital number of AIDA classification)	0
X17	Manifacture ATECO code		All the firms that belong to the manufacture sector under ATECO classification	In the Intercept

Table 6 – Own Elaboration. Dependent and independent variables used for the regression analysis

Chapter 5

The analysis

5.1 Analysis' benchmark

5.1.1 The Italian context

To interpret results from the regression analysis it is fundamental to understand the context in which the research is going on. The temporal period of analysis belongs to a wider time horizon characterised by a general European crisis that started in 2007. Moreover, Italy was one of the countries that most suffered this phenomenon and, until now, Italian companies are damaged by these circumstances.

There are many factors that caused the crisis, but what is more important is the general increase of the rate of unemployment with the diminishing purchasing power by families. Indeed, the previous period was characterised by low unemployment rate in 2006 of about 6.5%, but with low paid jobs, with real wages lower than those needed to maintain purchasing power adequate to price levels. Since capital intensive investments were lacking, industrial production was stagnant or declining, advanced technological sector was almost inexistent and therefore the Italian economy lost competitiveness in comparison with the EU partners (Tridico, 2013).

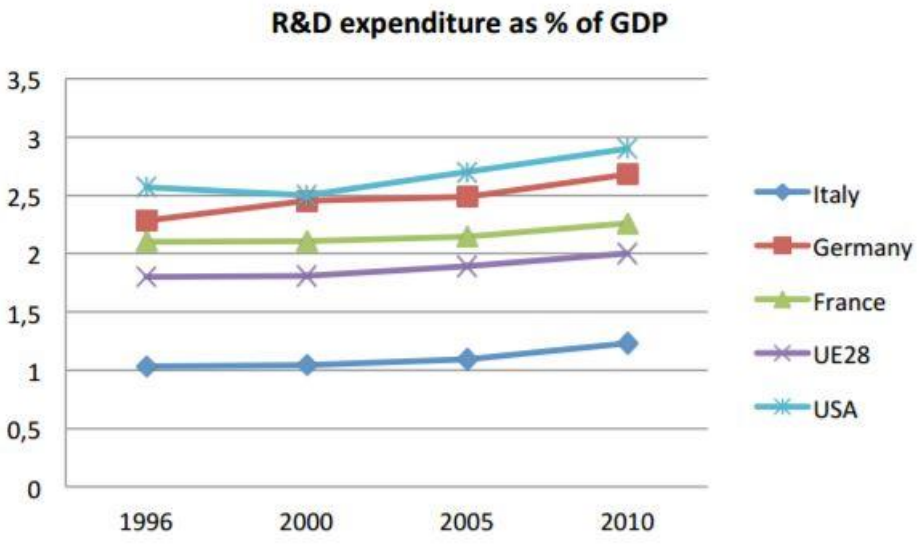


Fig.14 - Source: OECD (2012) and Eurostat (2012)

The scenario was a general trend of lower R&D expenditures for two decades which led to an incapacity to react on big market changes as it was in 2007. The only potential strategy for Italian companies was to rationalize their production reducing costs in order to save margins, i.e. their profits. Also for this reason companies were unable to lead disruptive innovation as described before. This lack led companies to invest only on a short-term point of view in the market, creating a stagnant situation in Italy.

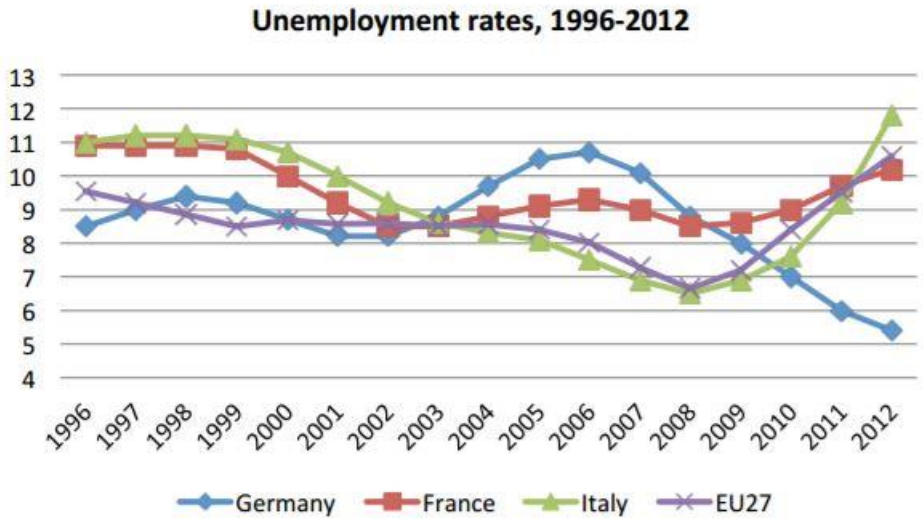


Figure 21
Source: Eurostat (2013)

The consequence was an increase of the Italian unemployment rate. Figure 15 pictures an incredible scenario about different trends in Europe. If Germany, France and EU27 had an unemployment rate greater than Italy from 2004 to 2008, after the crisis Italy's unemployment rate increased rapidly taking it over all other countries. The consequence was a lower purchasing power by families, creating a vicious cycle that finally led firms to not invest on R&D and to focus on short-term profits. Reading these trends it is understandable that clusters creations, followed by networks' contracts legislation, were a potential solution to respond to the crisis. As described, the objectives were to help firms to innovate, aggregating their knowledge and resources; moreover, at the same time the objective was to be more relevant in the market in order to gain the competitiveness lost in national and global markets.

For these reasons, it is very important to understand the context in which this analysis is occurring. The crisis that began in 2007 is still lasting in Italy and it has to be considered reading data.

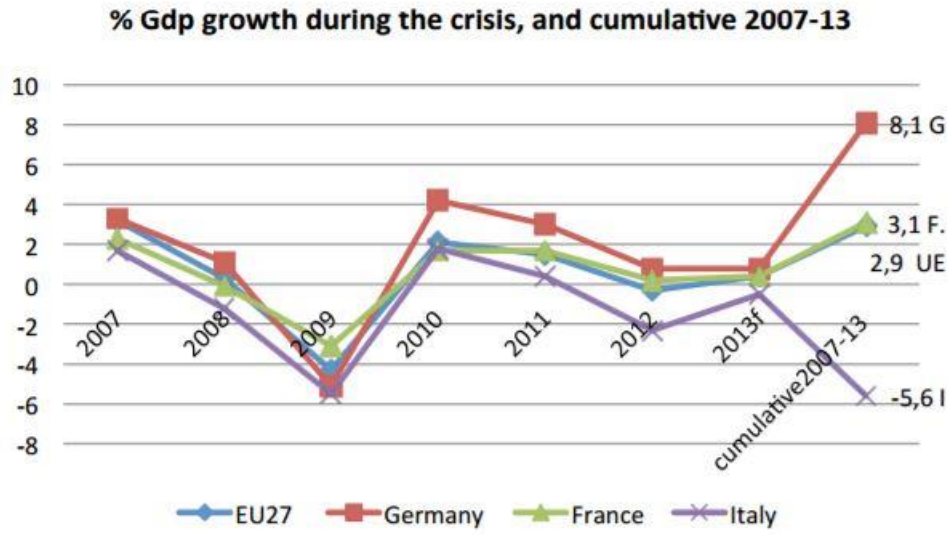


Figure 22
Source: Eurostat (2013)

Considering that entry's periods of firms into networks are from 2010 to 2013, it is evident how firms did not were able to improve their condition after the crisis, which is still permanent in the Italian market and, therefore, it is still influencing performances of firms. Networks in this sense have an important role to incentivise research and market relevance, through reciprocal support among companies.

5.1.2 The manufacturing sector

A regression analysis based on dummies variables needs to include in the intercept one variable for each group composed by the 0-1 mechanism. Therefore, I had to choose one variable among ATECO categories and objective's groups to add in the intercept. My choice was the ATECO category 2 represented by the manufacturing sector and the objective 2, i.e. market and reputation growth. The two variables were chosen because of: representativeness in the sample, clear influence on network performance, clear reciprocal influence on performance, theoretical background to have great relevance on networks and the Italian market. Therefore, the intercept which represents the benchmark for the analysis, is represented by two variables that are influential for network's forms of cooperation.

Indeed, the Italian manufacturing sector maintains still its relevance on a global dimension.

Industrial production pro-capite 2012

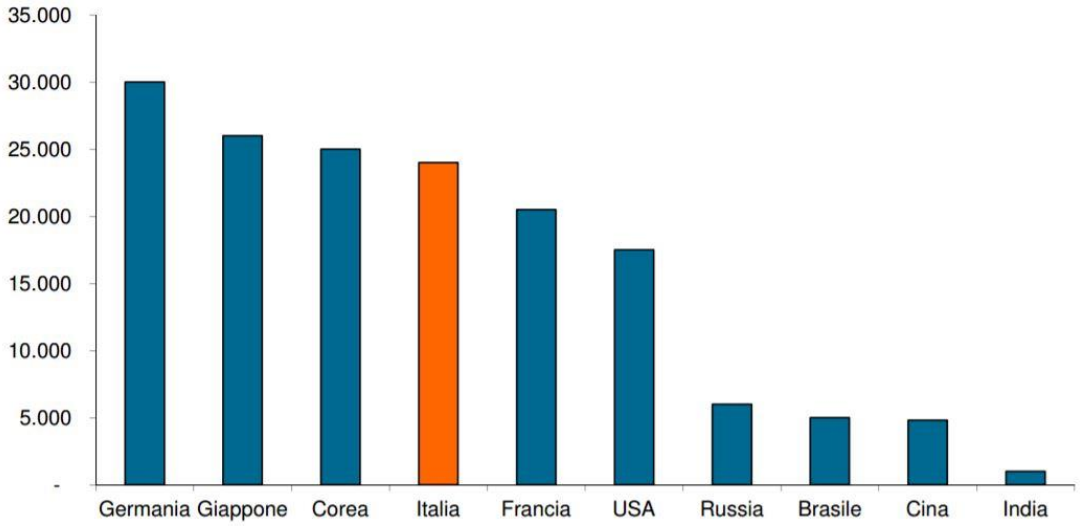


Figure 23
Source: Intesa-Sanpaolo Mediocratico Italiano, (2014), "Il quinto Osservatorio Intesa Sanpaolo-Mediocratico Italiano sulle reti d'impresa", Direzione Studi e Ricerche.

The industrial production in 2012 positioned Italy as the fourth global producer in the manufacturing sector and the second in Europe after Germany. As said, this figure underlines the potential capabilities of Italian companies to be competitive in a global level in this business. Therefore, its meaningful that networks are widely adopted by Italian companies competing in manufacturing, showing its opportunities and relevance for firms to growth and being more innovative in the market.

Loss of employment rate in the manufacturing sector as a % of the total employment in the same business per countries

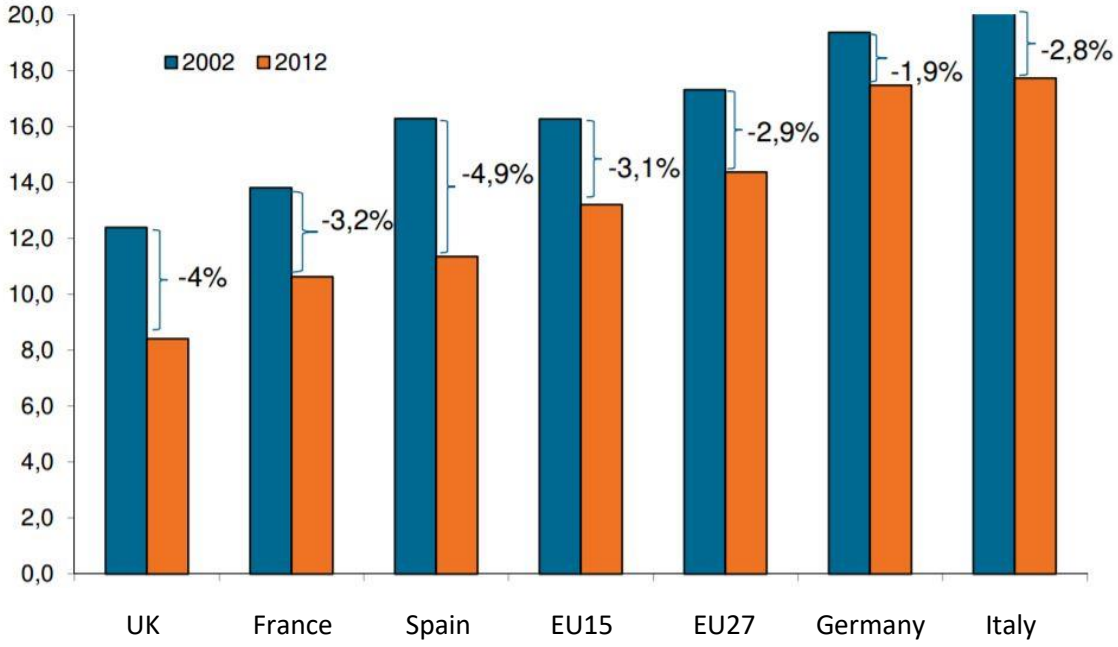


Figure 24
Source Intesa-Sanpaolo Mediocratico Italiano, (2014), "Il quinto Osservatorio Intesa Sanpaolo-Mediocratico Italiano sulle reti d'impresa", Direzione Studi e Ricerche.

Even though this sector is losing generally employees and the rate of occupation is decreasing for all markets in the 10 years between 2002 and 2012, Italy contained the loss maintaining its relevance in a global perspective, but also its importance for the internal growth of the Italian market.

Focusing on the Italian market, the trend during the period considered for the regression analysis is negative. The market is losing in terms of ROI and ROE.

Revenue from sales in the manufacturing sector from 2010 to

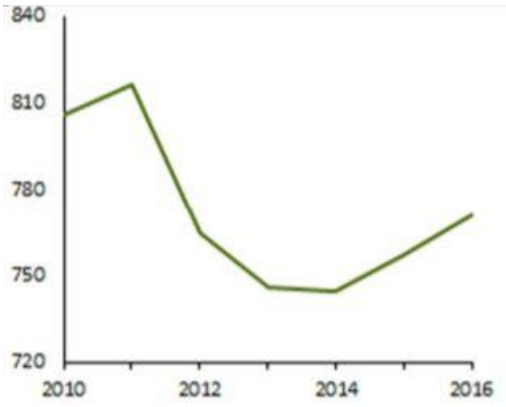


Figure 25 - Source: Intesa-Sanpaolo, (2014), "Rapporto Analisi dei Settori Industriali"

ROI and ROE in the manufacturing sector from 2007

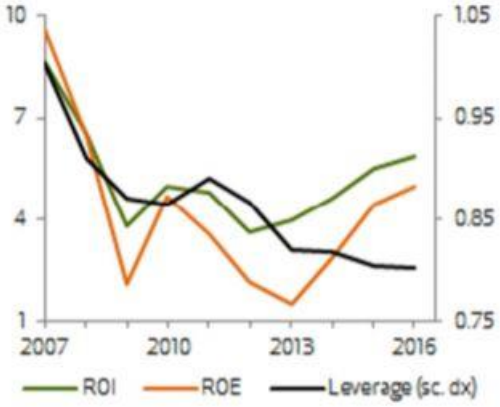


Figure 26 source: Intesa-Sanpaolo, (2014), "Rapporto Analisi dei Settori Industriali"

Rate of survival for companies in manufacturing sector for at least 3 years

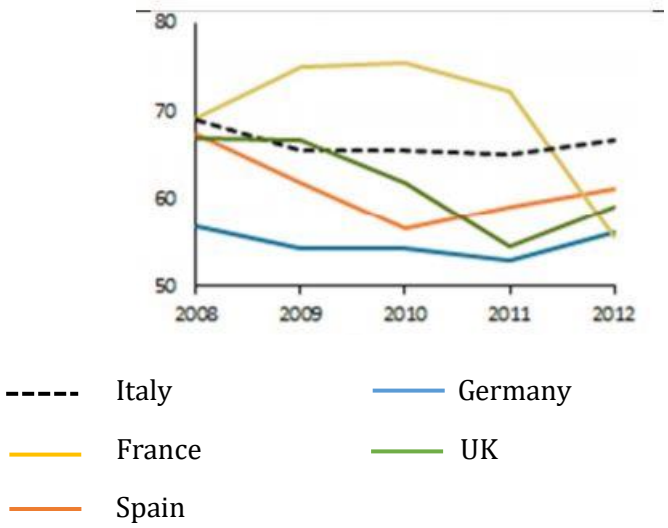


Figure 27
Source: Intesa-Sanpaolo, (2014), "Rapporto Analisi dei Settori Industriali"

These three graphs are confirming the general trend about crisis context. They show the relevance of the manufacturing sector in the last period for the Italian market. In fig.16 it is evident the rapid decreasing on revenues from sales between 2011 and 2013. Afterwards, from 2014 to now, revenues are re-taking a positive trend increasing their

values. ROI and ROE have a similar trend in fig.17 re-taking a positive trend from 2013 and reporting for the 6 years before (2007-2013) a loss on both these variables. Considering the period of my research, there is a general loss in the market; therefore, networks' positive influence in the analysis could be interpreted as safeguarding the loss in those years, limiting the general crisis present in the Italian market from 2007. Finally, in fig.18 it is evident the rate of survival for long-term Italian companies which is much better than other countries in Europe. This last data could indicate the presence of big firms able to survive to crisis that started in 2007 thanks to their dimensions, even though companies were worsening their performances.

