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From Hilferding to Hilferding?
Finance-Capital in Italian Capitalism, 1913-2010

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ABSTRACT:

This paper analyses the Italian corporate network from 1913 to 2010 by using the interlocking directorates technique and focusing on eight benchmark years (1913, 1927, 1936, 1960, 1972, 1983, 2001, and 2010). For each benchmark year, the top 250 companies (50 financial and 200 non financial companies) by total assets have been selected. For each benchmark year, after showing a descriptive statistics of the companies and the directors included in the sample, the paper develops a network connectivity analysis of the system. This is integrated by a historical and structural analysis. The paper reveals some distinct phases in the long term evolution of the Italian corporate network, consequent on some major institutional break-ups (the crisis of the German-type universal banks and the creation of large state-owned sector of the economy in the early 1930s; the nationalisation of the electricity industry in 1962; a massive privatisation of state-owned enterprises and a reform of the banking system in the 1990s) and the emergence of the technological trajectory of the third industrial revolution in the 1970s. In particular, the paper shows that one major consequence of the privatizations and of the reform of the banking system in the 1990s was a return of banks in a central position in the network from which they had disappeared after the collapse of the universal banks in the 1930s.

JEL CLASSIFICATION: N24; P12; C63

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1. Introduction[1]

The literature on "varieties of capitalism" has identified two principal "ideal" typologies of political economies among industrialized countries on the basis of the way in which firms solve their coordination problems. In "liberal market economies" (LME), firms coordinate their activities primarily via hierarchies and competitive market mechanisms. Instead, in "coordinated market economies" (CME) inter-firm coordination takes place by resorting to a large extent to non-market collaborative relationships, such as the exchange of information inside networks, which act as monitoring systems and facilitate the construction of the firms' competencies. One major feature of CME is the presence of "patient capital", i.e., forms of finance that are not shaped primarily by short-term balance sheet considerations. These are based on the development of dense networks between banks and industrial companies that are conducive to long-term relationships between the two. In this respect, LME lack close-knit corporate networks, whereas CME have strong inter-firm networks which make easy strategic interaction among firms and other actors. Within this framework, the US and the UK are considered the major LMEs; Germany, Japan and the Scandinavian countries stand out as CMEs, while Latin countries – i.e., France, Italy and Spain – are in a more ambiguous position (Hall and Soskice 2001).

Actually, the relationship between banks and industry has been a widely debated topic in historiography since Hilferding (1910) put forward his theory of the hegemony of finance capital. According to this view, finance capital designated a stage of capitalism in which the financial capital controlled by banks and the industrial capital controlled by stock corporations merged and formed powerful group of companies or trusts. Hilferding suggested that banks held a dominant position in such corporate groups, but he also held that a certain "community of interests" existed between banks and industry. Hilferding identifies three major channels of bank influence over industrial companies: capital participation, sharing of board seats and monitoring over day-to-day financial affairs. So, banks are attributed a central reason in the explanation of why interlocking directorates between companies are generated. At the level of the network structure, this theory would lead us to expect the network to be heavily clustered around banks and other financial corporations.

The theory of "finance capital" was pushed a step further during the 1970s. In particular, Kotz (1978) saw in bank influence not a force that increased the power of industrial-financial groups, but

[1] This work has relied on the use of Imita.db, a large dataset funded by Miur, the Italian Ministry for University and Scientific Research, on Infocamere, the large dataset of Unioncamere, the association of the Italian chambers of commerce and on R&S Mediobanca dataset on the Italian top companies. We thank the Chamber of Commerce of Modena for letting us have access to Infocamere and on R&S Mediobanca for providing precious information on balance sheets of the Italian firms. A special thank is due to Fulvio Coltorti, head of R&S-Mediobanca, for his valuable and generous help.

a force which put in danger the survival of industrial companies. This account became known as the "bank control model", which explicitly sees banks to be on top of the decision-making hierarchy within a group of companies and to use this power in their own interest. The bank control model would lead to a similar structure of clustering of the interlock network around banks as the finance capital model. However, it also predicts that ties between banks and industrial companies are directed from banks to industrial companies and thereby indicate the pre-eminence of banks. That is, interlocks between banks and industry are generated by bankers and bank fiduciaries sitting also in boards of industrial companies and not by industrialists sitting also in bank boards.

Contrary to these accounts, some authors argued that the banks' dominance over financial companies was a transient stage in the evolution of modern capitalism. Sweezy (1942) argued that a later stage would be characterized by reciprocal relationships between banks and industry, where coordination, rather than bank dominance, is the prevalent mode of interaction. Several factors may explain this effect. Competition between banks constitutes a strategic advantage for non-financial companies, which become valuable clients for banks rather than dependent solicitants. Also changing financing needs may lead to altered relations between industry and banks. Hyperinflation, the emancipation of national corporate networks from foreign companies in the aftermath of WW1 and the end of the liberal period during the 1920s contributed in many countries to create a more homogeneous national business elite, which in turn led to increasing interlocks within and across sectors (see, for Germany, Wixforth and Ziegler 1995, and, for Switzerland, David, Schnyder and Mach 2010).

This class-cohesion model presents interlocks as an expression of cohesion within the ruling class and as a means by which this unity is maintained and furthered. Windolf (2009) calls this a self-control function of corporate interlocks. As such, interlocks tend to replace ownership as a mechanism of control and help reduce opportunistic behavior by imposing a certain code of ethics on the members of the corporate elite. According to this model, we can expect the interlock networks to be dense with links between many companies. The main difference on the network structure as compared with the bank control model lies in the expectation that bank-industry ties are mutual rather than directed from the former to the latter.

In recent years, some theoretical approaches have been developed to analyze the structure of corporate systems. The "law and finance" approach suggests that legal protection of investors is the crucial determinant of capital market development, ownership concentration, and organizational structures, and argues that legal protection is ultimately a by-product of a country's legal origin (La Porta, Lopez de Silanes, Shleifer and Vishny 1998; La Porta, Lopez de Silanes and Shleifer 1999). According to this view, if a country offers a high level of protection to shareholders, typical of common law regulation, its economy will be characterized by a higher incidence of widely held

companies *à la* Berle and Means (1932). Countries with a low level of shareholder protection, typical of civil law regulation, are generally characterized by a greater ownership concentration with a large diffusion of cross-shareholdings, differential voting rights, and pyramidal groups (Wolfenzon 1998). Control is so valuable in such latter countries that companies will strive to make it uncontestable (La Porta, Lopez de Silanes and Shleifer 1999).

Recently the "law and finance" approach has been criticized, even on the basis of new empirical findings (Braendle 2006; Spamann 2006, 2010; Siems 2008; Armour *et al.* 2009). Firstly, it has been shown that there is not a robust correlation between the legal origin of a country and its capacity to grow in the long run. Secondly, the patterns of evolution in different legal systems do not follow the linear direction suggested by the "law and finance" theory: in fact, changes in legal rules show much variety amongst countries of the same legal family as amongst countries of different legal origin. In order to meet these criticisms, La Porta *et al.* have reformulated the legal origin claim by suggesting that legal origins do not refer only the legal institutions of a nation but in broader sense to "highly persistent systems of social control of economic life" which include culture and ideologies (La Porta, Lopez-de-Silanes and Shleifer 2008: 326). On the one hand, now these authors do not point to the overall superiority of either of the two legal families: civil law is more suitable when economic "disorder" is severe and common law when the economic situation is "calm". On the other hand, they admit that there are some factors – in particular globalization and increased international competition – that can promote "convergence" amongst different legal systems. Thus, according to this reformulation of the "law and finance" approach, a nation is not locked in a path dependency pattern but can move in various directions in the face of different situations.

An alternative approach, known as "political economy," has resulted from observing that the structure of financial systems is not uniform over time. Proponents of this view maintain that a country's financial system and governance structure are not determined by unchanging institutional factors, but mainly by the behaviour and structure of interest groups that change over time. One prediction of these theorists is that ownership is more concentrated in countries where the state plays a bigger role in the economy (Pagano and Volpin 2001; Rajan and Zingales 2003).

The relationship between banks and industry in fostering Italy's industrialization has also gone through all the seasons of Italian economic historiography. The first contribution can be traced back to Grifone's (1945) pioneering formulation on the centrality of finance capital. Gerschenkron (1962) singled out the German-type mixed banks as the major cause underlying Italy's first big industrial spurt in the Giolittian age. In his view, these banks provided financial support and managerial advice to the major companies, especially in modern sectors such as steel, heavy engineering, electricity, shipping and so on. In brief, in the face of the weakness of the

entrepreneurial class, the mixed banks acted as a "substitution factor" that enabled Italy to catch up to the technological paradigm of the second industrial revolution.

