*Essays in Economic & Business History*
2022, 40: 137-155
Published October 29, 2022

# The Development of the Space Industry in Italy: From State Ownership to the Entrepreneurial State, 1969-2017

Matteo Landoni, Department of Economic and Social History, University of Glasgow, matteo.landoni@glasgow.ac.uk

**Abstract**

This article shows the evolution of the aerospace sector in Italy using archival sources which have not yet been fully explored. The sector experienced a shift from the state ownership model to a demand-side industrial policy. The historical case of how Alenia Spazio evolved into an innovative firm thanks to the Italian Space Agency's demand-driven industrial policy contributes to the article's argument that a proper mix of government-business networks and technology-led institutional arrangements spared the Italian space sector from the country's general economic decline during the late twentieth and early twenty-first centuries. The analysis sheds light on the role of technology, institutions, and economic integration in the evolution of the space sector and the Italian form of capitalism at the end of the past century.

**Keywords**: state capitalism; space industry; economic decline; Italian economy.



ISSN 0896-226X LCC 79-91616 HC12.E2

## Introduction

The aerospace industry is nowadays one of the very few Italian technological industries, yet it is not one of the most famous.[1] In a wider industrial panorama that has seen the eclipse of many of Italy's advanced technological industries in the past three decades—such as information technology and the chemicals industries—aerospace is one of the last Italian technological frontiers. However, it is still perhaps little known, but certainly worthy of attention, that a large number of international projects relating to the research and exploration of space involve Italian companies. These include forty percent of the living space of the International Space Station, the antenna of the Cassini–Huygens probe, and the Vega launcher.[2] As in other European countries, this sector has had important participation from state-owned enterprises (SOEs) since its inception.

In Italy, however, and unlike for other state-owned industries,[3] the aerospace sector has been able to evolve, overcoming the privatization phase of public enterprises and becoming a globally recognized player, in which the state is not absent but has largely changed its function. The present article argues that the evolution of government-business networks and technologyl-led institutions served to support the transformation of the space sector in the context of the Italian economic decline over the last few decades. It offers an analysis of the historical divergence of this sector from the more general retreat of the Italian high-tech industry. This divergence has allowed the formation of a pole of technological expertise in the form of a company, Alenia Spazio, which has overcome the model of public enterprises based on state ownership. Its relationship with the state has changed, not only in terms of the share of capital held by the public holding company but also in its structures and strategies. This was a shift from direct ownership management to an indirect strategy based on intermediate institutions. In this case, it is essential to evaluate the industrial policy entrusted to the Italian Space Agency.

The recipe for the surge and survival of an Italian technology-based industry comprises many ingredients. It includes the nature of the government-business relationship that has shaped so many Italian industries for most of the past century,[4] the role of the entrepreneurial state in the formation of the government-business network,[5] the internationalization of business and the integration of economies at the European level,[6] and, lastly, the interdependencies between the institutional and technological changes in advanced industrial societies.[7] All these elements have played a part in the relative success of the Italian space industry, a case of industrial development that has escaped the overall decline of the Italian economy in the last twenty-five years.

The present article analyses archival sources to explore this field of research. Sources come from the former aerospace companies that formed Alenia Spazio, and documents from the Italian Space Agency. These sources are for the most part unedited, only recently disclosed in the relevant archives, which have nearly never been investigated by business historians, either Italian or foreign. The context of the research is the general decline of the Italian economy, the productivity of its industrial sectors, and the socio-technical model of capitalism. The article combines the primary data with secondary sources for a deeper analysis that brings new light to the transformation of Italian capitalism towards an

[1] In comparison to the so-called three F of Made in Italy, Fashion, Food, and Furniture.

[2] *IEEE Earthzine* (2013).

[3] For example, telecommunications and ICT, as in Emanuele Felice (2015).

[4] See, for example, Francesca Fauri (2010).

[5] For a discussion on European state-owned enterprises in the twenty-first century see Roberto Cardinale (2020).

[6] See, for comparison, François Chesnais, Grazia Ietto-Gillies, and Roberto Simonetti (2003, part I).

[7] See, for example, on the US and Japan, Henry W. Chesbrough (1999).

intermediated form of state intervention in the new scenario of globalization, partly renewing the mission of the "entrepreneurial state" without distorting the basic character of public industry, even in technologically advanced sectors. The entrepreneurial state refers to the ability of a public authority, either the central or a local government, to exercise entrepreneurial functions from the demand side of the economy.[8] The novelty of this study is in its presentation of a divergent case of industrial and technological development in the broader context of the Italian decline at the turn of the twenty-first century, which has implications for understanding of the roles of institutions in the theory of the varieties of capitalism.[9]

The article unfolds as follows. The next section depicts the context of changing Italian capitalism. This section considers the role of the state and the interaction between technological and institutional change, and places the socio-technical transformation into the Italian context of economic decline and European integration. It also sketches the framework of the new Italian model of capitalism. The following section explores the historical case of the space industry as a divergent sector that escaped the relative decline of the Italian economy thanks to its adherence to the emerging model of capitalism, which allowed innovation and internationalization as a result of the new public-demand policy. Lastly, the conclusion contributes to the debate on the economic decline of Italy by contrasting this with the exceptionality of the space sector.

## Context and Scope of the Research

The context of this research is the evolution of the Italian form of capitalism, and the aim is to understand the role of institutions and institutional change in the transformation of the socio-technical structure of innovation. Innovative firms act in a network of institutions and technologies that shapes strategies and outcomes. This network is interdependent with the history of national forms of capitalism and with technological development. Path dependencies exist, and at the same time, the need for continuous adaptation guides the evolution of institutional arrangements between the government, firms, and technologies.