Strategic decisions of firms operating on manufacturing sector

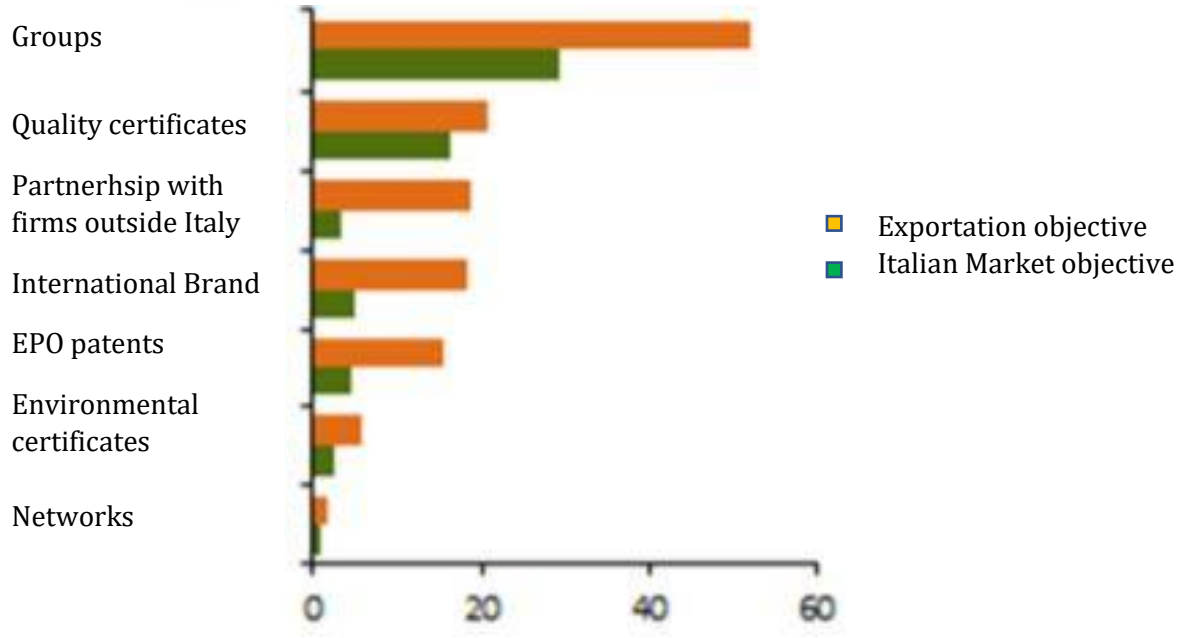


Figure 28
Source Intesa-Sanpaolo, (2014), "Rapporto Analisi dei Settori Industriali".

As can be seen in the figure, networks are only the seventh solution for firms operating in the manufacturing sector. Anyway, it is very interesting to see the difference with the strategic decision defined as "group" that indicates a general aggregation without the network contract legislation. Moreover, as third solution there are partnerships opportunities. These three solutions are considered valid both for export and to operate in Italy by companies. These indications are suggesting the relevance for manufacturing companies to work together and share processes or knowledge. The main difference in

the solution adopted seemed to be represented in the way these collaborations are coordinated and regulated. Given these results, it can be interpreted as a lack of network contract to properly regulate manufacturing structures; moreover, it appears that companies in that sector are not finding attractive the opportunity given by this legislation. The fourth solution represented by "International Brand" is corresponding to objective 2 of "market and reputation growth" in order to increase their relevance to the market. Even though they are not perfectly corresponding to objective 2, "qualitative certificate", "EPO patents" and "environmental certificates" are related to being more competitive and having a greater influence on the market. Therefore, even though they are more related on improving internal processes and working in a more responsible way, these three solutions have a second objective to increment the reputation in the market.

For these reasons, it appears that networks and objective 2 are in line with the manufacturing sectors, and Italian companies have individuated them as potential solution to improve their business.

5.2 Combining data to interpret the analysis' benchmark

The manufacturing sector has a great relevance in the dataset representing all the firms entering in a network between 2010 and 2013. There are 2067 companies which belong to this sector (34% of the overall dataset) and their performances is greater than the overall sample of networks in terms of revenues from sales and ROE. Therefore, with measures oriented on a short-term and financial points of view, the sample of overall dataset's networks had greater chance to succeed and have profitable return. Instead, on ROA and ROS measures oriented on assets and efficiency on revenues have a higher rate of failure (respectively 65,30% and 59,90% rates of failure).

Instead, the manufacturing sector showed higher sensibility to networks performance having a greater rate of success on revenues and ROE, and at the same time it possesses worse rates of failure in case of ROA and ROS. Therefore, manufacturing sector seemed to be more sensible to network's forms of structure, giving strong indication on networks success and failure.

Manufacturing sector vs. Networks' overall dataset performances - 2010/2013

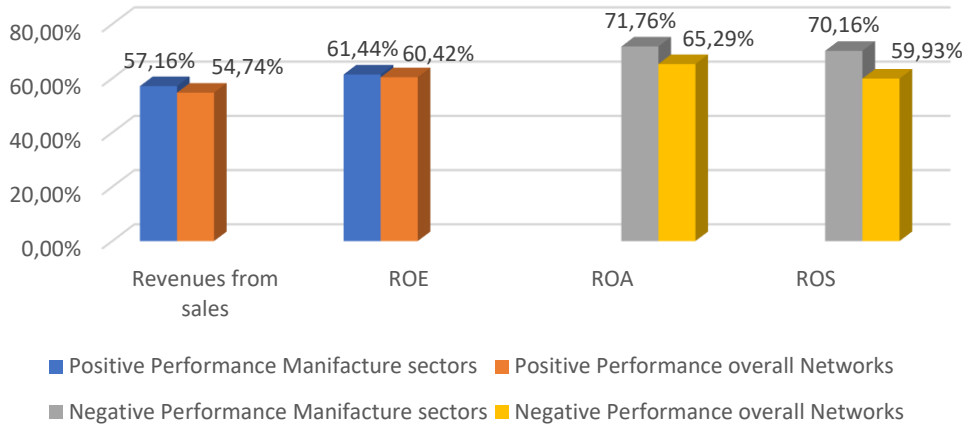


Figure 28 – Own elaboration.
Source: InfoCamere network contracts dataset, 2016

If we consider also the effect of objective 2 combined with the manufacturing sector the effects are even greater. Indeed, objective 2 has the same behaviour of the manufacturing sector: it has better performances on short-term measures, revenues (55,48% rate of success) and ROE (60,43% rate of success). On the other side, considering ROA and ROS, it has a worse performance respect to overall networks ones, with respectively 71,10% and 63,40% rates of failures.

In case of combining the two variables that will represent the benchmark we have this result respect to the overall sample:

Manufacturing sector and market and reputation growth objectives vs. Networks' overall dataset performances - 2010/2013

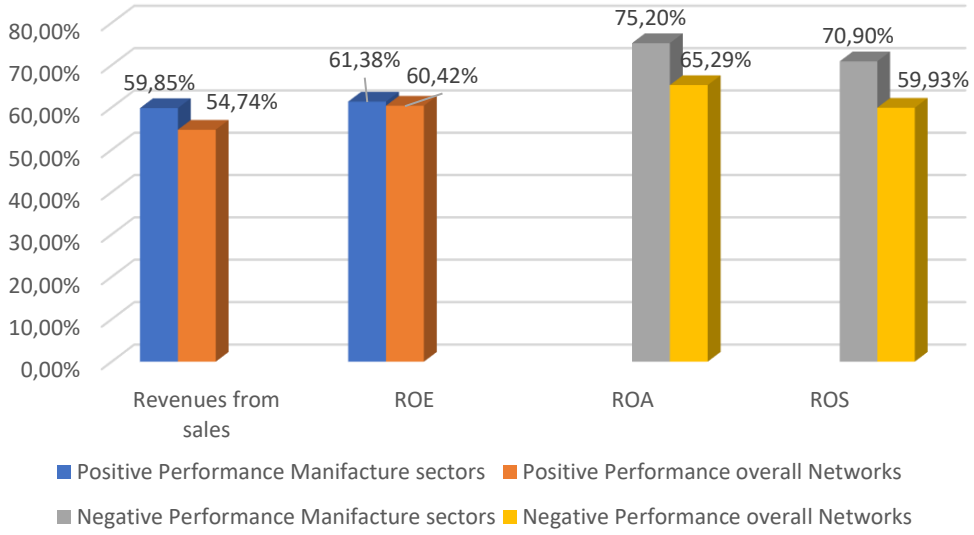


Figure 29 – Own elaboration.
Source: InfoCamere network contracts dataset, 2016

During the interpretation of the regression analysis these data will be the benchmark to read and understand results.

To resume their relevance in the dataset, here are reporting the values given by Pivot tables of the overall dataset compared with manufacturing sector, and with a second table reporting the combination of the last two variables. The data compared are excluding revenues from sales, ROA, ROE and ROS because were already examined before.

Overall networks' dataset	Actors per Network	Network with Juridical Subject	Networks Regional proximity	Networks Province proximity	Average of employees	Firms of big dimensions	Av. ROT	Av. H.I.
2010	5,34	0	30	21	16	0	0,66	0,88
2011	21,56	121	691	460	39,50	16	0,55	1,01
2012	7,18	60	1159	544	43,20	35	0,43	1,05
2013	9,02	624	2279	1208	33,78	46	0,47	1,08
2010-2013	10,40	805	4159	2233	37,15	97	0,47	1,05

Table 7 – Own elaboration.

Source: InfoCamere network contracts dataset, 2016

Ateco2	Actors per Network	Network with Juridical Subject	Networks Regional proximity	Networks Province proximity	Average of employees	Firms of big dimensions	Av. ROT	Av. H.I.
2010	4,31	0	11	9	19,4	0	0,43	0,81
2011	10,15	11	189	94	51,53	9	0,42	1,05
2012	7,14	26	473	209	64,67	9	0,54	1,06
2013	7,21	136	766	370	45,27	19	0,67	1,03
2010-2013	7,59	173	1439	682	52,25	47	0,45	1,05
Weight in dataset (34%)	-37,02%	21,49%	34,60%	30,54%	+28,90%	48,45%	-0,04%	+0%

Table 7 – Own elaboration.
Source: InfoCamere network contracts dataset, 2016

The first comparison shows the difference between the characteristics of firms operating in the manufacturing sector and those of the overall dataset. Looking to networks structural elements the systems of firms operating in this sector are composed by fewer actors (-37,02%) but members are generally of medium dimension with 52 employees on average (+28,90% respect to the overall dataset average). Comparing the relevance of manufacturing firms to the overall dataset, companies have a higher weight in the variable "presence of firms of big dimensions". It means that half of the firms with more than 250 employees are companies operating in this business. The most interesting result is given by the contrast between "presence of firms of big dimensions" and a greater average of employees per firm with the only 21,49% of companies belonging to networks with juridical subject. As seen previously, this result confirms that juridical subject's forms are more diffused in networks with many actors and companies of small dimension, needing a regulatory body to coordinate strategic actions.

Ateco2 with objective 2	Actors per Network	Network with Juridical Subject	Networks Regional proximity	Networks Province proximity	Average of employees	Firms of big dimensions	Av. ROT	Av. H.I.
2010	5,4	0	5	3	20,67	0	N/A	0,51
2011	4,77	1	42	27	35,61	1	0,44	1,11
2012	7,26	1	198	92	40,20	7	0,44	1,05
2013	5,90	28	310	146	43,16	8	0,57	1,04
2010-2013	6,25	30	555	268	41,30	16	0,45	1,05
Weight in dataset (12,59%)	-34%	3,73%	13,3%	12,0%	10,1%	16,5%	-0,04%	+0%
Weight in Ateco2 sector (37,59%)	-21%	17,3%	38,6%	39,3%	-26,5%	48,5%	+0%	+0%

Table 8 – Own elaboration.
Source: Info Camere network contracts dataset, 2016

Results of combinations between manufacturing sector and "market and reputation growth" objective are suggesting that these two variables are aligned, reinforcing the difference between this combination and the overall dataset.

After market and reputation growth's objective was added to this analysis, the number of actors are reduced sensibly further; moreover, also the geographical proximity variables, represented by province and region closeness, are reinforced. It means that companies to cope with this objective try to cooperate more closely. Finally, also in this case the juridical subject form is not adopted and it diminished further the weight of this form of the benchmark analysed (+17,34% respect to the overall weight of firms being part of the benchmark in the overall dataset 37,49%).

5.3 Regression analysis

The following table presents statistical results using R with the regression logit. Data are presented with the estimation of each independent variable and the standard error in parenthesis. In case of significance for some variables, they are indicated with "." or "*" according to their significance level resumed in a legend below the table. Independent

variables without an estimation were cancelled from the regression of that variable to improve the statistic precision. Here data are resumed with their results:

Variables	Intercept	Year	Actors	Obj0	Obj1	Obj3	Obj4	Subject	Reg	Pv
Revenues from sales	0.067 (0.440)	-0.156 (0.113)	0.039 (0.039)	0.291 . (0.164)	0.209 (0.166)		-0.188 (0.189)	-0.031 (0.395)		0.146 (0.172)
ROS	-3.213 *** (0.708)	1.424 *** (0.188)	0.006 (0.057)	0.157 (0.241)	0.766 ** (0.247)	-0.366 (0.433)	-0.353 (0.292)	0.328 (0.565)	0.204 (0.295)	0.455 . (0.274)
ROA	-4.217 *** (0.746)	2.452 *** (0.250)	0.086 (0.059)	0.551 * (0.032)	0.454 . (0.087)	-0.322 (0.459)	-0,154 (0.623)	-0.446 (0.694)	0.268 (0.306)	0.276 (0.290)
ROE	0.100 (0.596)	-0.283 . (0.148)	0.031 (0.050)	0.047 (0.220)	0.242 (0.228)		-0.268 (0.251)	-0.303 (0.445)	-0.466 . (0.258)	0.343 (0.248)

Variables	ROT	Employees	Big	Hirschman	Ateco0	Ateco1	Ateco3	Ateco4	Ateco5	Ateco6	Ateco7
Revenues from sales	-0.086 (0.128)	-0.001 (0.0001)		0.243 (0.480)					-0.843 ** (0.291)		
ROS	0.053 (0.180)	0.001 (0.002)	-0.559 (1.481)	0.441 (0.697)	2.392 (1.286)				0.894 * (0.393)		
ROA	0.022 (0.187)	0.003 (0.003)	-1.224 (1.350)	-0.533 (0.736)	2.393 . (1.275)				1.271 *** (0.379)	-0.661 (0.588)	-1.306 (0.930)
ROE	0.226 (0.170)	0.002 (0.002)	-2.444 . (1.402)	1.050 . (0.631)				-0.984 (0.915)	-0.472 (0.334)	-0.839 . (0.451)	-1.657 * (0.700)

Variables	Ateco8	Ateco9	Ateco10	Ateco11	Ateco12	Ateco13	Ateco14	Ateco15	Ateco16	Ateco17
Revenues from sales		0.339 (0.254)	-0.797 (0.931)	-1.66 * (0.791)	0.283 (0.224)	0.479 (0.359)				
ROS		1.090 ** (0.355)	1.825 * (0.816)		1.103 *** (0.322)	0.598 (0.527)		1.991 ** (0.674)		
ROA		1.508 *** (0.360)	3.998 *** (0.922)			0.548 (0.608)				
ROE		-0.303 (0.316)					-0.749 (0.816)			

N = 6155
. p <= 0.1 ; * p <= 0.05 ; ** p<= 0.01 ; *** p <= 0.001

Table 9 - Own Elaboration.

The structure of the regression analysis was built in order to find a model that contains all the fundamental variables individuated before and considered as potentially determinant for networks' performances, but also a regression that statistically could explain the dependent variables with a good precision. Given the objective to counterbalance these two goals, results aim to evaluate independent variables for different financial metrics (Revenues, ROS, ROA, ROE) in order to individuate when they are effective and, consequently, why.