However, the role of mixed banks has been reconsidered by more recent historiography. Confalonieri (1974-76, 1982, 1992, 1997) provides little support for Gerschenkron's hypothesis, at least for the period prior to 1914. He stresses the continuity between the new German-type mixed banks and their French-style predecessors as the former hired most of the staff and followed the practices of the latter. Moreover, the mixed banks were more concerned with normal banking activities than with drafting an overall industrial strategy. They lent money on a project-by-project basis not as part of some larger industrial development strategy, with the possible exception of the electric power industry. Last but not least, the mixed banks avoided permanent ownership of industrial companies. They accepted shares only as collateral for loans and subscribed to new issues with the intention of selling the shares afterwards to their clients. This strategy foundered when the post-WW1 crisis made it impossible for many companies to repay their debts to banks. So the banks unwillingly became the real owners of much of the "military-industrial complex" and of several important companies in other industries. When the Great Depression struck, the entire system collapsed and both the banks and their industrial clients had to be bailed out by the state.

Fohlin (1998, 1999) finds that mixed banks tended to attach themselves to large, established companies instead of providing venture capital to promising but risky small ones. She also finds that firms attached to mixed banks did not invest more than unattached ones, a point confirmed by Battilani (1995) for a sample of cotton firms in the 1920s. In other words, association with the mixed banks did not necessarily eliminate financial constraints for sound investments.

The early 1930s represented a turning point as, in order to face the Great Depression, the fascist government promoted state intervention and, in 1933, created the *Istituto per la Ricostruzione Industriale* (Iri), which took over the universal banks and their industrial securities. The result was the substitution of the state for the mixed banks, as the linchpin of the system of financial intermediation (Toniolo 1980; Zamagni 1993). The end of the fascist regime in 1945 did not change much in this respect. The boundaries of state-owned enterprises (henceforth SOEs) further expanded after WW2: Iri still remained the main pillar of the system but a second pillar, the state energy super-holding, *Ente Nazionale Idrocarburi* (Eni), was founded in 1953 (Carnevali 2000). This two state holdings enabled Italy to catch up to the technological paradigm of the mass production during the "Golden Age". In the 1970s, the oil crises and the advent of a new technological paradigm, based on ICT, marked a big change for the industrial structure of the Western economies. Italy was severely hit by this new situation. SOEs were increasingly burdened with special social objectives, such as prompting the industrialization of the backward South or rescuing ailing companies (Amatori 2000; Toninelli 2004). The structure of Italian corporate system

turned noticeably between the 1970s and the 1980s: the new technological paradigm contributed both to speed up the crisis of the SOE system and to the soaring of industrial districts and networks of small and medium-sized enterprises. SOEs degenerated in the 1980s in the absence of a functioning political market to guarantee democratic changes of parties in power and the erosion of the "mission" culture of SOE managers (Barca and Trento 1997).

In the 1990s massive privatizations reduced the area of SOEs, but failed to create North American style public companies. Fully privatized companies became under control of powerful families and of foreign multinationals, while the state has remained the majority shareholder in some strategic (and profitable) companies such as Eni, Enel and Finmeccanica. This process did not (or only randomly, as in the case of Finmeccanica) result in the emergence of global technological leaders enjoying dominant positions, eventually supported by the state in the process of their international expansion (Felice 2010).

Despite the relevance of the relationships between banks and industry for the Italian economic historiography, only very few studies have addressed this topic by using the interlocking directorates technique. An interlock is the link that is formed between two companies when a person is a director of both. Interlocking directorates are an important economic institution that provides an opportunity structure for the channeling of information, monitoring, and coordination of market exchange between companies. Firms placed at the centre of the system of interlocks are presumed to have better access to information, better opportunities to spread information and someway a "power" to coordinate the whole network.

The pioneering works by Zorzini (1925) and Luzzatto Fegiz (1928) found in the mid-1920s a high presence of directors of the two largest mixed banks – *Banca Commerciale Italiana* and *Credito Italiano* – on the boards of electric power companies and, more generally, a high concentration of the whole corporate system, in which 2 per cent of directors controlled more than one-third of the total share capital of Italian joint-stock companies. However, a more recent study by Vasta and Baccini (1997) – using a large sample of more than four thousand Italian joint-stock companies – came to a different conclusion for the interwar period. In fact, these authors held that Italian capitalism does not seem to have been characterized by a strong centrality of banks as it was commonly believed. The location of banks at the center of the corporate system could be detected in 1911 and even more in 1927, but this was no longer the case in 1936, after the collapse of the mixed banks. These authors also find that a highly stable system of interlocks existed in parallel to that centered on the banking system, and remained substantially unchanged over the course of time.

For the period immediately after World War II, a survey made by the Economic Commission of the Ministry for the Constituent Assembly verified that a few large corporate groups dominated Italy's entire economic life by controlling, directly or indirectly, three-quarters of the share capital of

private firms. Among them, the four larger electrical-commercial holdings – Edison, Società Adriatica di Elettricità (Sade), La Centrale, and Strade Ferrrate Meridionali (Bastogi) – stood out. A dense web of ties linked these companies to each other and to the other major private groups, such as Fiat (motor vehicles), Montecatini (chemistry), Italcementi (cement), Falck (steel), Pirelli (rubber and cables), Snia-Viscosa (manufactured fibers), and Italgas (gas); as well as to the big state-owned holding, Iri (Ministero per la Costituente 1947; Zerini 1947; Rienzi 1947-48; Cgil 1948; Radar 1948).

A major break-up in the structure of Italian corporate interlocks came from the nationalization of the electricity industry in 1962. Ragozzino (1969) argued that this put an end to a system of relations centered on the larger electrical-commercial firms that had maintained close relations with the banking and insurance systems. The consequence of this was the emergence of a new order in which the larger family groups, such as Fiat and Pirelli, returned to occupy a central position within Italian capitalism.

Chiesi (1982, 1985) introduced to Italy the use of formalized network analysis techniques. This author illustrated the existence in the mid-1970s of a centre of the system inside of which two large poles cohabited, hinged respectively on SOEs and on privately owned enterprises. Their integration was guaranteed by the zipper function carried out by some companies – such as Sme, Bastogi and, to a lesser extent, Snia-Viscosa and Tubificio di Brescia – on the boards of directors of which sat several of the major players in companies from both poles. Chiesi's analysis also dealt with the relations between banks and industry, observing that the absence of large banks from the centre of the system depended on the effects of the 1936 banking law which, by separating the function of the collection of deposits from industrial credit, had rendered it impossible to re-establish those close relations between banks and industries that had so strongly distinguished the period prior to the crisis. Instead, a more recent study by Ferri and Trento (1997) arrived at substantially different conclusions: basing themselves on a reduced sample of companies, they held that the relations between SOEs and private enterprises were a characterising trait of Italian capitalism, at least up until 1970. In addition, as regards the relations between banks and industry, they maintained that, in spite of the implicit prohibitions in the banking law, a dense web of interlocking directorates between banks and industrial companies existed throughout the 20th century and represented a permanent trait of Italian capitalism. A similar result was reached by Bianco and Pagnoni (1997) who analyzed the interlocks among the Italian listed companies from 1985 to 1995. This study confirmed that in the presence of a legislation which strongly limited banks' participations in non financial companies (and vice versa) cross-board memberships played a crucial role as substitutes for share relationships.

In some previous articles the present authors analyzed the structure of the Italian corporate network from 1952 to 1983 using a large sample of about 25,000 companies (Rinadi and Vasta 2005, 2012). The main results were that in 1952 and 1960 the network, centred on the larger electrical companies, showed the highest cohesion. This centre dissolved after the nationalization of the electricity industry in 1962 and in 1972 had been replaced by a new and less cohesive one hinged on financial intermediaries: banks, insurance and finance companies. SOEs and private companies were strongly interconnected as they showed a high propensity to share board members. SOEs were well represented among the most central companies. The 1972-83 period brought about significant changes in the structure of the system. These included, on the one hand, a large decrease in the network overall cohesion, and, on the other, a weakening of the ties between the private sector and SOEs, with the latter's marginalization from the centre.

This paper adds to the previous research by analyzing the structure of the Italian corporate network, with particular regard to the relations between banks and industry, in seven benchmark years covering the longer span from 1913 to 2001. For comparative purposes, we use a smaller sample of the top 250 companies by total assets for each benchmark year.

This paper is organized as follows: after this Introduction, Section 2 describes the source utilized for this study. Section 3 presents some descriptive statistics of the network. Section 4 analyzes the structure of the network through the use of several indicators typical of network analysis. Section 5 provides actor centrality analysis. Section 6 examines the connections generated by the central actors of the system, the *big linkers*, defined as the those directors who held the largest number of board positions in Italian joint-stock companies in each benchmark year. Lastly, Section 7 concludes.