In this analytical framework, this article examines the role of the entrepreneurial state. Historians and scholars have found evidence of the entrepreneurial state in the action of exploiting and orchestrating resources,[10] in the cases of underdeveloped countries,[11] in Russian economic development,[12] and in the control of strategic industries in Italy.[13] More recent works consider the comparison of SOEs in the UK and Italy,[14] different degrees of state-ownership,[15] and reflect the renewed popularity of Mariana Mazzucato's book *The Entrepreneurial State*.[16]

### *The State and the Italian Form of Capitalism*

Italy experienced a period of remarkable and sustained economic growth after World War Two that measured about thirty years (the "Glorious Thirty"). Growth reached its peak in the years of the economic miracle (1958-1963). This economic growth coincided with a distinctive form

[8] Peter K. Eisnger (1988, 10-11).
[9] Peter A. Hall and Kathleen Thelen (2009).
[10] For example, in the atomic industry, Niall MacKenzie Stephen Knox, and Matthew Hannon (2022).
[11] Frederick Riggs (1956).
[12] Alexander Gerschenkron (1962).
[13] Stuart Holland (1972).
[14] Franco Amatori, Robert Millward, and Pier Angelo Toninelli (2013).
[15] Aldo Musacchio and Sergio Lazzarini (2014).
[16] Mazzucato (2013).

of capitalism that, although inserted in the area of the liberal-democratic countries led by the United States, was also characterized by a degree of economic dirigisme.[17]

The recovery after World War Two centered around low public debt, controlling inflation, the stability of the lira in the context of monetary parity based on the gold-exchange standard (formally since 1958 but stable even before then), the opening of international markets promoted by the Bretton Woods system[18] and by the start of the Common European Market (also in force since 1958), American technology introduced by the Marshall Plan,[19] and, lastly, public intervention in the economy. Other sources are useful for a more detailed discussion of the peculiarities of the Italian economic success in the second half of the twentieth century.[20]

What interests us here is the contribution of the public sector. Based on what had survived of IRI, the Institute for Industrial Reconstruction created by Alberto Beneduce in 1933, the system of public enterprises was reorganized in the first years after the end of World War Two. The government started the Mechanical Industries Fund (FIM) in 1947, and the following year reorganized IRI; in 1950 the government created the *Cassa per il Mezzogiorno*, a fund for the development of the southern regions. Finally, a law established the Ministry for State Holdings in 1956 to manage state-owned entities and companies. Contemporary estimates measured the investment rate of public enterprises as more than double the rate for all enterprises.[21] Even today, historians debate the contribution of the state to the Italian economy; some positions are divergent and skeptical, if not negative.[22] However, the state and its holdings were important factors during the country's greatest period of economic growth.[23]

The presence of a few large public enterprises and many small and medium-sized enterprises, especially family businesses,[24] marked the Italian form of capitalism for most of the last century. Large private companies operated only to a lesser extent, often managed by family holdings.[25] However, these latter groups progressively increased their influence on the form of Italian capitalism in the last few decades of the twentieth century, thanks to the actions of Mediobanca, the true pivot of the great families of Italian capitalism.[26] In any case, the actions of state-owned companies were completely in line with the scheme of substitute factors for self-sustaining capitalist development (in the sense of Alexander Gerschenkron).[27]

The reasons for replacing private enterprises were the lack of Italian entrepreneurial propensity in capital-intensive sectors, the reduced presence of large firms that could support substantial investment in research and development, and the concentration of corporate control in the few large firms. On the last point, Fabrizio Barca and Sandro Trento considered the limited separation between ownership and control as a weakness of Italian capitalism, a problem which persisted in large enterprises.[28] The few pyramidal holding companies maintained direct control of large private groups, and family members acted as managers of them. Business groups have remained a constant in the economic history of Italy, playing a pivotal role in the development and later in the transformation of the national economy.[29] In

[17] Nicholas Crafts and Gianni Toniolo (1996, 2012); Bart Van Ark and Crafts (2007); Tamás Vonyó (2008).
[18] Michael Bordo (2017).
[19] Crafts (2013).
[20] Felice (2015, 229).
[21] Michael Posner and Stuart Woolf (1967).
[22] Giovanni Federico (1999).
[23] Amatori (2011).
[24] Andrea Colli and Michelangelo Vasta (2010); Paolo Di Martino and Vasta (2018).
[25] Colli and Alberto Rinaldi (2015).
[26] Luciano Segreto (1999).
[27] Ibid.
[28] Barca and Trento (1997).
[29] Colli, Rinaldi, and Vasta (2016).

comparison, public enterprises have managed to introduce and maintain a separation between managerial control and ownership.[30]

The dual structure of Italian capitalism—based on the compromise between large public enterprises of a type similar to Ford and small or medium-sized private enterprises—began to change shape during the 1970s.