5.3.1 Revenues from sales

Revenues from sales are the amount of revenues realized from products or services' sales during a specific period of time, such as a fiscal quarter or a year. Sales revenue figures are an important measure of a company's growth and financial performance, and the starting point for calculating many other important metrics, including gross profit, operating profit, and net profit. Therefore, they are the base from which all the most important financial metrics are extracted; i.e. they represent an important indicator to evaluate individual firms' performances.

Anyway, during the period of regression analysis (2008 – 2015), it is important to take into account the scenario previously described of crisis that started from 2007 and it is still influencing overall Italian and European markets now. Indeed, revenues from sales represents the dependent variable which could be most influenced by this period. Firms responded to crisis losing their volumes of sales or reducing prices in order to still maintain a good amount of sales. Revenues, indeed, do not take in account properly costs, therefore this indicator is losing profitability optimization.

The regression analysis gave few variables as significant for the revenues from sales explanation. Indeed, the AIC is 1010.80, more or less the double of the AIC of other dependent variables. In this sense, it means that there are other variables that are more relevant to explain revenues from sales and are not included in the model yet.

The overall dataset had a rate of 54.74% of success and considering the benchmark included in the intercept it reached the 57.16%. Therefore, the trend is slightly positive for networks influence on individual firms. Given the regression results, the most

significative variables are represented by different industries sectors: Ateco code 5 (Construction) and Ateco code 11 (Real estate activities). These two sectors that are apparently similar among them in the way to do business have both a negative estimation; therefore, firms on these sectors have expected negative returns on revenues from sales when they enter in a network.

Indeed, the rate of success for firms in the construction sector, which has a considerable weight of 9,83% in the dataset, is 41.51%. For this sector, it appears that when it is combined with the objective 0 (Innovation and Research) has a rate of success of 48.96%, improving slightly the general performance of this business. The other two objectives diffused equally with objective 0 for construction business are "marketing" and "market and reputation growth". The second variable is included in the intercept and it has a negative influence on the performance of firms (39.05% rate of success). Instead, the most suggested objective, marketing, presents a rate of success of 58.02%.

In case of Ateco 11, firms represent only the 1% of the overall dataset with a 18.18% as rate of success. Number of firms belonging to this dataset is too small to individuate indicative trends.

Considering the revenues from sales analysis, the variables studied do not show particular significance to explain the networks' performances. The objective Innovation and Research had a 55.57% rate of success considering revenues from sales. The result has not to surprise because this objective's group could include both short and long-term goals; indeed, the "object category" that firms have to insert in the contract when they create a network, in many cases there was a lack of time-horizon specification. The lack of any indication led to classify research and new technologies development together with innovation, that in many cases is represented by short-term improvements. Therefore, this group indicates the approach used to collaborate with members and the general goals expected of improving themselves through external knowledge. Given these considerations, it appears clear that an intense flow of information could help firms to adjust production processes, efficiency and effectiveness in facilities as transportation and sales.

For these reasons, a potential future research of study is to identify more clearly the objectives of firms separating them for time-horizon of networks' strategic decision. To

deal with this issue, a change in the legislation with more clear specification on way to measure objectives and expected time needed to reach them, would be helpful to better understand data and areas of improvements.

Moreover, juridical subject form, Hirschman, and number of actors were particularly non-significant to explain revenues from sales. Therefore, it could be interpreted this result that internal configuration and structure of the network is not so relevant. Juridical form which gave the opportunity to create a regulatory body, a common fund and a legal personality, is not affecting firms' revenues performance at all.

Given the short-term point of view of revenues variable, but also regarding the period of research of this dataset, it is likely that forms as a regulatory body which help to coordinate strategic decision could not be helpful; i.e. firms do not have time to get comfortable with this new structure, exploiting its potentials. Moreover, the creation of a common fund and an administrative department which represents a third entity need time and an initial investment. Therefore, revenues in first years could decline given by the rate of initial investments to coordinate members.

5.3.2 ROS (Return on Sales)

ROS is a financial ratio that calculates how efficiently a company is generating profits from its top-line revenue. It measures the performance of a company by analysing the percentage of total revenue that is converted into operating profits.
ROS is used to compare current period calculations with calculations from previous periods. This allows a company to conduct trend analysis and compare internal efficiency performance over time.
The ROS calculation is taken as a company's operating profit in a specific period divided by net sales for that same period. The equation for ROS is as follows:

ROS = (Operating Profit) / (Net Sales).

The calculation shows how effectively a company is producing its core products and services and how its management team is running the business. Therefore, ROS is used as an indicator of both efficiency and profitability. This measure provides insights into how much profit is being produced per dollar of sales. An increasing ROS indicates that a

company is growing more efficient, while a decreasing ROS could signal looming financial troubles (investopedia.com).

The study of ROS in the regression analysis showed the relevance of different variables with an AIC of 534.58. The precision of this measure therefore improved a lot respect to revenues from sales analysis. At first, it is meaningful to note the positive influence of networks on ROS at individual firms' levels for different sectors; in descendent order of significance the Ateco codes most influenced by entries in a network are the Ateco code 12 (Professional, scientific and technical activities, with a presence of 12,40% in the overall dataset), Ateco code 9 (Information and communication services, 8,20%), Ateco code 15 (Health and social assistance, 2,70%), Ateco code 5 (Constructions, 9,83%), Ateco code 10 (Financial and insurance activities, 0,94%), and Ateco code 0 (agriculture, silvicolture and fishing, 4,06%). Taking into account that all these Ateco codes had a positive influence by being part of a network from a ROS point of view, and all these sectors aggregated represent the 38,13% of the overall dataset, it appears that networks are beneficial on ROS performances only for some specific sectors. Therefore, the business type that a firm is operating on is decisive to improve the return on sales, which could be translated as *efficiency on their potential profitability.* For the same reasons that the type of sectors is fundamental to reach a positive performance, it is suggested also to evaluate with attention potential partners which belong to these Ateco codes that could lead to greater benefits on ROS values respect to other firms operating in businesses as manufacturing, which had a big rate of failure on this aspect.
As already reported ROS positive performances in the overall network dataset is only the 40,06%, underlying potential difficulties on improve efficiency in collaborations among firms. An element that could be responsible to this aspect is the lack of proper coordination mechanisms that could improve the flow of information. Moreover, few number of firms are adopting the juridical subject, which includes a third regulatory body, and the sample is too small to understand if this body could really help firms in this aspect. Anyway, until now the analysis showed its no significance to improve members' performances. Therefore, this legislation on this aspect is not attractive for firms, but also not decisive to improve ROS values, i.e. efficiency of making profits by firms.

Studying deeper the sector that resulted most positively significant and with the higher relevance, Professional, scientific and technical activities, has a rate of success in ROS is 48,87%, which is considerably greater than the referral benchmark (only 29,10% rate of success), but still less of the 50%. Given this data, it is evident how the actual structures of networks are not helping firms to improve these aspects. At the same time, it is not possible to find indicative variables that could improve the ROS because the best performing sector has performances not sufficiently good yet. Anyway, looking those firms that belonged to this sector, the average number of actors is 6 against the mean of the overall dataset of 10, and the average of employees is 12 against 33 of the overall networks' scenario; therefore, group of firms with less actors and with smaller dimensions seems to help companies on improving this financial measure. Anyway, they are not significant in the regression analysis, so it is not possible to state that these suggestions could be determinant for the improvement of firms.

One variable that showed a great relevance and a positive influence on improving ROS performances is the objective of group1, Marketing. This objective is representing goal on improving the communication and penetration in the market, with products of higher value and improving the share of commercial capabilities. This positive influence of this variable on ROS is in line with the theoretical explanation of this financial indicator: improving commercial skills and firms' offers have a good influence on return of sales; i.e. products of higher qualities or with a wider choice can be sold at higher prices and to a greater share of the market. Therefore, as a consequence also the marginal return from each sales is greater. Anyway, with objective 1 the rate of success on ROS is still poor (40,08%) and it underlines the structural problems of networks in case of financial performance on return from sales.

Studying geographical proximity, results are more evident about a potential indication on improving performances: province proximity (all members of the network are based on the same province) has a 44,21% of success, while regional proximity (members in the same regional area but at least two of them come from different provinces) is 36,41%, and companies in different areas of Italy perform 38,82%. The results suggest the improvement of performance in case of geographical proximity.

Looking further the benchmark of the regression, the manufacturing sector that represent the 34% of the overall dataset and it is particularly relevant for networks'

failures on ROS, the objective of group3 resulted as the worst choice, with a 76.79% rate of failure. This objective represented general collaborations and sharing rules and managerial activities.

Finally, the ROS seemed very sensitive to types of sectors that firms are belonging to; moreover, the companies with better performances are part of businesses that need intense communication flow. For these reasons, geographical proximity has a positive influence, facilitating coordination mechanisms; moreover, the need to communicate could help firms to build trust among them overcoming possible problems of coordination and communication that other companies have to afford.

5.3.3 ROA

Return on assets (ROA) is an indicator of how profitable a company is relative to its total assets. Therefore, ROA gives an idea as to how efficient management is at using its assets to generate earnings. Calculated by dividing a company's annual earnings by its total assets, ROA is displayed as a percentage. Sometimes this is referred to as "return on investment".

The formula for return on assets is:

ROA = (Net Income) / (Total Assets)

The assets of the company are comprised of both debt and equity. Both of these types of financing are used to fund the operations of the company. The ROA figure gives an idea of how effectively the company is converting the money it has to invest into net income. The higher the ROA number, the better, because the company is earning more money on less investment (investopedia.com).

ROA from the regression analysis showed to be very aligned with ROS performances, foremost about Ateco codes. The strong dependence on some ateco codes made the AIC as the lowest among these four financial dependent variables with an AIC of 503.69. Indeed, also in this case the most relevant variable belong to the type of business firms are operating on. Moreover, the majority of codes which were significant for ROS are still relevant for ROA: Ateco 5 (Constructions), Ateco 9 (Information and communication

services), and Ateco 10 (Financial and Insurance activities). Aggregating these three Ateco codes I individuated some variables that were particularly effective to give this performance improvement. The three business sectors together have a rate of success of 50,09% respect to the benchmark of 24,80%. Objectives of "innovation and research" and marketing had respectively in this sample a rate of success of 52.44% and 51.30%. Meanwhile, the other two objectives, "coordination and management" and "internal growth" had a worse performance of 45,95% and 47,45%. As the ROS' indications geographical proximity has a weight too: firms in the same province have a 55.96% rate of success in the sample representing the three significant Ateco codes, while regional closeness has a 53,75%, and firms operating in different areas of Italy performing with a 44.31% of success. Moreover, networks form with a juridical subject has a rate of failure of 70.83% in the sample considered.

From these results, it emerges the strict correspondence between ROA and ROS. Indeed, both focus on exploiting resources (assets and investments, or financial) in an efficient way and improving margins from revenues. In this sense, geographical proximity represents an important variable to consider by firms, as "marketing" and "innovation and research" objectives. Moreover, given the number of actors with pvalue = 0.143, which is quite close to consider it significant, it could be individuated possible interesting patterns: indeed, the average number of actors in the overall dataset is 10, while the mean for suggested number of members inside a network to have a positive ROA is 14. The increment on elements can potentially lead to improvement on ROA performance; this result indicates a space for future studies on the dependence between number of actors and ROA's improvement. This indication could suggest the potential significance to have many members inside the network in order to increase the amount of common assets and, therefore, their potential investments and influence on the market, which is part of objective 2 ("market and reputation growth"), which has a 53.30% of success in the sample previously considered.

5.3.4 ROE

Return on equity (ROE) is the amount of net income returned as a percentage of shareholders equity. Return on equity measures a corporation's profitability by

revealing how much profit a company generates with the money shareholders have invested. ROE is expressed as a percentage and calculated as:

Return on Equity = Net Income/Shareholder's Equity.

Also in this case, as ROA and ROS, the efficiency on exploiting proper and common resources is fundamental to determine a good performance on this financial measure. A high ROE generally means that the rate of return on equity is going up and that the company is doing a good job of growing profits without adding new equity into the business (investopedia.com).

Regarding ROE measure, in the regression analysis are present different variables significative to explain firms' levels of performances, with an AIC 604.85. The main difference among ROE and other financial measures is the low dependence on Ateco codes: only Ateco code 7 (2,65% of the whole dataset), transportation, shipping and storage, and Ateco 6 (9,54%), wholesale and retail trade / repair of vehicles and motorcycles, are significant to explain ROE. In this sense, it could be understood the AIC bigger than ROS and ROA; even though, considering all other structural variables this measure is more dependent on them. Both these sectors are expecting to diminish the ROE performance which has a rate of success of 60,42% and 61,44% considering the referral benchmark. ROE therefore is the financial performance which give the best results in networks' context.

Given the results of the regression, geographical proximity is important also for this variable. Region, indeed, is significant and it has a negative influence for networks performances with a rate of success of 45.97% against province proximity (60.48%) and collaborations with at least two firms that come from different regions (61.46%). Geographical proximity showed also some relevance with other variables determining a success or failure in ROE performance. The positive performance of networks with at least two firms operating in different regions is even stronger when firms of big dimensions are included (77,7% of success), even though this variable is negatively significant for firms operating in the same region. Probably firms of big dimensions are more able to manage distant relationships and have better resources to communicate and maintain constant flow of information. Moreover, networks with juridical subject

increase ROE rate of success with firms in different regions until the 63,33%, probably because a third regulatory body can facilitate the coordination among distant members and helping on trust-building processes. Also in this case, even though this variable is not significant in general for ROE, juridical subject is a variable that has a negative influence on networks. Finally, also objectives influence is different between networks with opposite geographical proximity. In case of province proximity, the best performing objective is the group2, i.e. market and reputation growth, with 60,63% rate of success; instead, when firms operate on different regions the best objective is marketing with 65.58% while for province closeness it has only a 56.36% rate of success. These considerations suggest that geographical proximity could be a variable with different level of efficiency according to the use of variables as juridical form or other objectives in order to exploit fully networks' potentials. Anyway, both of them confirmed the worse performance of objective 3 respect to the others, as already seen in other financial variables.

"Big" and "Hirschman" are other two variables that are significant for the regression. The presence of firms with big dimension (employees > 250 at firm level) is influencing in a negative way the ROE performance. Instead, Hirschman value showed an increasing trend with ROE: higher the Hirschman index, higher the degree of inhomogeneity among companies in the same network, greater the ROE measure.

Chapter 6

A second-step analysis

6.1 A new experimental analysis

First results on firms individual financial performances based on network participation give good indication about its influence. The analysis showed the high relevance of business sectors firms are belonging to. Afterwards, each financial performance was more sensible at 2 or three structural variables. Anyway, after the first analysis I thought that it was necessary a second experimental analysis, introducing, or reinterpreting the variables present in the dataset.

Indeed, there are some variables that I was expecting that they were more significant to "explain" financial performances. Those variables showed their no significance for any dependent variables; therefore, it is necessary a second step process which try to re-collect data in a different way in order to see if they could be more relevant for some variables.

This second step analysis introduces five new variables: network contracts' temporal duration, networks with one specific objective or with more than one scope (general orientation of improvement), actors' classification into new categories, employees' classification into new categories, networks with members all belonging to same Ateco codes.

Moreover, to have a more complete view of financial performances and how they are influence from networks, I decided to introduce the ROI variable. Finally, all financial measures were reinterpreted considering them with a larger time horizon. Indeed, each measure was calculated from the year of entry of each firm until 2015. There are no more fixed period of performance for each year of entry; instead, now the relevance is focused on the duration that a firm stays inside a network and how its performance are affected by different time-horizon. The scope of this analysis is to find a model that

explains better financial outcomes and it can also reveal more insight about relevance of time inside a network.

h11: More a firm stay inside a network, greater are its financial performances with time, thanks to better communication, higher trust, and improve coordination mechanisms.

Below the new variables introduced in the dataset are presented.

ROI: ROI represents a dependent variable added to the previous model. The ROI is a measure used to evaluate the efficiency of an investment or to compare the efficiency of a number of different investments. ROI measures the amount of return on an investment relative to the investment's cost. To calculate ROI, the benefit (or return) of an investment is divided by the cost of the investment, and the result is expressed as a percentage or a ratio (investopedia.com).

ROI is also dependent on ROS and ROT values. Indeed, ROI = ROS * ROT.

Therefore, there is a direct relationship between ROI and ROS, and also with ROT. Indeed, greater efficiency on investments is derived from greater margins on sales and an inclination to invest on their yearly revenues. This value is important in network's analysis, because networks represent a form of investment and companies to reach overall objectives have to invest time, energies but also money. Even though ROI could necessitate a longer period of analysis to have enough time to evaluate results of data, it is an important indication about first results in terms of networks performances.

Given its dependence on ROS and ROT is was calculated combining this two indicators. If ROS was equal to 1, i.e. positive performance respect to the referral benchmark, and ROT was bigger than 1, i.e. a firm has the propensity to re-invest at least as much as its earnings, it was signed with 1, otherwise 0.