2. The source

The source we used in this work for the benchmark years from 1913 to 1983 is *Notizie statistiche sulle principali società italiane per azioni*, edited by the Associazione fra le Società Italiane per Azioni (Assonime). The Imita.db database is an electronic version of this source.[2] This dataset contains information regarding companies, boards of directors, and balance sheets of a large sample of Italian joint-stock companies for several benchmark years.[3] The source includes all the joint-stock companies listed on one of the Italian stock exchanges, together with those companies located

[2] Imita.db is one of the largest datasets on joint-stock companies in historical perspective in the world. For details on the database, see Vasta (2006). The database is available on line: http://imitadb.unisi.it

[3] Data for companies and boards of directors are available for 1911, 1913, 1921, 1927, 1936, 1952, 1960, 1972, and 1983; for balance sheets, time series are available for the span from 1900 to 1971 and for 1982 and 1983.

in Italy whose share capital at the closure of the last balance was higher than a set threshold, which varied from year to year.[4] On the whole, the dataset contains data on more than 38,000 companies, almost 300,000 directors, and more than 100,000 balance sheets. Representativeness, in terms of capital, is very high as the sample covers well over 90 percent of the total universe in all but the first two benchmark years (1911 and 1913) and the last one (1983), for which the proportion is around 85 percent.[5]

For the benchmark years 2001 and 2010 we selected the top 250 companies from *Le principali società italiane*, the annual report on Italian joint-stock companies edited by R&S-Mediobanca. As this source does not report the names of the board members, for 2001 we extracted them from Infocamere, a large dataset of Unioncamere, the association of the Italian chambers of commerce. Infocamere contains information regarding all businesses (both corporate and non-corporate) registered at any Italian chamber of commerce, including shareholders, boards of directors, attorneys and balance sheets, starting from the late 1980s, whereas for 2001 we extracted them from Aida, the databank of the Italian joint-stock companies of Bureau Van Dijck.

This paper focuses on eight benchmark years: 1913, 1927, 1936, 1960, 1972, 1983, 2001, and 2010. In compliance with the guidelines of the comparative research project "Corporate networks in the 20th century: structural changes and performance", for each benchmark year we have selected the top 250 companies by total assets, with the exclusion of subsidiaries. The top 250 companies have been selected according to the following repartition: 50 financials and 200 non financials.

As for the directors, we used only data for members of a board of directors in the strict sense, leaving out the members of *Collegi sindacali*.[6] Until 2003 Italy had a Anglo-Saxon model single-board system constituted by a board of directors appointed by the shareholders meeting. In that year the corporate governance reform gave each company the possibility to choose its preferred organizational statute, that is to either follow the traditional single-board system or the German model two-board system constituted by an executive boards appointed by a supervisory board which is in turn selected by the shareholders. So we find that eight of the 250 companies included in our 2010 sample had adopted the two-board system. In compliance with the guidelines of the comparative research project "Corporate networks in the 20th century: structural changes and performance", for these companies we selected members of both boards.[7] Also in this case we left out the members of the *Collegi sindacali*.

[4] The threshold was set at 1 million Italian lire until 1940, with the sole exception of 1914, when it amounted to 500,000 lire. In 1952, the threshold was raised to 10 million, then to 25 in 1956, 50 in 1961, and 100 from 1964 through 1972. Finally, for the benchmark year 1983 the threshold was further raised to 2 billion lire.

[5] For 1983, there are not enough official data on the representativeness of the sample. According to a recent estimate, such a weight could, nevertheless, reach 83.3 percent of the total of Italian joint-stock companies (Cerise 2006).

[6] *Collegi sindacali* are special committees of auditors for firms, and are similar to supervisory boards (Scott 1985).

[7] These eight companies are A2A, Banco Popolare, Coop Centro Italia, Deutsche Bank, Intesa San Paolo, Manutencoop Facility Management, UBI Banca, and Unicoop Firenze.

We have carefully standardized the names of the directors to make them as homogeneous as possible. However, we estimate that the information on boards of directors contained in Imita.db has a margin of error of about one percent, as is the case with other similar databases (Mintz and Schwartz 1985). These errors are mainly due to cases of homonymy, misprints, or shortcomings in the source.

3. Descriptive statistics of the network

An interlock, as anticipated, is the link formed between two companies when a person is a director of both. In this work, we have used primary interlocks without taking into account either the directionality or the strength of the links.[8]

Table 1 gives a summary of the general statistics of the sample. The number of total seats was highest in 1927 with 3,024 board positions and an average of 12.1 members per board. The average size remained stable until 1972 at about 11-12 members per board, then it dropped considerably with a minimum of 9.1 members in 2001. In 2010 it rose again to 9.7 members, due to the inclusion in the sample of some companies that had adopted a two-board system.

An important measure in the description of the system is the *cumulation ratio* (CR), that is, the average number of positions held by a single director. This, too, reached a maximum in 1927. Then it decreased: firstly slightly in 1936 and 1960, but then substantially since 1972.

Table 2 classifies the 250 companies of each benchmark year into several industries. The weight of the different industries varies over the time. Manufacturing companies were always the most represented industry. Their number dropped from 101 to 85 between 1913 and 1927, but then increased and reached a maximum of 148 in 1972. They remained stable at 142 in 1983, which marked a new turning point. In fact, manufacturing companies dropped substantially to 111 in 2001 and to 87 in 2010. However, the biggest change concerned the weight of the public utilities companies. These were highly represented from 1913 to 1960 when they accounted for about one quarter of all non financial companies. Then they nearly disappeared in 1972 and 1983 as a consequence of the nationalisation of the electricity industry in 1962. Finally, they showed a staggering increase starting from 2001 as a consequence of the massive wave of privatisations of state-owned and municipal enterprises that was carried out in Italy in the 1990s and of the take-off of the mobile telephone industry. It is also worth noticing the substantial increase of service and

[8] In the case of directionality, it is assumed that the direction of the interlock goes from the company in which an individual director has a more important position to that in which the position is of lesser importance. In the case of strength, the connections between two companies are weighted by taking into account the number of directors who sit on both boards of directors. See Pennings (1980) and Wasserman and Faust (1994).

telecommunication companies in 2010, due to a structural change of the Italian economy in the final years of the period under investigation.

Table 1. Descriptive statistics of the network

	1913	**1927**	**1936**	**1960**	**1972**	**1983**	**2001**	**2010**
A: Number of non-financial firms	200	200	200	200	200	200	200	200
Total number of seats	1,781	2,236	1,841	2,150	2,106	1,813	1,536	1,676
Average size of the board	8.9	11.2	9.2	10.8	10.5	9.1	7.7	8.4
Total number of directors	1,166	1,356	1,371	1,457	1,641	1,456	1,307	1,528
B: Number of financial firms	50	50	50	50	50	50	50	50
Total number of seats	611	788	705	783	909	865	727	751
Average size of the board	12.2	15.8	14.1	15.7	18.2	17.3	14.5	15.0
Total number of directors	554	668	592	653	761	752	602	685
A+B : Total number of firms	250	250	250	250	250	250	250	250
Total number of seats	2,392	3,024	2,546	2,933	3,015	2,678	2,263	2,427
Average size of the board	9.6	12.1	10.2	11.7	12.1	10.7	9.1	9.7
Total number of directors	1,571	1,827	1,618	1,932	2,230	2,108	1,850	2,155
CR: Cumulation Ratio	1.52	1.66	1.57	1.52	1.35	1.27	1.22	1.13

Table 2. Firms by sector

	Total	**1**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
1913	250	50	8	37	4	101	9	-	8	21	7	4	-
1927	250	50	10	62	8	85	10	-	13	6	3	3	-
1936	250	50	5	66	4	98	7	-	2	9	3	4	2
1960	250	50	4	46	6	118	9	-	8	2	2	-	5
1972	250	50	5	5	5	148	6	-	10	-	1	3	17
1983	250	50	15	7	9	142	2	-	8	-	1	7	9
2001	250	50	10	41	11	111	1	-	2	3	-	11	9
2010	250	50	16	42	13	87	1	-	2	3	-	12	23

Legend: 1: Financials; 3: Service industry; 4: Electric utility. Water, Telephone, and Gas; 5: Trade companies; 6: Manufacturing companies; 7: Mining industry; 8: Oil companies; 9: Shipping industry; 10: Railway companies; 11: Tramway companies; 12: Building companies; 13: Transport, Warehousing, and Communication.

4. The structure of the network[9]

For most of the period investigated the Italian corporate network consisted of a large main component that included about 90% of the firms of the sample (Table 3). However, from 1983 the

[9] We have used Pajek software and the books by De Nooy, Mrvar and Batagelj (2005) and Wasserman and Faust (1994) for the definitions and calculations of the various indexes and measures presented in this paper.