### *Technology and Institutions*

Many exogenous factors conditioned the Italian economy after the end of the Glorious Thirty. The most significant were the end of the dollar-centered gold-exchange standard that US President Richard Nixon unilaterally withdrew on August 15, 1971, the oil shock following the Yom Kippur War in October 1973, and the subsequent devaluation of the lira against the dollar and the German mark by twelve and thirty percent respectively.[31]

Internally, the slowdown of the Italian economy—although the main indices remained positive into the 1970s—began to show the limits of the Italian capitalist system. A financial system still dominated by state-owned banks made the stock market undercapitalized, and an export-oriented industrial model without an equally adequate aggregate domestic demand, together with very low investment in training and research, made Italian companies largely dependent on foreign technologies and markets.[32] The challenge was to adapt the Italian model to the dismantling of the Fordist socio-technical system. This had never really been fully implemented in Italy, but now it was under even more pressure from alternatives such as flexible specialization, automation, and information technology (IT). In this phase, small businesses proved to be more reliable and ready to make the transition to new production models, not least because of the organizational agility offered by their small size. It was in these years that some of the most dynamic realities of the third Italy emerged: the industrial districts, and the basis for the fourth Italian capitalism to come.[33]

Until then, the Italian socio-technological structure balanced political consensus and economic wellbeing. At the start of the Glorious Thirty, the state provided economic wellbeing centered on a system of which the state holdings were a fulcrum. The new model progressively replaced public enterprise, first with monetary inflation, which reached twenty percent per annum in the 1970s and led to a currency devaluation that boosted exports.

These palliative efforts succeeded in guaranteeing social peace in a troubled period of Italian history, marked by a season of subversive terrorism and by economic growth, but they also paved the way for the future development of the country. They were measures that guaranteed the export-oriented part of the productive system and did not affect the administrative structure or the investment and innovation capacity of the system.[34]

SOEs, on the other hand, not only failed to adapt to technological change, but were emptied of their original mission and increasingly associated with the interests of the main political parties. Politics distracted SOEs from the managerial autonomy they had benefitted from, and directed them towards political ends.[35] It is possible that large private groups had an interest in dismantling SOEs for competitive reasons.[36] More interesting, however, is the theory of complementarity between technological and institutional change.[37] With the given institutional set-up, the current technology is the most efficient available. The inverse is also

[30] Barca (1997).
[31] Felice (2015, 267); Vera Zamagni (2018, 50 ff).
[32] Alessandro Nuvolari and Vasta (2015).
[33] Colli (2002, 2019); Marco Bellandi (2007).
[34] Di Martino and Vasta (2017, 51).
[35] Barca and Trento (1997); Toninelli (2004).
[36] Rinaldi and Vasta (2012, 408).
[37] Rinaldi and Vasta (2012); Ugo Pagano and Trento (2003).

true: given a certain technology, the current institutional set-up is the most efficient. This means that technological paradigm may require a certain institutional set-up to fully develop.[38] It follows that innovative technologies might not flourish in a stable institutional framework, and might require a new arrangement that comprises also the form of state intervention and the government-business relationship. This affects business structures and the model of capitalism.

State ownership reached its peak in the early 1980s. Then, the need to open up to a competitive market for access to the European Economic Area necessitated the dismantling of public enterprise. This was reinforced by the technological motivation to rationalize a galaxy of uneven and incoherent activities, and the growing discontent of public opinion towards a system considered patronizing and corrupt, governed by parties and crushed by judicial scandals. The first action in this direction was the reorganization of Finmeccanica, which sold the Alfa Romeo automobile brand to Fiat in 1986. This was followed by the 1993 referendum that abolished the Ministry for State Holdings to seal the end of decades of intense state interventionism in the economy.

## *A New Model of Italian Capitalism*

Economic and political transformation in the early 1990s ended an era of economic development in Italy. Slowed down by the crises of the 1970s and the pursuit of the conditions to take part in the birth of the European monetary union, the already-diminished innovative capacity of the Italian economy was further reduced.[39] The result was that growth was limited for the next twenty-five years (gross domestic product [GDP] per capita finally returned in 2017 to its 1999 level),[40] while productivity remained almost unchanged.[41] The economic opportunity for Italian businesses arising from the opening of international markets imposed a need for broader industrial change.[42]

The privatization of former SOEs took place in Italy as in most of the Western world.[43] Their later break-up was barely compensated for with new private firms, causing a general shrinkage in the Italian industrial base, with a particular effect on large firms.[44] Nevertheless, not all the results of the privatization process between the 1980s and 1990s turned out to be negative. Some of the former SOEs continued to achieve appreciable results, particularly when floating stocks paired with a state minority ownership, as in the case of, Eni, Enel, and Finmeccanica.[45] In all these companies, not surprisingly, the government maintained a strategic presence, together with a minority ownership stake of around thirty percent or higher.

The case of Finmeccanica (now Leonardo) is particular and deserves further investigation. Already in the mid-1980s, the group then led by Fabiano Fabiani divested its automotive branch and chose to focus its strategy on aerospace and defense, including helicopters.[46] These sectors were prominent in the national interests of a modern state with an advanced economy. This case demonstrates how, although SOEs were disappearing

[38] Richard R. Nelson (1994); Pier P. Saviotti (2005); Nick Von Tunzelman (2003).

[39] Zamagni (2018, 57-58).

[40] World Bank data: https://data.worldbank.org/share/widget?end=2017&indicators=NY.GDP.PCAP.KD&locations=IT&start=1992&view=chart [accessed March 2022].

[41] Felice and Giovanni Vecchi (2015). Labor productivity increased between 2000 and 2016 by an aggregate of around 0.4 percent in Italy, 15 percent in the UK, France, and Spain, and 18.3 percent in Germany (ISTAT, 2019, 1).

[42] Patrizio Bianchi (2013).

[43] Judith Clifton, Francisco Comin, and Daniel Díaz Fuentes (2003); Millward (2011).

[44] Luciano Gallino (2003).

[45] Di Martino and Vasta (2017, 529).