Network contracts' temporal duration: this variable indicated with the name **duration** considers the influence of different temporal periods on financial performances. Indeed, it is calculated the significance by different permanence inside the same network in terms of years. In case of companies entered in 2010, financial performances represent the period of six years, from 2010 to 2015. Companies that participated to a network in 2011 cover a period of performance of five years; firms that

entered in a system in 2012 considered four years; and members of networks that entered into 2013 have the same financial performance of the previous dataset with 3 years considered. Duration variables has to reveal potential influence of permanence into networks for more time; indeed as showed by the figure x in chapter 4, firms that are staying more time into a network could improve their performance, mainly for certain objectives which require more time to be reached.

The variables is marked with progressive number from 0 to 3, in which 0 indicated the shortest time-period of three years and 3 the longest period of six years which belong to those firms that entered into networks in 2010.

Networks with one specific objective or with more than one scope: In this case are considered networks with one clear state objective or with more than one scope but all them were individuated in the same macro-category created before. On the other hand, networks build by members to improve their performance and exploit general advantages have to be considered differently; indeed, these systems are built without clear strategic actions and also without any clear way to measure objectives. Many times it is a process in itinere towards a continuous flow of information or cooperation, with no clear ideas about the final expected results.

The variable, named **objective**, is signed with 1 when networks possess only one category of objectives and 0 otherwise.

Actors' classification into categories: In order to increase the relevance in the analysis of the actor's variable, named in the regression analysis **actor**, I classified networks' dimensions into macro-categories:

- Direct collaborations: networks made by 2 members
- Networks of small dimensions: networks made from 3 to 5 members
- Networks of medium dimensions: networks made from 6 to 10 members
- Networks of big dimensions: networks made from 11 to 20 members.
- Networks of big dimensions: networks with more than 20 employees

I assigned to each category a number in ascendant order from the smallest collaboration, 0, to big dimension firms' category, 4.

Employees' classification into categories: As described for the precedent variable, **employees**, which determine firms' individual dimensions, were categorized into different macro-segment in order to increase their relevance for companies' financial outcomes.

- Micro-firms
- Firms of small dimensions
- Firms of medium dimensions
- Firms of big dimensions

As for actor variable, it was assigned an ascendant order from the small dimensional form, 0, to big firms' dimensions, 3.

Networks with members all belonging to same Ateco codes: During the analysis it emerged the significance of Ateco codes variables on financial measures. Indeed, according to different financial outcomes there were different Ateco codes that were significant for companies. On one hand, theoretical backgrounds showed the main problem to coordinate actors and their strategies into the same networks; moreover, they underlined the important to have a fluid communication flow. On the other hand, Burt's theory of structural holes and other researchers supported the idea that members have to create relationships not too intense among members. Indeed, they have to be free to grow individually their business, in order to acquire information from the external environment and, then, leading them inside the system. For these reasons, Ateco codes' affinity in the same network could represent a fundamental variable to understand the relevance to possess firms strictly aligned in the same business. It is expected a greater innovative rate on a short-term point of view, given the potential to share rapidly is expected a greater innovative rate on a short-term point of view, given the potential to share new knowledge that could rapidly improve collaborators'

performances. On the other side, on a long-term perspective companies can receive more information and suggestion to improve, even radically, their business with networks rich of different Ateco codes and experiences.

Firms belonging to a network composed only by firms of the same Ateco code were classified with 1, otherwise 0. The variables in the regression analysis is indicated with the name **ateco**.

The new actor and employees categories substituted the old variables about number of actors and employees present in the first model. Instead, duration, objective, and ateco variables were added to the first model. All of them were considered as independent variable.

As in the first model, the referral benchmark is still manufacturing sector with objective 2, market growth and reputation. Therefore, data will be red in the same way. Finally, given the new calculation of revenues, ROS, ROA, and ROA with different temporal periods, these independent variables are modified accordingly, taking into account all the years of performance that were available in the dataset.

6.2 Reading the analysis

The table below presents all the results of the regression analysis given the second model proposed.

Variables	Intercept	Duration	Actors	Obj0	Obj1	Obj3	Obj4	Objective	Subject
Revenues from sales	0.46 (0.45)	0.11 (0.12)	-0.11 (0.14)				-0.37 . (0.21)	0.08 (0.17)	-0.52 (0.37)
ROS	-2.40*** (0.69)	1.04*** (0.16)	0.03 (0.20)	-0.49 (0.33)	-0.34 (0.25)	-0.42 (0.39)		-0.52 . (0.32)	-0.48 (0.66)
ROA	-3.75*** (0.81)	2.24*** (0.22)	0.11 (0.64)	-0.79 * (0.40)	-0.48 . (0.29)		-0.31 (0.37)	-0.66 . (0.38)	-1.27 (1.11)
ROE	-0.72 (0.61)	2.69*** (0.24)	-0.26 0.20			-0.37 (0.37)	-0.33 (0.28)	-0.23 (0.23)	-0.51 (0.56)
ROI	-1.85** (0.63)	1.58*** (0.14)	-0.27 (0.16)	0.45 (0.31)	0.29 (0.22)	0.44 (0.36)		0.37 (0.31)	0.32 (0.45)

Variables	Region	Province	ROT	Employees	Hirschman	Ateco	Ateco0	Ateco1	Ateco3	Ateco4	Ateco5
Revenues from sales	0.26 (0.20)	-0.27 (0.20)	-0.03 (0.14)	-0.01 (0.11)	0.23 (0.48)	-0.07 (0.19)					-0.70 * (0.30)
ROS	0.56 * (0.27	-0.34 (0.27)	0.17 (0.18)	-0.22 (0.14)	-0.45 (0.67)	0.57 * (0.25)					2.10*** (0.40)
ROA	0.66 * (0.32)	-0.17 (0.31)	0.002 (0.21)	-0.21 (0.18)	0.86 (0.78)	0.08 (0.29)	2.41 (1.50)				2.08*** (0.45)
ROE	0.31 (0.27)	-0.36 (0.28)	0.14 (0.18)	-0.11 (0.15)	-1.53 * (0.67)	-0.35 (0.26)					-1.73*** (0.45)
ROI	0.12 (0.24)	-0.25 (0.25)		-0.12 (0.24)	-1.49 * (0.65)	-0.61 * (0.25)	2.21 * (1.01)			-0.63 (0.87)	-0.59 (0.38)

Variables	Ateco6	Ateco7	Ateco8	Ateco9	Ateco10	Ateco11	Ateco12	Ateco13	Ateco14	Ateco15	Ateco16
Revenues from sales					-1.37 (1.19)	-1.06 . (0.61)	-0.27 (0.23)				
ROS		0.92 (0.56)		1.05 (0.32)		0.74 (0.82)	1.06** (0.33)	0.50 (0.50)	1.65 * (0.76)	1.19 . (0.69)	
ROA		1.75** (0.66)		1.32*** (0.36)	3.01 * (1.23)		1.17** (0.37)	0.49 (0.40)	0.87 (1.06)	1.41 (0.88)	
ROE				-0.62 . (0.35)		-2.54** (0.90)	-0.78 * (0.35)	-1.22 * (0.57)			
ROI	-0.98 . (0.53)	0.73 (0.54)		-0.21 (0.31)		-0.80 (0.75)	-0.28 (0.32)	-0.93 . (0.52)	-0.97 (0.97)		

Variables	Revenues from sales	ROS	ROA	ROE	ROI
Ateco17					

N = 6155
. p <= 0.1 ; * p <= 0.05 ; ** p<= 0.01 ; *** p <= 0.001

Table 10 - Own Elaboration.

This second step analysis focus on interpreting differences between the first model and the second one. Considering new values of independent variables with temporal duration included, and the presence of a new group of dependent variables inside the second model, it is expected a difference in the significance of the model. Any difference between first and second model have to be interpreted with the main difference of temporal variable inside financial performance in mind.

Revenues from sales

Revenues from sales had Ateco codes variables as those with most significance to explain this financial outcome. As in the first model, Ateco 5 (Construction sector) and Ateco 11 (Real estate activities) have worse revenues from sales when they enter into networks. Regarding these businesses the reasons are the same as those hypothesized for the first model.

Regarding structural variables, juridical subject form is not significant yet. Anyway, it increase its potential relevance respect to the first model, as objective 4 and geographical proximity. It is interesting the opposite influence of province closeness from the first and the second regression analysis. Indeed, in the first case, with revenues from sales considered only in a fixed period of three years, networks with firms belonging all to the same province have expected benefits in terms of revenues. In the second model, in which revenues have a more long-time horizon, province proximity has a negative influence on revenues' measure.

The new dependent variables proposed are not significant to explain revenues from sales. It means that revenues still necessitate further studies to interpret it correctly. Anyway, AIC improved from 1010.8 to 900.63, i.e. the second model has a greater precision on explaining revenues from sales behavior of firms belonging to networks. Given the indications from the first model and this second result on AIC, considering revenues performance in more years could extract more significance from these structural variables.

ROS

The second model presented the same significance on Ateco codes of the first analysis.: Ateco 5 (Construction), Ateco 9 (Information and communication services), Ateco 12 (Professional, scientific and technical activities), and Ateco 15 (Health and social assistance). All of the them maintained a positive influence received by network's participation as the first model. To these value, there is also the Ateco 14 (Education) that was not present in the previous analysis. As in the first model, different Ateco codes showed to react positively on networks' adoptions on the ROS aspect.

As it will be analysed in ROA objectives proved to be negatively related to ROS performance in the second model. SCAMBIO TRA ROS E ROA CON ANALISI DI OBIETTIVO

Moreover, region variable is positively correlated with this financial performance. Scambio con roa consideration

Another similarity with ROA is represented by the opposite significance of the variable year respect to duration in the second model. Scambio con roa.

Finally, also ateco variables showed relevance to explain ROS behaviour. Networks with firms that belong to same Ateco codes are more significant on ROS point of view. The result can be confirmed also by the many relevancies showed by different Ateco codes on ROS, as described before. Moreover, firms of the same Ateco codes can share more rapidly information and innovate accordingly with a constant communication. In a short-term point of view this can represent an advantage, mainly in terms of profit maximization, i.e. improving the efficiency on sales. It will be interesting to observe the permanence of this significance in networks' analysis based on a longer time-horizon.

ROA

ROA analysis give interesting results respect to the first model, lowering the AIC from 503.69 to 490.96. Even though the precision to explain ROA outcomes improved, the most interesting part is represented by some contrasting results emerged between the two analyses.

Regarding Ateco codes analysis Ateco 5 (Construction), 9 (Information and communication services) and 10 (Financial and insurance activities) confirmed to be relevant and to have their ROA performance influenced by network's participations. To these sectors, also Ateco 7 (Transportation, shipping and storage) and Ateco 12 (Professional, scientific and technical activities) are significant in the second model. Considering the last two codes their significance increased rapidly from the first model to the second one, it is evident the positive influence of ROA on long term. For Ateco 12 mainly, the sector's theory is aligned with these result: scientific and technical sector are expected to improve performances on a more long-term point of view.

Regarding the geographical proximity the second model showed a higher relevance of regional closeness among members' networks. Indeed, firms that are operating in the same region have improved their ROA performance adhering to a network.

Anyway, the most interesting results come from objective and temporal analysis. Accordingly, the variable year in the first model indicates the significance to enter progressively into 2013. Instead, in the second model the variable duration indicates that ROA performance improve with greater duration of networks' contracts. Therefore, the second model changed completely the scenario; these results indicates that to improve ROA firms have to stay into network contracts for more years, and performance the return on asset will improve with time. These indication is in line with the general concept of ROA, which is the most long-term oriented financial measure of this research.

Considering the new variable objective, it emerges that general objectives, i.e. networks with state objectives that belong to different macro-categories, improve the performance in terms of ROA. ROA was defined before as a measure that defines how much a firm is profitable in the management of its assets in order to generate earnings. Therefore, firms have to better use their investments in order to increase this financial

measure, which is linked to a wide use of different capabilities and strategies. In this sense, it could be read the need to amplify competences in order to increase skills in exploiting assets, and, therefore, there is the necessity to improve generally in different fields. Indeed, it is expected that to increase ROA efficiency it is important to improve both internal processes, external relevance, and general managerial capabilities.

In this sense, general objectives of "improving performances through cooperation and information flow" could be more relevant to ROA's measure. Moreover, also the other big difference between second and first model can be aligned with this concept. While objective 0, innovation and research, and objective 1, marketing, were relevant in the previous analysis, in the second one they are still relevant but with opposite influence. In the second model, they have a negative influence on ROA's performance; moreover, even though it is not significan, objective 4 showed to be also negatively link to this financial outcome. It means that a specific objective is not influencing in a good way ROA, limiting its development. Moreover, it indicates also the positive performance of the benchmark in this case of objective 2, market reputation and growth.

ROE

The result confirmed data showed in chapter 4 in which duration is highly significant to improve ROE's performance Indeed, in the first model there was a negative influence of years, i.e. entries in 2013 were improving generally ROE's performance. Instead, the secondo showed the importance of network's large time horizon in order to improve ROE efficiency. Respect to the first model ROE analysis lost its geographical significance. Moreover, it appears that internal composition of actors and employees are not significant to the improvement of ROE.

Another completely different indication is represented by the Hirschman Index: from inhomogeneity of network's composition that improve ROE performance, to homogeneity as a significant variable to improve ROE. Also in this case, it is clear the great influence that duration variable inside the calculation of financial performance has.

ROI

ROI represents the new dependent variable introduced in the second analysis. In this model the variable duration shows the relevance of a long temporal period to have good results in ROI. While geographical proximity proved to be not significant at all, actors gave better results respect to other financial measures. Indeed, even though actor value is not relevant yet the probability is quite close to the minimum level of significance. Given the small amount of data, it can be predicted that results of more years which follow this general direction could make networks' dimensions as an important factor for return on investment.

Chapter 7

Conclusion

Given all the new residuals analysis in Appendix B it is evident the better explanation of the second model respect to the first one. It means that grouping variables had more relevance and it helped the model to explain better financial outcomes. Indeed, mainly even though the dataset showed to be relevant and with an huge number of data about Italian companies, it seems necessary to continue this research with more data available.

The model explained the importance of some structural variables, as Hirschman Index, type of state objectives and network's dimension. Anyway, as said to influence financial results and find a common pattern to explain the variability of revenues, ROS, ROA, ROE, and ROI it is necessary a study of more years and time. To confirm this hypothesis, the variable most significant was the duration of a firm inside a network. It was evident how the variable change completely its significance from the first and the second model, suggesting that to build network's form of cooperation and to improve overall performance many year are necessary. This result is in line with the theoretical background on networks. Indeed, the studies on network's effects suggest that there are many unpredictable variables that concern relationships, trustworthiness, individual behaviours and internal equilibrium among members duties. In order to reach all these characteristics it is fundamental to be persistent in the network's presence.

The analysis revealed that all financial variables are influence by network's indicator that I proposed. Indeed, it does not seem that there is a negative factor that worse performance at both network and individual firm's level. Instead, I think that the most interesting suggestion from this analysis is the change of performance according to different combination of structural conditions. Variables showed to be relevant one with each other; the way they are combined gave good or bad financial results.

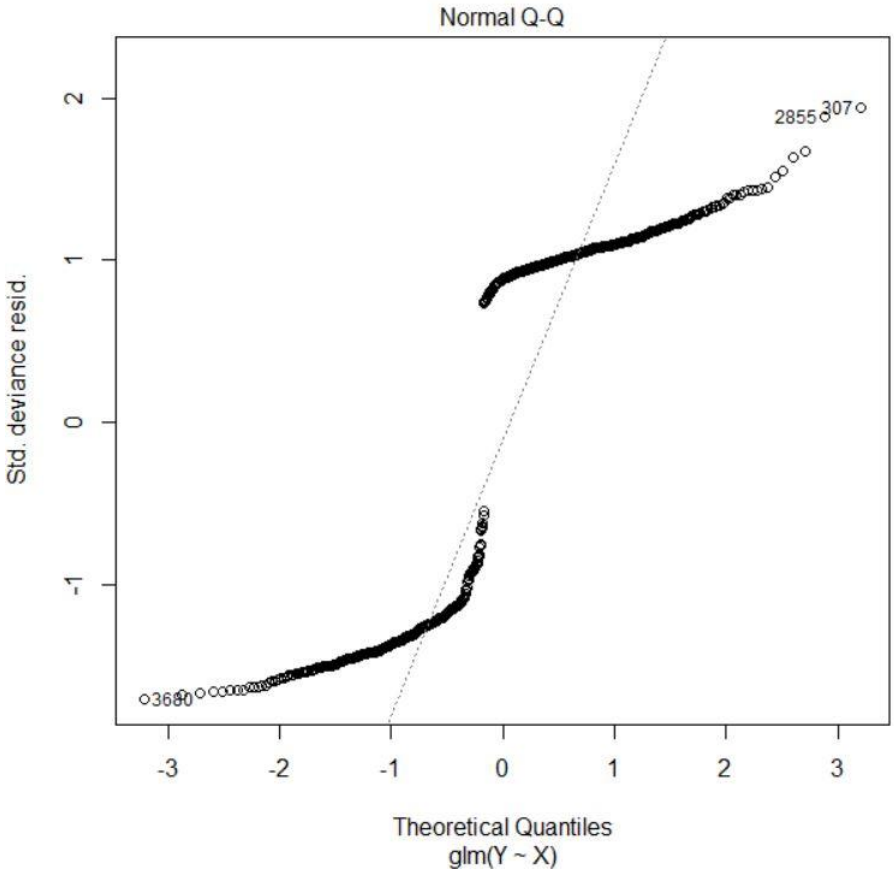
Given these considerations, the models' analysis and the theory analysed about networks and network's contracts, I supposed that building a network contract with

clear managerial guidelines is mandatory and fundamental to improve overall performances. Indeed as already analysed, contracts nowadays are regulating these forms of collaborations through specific accounting and fiscal rules. Anyway, contracts do not have any clear classification on networks' types on a managerial point of view, helping firms to concretely afford problems of day by day communication.