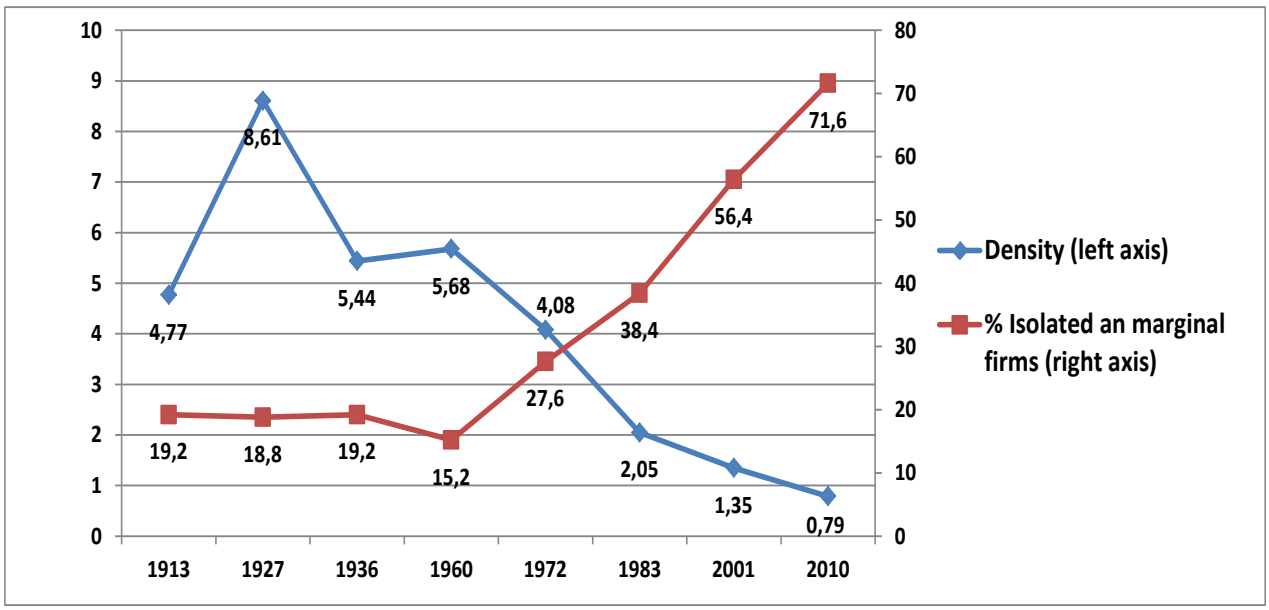
proportion of the firms in the main component started to decline, and in 2010 dropped to 48.4%. In that year the network appeared much more fragmented and – apart from isolated firms – there were another 15 small components in addition to the main component.

Isolated firms remained stable from 1913 to 1960 at little less than 10% of the total but then their number started to increase. The rise was slight in 1972 and 1983 but became massive in 200 and in 2010, when they came to account for nearly 38% of total firms.

Also marginal firms were stable from 1913 to 1960 and increased starting from 1972. Their number rose steadily until 2010, when they accounted for 34% of total firms.

The overall proportion of isolated and marginal firms remained quite stable around 19% prior to the WW2. It dropped to 15% in 1960 but then it began to rise and reached a maximum of 72% in 2010. Thus the Italian corporate network seems to have become much less interconnected starting from the benchmark year 1972, with the disentangling proceeding further in the subsequent decades (see Figure 1).

Figure 1. Isolated and marginal firms



We then calculated the number of ties (or lines) between companies and the number of multiple ties. The latter is considered important because it is argued that multiple ties are less personal and more institutional (De Nooy, Mrvar and Batagelj 2005). We can observe that both the total number

of lines and multiple lines reached a peak in 1927. Then they remained stable between 1936 and 1960 and diminished considerably starting from 1972, with a minimum value in 2010.

A technique for analyzing a network based on line multiplicity is the m-core technique. An m-core is a sub-network defined by the multiplicity of its lines (De Nooy, Mrvar and Batagelj 2005). In the research project "Corporate networks in the 20th century: structural changes and performance" we are interested in the 2m-cores sub-network, in which firms are connected by lines with a value of two and higher. The number of firms that are part of the 2m-core was very high and stable from 1913 to 1960, with values around 215-220 out of 250. Then in 1972 it started to decrease and dropped sharply in 2010 when it plummeted to 103.

We then reported the traditional sociometric measure of density, defined as the ratio between the number of links between pairs of units and the number of possible connections:

$$D = L(r)/L(p)$$

where L(r) is the number of real connections and L(p), defined as n(n-1)/2, indicates the number of all possible connections. The density indicates the degree of overlap between the companies in the system. Given the same number of companies, a greater density means tighter relations between the sub-systems. It is possible to notice that an increase in the number of companies causes a decrease in the density index: with the same number of links, the increase in the number of companies determines a decrease in the density. The index D varies between 0 and 1, i.e. for L(r)=0 and L(r)=n(n-1)/2, respectively. These refer, respectively, to the extreme cases of a total absence of any link and to that of the realisation of all possible links (Scott 1991).

Density had a peak of 8.27 in 1927, when the German-type universal banks had pre-eminent position in the system. Then, in 1936 and 1960 it returned to values only slightly higher than those of 1913. Then in 1972 the density started to decline. The fall was particularly strong in 1983 and proceeded also in the two final benchmark years, with a minimum of 0.79 in 2010, to further signify that the Italian corporate network had become much less interconnected starting from the 1970s.

Developments quite similar to that of the density – that is, the network reached its highest cohesiveness in 1927 and showed a massive decline starting from 1972 – are shown by all the other

centrality and cohesiveness indicators reported in Table 3: diameter[10]; average distance[11]; average degree[12]; degree centrality[13] and closeness centrality[14].

The overall picture that emerges from all the connectivity indices is a strong reduction in the overall cohesion of the Italian corporate network, that seems to have started after such a major institutional break-up as the nationalization of the electricity industry in 1962, became more substantial between 1972 and 1983, that is during the crisis that followed the end of the "Golden Age", and even sharper between 1983 and 2001, after the massive privatizations of SOEs that occurred in Italy in the 1990s. In comparative perspective, in the period prior to the WW2 the density index in Italy seems to have followed the same trend as in Germany, even if at lower values (see Figure 2). Italy behaved like Germany until the early 1960s. Then the Italian corporate network showed a sharp decline, in contrast with Germany where in the mid 1990s the density of the network was still more or less the same as in the early 1950s. At the beginning of the 21st century the density of the Italian corporate network had become as low as that of the major LME, with values comparable to those of the US and the UK, and much lower than Germany and France.

[10] The diameter indicates the longest geodesics of the networks, that is the length of the path between the two most distant vertices (in our case, firms). Geodesics is the shortest path between two vertices (De Nooy, Mrvar and Batagelj 2005, 320).

[11] The distance between two vertices is the length of the geodesics between them (De Nooy, Mrvar and Batagelj 2005, 320).

[12] The degree of a vertex is the number of vertices to which it is tied. Average degree is a better measure of overall cohesion than density because it does not depend on network size, so average degree can be compared between networks of different sizes (De Nooy, Mrvar and Batagelj 2005, 64).

[13] The degree centrality of a vertex is its degree (De Nooy, Mrvar and Batagelj 2005, 320).

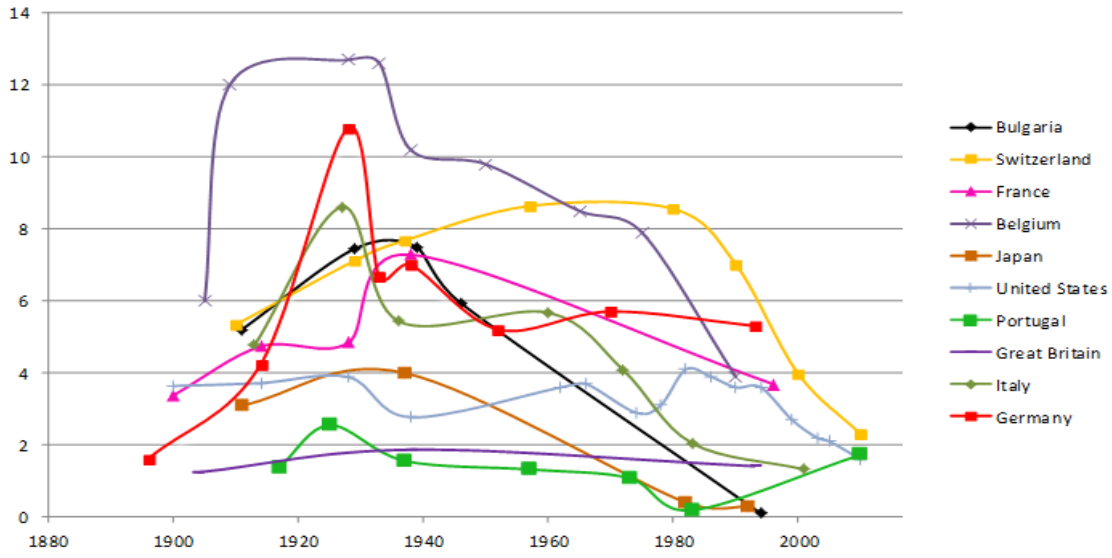
[14] The closeness centrality of a vertex is the number of other vertices divided by the sum of all distances between the vertex and all others (De Nooy, Mrvar and Batagelj 2005, 318).