[46] Felice (2015).

through privatizations, the active presence of the state remained. What changed was the model of engagement between the state and strategic enterprises: the new model changed the relationship between the entrepreneurial state and national champions into that between an innovative state and an innovation-oriented policy.[47]

## The Historical Case of the Space Industry in Italy

This section analyses the antecedents, evolution, and dynamics of the Italian space industry based on the exploration of archival and secondary sources. The analysis considers the dynamics of innovation and international expansion and depicts their relationship with the changing modes of intervention of the state in Italian capitalism.

### *Italian State-Owned Enterprises in the Aerospace Industry*

Italy had already begun to focus on the space sector in the 1980s, using a strategy that consisted of two lines of action. First, it favored the aggregation of skills previously scattered across both public and private companies in various sectors, especially the evolving aeronautics sector,[48] as well as electronics and telecommunications; second, the state changed its form of intervention in the economy from the direct control of public enterprises to the direction of public demand in favor of strategic sectors. The government had a strategic objective to favor the internationalization of the Italian aerospace industry, an essential prerequisite for keeping its position on the technological frontier within the international network of knowledge exchange and technological division of labor.[49]

SOEs in Italy have operated in several sectors; increasingly, the number of different industries containing SOEs grew out of the lack of a clear strategy, so that several state-owned holdings mixed unrelated sectors. Furthermore, different SOEs operated in the same line of activity, which resulted in overlaps, inefficiencies, and internal competition within the SOE system. Finmeccanica, for example, has operated in various lines of business since its formation in 1948, although it was the holding company of the IRI Group devoted to the mechanical sector. Finmeccanica controlled the car manufacturer Alfa Romeo, the energy and transport company Ansaldo, and the aeronautics company Aeritalia. The last of these was a company formed in Naples in 1969 after the merger of the state-owned Aerfer with the private Fiat Aviazione.[50] State intervention in the aircraft industry was not a novelty, having been present since the inception of the industry well before World War Two, as has been recently documented.[51] Finmeccanica organized its business into coherent sectors during the 1980s: first, it sold Alfa Romeo, and, second, its subsidiary Aeritalia acquired electronics companies—Laben, Proel, and Space Control—from its parent holding company IRI.[52]

The merger of Microlambda and Sindel in 1961, again in Naples, created Selenia Industrie Elettroniche; Finmeccanica, Fiat, and the American firm Raytheon controlled the company, which was active in the production of radar.[53] Selenia's activities gradually shifted towards the space sector, so that in 1982 Selenia formed a spin-off company dedicated to that sector, Selenia Spazio. In 1990, IRI, which controlled the capital of Aeritalia and Selenia with

[47] Mazzucato (2013). On innovation policy in Italy see Salvatore Zecchini (2016).

[48] Emilio Esposito (2002).

[49] On the international strategy of the aerospace industry during the 1990s, see Laura Ramaciotti (1999, 492 ff).

[50] Zamagni (2009).

[51] Fauri (2021).

[52] *Archivio Storico* (Historical Archive), IRI (hereafter ASIRI), *Archivio Centrale dello Stato*, Rome (hereafter ACS), *Archivio Generale* (hereafter A.G.), Folder (hereafter b.) R1443; *Alenia Spazio. Relazione CdA; 25 marzo 1993*, 1.

[53] Zamagni (2009).

different shareholdings, favored the merger of the two companies, after a decade of strong growth for both (see Table 1). The merged company was renamed Alenia shortly afterwards and transferred all its space activity to the newly formed subsidiary Alenia Spazio.

**Table 1**
Space Turnover of Aeritalia and Selenia (Sample Years)

| | Aeritalia | Selenia Spazio |
|---|---|---|
| 1980 | 12 (97) | 30[§] (24) |
| 1985 | 69 (56) | 148 (120) |
| 1990 | 185 (149) | 246 (199) |

Values: billion lire 1990; in brackets: million Euro 2008.
[§]: Selenia Spazio, Italtel space division, CNS, STS.
Source: author elaboration on ArchIRI data.

Alenia Spazio was then the first Italian space company, the only one capable of dealing with all stages of production and use of the satellite, from design to ground management. It was involved in the development and construction of satellites and space infrastructure for national and international programs.[54] Among these, the Columbus program, the result of collaboration between the European Space Agency and the United States,[55] had a value of about 80 million euros.[56]

### *Innovation and Internationalization*

Alenia Spazio looked at the possibility of integration with an international partner. The aim was to form a player of European proportions, necessary for the market standards, made of big supranational players in charge of vast complex projects for the exploitation of extra-atmospheric space. Alenia—which in space technologies could "boast a significant presence"[57]—explored several companies for a strategic alliance, from the Airbus consortium to the British-based Marconi. Eventually, Alenia found its partner in Alcatel Space, part of the French telecommunications group Alcatel, which in turn had integrated in 1998 the satellite business of the French state subsidiary Aérospatiale, followed by that of Thompson-CFS, also owned by the French state.