Finally, I suggest that contracts have clarify potential categories of objectives and clear ways to measure them. Moreover, networks have to be distinguished according different factors (some of them are those variables analysed in the model) and managers have to know which type of network they are building and what they have to expect. I found an incredible opportunity to let free companies to form networks in the form they prefer, personalising their collaborations and relationships management. In order to increase profitability from networks, I believe that keep free managers and companies to create their network is a chance to give, but with general constraints that help them to move inside their *path for innovation*.

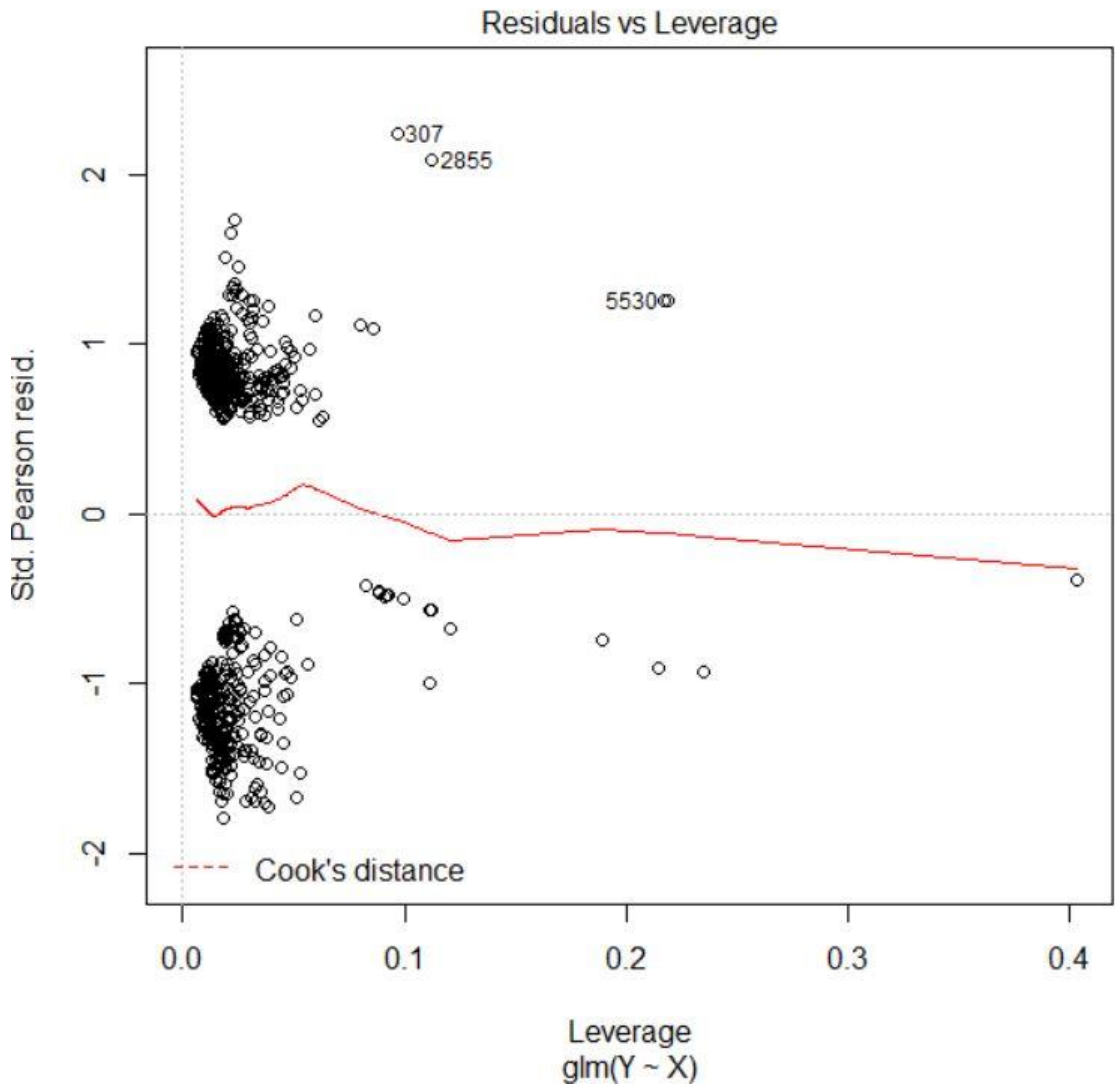
Appendix A

Revenues from sales' residuals

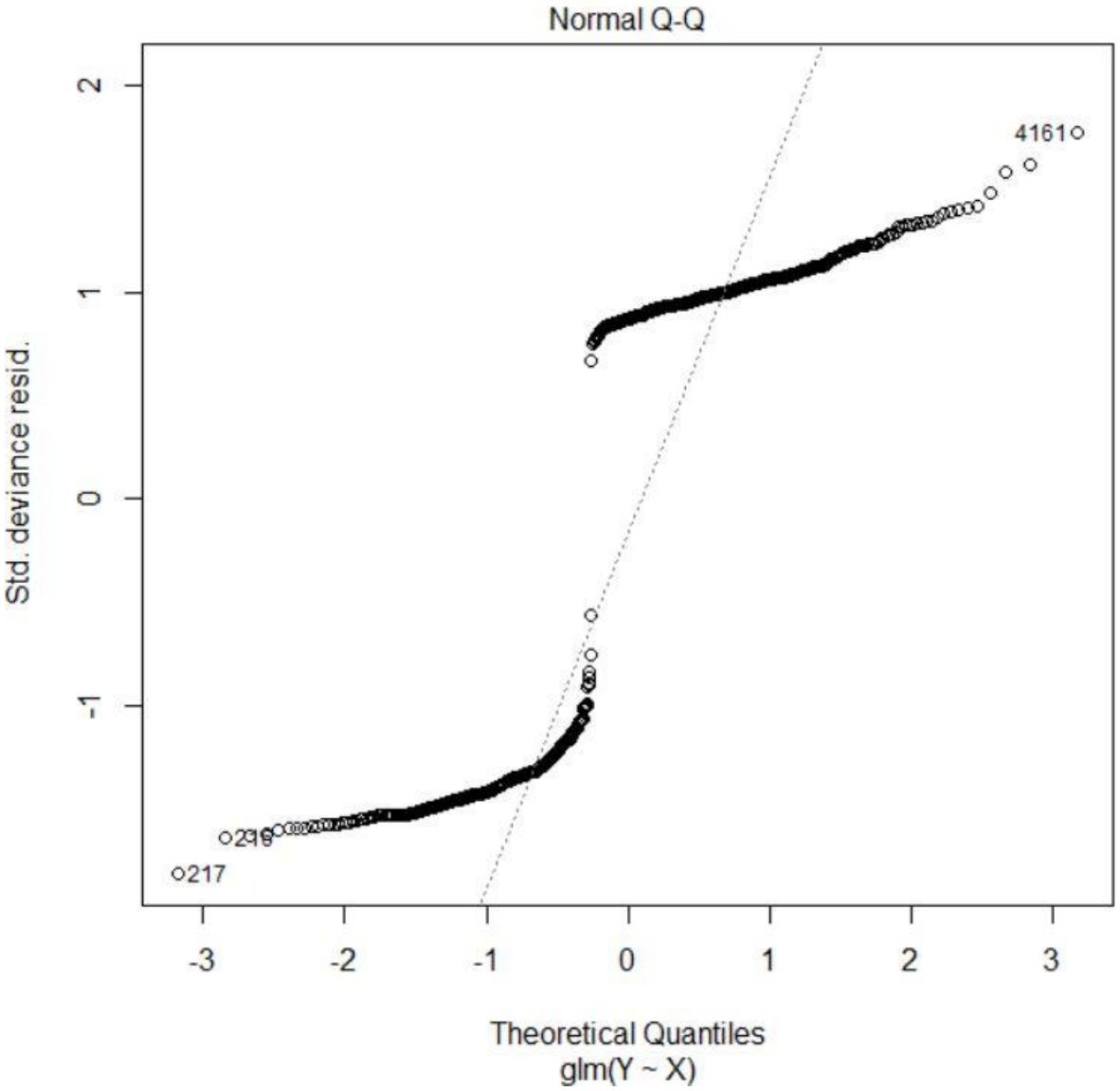


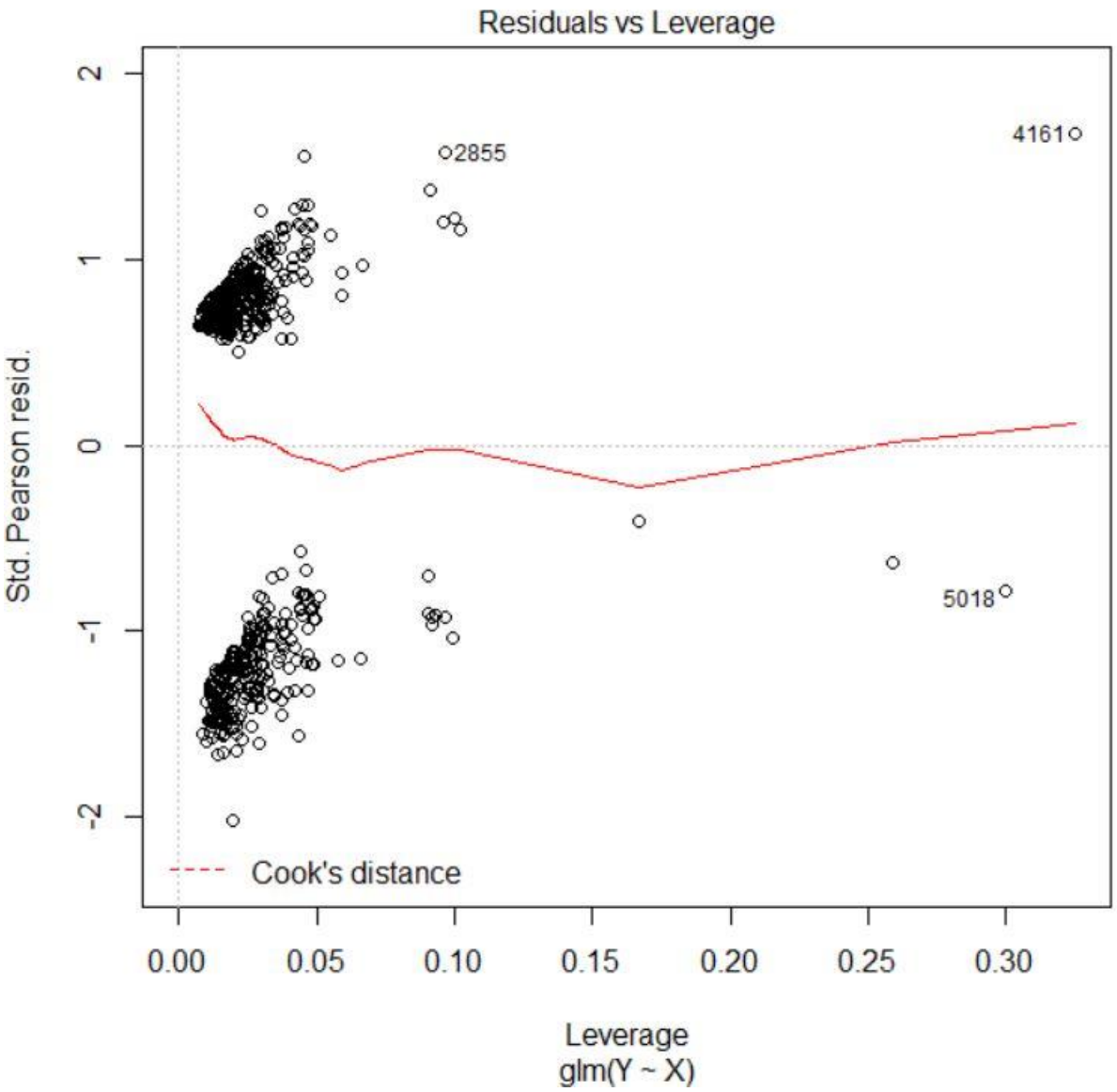
The analysis of residuals does not give good results with independent variables not able to explain sufficiently the revenues from sales behaviours. As already analysed, variables are not approximating in a precise way revenues. The reasons for this bad approximation could be two:

1) Revenues, given the temporal context, are volatile and are more dependent on individual conducts of business. As said, firms to cope with the crisis tried differently to increase volume of sales or rationalize costs that lead to different results and financial performances.
2) In this sense revenues are more dependent on the type of sector firms are operating in. Indeed, different businesses suffered in a different way the crisis from 2007 which took different sectors in different periods. For this reason, Ateco code are the independent variables which most influenced the revenues from sales explanation.

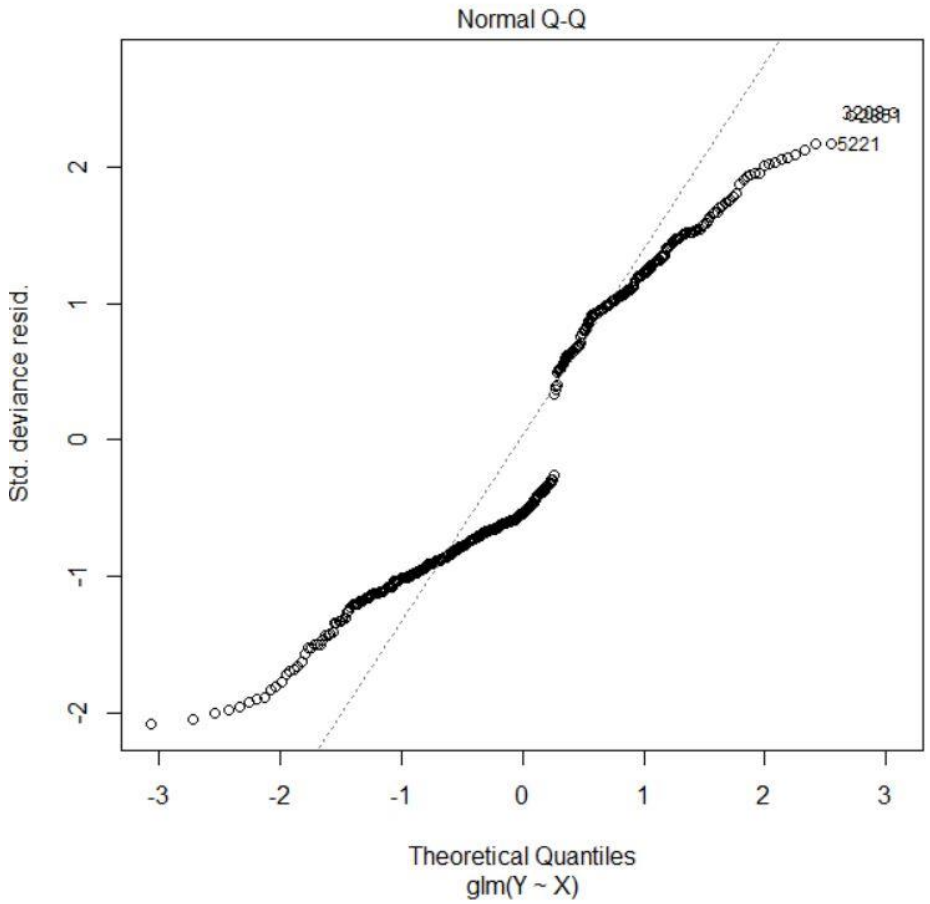

Residuals vs Leverage
307
2855
5530
Std. Pearson resid.
2
1
0
-1
-2
Cook's distance
0.0
0.1
0.2
0.3
0.4
Leverage
glm(Y ~ X)