Table 3. Network statistics

	1913	1927	1936	1960	1972	1983	2001	2010
Size and structure								
Number of firms	250	250	250	250	250	250	250	250
Number of marginal firms (M)*	27	32	29	21	45	63	70	85
M as % of total number of firms	10.8	12.8	11.6	8.4	18.0	25.2	28.0	34.0
Isolated firms (I)	21	15	19	17	24	33	71	94
I as % of total number of firms	8.4	6.0	7.6	6.8	9.6	13.2	28.4	37.6
I + M as % of total number of firms	19.2	18.8	19.2	15.2	27.6	38.4	56.4	71.6
Number of firms in main component	229	234	223	229	222	209	153	121
% of firms in main component	91.6	93.6	89.2	91.6	88.8	83.6	61.2	48.4
Number of components**	0	2	4	2	2	4	11	15
Ties								
Total number of lines	1,484	2,680	1,693	1,768	1,270	657	420	245
Number of multiple lines	304	736	463	545	291	182	143	65
Number of firms in 2m-cores	216	223	215	216	197	182	130	103
Density (x 100)	4.77	8.61	5.44	5.68	4.08	2.05	1.35	0.79
Centrality/Cohesiveness								
Diameter	7	6	6	7	7	9	11	9
Average distance	2.75	2.37	2.57	2.61	2.96	3.84	4.23	4.45
Average degree	11.9	21.4	13.5	14.1	10.2	5.1	3.4	2.0
Degree centrality (x 100)	16.2	35.4	20.0	28.3	17.3	8.1	5.9	4.5
Closeness centrality	78.4	95.1	79.3	82.4	68.9	47.1	23.3	13.9
Betweenness centrality (x 100)	6.46	7.79	6.51	9.27	5.86	9.21	7.64	6.33

* M: Firms with degree 1 or 2.
** Main component and isolated firms are not included.

*Figure 2. Density of the national corporate network in some selected countries**



Sources: The data on density are obtained from the papers presented at the Conference "Corporate networks in the 20th century" (Lausanne, 27-28 August 2012). In particular: François and Lemercier for France; Ivanov and Ganev for Bulgaria; Ginalski, David and Mach for Switzerland; Ghita, Cuyvers and Deloof for Belgium; Koibuchi and Okazaki for Japan; Schifeling and Mizruchi for the United States; Schnyder and Wilson for Great Britain; Silva and Neves for Portugal; Windolf for Germany, France and the US; Rinaldi and Vasta for Italy.
* Density refers to the top 250 companies for Germany, Great Britain, Italy, Japan and the United States, and to the top 125 companies for Belgium, Bulgaria, France, Portugal and Switzerland.

5. Actor centrality

In network analysis it is presumed that actors that are central have better access to information, better opportunities to spread information and someway a "power" to coordinate the whole network. In this paper we use two measures to calculate the centrality of firms: degree centrality and betweenness centrality.

Degree centrality is the simplest and most intuitive measure of actor centrality. It simply counts the number of actors to which an actor is tied: this is its degree. However, degree centrality is a local centrality measure as it does not take into account the centrality of the neighbours to which an actor is linked. Thus an actor can have many neighbours but still be at the periphery of the network as a whole. This shortcoming is overcome by betweenness centrality. This measures is based on the idea that a firm is more central if it is more important as an intermediary in the communication network. So it calculates for each actor the number of shortest paths between any pairs of actors in the network that pass through this actor (De Nooy, Mrvar and Batagelj 2005).

By analysing degree centrality, we observe that in 1913 the banking sector was the most represented among the most central companies, with four presences out of ten (Table 4).

The three larger universal banks (Banca Commerciale, Credito Italiano and Società Bancaria Italiana) and the Bank of Italy (which at that time was still a privately-owned joint-stock company) seemed to play a central role in the system [15].

In 1927 the centre appeared to have been enlarged and reached its highest connectivity. The two larger universal banks had further strengthened their links with industry and especially with electrical companies. Now the centre included, together Banca Commerciale and Credito Italiano, the major electrical companies and the Società Italiana per le Strade Meridionali, a former railway company which, after the nationalisation of the Italian railways in 1905, had turned into a finance company that invested the sums it had received from the state, in compensation for the railway nationalisation, mainly in securities of the major electrical-commercial companies.

As we have seen, the economic crisis of the early 1930s pushed the government to create, in 1933, the big state-owned holding Iri that took over the universal banks and their industrial securities. In 1936 a new banking law imposed a clear-cut separation between banks and industry. Banks were allowed to practice only short-term credit, while their share participations in non financial companies were strictly limited. At the same time, industrial credit was entrusted to newly-created specialised institutes.

These changes had profound effects on the structure of the Italian corporate network and resulted in a remarkable decrease in the cohesion of the system. In 1936, the most central companies had little

[15] The list of the top ten companies according to degree centrality for each benchmark year is reported in Appendix 1.

more than one-half of the links of their counterparts in 1927. The former universal banks had lost their pre-eminent position, while a central position in the system was now occupied by the larger electrical groups, the two bigger insurance companies, and the Società Italiana per le Strade Meridionali.

The situation little changed in 1960, with four large electrical companies and two finance companies deeply involved in the electricity industry among the top ten.

The nationalisation of the electricity industry in 1962 led to a dissolving of the old centre of the system. In fact, in 1972 electrical companies had disappeared from the top ten, that now included a higher proportion of manufacturing companies (five out of ten) than ever before. In 1972, it is also possible to observe a larger presence of SOEs among the most central companies: four of the top ten companies (as compared with two in 1960) were now state-owned. The fact that two of the latter were industrial credit institutes highlights the central role that the state had come to play in channelling funds to industry.

The year 1983 saw a dramatic decrease in the number of interlocks of the most central companies, that halved with regard to 1972. The central role of manufacturing companies was further strengthened as these now accounted for seven of the top 13 companies. Yet, the most important change was the marginalisation of SOEs from the centre of the system, as they now numbered only three of the top 13. [16]

In the face of the marginalization of SOEs, between 1972 and 1983 the system's centre seems to have been reshaped around the pivotal role Mediobanca played, as the only merchant bank operating in Italy at that time. Mediobanca did not appeared in the list of the more central companies in that year. However, nine of the 13 companies on the 1983 list, especially those belonging to the Fiat and Montedison groups, and the two big insurance companies Assicurazioni Generali and Ras were closely tied to it through credit relations, cross participations, and Mediobanca's presence in their controlling syndicates.

The massive wave of privatizations of SOEs in the 1990s marked another major institutional break-up. As a result, in 2001 the Italian corporate network had become even more disentangled with all the connectivity indicators showing their lowest values. Manufacturing companies had nearly disappeared from the more central companies, with only the big aerospace and defence state-owned company Finmeccanica remaining. Now the most represented sectors among the top ten companies by degree centrality were telecommunications and banks with three presences each. At the same time, insurance companies confirmed their importance at the core of the network with two presences.

[16] In 1983, 2001 and 2010 the actual number of companies was 13, 11 and 15 respectively, instead of the ten speculated, since in those years some companies appear in tenth position with the same degree.

In 2010 banks and insurance companies – i.e., finance capital – returned to the center of the system with seven presences among the top 15. This was the consequence of a reshuffling of Italian capitalism which occurred after the 1993 banking law had paved the way to a return to a German model of banking, allowing Italian banks to own non-financial firms with the view of promoting stability of their ownership structures and long-term strategies.

An analysis of the top ten companies according to betweenness centrality shows results that are very similar to those obtained with degree centrality (Table 5).

The major differences between the two measures concerns the place of SOEs in 1983 and that of telecommunications and electricity companies in 2001[17].

As to the former, in 1983 SOEs are marginalized from the centre of the network according to degree centrality, but they have a stronger position according to betweenness centrality. A possible explanation is of this apparent paradox is that it can someway be a consequence of the change in the structure of the network that occurred between 1972 and 1983, with the passage from one large centre that included both private enterprises and SOEs to two centres: one larger and private and the other smaller and state-owned, clearly disconnected one from the other. It is possible that a smaller proportion of companies functioned as key channels of communication in the larger private centre which could explain the higher proportion of SOEs among the top ten by betweenness centrality. In brief, Chiesi's thesis seems to be confirmed for the smaller sample (Italy's top 250 companies) used in this paper whereas it does not hold for the larger sample (Italy's top 5,564 companies) we used in our previous paper (Rinaldi and Vasta 2012).

Instead, in 2001 we find three telecommunications companies among the top ten by degree centrality and none among the top ten by betweenness centrality. Conversely, electrical companies, that are absent from the top ten by degree centrality, have two presences among the top ten by betweenness centrality. Such a circumstance seems to mark a return to a central position of a sector that had been pivotal until the nationalization in 1962 and that thirty years after had been massively involved in the privatizations of the 1990s. Once privatized in the 1990s, electrical companies returned for a short while to play a central role as connectors of the network, but were eventually superseded in this function by banks and insurance companies in 2010.

[17] The list of the top ten companies according to betweenness centrality for each benchmark year is reported in Appendix 2.