Thales Alenia Space (TAS) was formed in 2005 by the merger of the aerospace company of the Finmeccanica group (today rebranded as Leonardo) and the space branch of Alcatel-Lucent, acquired the following year by the Thales defense group, and approved in 2007 by the European Union.[58] As the Italian and French states partially own Leonardo SpA and Thales, which in turn own 34 and 66 percent of TAS respectively, TAS is effectively a joint venture owned by the French and Italian governments.[59]

TAS is a multinational company and a European technology champion. Its Italian branch, TAS Italia, the largest Italian aerospace company, has generated over 200 million euros of income each year between 2008 and 2017, with a maximum recorded in 2016 of 580

[54] ACS, ASIRI, A.G., b. R1381; Alenia. *Relazione CdA*; *21 dicembre 1990, Apporto delle attività spaziali in Selenia Spazio SpA*.
[55] ACS, ASIRI, A.G., b. R1381; Alenia. *Verbale assemblea ordinaria*; *29 aprile 1991*, 16, 17.
[56] ACS, ASIRI, A.G., b. R1381; Alenia. *Bilancio 1991*.
[57] Ramaciotti (1999, 495).
[58] Landoni (2020a).
[59] Ibid.

million euros, and counting over 2,000 employees in the four Italian production sites of Turin, Gorgonzola near Milan, Rome, and L'Aquila (see Table 2).[60]

**Table 2**
Thales Alenia Space Italia, 2007-2015 (euro 2008 constant)

| Year | Employees | Turnover (€) | Turnover per employee (€) |
|---|---|---|---|
| 2008 | 2,139 | 298,300,000 | 139,458 |
| 2009 | 2,135 | 269,266,667 | 126,120 |
| 2010 | 2,134 | 433,307,207 | 20,049 |
| 2011 | 2,179 | 220,431,532 | 101,162 |
| 2012 | 2,192 | 198,555,856 | 90,582 |
| 2013 | 2,236 | 210,299,099 | 94,051 |
| 2014 | 2,240 | 280,881,982 | 125,394 |
| 2015 | 2,180 | 187,528,086 | 86,022 |
| 2016 | 2,150 | 523,230,444 | 243,363 |
| 2017 | 2,126 | 310,888,317 | 146,232 |

Source: author elaboration on Bureau Van Dijk, Aida data.

### *Public Demand and New Intermediaries*

TAS is the result of a combination of technologies from telecommunications, electronics, and aeronautics industries that—partly controlled in SOEs, partly acquired and organized by the state—has produced a real technological breakthrough in an innovative sector.[61] The grouping of space activities in Alenia originated from the combination of distant technologies, which came into contact through the far-sighted actions of a state holding system that guided business integration.[62] This happened in Italy at the same time as the privatizations of the 1990s, and likewise in France at the turn of the century. In both parent companies, the state did not disappear from the shareholding structure, but significantly reduced its shareholding to approximately one-third of the capital.[63]

The result was a new model of state intervention. Public procurement took the place of direct control. The public demand-side policy in the Italian space sector began in 1979 with the National Space Plan (NSP). The NSP provided a five-year budget to support industrial activities in one of the most promising sectors for technological innovation and international collaboration.[64] The first Plan concentrated its development lines on satellite telecommunications and made available 200 billion lire (384 million euros today) for the years 1979-1983, allocated on the approval of the government.[65] The National Research Council (CNR) was initially in charge of a "systemic and organic"[66] development of the Plan. However, the CNR itself complained of the insufficiency of resources and skills required to manage an

[60] https://www.thalesgroup.com/en/italy [accessed January 2021].
[61] Mario Benassi and Landoni (2018).
[62] ACS, ASIRI, A.G., b. R1443; Alenia Spazio. *Relazione CdA*; *25 marzo 1993*, 1.
[63] Landoni and dt ogilvie (2019).
[64] For a broader reading see Landoni (2017a, 82-90).
[65] Italian Space Agency Archive [*Archivio Agenzia Spaziale Italiana*] (hereafter ArchASI), *PSN 1984-1988, Proposta di aggiornamento dicembre 83, Analisi economica 84-88*, p. 43, not classified (hereafter n.c.), ASI, via del Politecnico snc, 00133 Rome.
[66] ArchASI, *PSN 1984-1988, Proposta di aggiornamento dicembre 83, Quadro di riferimento*, p. 6, n.c., ASI.

industrial development plan. Thus, during the first two five-year plans, Parliament debated the proposal to establish a dedicated body, i.e., a national space agency.

The Parliament started to discuss the law for the establishment of the Italian Space Agency (ASI) in 1985. A long and articulate debate followed concerning the aims and functions of the agency, which had to distinguish itself from the scientific responsibilities of the CNR and other public research authorities and pursue instead the aim of the technical and economic exploitation of space.[67] Parliament passed the law establishing the ASI in 1988, assigning to the new institution the management of the NSP and the pursuit of the industrial development of the sector.[68] This made the ASI a body capable of guiding industrial policy with a defined spending capacity. It was an innovation-oriented industrial policy with a mission directed towards the development of an innovative industry, the space sector.

The dismantling of the system of SOEs and the retreat of state ownership imposed a need to pursue a mission-oriented strategy. State ownership was replaced by the entrepreneurial state,[69] even if it was limited to a sector that until then had been marginal, at least in Italian business history; a sector, however, on which an appropriate technological base had been built in order to enter the network of the global division of technological work. The ASI operated towards this dual end, or at least should have done so in its original function. On the one hand, the ASI managed the demand for technology via public contracts with its mission for innovation, through which public demand stimulated research and development.[70] On the other hand, the agency also operated as an intermediary between companies and international partner institutions, e.g., the European Space Agency and NASA, to link the Italian industry to international projects that guaranteed profits and international technological exchange.[71]

The impact of the NSP on the Italian space industry caused a growth in the number of people employed in the sector, which increased fourfold from a little over 1,500 people in 1980 to more than 6,000 ten years later.[72] Aeritalia and Selenia alone employed over 2,000 people in 1990, a third of the total sector. The rise in employment matched the increase in market demand, largely conditioned by public orders financed by the NSP. There were 188 contracts signed under the framework of the space plan during the ten years between 1981 and 1990, with an average value of 14.2 billion lire per contract (almost 13 million euro today). Over that decade, public demand met by the sector increased by about fifteen-fold.[73] The two largest NSP contractors were, not surprisingly, Aeritalia and Selenia, which together absorbed 75 percent of the allocated funds, respectively 41.4 and 33.7 percent (see Figure 1).