Revenues model 2



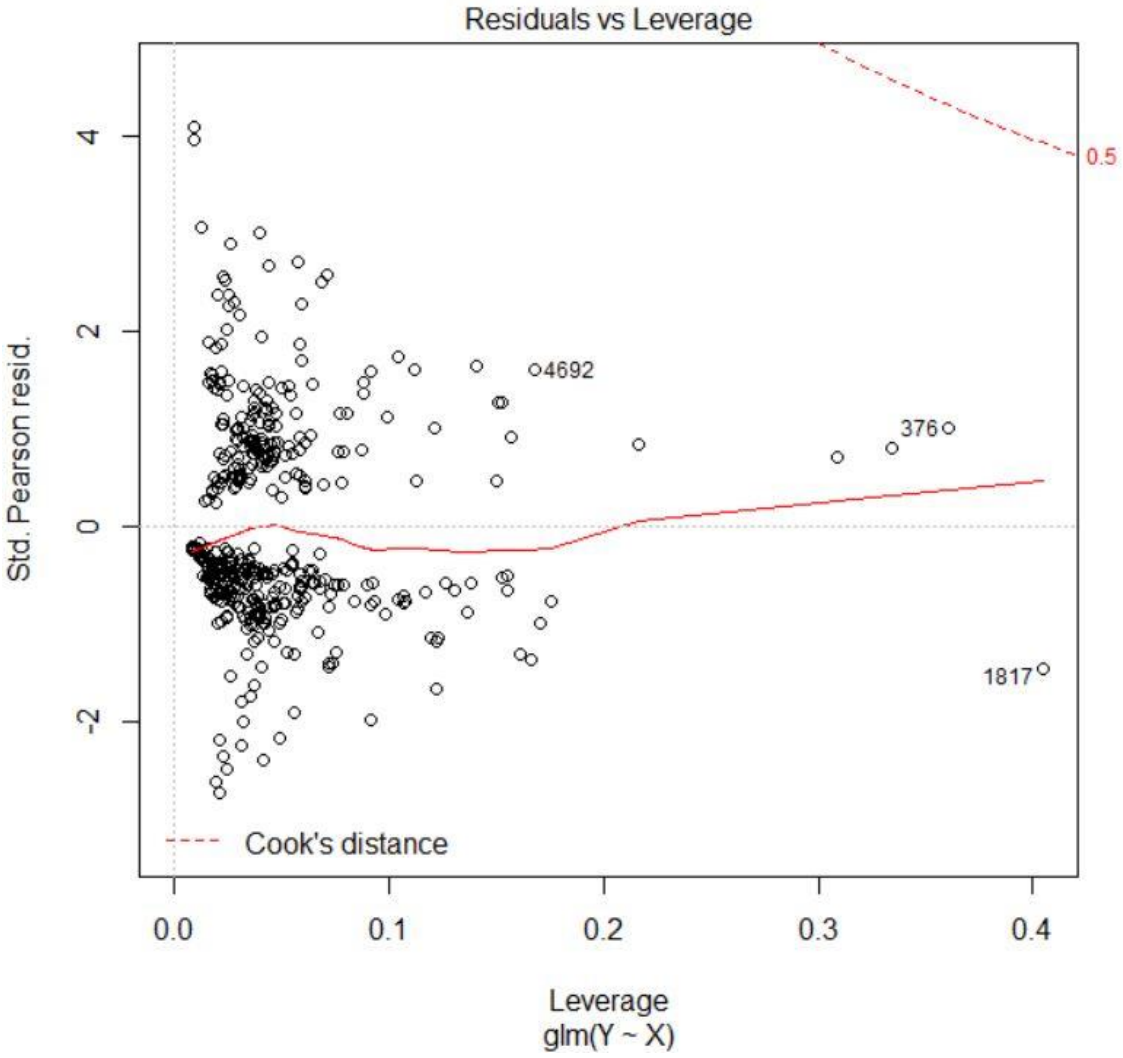

Residuals vs Leverage
Std. Pearson resid.
2
1
0
-1
-2
2855
4161
5018
Cook's distance
0.00
0.05
0.10
0.15
0.20
0.25
0.30
Leverage
glm(Y ~ X)

ROS' residuals model 1

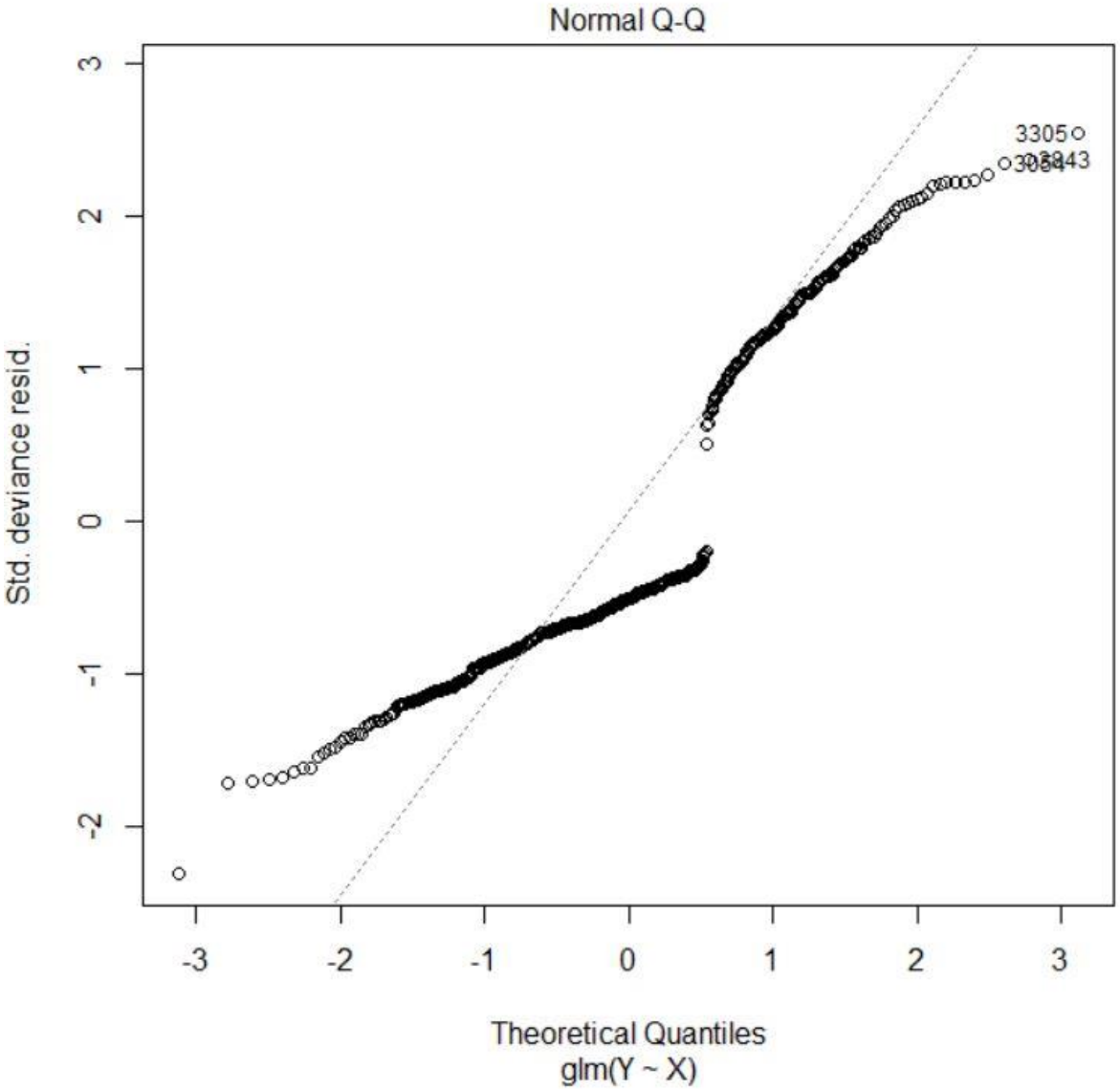


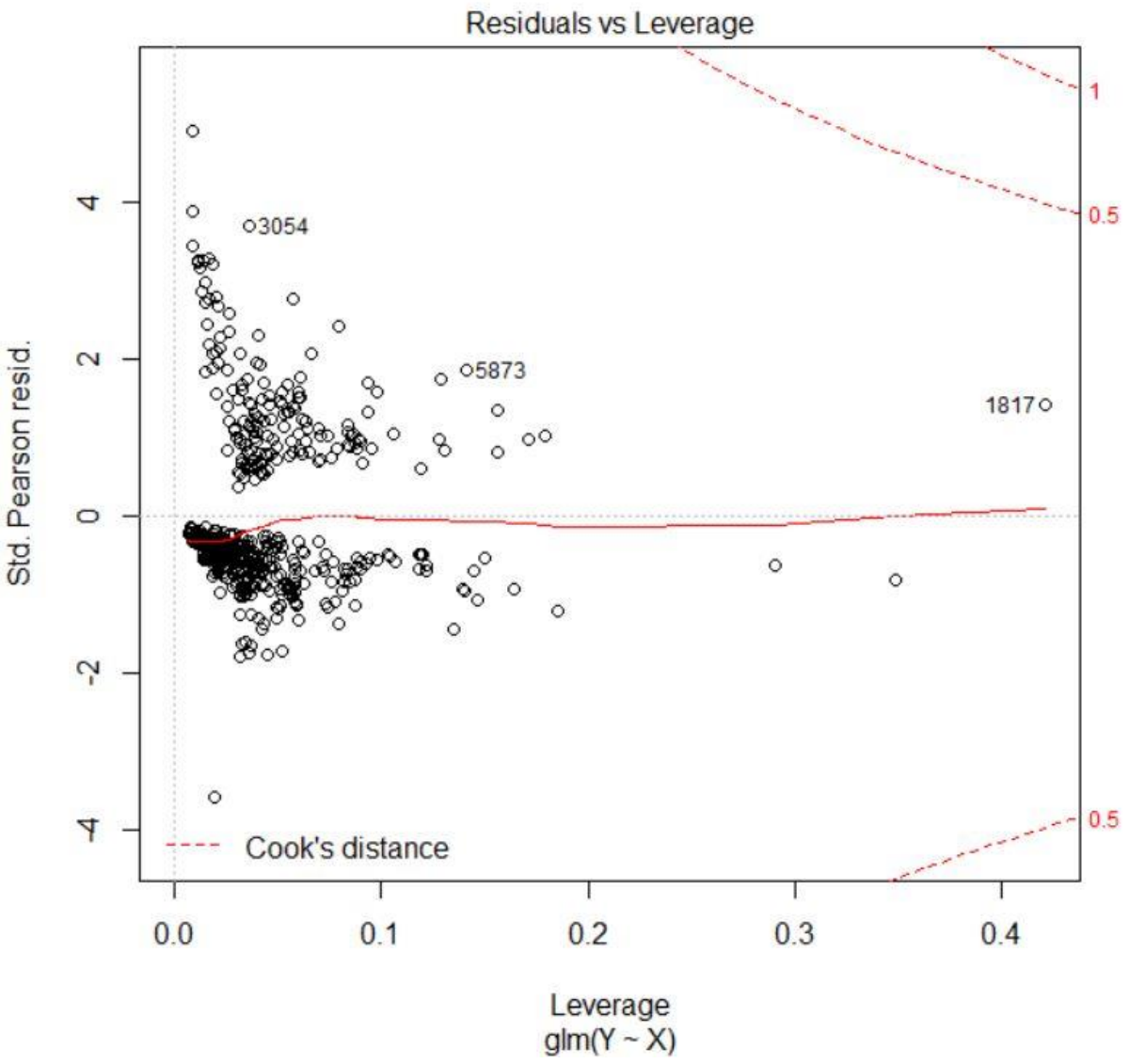
The analysis of residuals gives results with a better precision respect to revenues from sales. Indeed, also the AIC which is half of the revenues one. The estimated values are more closed to the real explanation of the ROS variable. Moreover, residuals are distributed in a more casual way without a clear pattern.

Therefore, the variables considered are more decisive to explain ROS. Ateco codes maintain their relevant role for ROS evaluation. Anyway, variables as type of objective and geographical proximity influenced the performance of firms.

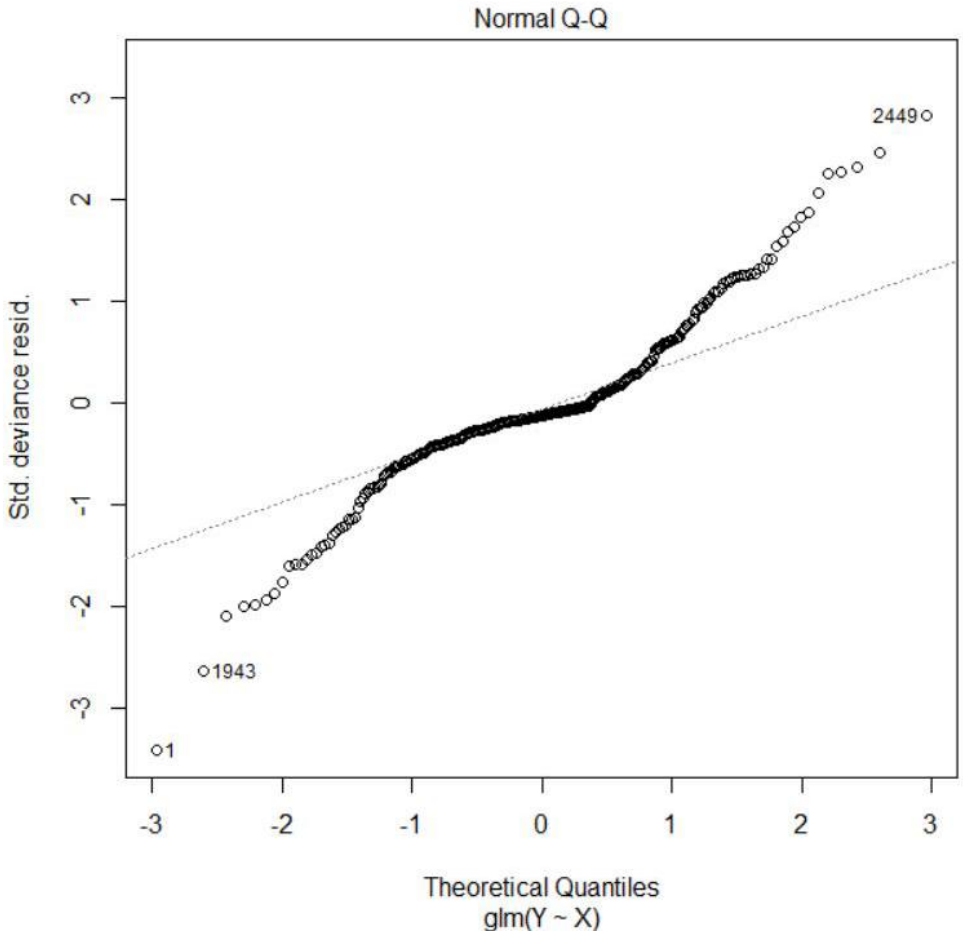

Residuals vs Leverage
Std. Pearson resid.
Leverage
glm(Y ~ X)
Cook's distance
0.5
4692
376
1817
4
2
0
-2
0.0
0.1
0.2
0.3
0.4