Table 4. Top ten companies according to degree centrality by sector of activity

Sector of activity	1913	1927	1936	1960	1972	1983*	2001*	2010*
Manufacturing	2	1	-	2	5	7	1	3
Electrical power	3	6	4	4	-	-	-	1
Energy	-	-	-	-	1	-	-	-
Constructions	-	-	-	-	-	1	-	-
Railway	1	-	-	-	-	-	-	-
Transport	-	-	-	-	-	-	1	1
Telecommunications	-	-	-	-	-	-	3	1
Banking	4	2	2	-	1	-	3	3
Finance	-	1	2	3	2	3	1	-
Insurance	-	-	2	1	1	2	2	4
Services	-	-	-	-	-	-	-	2
Total	10	10	10	10	10	13	11	15

* In 1983, 2001 and 2010 the actual number of companies was 13, 11 and 15 respectively, instead of the ten speculated, since in those years some companies appear in tenth position with the same degree.

Table 5. Top ten companies according to betweenness centrality by sector of activity

Sector of activity	1913	1927	1936	1960	1972	1983	2001	2010
Manufacturing	2	2	1	2	4	4	2	3
Electrical power	2	3	4	2	-	-	2	-
Energy	-	-	-	-	-	1	-	-
Constructions	-	-	-	-	-	-	-	-
Railway	2	-	-	-	-	-	-	-
Transport	-	-	-	1	-	-	1	-
Telecommunications	-	-	-	-	-	1	-	1
Banking	3	3	2	1	1	-	2	4
Finance	-	2	1	3	4	4	1	-
Insurance	1	-	2	1	1	-	2	2
Total	10	10	10	10	10	10	10	10

6. The big linkers

An analysis of the "big linkers" (henceforth BL) – i.e., the ten individuals who held the largest number of directorships in each benchmark year – can be very insightful. In capitalist countries, the BL perform an important function in ensuring the cohesion of the system, for they are usually the business community's opinion leaders, the vehicle through which information is collected and spread among companies, as well as the principle channel connecting the business world and the political domain (Scott 1985).

A close examination was made of the IDs generated by the top ten BL. Table 6 shows that in each benchmark year these individuals accounted for a very high proportion of total IDs, ranging from 21% in 1972 to 37% in 1960. That is, the Italian corporate network was constituted to a large extent

by the links generated by a handful of individuals, who played a paramount role in assuring the cohesion of the whole system.

The distribution of directorships of the BL often proved to span over a wide range of sectors. However, the reconstruction of their individual biographies made it possible to identify the prevalent career sector for each one of them. The prevalent career sector was defined as the sector in which an individual had dedicated most of his career, and by virtue of the affiliation with which he was able to hold a number of board positions sufficient to make him a BL. The results of these procedure are reported in Appendix 3.

Table 7 outlines the abovementioned information in a concise form, for each benchmark year. In 1913, finance and banking were the most represented sectors, each one with three BL out of ten, followed by electrical power with two. In 1927 electrical power joined finance in top position with four individual each, who were followed by two bankers. In 1936, electricity companies managers were still in top position; the collapse of the mixed banks had reduced the number of bankers and financers, while for the first time there was a sizeable number of BL occupied in manufacturing sectors related to the technological paradigm of the second industrial revolution. There were not significant variations in 1960, whereas a big change could be observed in 1972. At that time, ten years after the nationalization effort, the electrical power industry was no longer supplying any BL. Finance had jumped in top position, with five individuals out of nine. Most of these financers were directors who held a large number of seats in companies belonging to different business groups, without a strong or prevalent affiliation with any of them. These BL functioned as *zipper figures* among several corporate groups and played a crucial role in assuring the strong interconnection between SOEs and the private sector that distinguished the Italian corporate network in the early 1970s. In 1983, the increasing disconnection between SOEs and private companies led to the disappearance of bankers and financers. Now all BL but one were occupied in manufacturing sectors, among which motor-vehicles stood out. The massive privatizations of the 1990s brought about a radical change in the BL sectoral specialization. In fact, in 2001 electrical power returned to the top position it occupied before the nationalization in 1962. Another come-back is that of bankers and insurance company managers, while the number of BL occupied in manufacturing dropped from nine to two. The three BL who in 2010 came from the motor-vehicles industry were all top managers of the Fiat group.

Table 6. IDs generated by the top ten BL

	1913	1927	1936	1960	1972	1983	2001	2010
(1) Total IDs	1,924	4,029	2,479	2,702	1,741	925	701	361
(2) IDs by the BL	516	1,450	767	999	535	201	235	81
2 / 1 (%)	26.8	36.0	30.9	37.0	30.7	21.7	33.5	22.4

Table 7. BL by career sector

Sector	1913	1927	1936	1960	1972	1983	2001	2010
Electrical Power	2	4	4	5	-	-	4	4
Finance	3	4	3	4	5	-	2	-
Banking	3	2	1	1	1	-	1	1
Insurance	1	-	1	-	-	-	1	1
Metal-engineering	1	-	-	-	-	1	-	-
Motor-vehicles	-	-	1	-	-	4	-	3
Chemicals	-	-	1	-	-	-	-	-
Rubber & cable	-	-	1	-	-	-	-	-
Cement	-	-	-	1	1	2	-	-
Steel	-	-	-	1	1	2	1	-
Energy	-	-	-	-	1	1	2	-
Textiles	-	-	-	-	-	-	1	-
Total	10	10	12	12	9	10	12	9

7. Conclusions

This paper has analysed the structure of the Italian corporate network from 1913 to 2010 by considering a sample of the top 250 companies by total assets for eight benchmark years and using network analysis techniques.

This paper has shown that the system was very cohesive from 1913 to 1960. The connectivity indexes remained substantially stable for the first four benchmark years; the highest values were observed in 1927, when the influence of the larger German-type universal banks on the nation's corporate system reached its apex. Conversely, the cohesion of the system started to decrease in 1972, after the nationalisation of the electricity industry and the first appearance of the ICT which both contribute to mark a break-up of the institutional structures of the Italian corporate sector. The fall in the degree of cohesion of the system became sharper from 1983, and in 2010 the connectivity indexes plummeted to their lowest values, probably as a consequence of the full emergence of the new technological trajectory of the third industrial revolution and of the transition from fordism to post-fordism. Moreover, multiple ties became rarer and the inclusiveness of the network sharply declined, with a strong increase of isolated firms.

In comparative perspective, in the period prior to the WW2 the structure of the Italian corporate network seems to have been similar to that of Germany, even if at lower values. Italy behaved like Germany until the early 1960s. Then the two networks started to diverge: the Italian corporate network showed a sharp decline, in contrast with Germany where in the mid-1990s the cohesion of the network was still the same as in the early 1950s. At the beginning of the 21st century the density of the Italian corporate network had become so low that it had plummeted to values similar to those of the major LME, such as the US and the UK, and much lower than those of Germany and France.

One major consequence of the massive privatizations that occurred in the 1990s was a return of banks and insurance companies – i.e., finance capital – in a central position in the now weaker network from which they had disappeared in the 1930s. This come-back of the banking sector was favored by the 1990 banking law that reintroduced universal banking in Italy. Thus, it seems that the privatizations missed the goal they purported: to prompt the formation of North American-style large public companies in Italy. Instead, the privatizations had eventually the consequence to prompt a return to the core of the system of two traditional actors of Italian capitalism: finance capital (banks and insurance companies) and – for a short while between the end of the 20th and the beginning of the 21st century – the electrical companies.

Finally, we can observe that in the first four benchmark years nearly all the more central companies in the Italian corporate network served principally or exclusively the domestic market: this was the case for the universal banks and the electrical companies in 1913 and 1927, and for the electrical companies and the major insurance and finance companies in 1936 and 1960. This can seem paradoxical for an economy that is widely known as export-oriented.

In 1972 and 1983 the disappearance of the electrical companies and the entry of several manufacturing companies among the top ten implied that for the first time a substantial proportion of the central companies exported a remarkable part of their production. Maybe not by chance, the entry of exporting companies among the more central companies of the Italian corporate network occurred when the degree of openness (the ratio of the sum of total imports and exports to GDP) of the Italian economy jumped from about 25% in the early 1960s to nearly 50% in the early 1970s (Vasta 2010).

However, the situation was reversed after the privatizations took place: in 2001 and 2010 exporting companies were marginalised and, as a consequence of the privatizations of the 1990s, a central position in the network was once again occupied by the sectors that served mainly or exclusively the domestic market: banking, insurance, electricity, and telecommunications. The marginalization of exporting firms was also a consequence of the fact that by the beginning of the 21st century nearly all large Italian manufacturing companies had disappeared and now the exporting sector consisted nearly totally of small and medium sized enterprises that were part of local networks constituted by firms that were too small to be included in our sample.

So the reshaping and the further weakening of the Italian corporate network after the privatizations of the 1990s seems to reflect the dualism of the Italian corporate system and the different dynamics of its two components. On the one hand, there is the exporting sector, constituted principally by small and medium-sized manufacturing firms operating in the sectors of the “Made in Italy”, mechanical engineering and motor-vehicles, whose share in the nation’s economy increased since the 1980s but for which the declining importance of the domestic market decreased also the

relevance of being inserted into a national corporate network. On the other hand, there is the sector serving the domestic market, whose weight in the national economy has diminished over the course of time but for which the integration in a national corporate network remains important. This can explain the weakening of the network as a whole and the monopolization of the centre by companies operating in the latter sector.