Besides the increase of demand for the domestic market, the two major space companies witnessed a sharp increase in their exports. For example, the appearance of the ASI significantly influenced the internationalization of Selenia Spazio. In 1980, the company did not generate any turnover from abroad; ten years later, foreign markets accounted for almost a third of the total 246 billion lire (80 million euro today).[74] Similarly, Aeritalia also saw international sales increase from 10 percent of turnover in 1980 to 45 percent in 1990. This was mostly a result of the support of the NSP, recognized by Aeritalia's management as one

[67] On the parliamentary debate see Landoni (2017a, 106 ff).

[68] *Archivio Storico* (Historical Archive) *Istituto Luigi Sturzo* (hereafter ASILS), *Fondo Luigi Granelli* (hereafter LG), serie IV, b. 13, fascicolo 35, *Schema di legge: istituzione dell'Agenzia Spaziale Italiana*, 1985, p. 3.

[69] Mazzucato (2013).

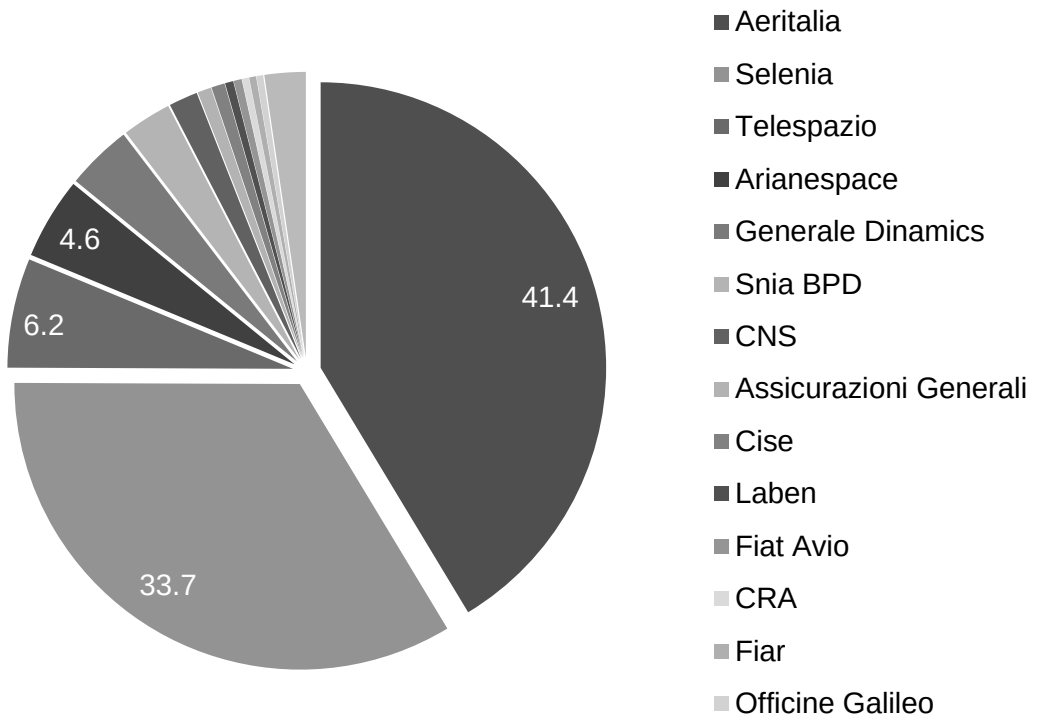
[70] Landoni (2017b).

[71] Landoni (2018).

[72] ArchASI, *Indagine Censis per ASI*, 1991, n.c., ASI.

[73] Landoni (2017a, 136).

[74] ACS, ASIRI, A.G., b. R1446; Selenia Spazio. *Verbale assemblea ordinaria*; *20 aprile 1990, relazione di bilancio 1989*, p. 9.




Source: author's elaboration on ArchASI data.

**Figure 1**
Percentage Share of NSP Contracts per Company, 1981-1990

of the "essential factors in support of the planned development of Aeritalia's space activities".[75] The NSP projects created the market demand needed for the companies' technological development, their increase in size, and their access to markets beyond the national, especially via international collaborations negotiated at government level.

The Italian aerospace industry has caught up with the average of the major European countries since the start of the first NSP. It surpassed the British space industry and reached the level of the German one for number of employees and turnover, remaining second only to the French one (see Table 3).

In 1988, after the appearance of the ASI, industrial policy related to the space sector took a further qualitative leap forward. The ASI worked to ensure managerial coordination in order to reconcile the scientific objectives of the plan with "those more immediately dedicated to operational applications … [as] a catalyst of supply and demand, constituting an effective center between the users of the good and the bad".[76]

### *State Action in the Transformation of the Space Industry*

The growth in market demand forced the space industry to seek a new strategy and a new organizational structure. In response to the new competitive scenario IRI, through its subsidiary Finmeccanica, orchestrated the merger of Aeritalia and Selenia into the new entity Alenia. The new company was organized into four distinct divisions, each targeting a different market area: Terrestrial Stations, European Space Agency (ESA) Programs, National and

[75] ACS, ASIRI, A.G., b. R1368, Aeritalia. *Piano 85–89*, p. 14.
[76] ArchASI, *Linee guida per la definizione del piano triennale 1994–1996*: 6–7, n.c., ASI.