ROS' residuals model 2

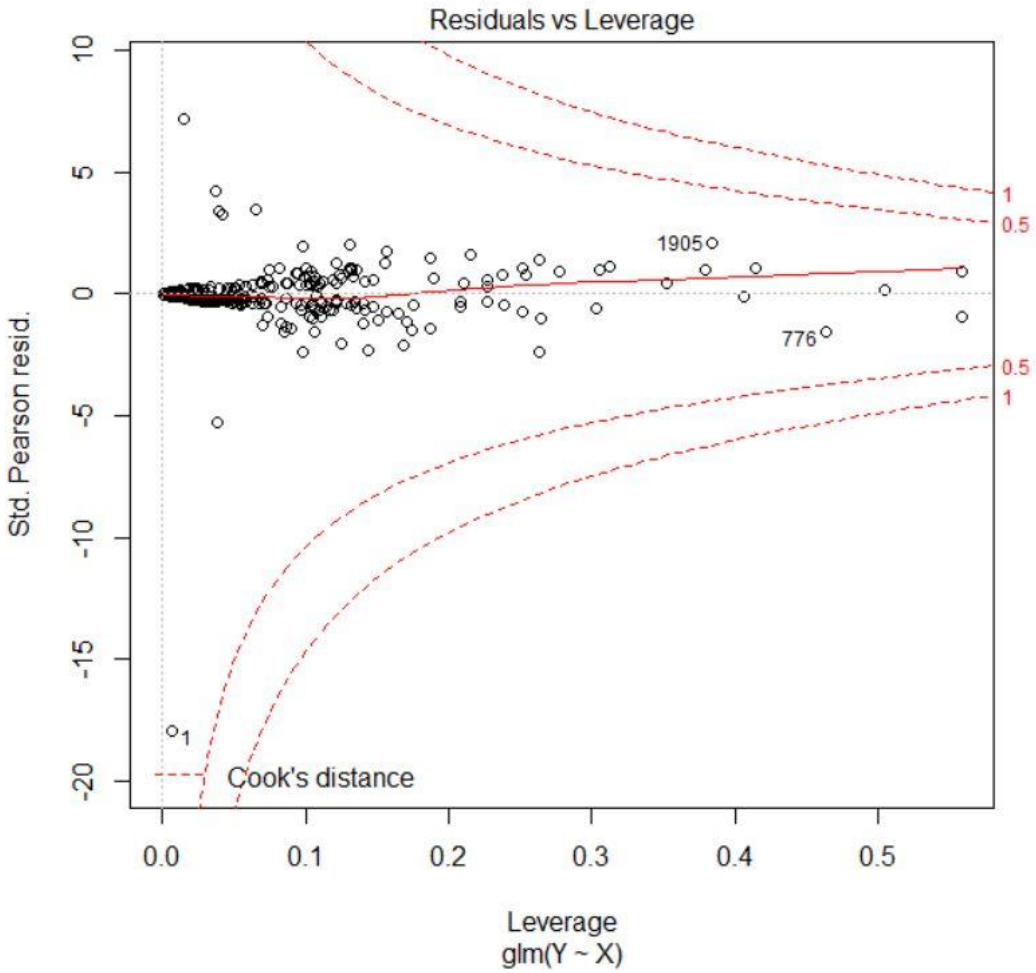



Residuals vs Leverage
Std. Pearson resid.
Leverage
glm(Y ~ X)
Cook's distance
3054
5873
1817
1
0.5
0.5
4
2
0
-2
-4
0.0
0.1
0.2
0.3
0.4

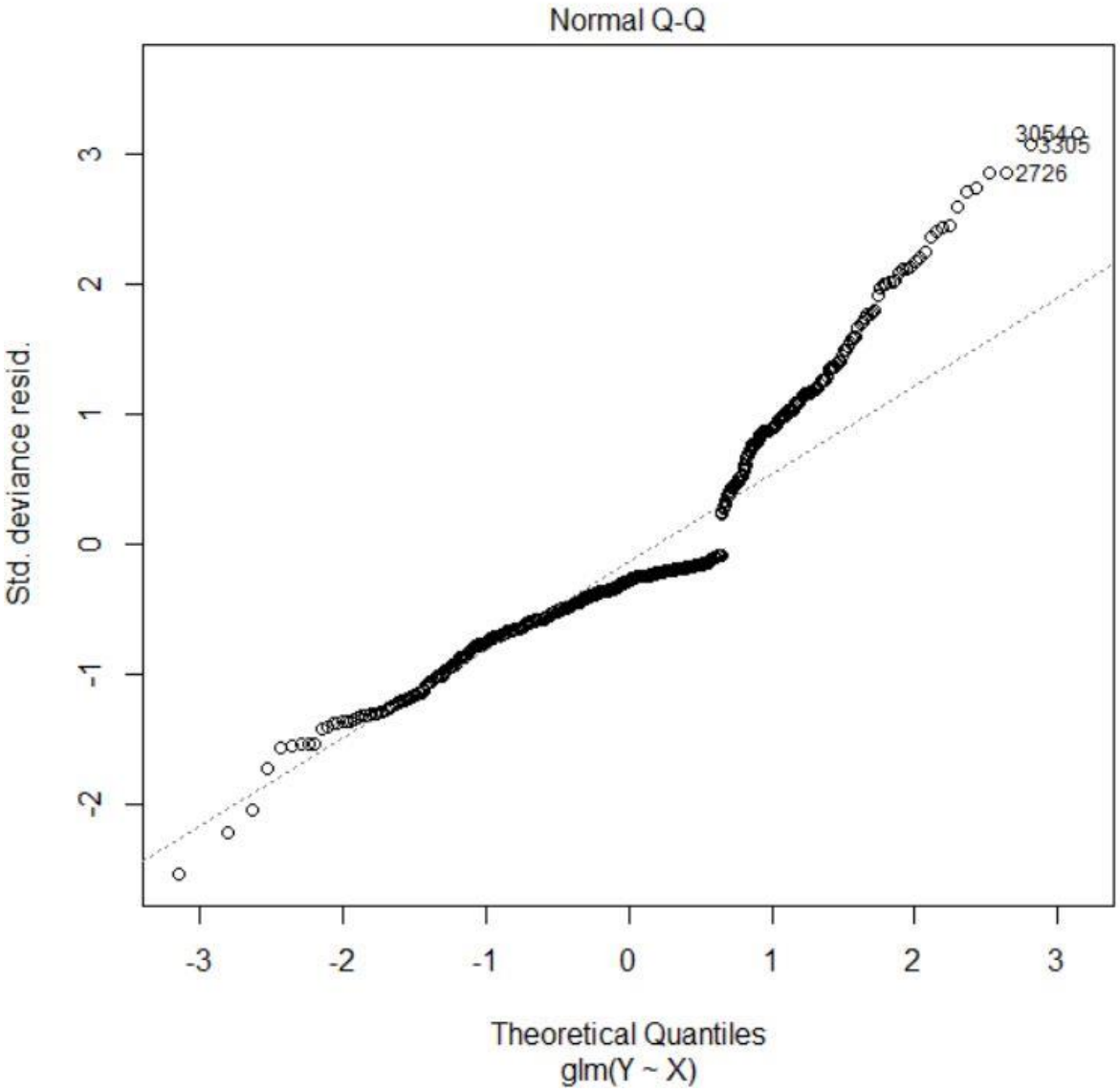
ROA's residuals model 1

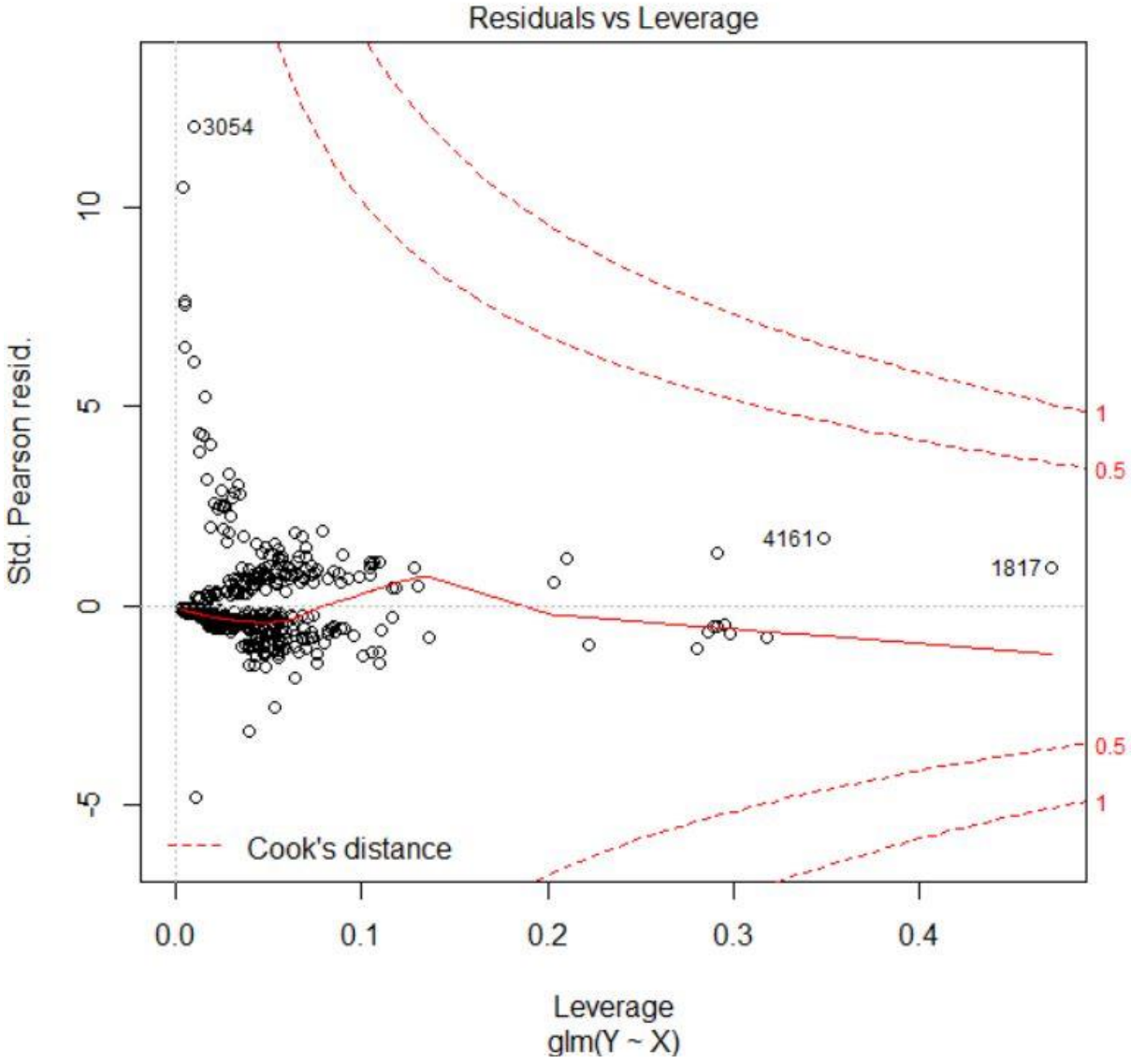


As reported before, ROA has the best AIC values respect to all other financial variables. The good approximation of estimated values is given foremost by the strict dependence of the three Ateco codes (Construction, Information and communication services, Financial and insurance activities) with ROA measure. Indeed, these three sectors have a big level of significance and are influencing the estimation of variables. About networks' structures, objectives represent the most significant variables. Respect to ROS, the independent variables still need to approximate better.

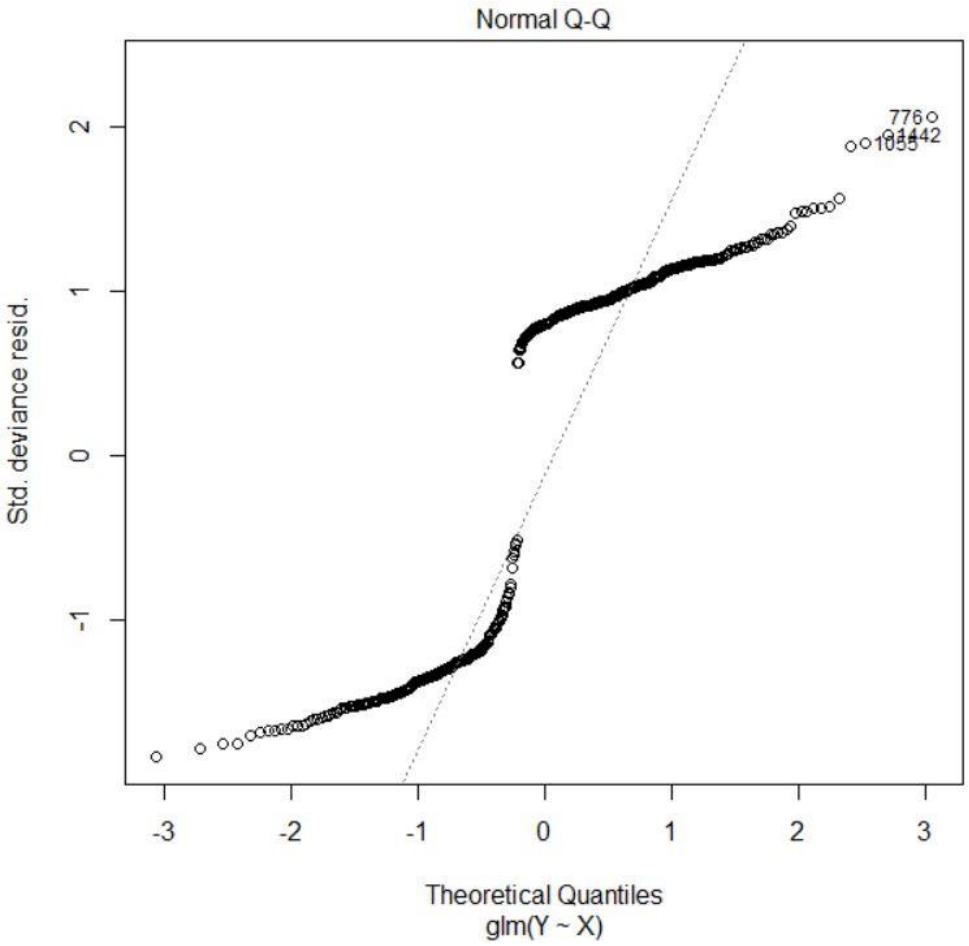

Residuals vs Leverage
Std. Pearson resid.
Leverage
glm(Y ~ X)
Cook's distance
1905
776
1
1
0.5
0.5
1
10
5
0
-5
-10
-15
-20
0.0
0.1
0.2
0.3
0.4
0.5

ROA's residuals model 2




Residuals vs Leverage
3054
4161
1817
Std. Pearson resid.
10
5
0
-5
1
0.5
0.5
1
Cook's distance
0.0
0.1
0.2
0.3
0.4
Leverage
glm(Y ~ X)