Appendix 1: Top ten companies according to degree centrality

1913

#	Company	Degree	Sector of activity	Ownership
1	BANCA COMMERCIALE ITALIANA	52	Banking	P
2	SOCIETÀ BANCARIA ITALIANA	51	Banking	P
2	SOCIETÀ ELETTRICA RIVIERA DI PONENTE ING. R. NEGRI	51	Electrical power	P
4	SOCIETÀ ITALIANA PER LE STRADE FERRATE DEL MEDITERRANEO	45	Railway	P
5	SOCIETÀ GENERALE ITALIANA EDISON DI ELETTRICITÀ	43	Electrical power	P
6	ILVA	42	Steel	P
7	A.E.G. THOMSON HOUSTON	41	Mechanical engineering	P
8	BANCA D'ITALIA	38	Banking	P
9	CREDITO ITALIANO	35	Banking	P
9	UNES UNIONE ESERCIZI ELETTRICI	35	Electrical power	P

Legend: *P* Privately-owned.

1927

#	Company	Degree	Sector of activity	Ownership
1	BANCA COMMERCIALE ITALIANA	109	Banking	P
2	SOCIETÀ ITALIANA PER LE STRADE FERRATE MERIDIONALI	89	Finance	P
3	SOCIETÀ GENERALE ELETTRICA TRIDENTINA	85	Electrical power	P
4	SOCIETÀ GENERALE ITALIANA EDISON DI ELETTRICITÀ	81	Electrical power	P
5	ANSALDO	78	Manufacturing	P
5	SOCIETÀ IDROELETTRICA PIEMONTE	78	Electrical power	P
7	CREDITO ITALIANO	69	Banking	P
8	CIELI COMPAGNIA IMPRESE ELETTRICHE LIGURI	67	Electrical power	P
9	TERNI SOCIETÀ PER L'INDUSTRIA E L'ELETTRICITÀ	64	Electrical power	P
10	GENERALE ELETTRICA DELLA SICILIA	63	Electrical power	P

Legend: *P* Privately-owned.

1936

#	Company	Degree	Sector of activity	Ownership
1	SOCIETÀ ITALIANA PER LE STRADE FERRATE MERIDIONALI	63	Finance	P
2	SME SOCIETÀ MERIDIONALE DI ELETTRICITÀ	59	Electrical power	P
3	RAS RIUNIONE ADRIATICA DI SICURTÀ	56	Insurance	P
4	SOCIETÀ GENERALE ITALIANA EDISON DI ELETTRICITÀ	54	Electrical power	P
5	ASSICURAZIONI GENERALI	53	Insurance	P
6	BANCA COMMERCIALE ITALIANA	50	Banking	SO
7	ISTITUTO DI CREDITO PER LE IMPRESE DI PUBBLICA UTILITÀ	47	Long-term credit	SO
7	CIELI COMPAGNIA IMPRESE ELETTRICHE LIGURI	47	Electrical power	P
9	CREDITO ITALIANO	44	Banking	SO
10	GENERALE ELETTRICA CISALPINA	43	Electrical power	P

Legend: *P* Privately-owned, *SO* State-owned.

1960

#	Company	Degree	Sector of activity	Ownership
1	SOCIETÀ ITALIANA PER LE STRADE FERRATE MERIDIONALI	84	Finance	P
2	RAS RIUNIONE ADRIATICA DI SICURTÀ	66	Insurance	P
3	MONTECATINI SOCIETÀ GENERALE PER L'INDUSTRIA MINERARIA E CHIMICA	58	Chemicals	P
4	SOCIETÀ GENERALE ITALIANA EDISON DI ELETTRICITÀ	56	Electrical power	P
5	SME SOCIETÀ MERIDIONALE DI ELETTRICITÀ	51	Electrical power	P
6	FINSIDER SOCIETÀ FINANZIARIA SIDERURGICA	48	Finance	SO
6	EDISONVOLTA	48	Electrical power	P
8	FRANCO TOSI	47	Mechanical engineering	P
9	STEI SOCIETÀ TERMOELETTRICA ITALIANA	44	Banking	P
10	FINELETTRICA FINANZIARIA ELETTRICA NAZIONALE	42	Finance	SO

Legend: *P* Privately-owned, *SO* State-owned.

1972

#	Company	Degree	Sector of activity	Ownership
1	RAS RIUNIONE ADRIATICA DI SICURTÀ	53	Insurance	P
2	FRANCO TOSI	41	Mechanical engineering	P
3	SNIA VISCOSA SOCIETÀ NAZIONALE INDUSTRIE APPLICAZIONI VISCOSA	40	Chemicals	P
4	CREDITO COMMERCIALE	39	Banking	P
5	ISTITUTO DI CREDITO PER LE IMPRESE DI PUBBLICA UTILITÀ	36	Long-term credit	SO
5	MONTEDISON	36	Chemicals	P
5	ITALGAS SOCIETÀ ITALIANA PER IL GAS	36	Energy	SO
8	ITALSIDER	35	Steel	SO
8	I.M.I. ISTITUTO MOBILIARE ITALIANO ROMA	35	Long-term credit	SO
10	CEMENTERIE SICILIANE	33	Cement	P

Legend: *P* Privately-owned, *SO* State-owned.

1983

#	Company	Degree	Sector of activity	Ownership
1	SNIA BPD	25	Chemicals	P
2	EFIBANCA ENTE FINANZIARIO INTERBANCARIO	22	Long-term credit	P
2	I.M.I. ISTITUTO MOBILIARE ITALIANO ROMA	22	Long-term credit	SO
4	MONTEDISON	21	Chemicals	P
4	FIAT AUTO	21	Motor vehicles	P
6	RAS RIUNIONE ADRIATICA DI SICURTÀ	19	Insurance	P
7	FIAT	17	Finance	P
8	TEKSID	16	Steel	P
9	ASSICURAZIONI GENERALI	15	Insurance	P
9	ITALIMPIANTI SOCIETÀ ITALIANA IMPIANTI	15	Constructions	SO
9	NUOVA ITALSIDER	15	Steel	SO
9	IVECO FIAT	15	Motor vehicles	P
9	ACCIAERIE E FERRIERE LOMBARDE FALCK	15	Steel	P

Legend: *P* Privately-owned, *SO* State-owned.

2001

#	Company	Degree	Sector of activity	Ownership
1	OLIVETTI – ING. C. OLIVETTI & C.	18	Finance	P
2	RAS – RIUNIONE ADRIATICA DI SICURTÀ	16	Insurance	P
2	MEDIOBANCA – BANCA DI CREDITO FINANZIARIO	16	Banking	P
2	TELECOM ITALIA	16	Telecommunications	P
5	FINMECCANICA	15	Mechanical engineering	SO
5	AUTOSTRADE – CONCESSIONI E COSTRUZIONI AUTOSTRADE	15	Transport	P
7	ALLEANZA ASSICURAZIONI	14	Insurance	P
8	INTERBANCA	12	Banking	P
8	UNICREDITO ITALIANO	12	Banking	P
8	TIM – TELECOM ITALIA MOBILE	12	Telecommunications	P
9	WIND TELECOMUCAZIONI	12	Telecommunications	P

Legend: *P* Privately-owned, *SO* State-owned.

2010

#	Company	Degree	Sector of activity	Ownership
1	MEDIOBANCA - BANCA DI CREDITO FINANZIARIO (GRUPPO MEDIOBANCA)	13	Banking	P
2	FERRARI - ESERCIZIO FABBRICHE AUTOMOBILI E CORSE (GRUPPO FIAT)	11	Motor vehicles	P
3	TELECOM ITALIA (GRUPPO TELECOM ITALIA)	10	Telecommunications	P
3	INTESA SANPAOLO (GRUPPO INTESA SANPAOLO)	10	Banking	P
5	UGF ASSICURAZIONI (GRUPPO UNIPOL GRUPPO FINANZIARIO)	9	Insurance	P
5	AEROPORTI DI ROMA (GRUPPO GEMINA)	9	Services	P
7	ASSICURAZIONI GENERALI (GRUPPO ASSICURAZIONI GENERALI)	8	Insurance	P
7	ITALCEMENTI - FABBRICHE RIUNITE CEMENTO (GRUPPO ITALCEMENTI)	8	Cement	P
9	AUTOGRILL (GRUPPO AUTOGRILL)	7	Restaurants	P
9	INA ASSITALIA (GRUPPO ASSICURAZIONI GENERALI)	7	Insurance	P
9	ALLIANZ (GRUPPO ALLIANZ)	7	Insurance	P
9	FIAT GROUP AUTOMOBILES (GRUPPO FIAT)	7	Motor vehicles	P
9	UBI BANCA (GRUPPO UBI BANCA)	7	Banking	P
9	ENEL PRODUZIONE (GRUPPO ENEL)	7	Electricity	SO
9	ALITALIA - COMPAGNIA AEREA ITALIANA (GRUPPO ALITALIA)	7	Transports	P

Legend: *P* Privately-owned, *SO* State-owned.