**Table 3**
European Space Industry 1996-2005 (euro 2008 constant)

| | | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| France | Employees | 13,540 | 13,368 | 13,252 | 12,813 | 13,522 | 14,677 | 13,965 | 13,120 | 12,603 | 10,997 |
| | Turnover (€m) | 1,667 | 1,925 | 2,063 | 2,413 | 2,702 | 2,369 | 2,069 | 1,852 | 2,216 | 1,938 |
| | Turnover/Employee (€000) | 123 | 144 | 156 | 188 | 200 | 161 | 148 | 141 | 176 | 176 |
| Germany | Employees | 5,500 | 5,545 | 5,963 | 6,080 | 5,786 | 5,760 | 5,465 | 5,076 | 4,604 | 4,429 |
| | Turnover (€m) | 872 | 913 | 1,027 | 922 | 906 | 890 | 840 | 619 | 697 | 614 |
| | Turnover/Employee (€000) | 159 | 165 | 172 | 152 | 157 | 155 | 154 | 122 | 151 | 139 |
| Italy | Employees | 5,120 | 5,469 | 5,741 | 5,837 | 5,770 | 5,618 | 5,413 | 5,100 | 4,770 | 3,814 |
| | Turnover (€m) | 629 | 975 | 932 | 879 | 860 | 876 | 746 | 684 | 701 | 740 |
| | Turnover/Employee (€000) | 123 | 178 | 162 | 151 | 149 | 156 | 138 | 134 | 147 | 194 |
| United Kingdom | Employees | 4,380 | 4,512 | 3,577 | 3,035 | 2,732 | 3,139 | 3,137 | 3,159 | 3,448 | 3,382 |
| | Turnover (€m) | 573 | 553 | 490 | 469 | 381 | 385 | 369 | 293 | 471 | 502 |
| | Turnover/Employee (€000) | 131 | 123 | 137 | 155 | 139 | 123 | 118 | 93 | 137 | 148 |
| Europe | Employees | 35,010 | 35,391 | 34,883 | 33,608 | 33,207 | 34,727 | 33,254 | 31,728 | 30,638 | 27,858 |
| | Turnover (€m) | 4,555 | 5,147 | 5,319 | 5,481 | 5,561 | 5,257 | 4,726 | 4,041 | 4,706 | 4,428 |
| | Turnover/Employee (€000) | 130 | 145 | 152 | 163 | 167 | 151 | 142 | 127 | 154 | 159 |

Source: author's elaboration on Eurospace 2008 data.

Commercial Programs; and Defence Systems.[77] The management of Alenia evaluated the order backlog at the start of the company as "about two years of production and this allows [them] to face with serenity the long times that sometimes intervene in the start of large contracts"[78]. If Alenia was able to structure itself along these lines and plan its future activities from this perspective, it was made possible by the actions of the ASI.

Previous studies have highlighted the role of the ASI in forming public-private partnerships and how it guided innovation, as in the case of the Sirio and Italsat telecommunications satellites.[79] Here, it is its action as a public intermediary that deserves attention. The driving force behind the international expansion of Italian space companies was the ability of the ASI to involve Italian space and aerospace companies in the international projects managed by the ESA.[80] The ASI worked as a state-led disruptor in the Italian national system of innovation. The ASI combined a primary role in the performance of research and technology development with autonomy from both the core of the public sector and established industries.[81] But there is more to it than that. The Italian space industry benefited from privileged access to the European market and to the network of collaboration put in place, thanks to the actions of the ASI which served as a broker. Thus, Alenia Spazio was granted access to an international market and a network of industrial collaborations from its formation.[82]

### *Technological Exceptionality of the Space Industry in a Divergent Context*

Over the years considered in this study, the conditions for the development of technologies were partly limited by the structural dimension of the domestic industry. The delays in the technological adaptation of industrial research, largely dependent on innovations introduced from abroad,[83] reduced the pace of internal technological development. The fragility and lack of perspective of the institutions that were supposed to weave an organic industrial policy aimed at technological innovation caused the retreat of the form of capitalism from the frontier of innovation to an even more decisive extent.[84] Innovation was limited to the emergence of occasional activities, including some of excellence and with national prestige (e.g., experimental satellites for telecommunications and earth observation), even though they were carried out in a state of dependence on other countries that could boast broader and more structured technological development policies.

While the literature has documented well the poor innovative performance of Italy, the case of the space industry is divergent from the general picture of the country's industrial decline. Around the turn of the century, the Italian economy experienced slower GDP growth than some other major European economies and the EU average (see Figure 2).[85] However, in the period of ten years between 1996 and 2005, this decline is not found in the results of the Italian space industry, which grew more than national economy and faster than other European industries in the sector. In the same time-span, the growth in turnover of the country's space industry outperformed those of Germany and the UK (see Table 3 above).

[77] ACS, ASIRI, A.G., b. R1446; Selenia Spazio. *Verbale assemblea ordinaria*; *20 aprile 1990, relazione di bilancio 1989*, p. 8.

[78] ACS, ASIRI, A.G., b. R1446; Selenia Spazio. *Verbale assemblea ordinaria*; *20 aprile 1990, relazione di bilancio 1989*, p. 9. Author's translation.

[79] Landoni (2017b).

[80] Landoni (2018, 232).

[81] Dan Breznitz, Darius Ornston, and Steven Samford (2018, 890).