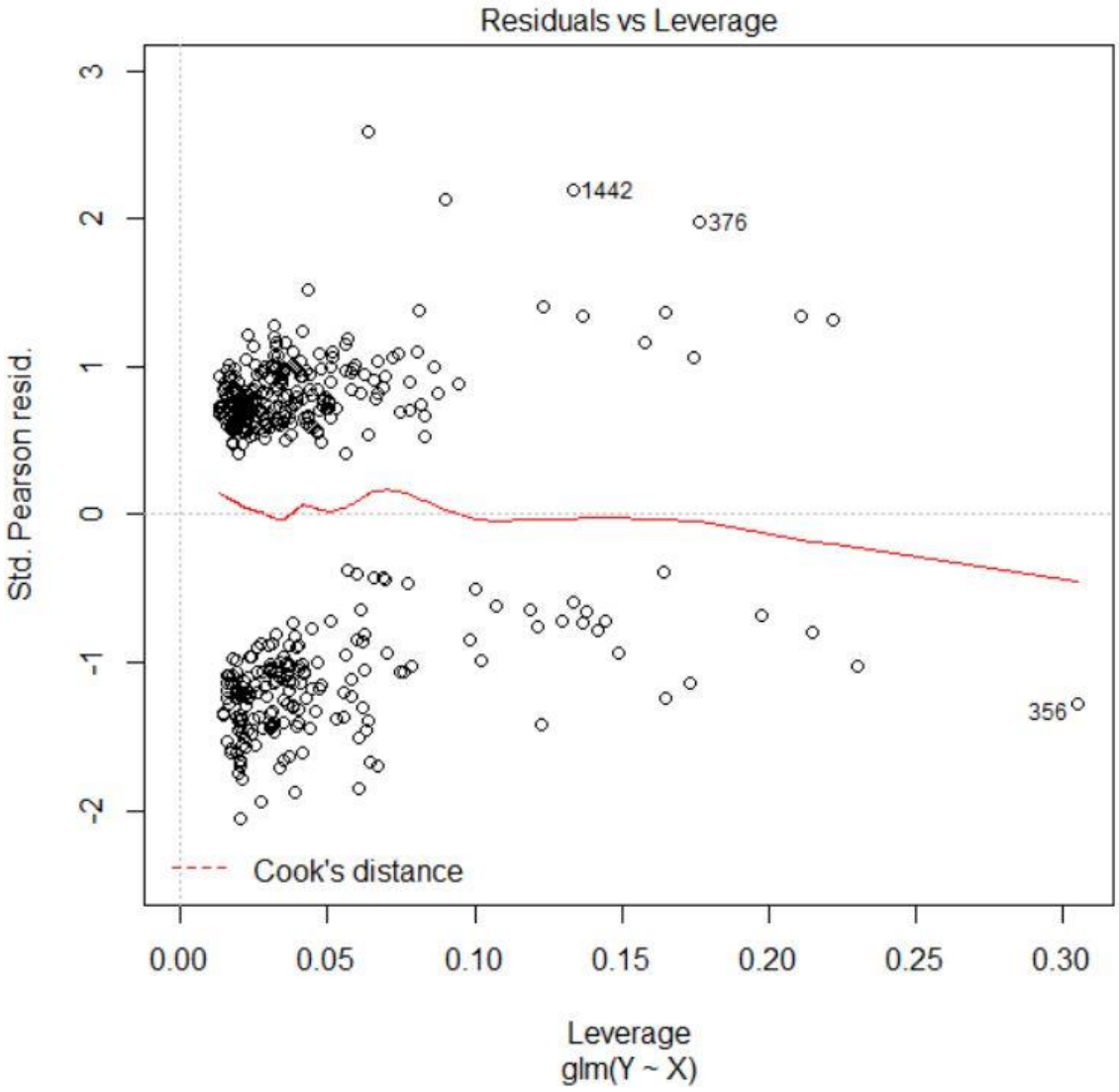
ROE's residuals model 1



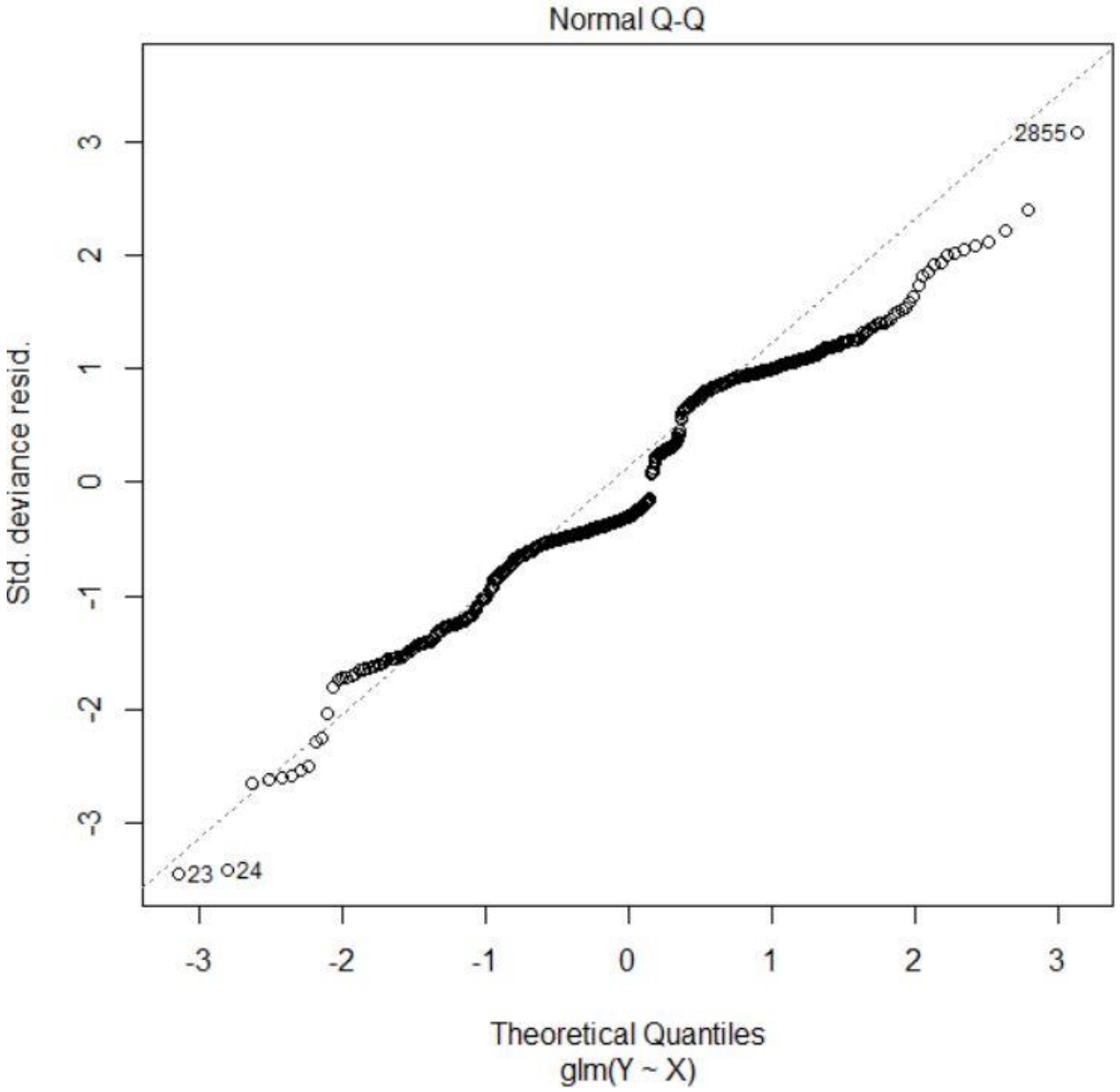
ROE has not a good estimation through the model proposed. Anyway, many variables were significant to determine its improvement or failure in performances. ROE is the unique financial measure that does not show any dependence by objectives; anyway, it is the only one to have dependence on both "big" and "Hirschman" index, confirming, moreover, the importance of geographical proximity.

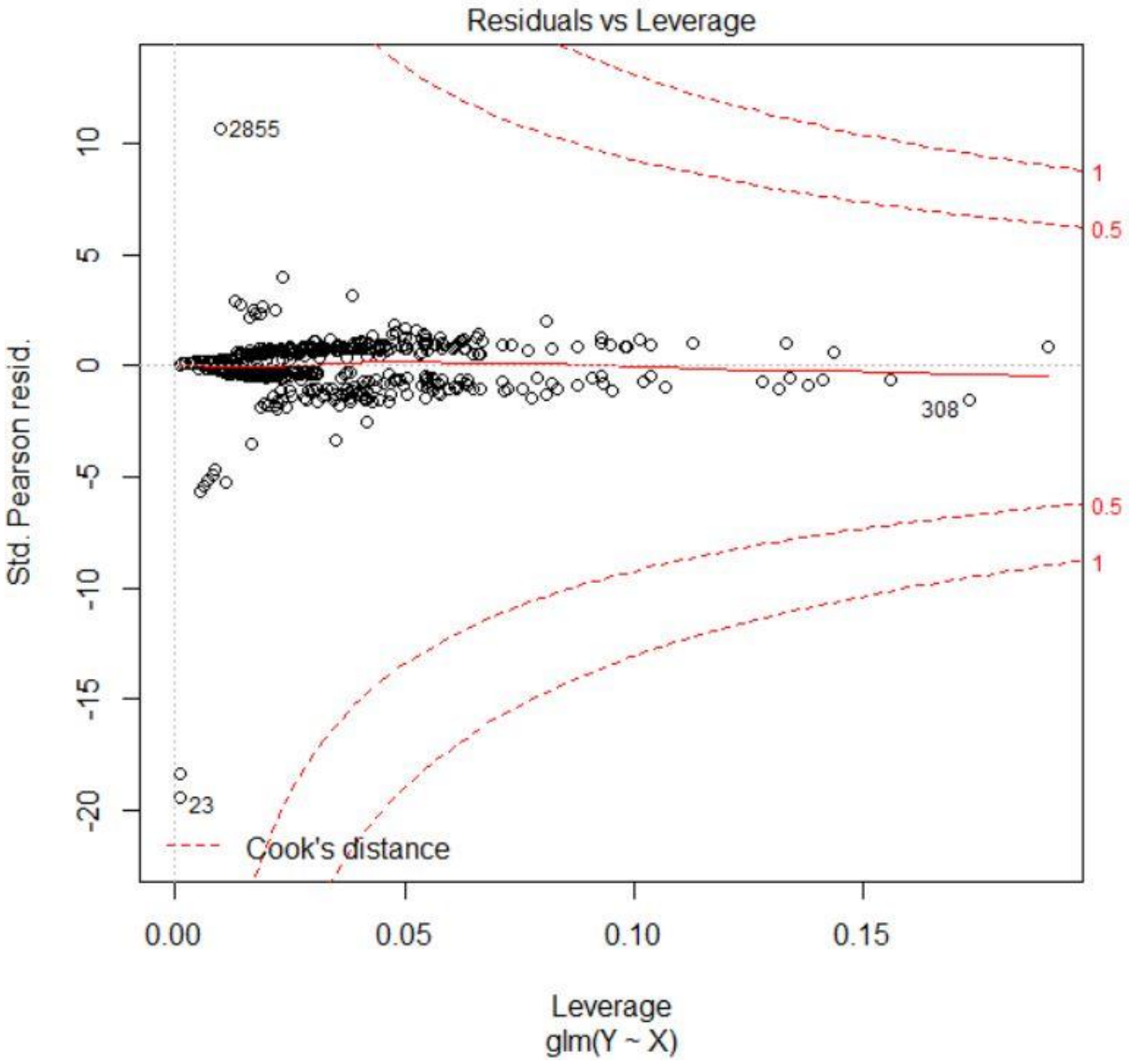
In this sense, ROE as ROS are both showing potential dependency on the structural variables proposed, with less importance given to Ateco codes, i.e. type of firms' businesses.

The residuals are quite casually diffused; therefore, it seems that the research has to continue on the direction already suggested by these variables, which influence the performances of firms on ROE.

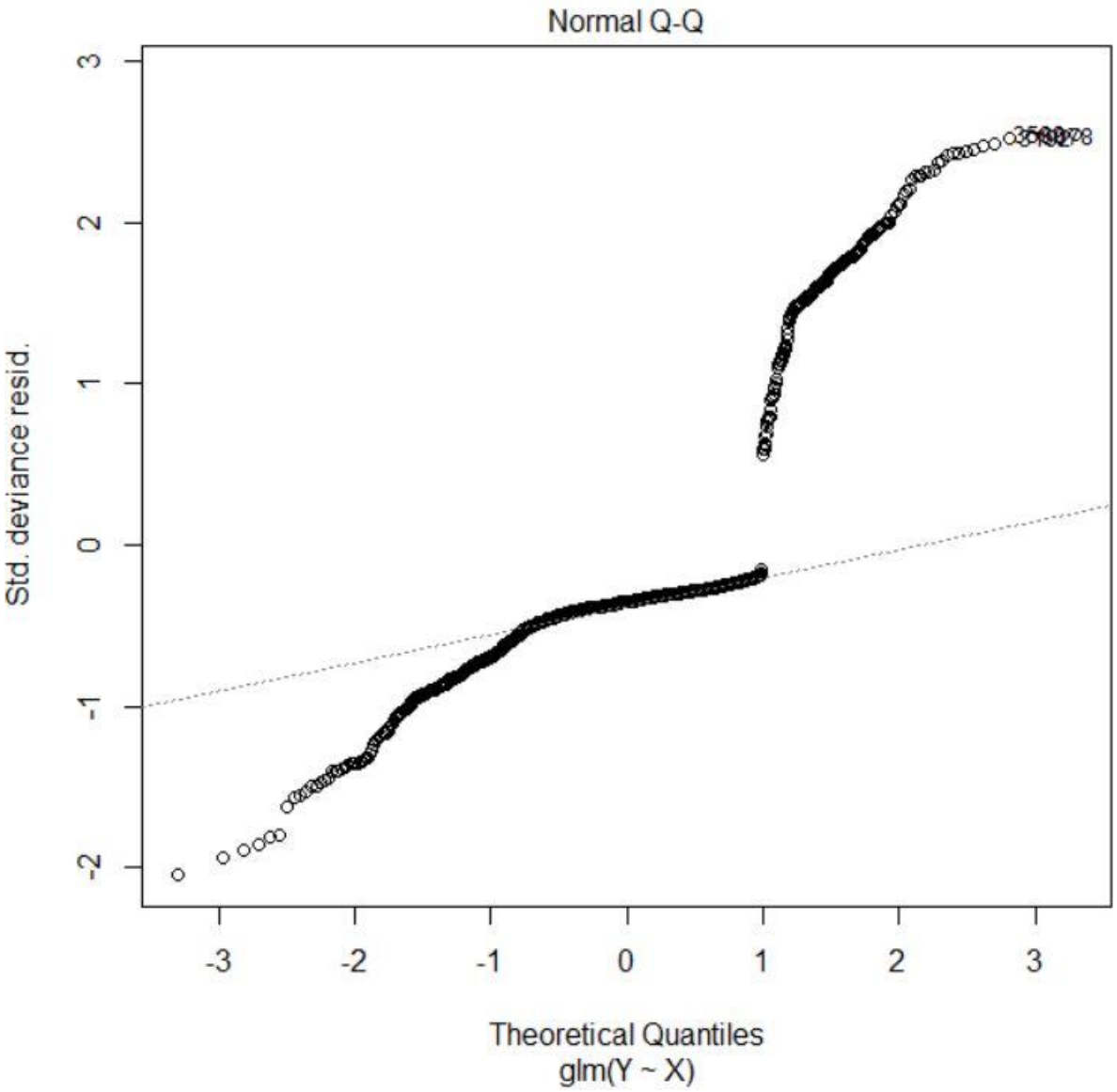


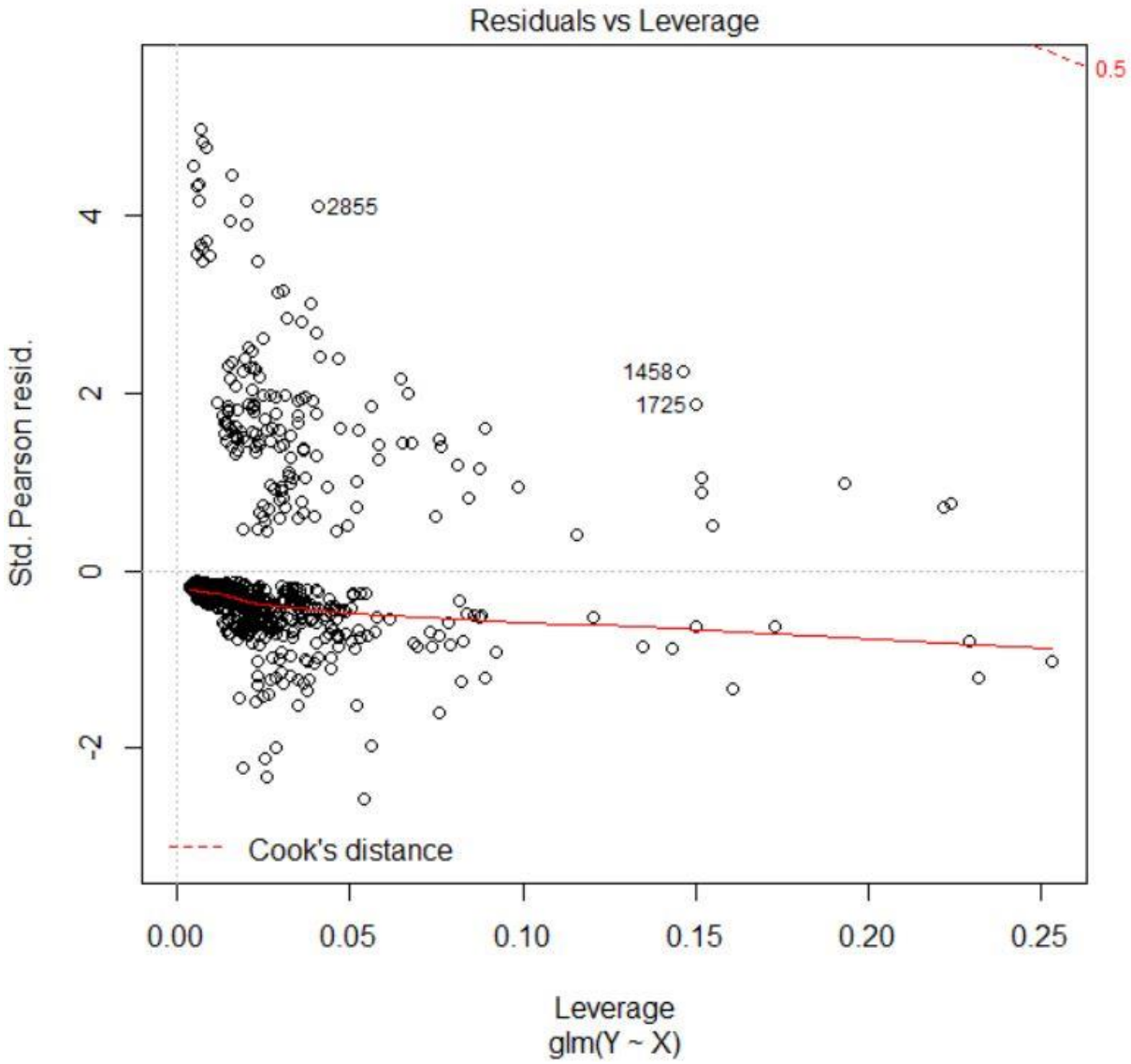
ROE's residuals model 2




Residuals vs Leverage
Std. Pearson resid.
Leverage
glm(Y ~ X)
Cook's distance
2855
308
23
1
0.5
0.5
1
10
5
0
-5
-10
-15
-20
0.00
0.05
0.10
0.15

ROI's residuals model 1




Residuals vs Leverage
0.5
2855
1458
1725
Std. Pearson resid.
4
2
0
-2
Cook's distance
0.00
0.05
0.10
0.15
0.20
0.25
Leverage
glm(Y ~ X)

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