Appendix 2: Top ten companies according to betweenness centrality

1913

#	Company	Value (x 100)	Sector of activity	Ownership
1	SOCIETÀ BANCARIA ITALIANA	7.03	Banking	P
2	BANCA COMMERCIALE ITALIANA	6.17	Banking	P
3	SOCIETÀ GENERALE ITALIANA EDISON DI ELETTRICITÀ	4.20	Electrical power	P
4	BANCA D'ITALIA	4.09	Banking	P
5	SOCIETÀ ELETTRICA RIVIERA DI PONENTE ING. R. NEGRI	3.37	Electrical power	P
6	ILVA	3.21	Steel	P
7	SOCIETÀ ITALIANA PER LE STRADE FERRATE DEL MEDITERRANEO	3.05	Railway	P
8	COTONIFICIO VENEZIANO	3.03	Cotton	P
9	TORINESE DI TRAMWAYS E FERROVIE ECONOMICHE	3.00	Railway	P
10	ITALIA SOCIETÀ DI ASSICURAZIONI MARITTIME FLUVIALI E TERRESTRI	2.66	Insurance	P

Legend: *P* Privately-owned.

1927

#	Company	Value (x 100)	Sector of activity	Ownership
1	BANCA COMMERCIALE ITALIANA	8.25	Banking	P
2	SOCIETÀ IDROELETTRICA PIEMONTE	4.81	Electrical power	P
3	BANCA NAZIONALE DI CREDITO	3.82	Banking	P
4	SOCIETÀ GENERALE ELETTRICA TRIDENTINA	3.50	Electrical power	P
5	ANSALDO	3.34	Mechanical engineering	P
6	SOCIETÀ ITALIANA PER LE STRADE FERRATE MERIDIONALI	3.33	Finance	P
7	CREDITO ITALIANO	3.30	Banking	P
8	COTONIFICIO VENEZIANO	3.28	Cotton	P
9	SOCIETÀ GENERALE ITALIANA EDISON DI ELETTRICITÀ	2.68	Electrical power	P
10	CONSORZIO DI CREDITO PER LE OPERE PUBBLICHE	2.42	Long-term credit	SO

Legend: *P* Privately-owned, *SO* State-owned.

1936

#	Company	Value (x 100)	Sector of activity	Ownership
1	ASSICURAZIONI GENERALI	6.98	Insurance	P
2	RAS RIUNIONE ADRIATICA DI SICURTÀ	4.66	Insurance	P
3	SME SOCIETÀ MERIDIONALE DI ELETTRICITÀ	4.66	Electrical power	P
4	SOCIETÀ GENERALE ITALIANA EDISON DI ELETTRICITÀ	4.35	Electrical power	P
5	BANCA COMMERCIALE ITALIANA	4.22	Banking	SO
6	SAN GIORGIO SOCIETÀ ANONIMA INDUSTRIALE	4.17	Mechanical engineering	SO
7	SOCIETÀ ITALIANA PER LE STRADE FERRATE MERIDIONALI	3.99	Finance	P
8	CREDITO ITALIANO	3.39	Banking	SO
9	CIELI COMPAGNIA IMPRESE ELETTRICHE LIGURI	2.92	Electrical power	P
10	GENERALE ELETTRICA CISALPINA	2.65	Electrical power	P

Legend: *P* Privately-owned, *SO* State-owned.

1960

#	Company	Value (x 100)	Sector of activity	Ownership
1	SOCIETÀ ITALIANA PER LE STRADE FERRATE MERIDIONALI	9.78	Finance	P
2	RAS RIUNIONE ADRIATICA DI SICURTÀ	4.49	Insurance	P
3	MONTECATINI SOCIETÀ GENERALE PER L'INDUSTRIA MINERARIA E CHIMICA	4.12	Chemicals	P
4	FINSIDER SOCIETÀ FINANZIARIA SIDERURGICA	3.90	Finance	SO
5	BANCA D'AMERICA E D'ITALIA	3.80	Banking	P
6	SOCIETÀ GENERALE ITALIANA EDISON DI ELETTRICITÀ	3.79	Electrical power	P
7	FIAT	3.43	Motor vehicles	P
8	EFIBANCA ENTE FINANZIARIO INTERBANCARIO	3.21	Long-term credit	P
9	STEI SOCIETÀ TERMOELETTRICA ITALIANA	2.93	Electrical power	P
10	AUTOSTRADA CEVA-SAVONA	2.85	Transport	P

Legend: *P* Privately-owned, *SO* State-owned.

1972

#	Company	Value (x 100)	Sector of activity	Ownership
1	RAS RIUNIONE ADRIATICA DI SICURTÀ	6.46	Insurance	P
2	SNIA VISCOSA SOCIETÀ NAZIONALE INDUSTRIE APPLICAZIONI VISCOSA	4.79	Chemicals	P
3	STET SOCIETÀ FINANZIARIA TELEFONICA	4.03	Finance	SO
4	ISTITUTO DI CREDITO PER LE IMPRESE DI PUBBLICA UTILITÀ	3.99	Long-term credit	SO
5	EFIBANCA ENTE FINANZIARIO INTERBANCARIO	3.91	Long-term credit	P
6	I.M.I. ISTITUTO MOBILIARE ITALIANO ROMA	3.54	Long-term credit	SO
7	MONTEDISON	3.54	Chemicals	P
8	ITALSIDER	3.47	Steel	SO
9	BP ITALIANA	3.17	Petrochemiclas	P
10	BANCA CATTOLICA DEL VENETO	3.13	Banking	P

Legend: *P* Privately-owned, *SO* State-owned.

1983

#	Company	Value (x 100)	Sector of activity	Ownership
1	MONTEDISON	9.97	Chemicals	P
2	I.M.I. ISTITUTO MOBILIARE ITALIANO ROMA	8.99	Long-term credit	SO
3	EFIBANCA ENTE FINANZIARIO INTERBANCARIO	7.25	Long-term credit	P
4	MIRA LANZA	6.50	Chemicals	P
5	SNIA BPD	6.19	Chemicals	P
6	SIP SOCIETÀ ITALIANA PER L'ESERCIZIO TELEFONICO	5.66	Telecommunications	SO
7	E.N.I. ENTE NAZIONALE IDROCARBURI	4.86	Energy	SO
8	STET SOCIETÀ FINANZIARIA TELEFONICA	4.40	Finance	SO
9	FINMECCANICA SOCIETÀ FINANZIARIA MECCANICA	4.25	Finance	SO
10	GRANDI MOTORI TRIESTE FIAT ANSALDO CRDA GMT	3.99	Mechanical engineering	P

Legend: *P* Privately-owned, *SO* State-owned.

2001

#	Company	Value (x 100)	Sector of activity	Ownership
1	FINMECCANICA	8.10	Mechanical engineering	SO
2	ALLEANZA ASSICURAZIONI	7.93	Insurance	P
3	MEDIOBANCA – BANCA DI CREDITO FINANZIARIO	5.40	Banking	P
4	EDISON	4.73	Electrical power	P
5	OLIVETTI – ING. C. OLIVETTI & C.	4.26	Finance	P
6	UNICREDIT BANCA MOBILIARE	4.22	Banking	P
7	AUTOSTRADE – CONCESSIONI E COSTRUZIONI AUTOSTRADE	4.20	Transport	P
8	SONDEL – SOCIETÀ NORDELETTRICA	3.94	Electrical power	P
9	COMAU	3.76	Mechanical engineering	P
10	RAS – RIUNIONE ADRIATICA DI SICURTÀ	3.31	Insurance	P

Legend: P *Privately-owned,* SO *State-owned.*

2010

#	Company	Value (x 100)	Sector of activity	Ownership
1	MEDIOBANCA - BANCA DI CREDITO FINANZIARIO (GRUPPO MEDIOBANCA)	6.63	Banking	P
2	FERRARI - ESERCIZIO FABBRICHE AUTOMOBILI E CORSE (GRUPPO FIAT)	5.00	Motor vehicles	P
3	INTESA SANPAOLO (GRUPPO INTESA SANPAOLO)	3.31	Banking	P
4	ASSICURAZIONI GENERALI (GRUPPO ASSICURAZIONI GENERALI)	3.28	Insurance	P
5	ANSALDO STS (GRUPPO ANSALDO STS)	3.23	Mechanical engineering	P
6	UNICREDIT (GRUPPO UNICREDIT)	3.22	Banking	P
7	ITALCEMENTI - FABBRICHE RIUNITE CEMENTO (GRUPPO ITALCEMENTI)	3.17	Cement	P
8	ALLEANZA TORO (GRUPPO ASSICURAZIONI GENERALI)	2.88	Insurance	P
9	BANCA POPOLARE DELL'EMILIA ROMAGNA (GRUPPO BANCA POPOLARE DELL'EMILIA ROMAGNA)	2.55	Banking	P
10	TELECOM ITALIA (GRUPPO TELECOM ITALIA)	2.51	Telecommunications	P

Legend: P *Privately-owned,* SO *State-owned.*

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