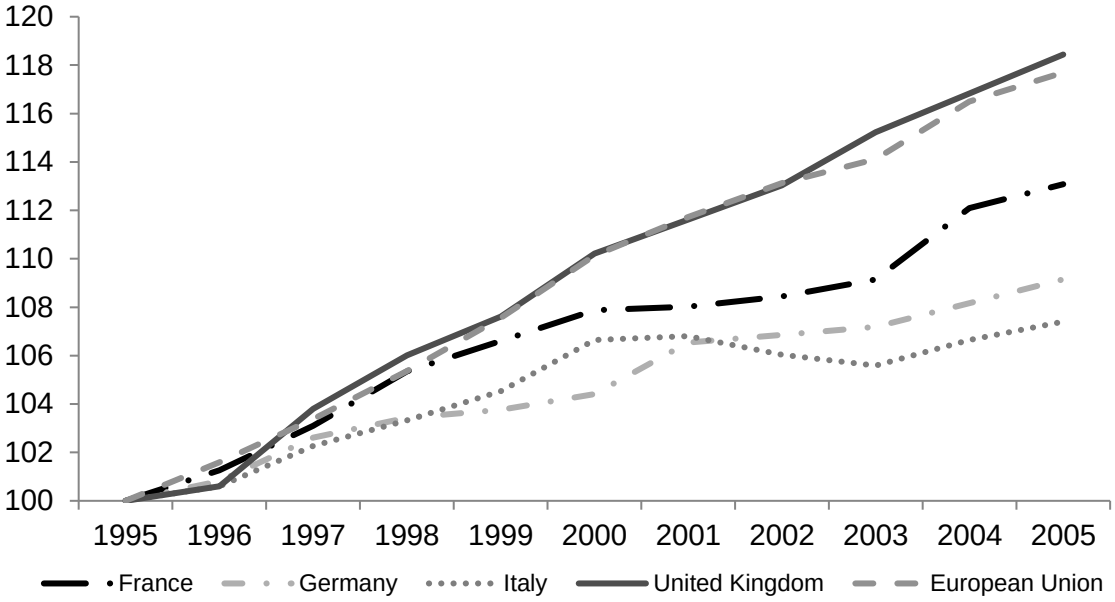
[82] Landoni (2020b).

[83] Federico Barbiellini Amidei, John A. Cantwell, and Anna Spadavecchia (2011); Felice (2015, 263 ff).

[84] Nuvolari and Vasta (2015); Di Martino and Vasta (2017).

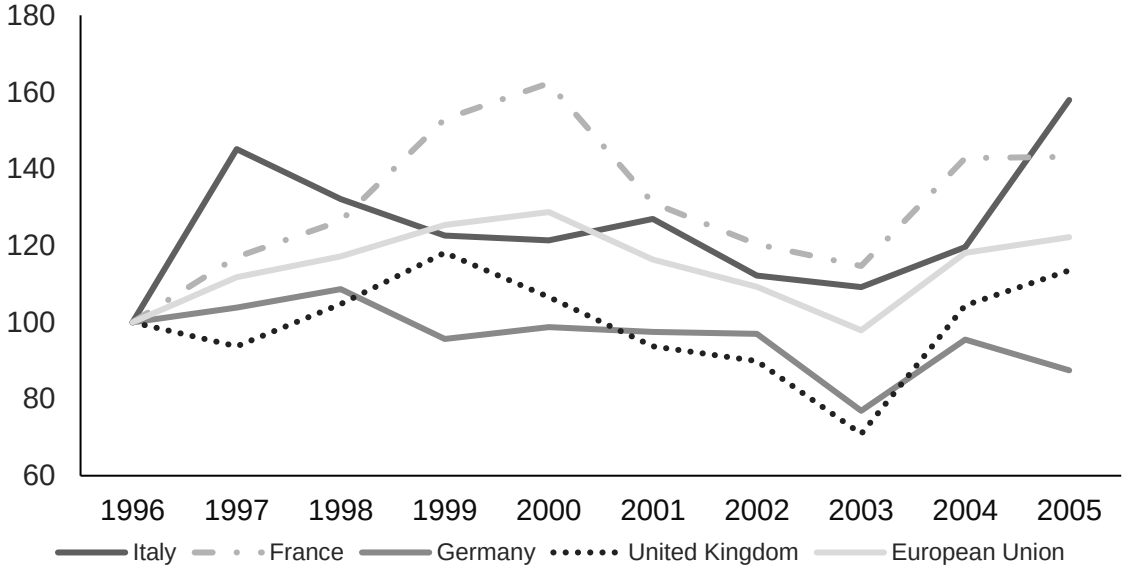
[85] Servaas Storm (2019).

The rate of turnover per employee offers a proxy for the productivity of labor in the industry. Italy and France registered an increase in turnover per employee over the period, while that in Germany, the UK, and the European Union on average declined relative to the base year (see Figure 3). These data seem not to support the ideas that state ownership favors employment over productivity over the long term and that SOEs are generally less efficient than the private sector.




Source: author's elaboration on AMECO data.

**Figure 2**
GDP 1995-2005 (at constant price, 1995 = 100)




Source: author's elaboration on Eurospace 2008 data (see Table 3).

**Figure 3**
Turnover per employee of the space industries of Europe (at constant price, 1996 = 100)

## Concluding Remarks

In conclusion, the present article has outlined the development of a peculiar form of Italian capitalism. The evolution consists in new institutional arrangements of the business-government relationship and in the institutions that guide this relationship, a transformation that happened in continuity with the historic role of the state in strategic sectors on the one hand, and on the other in the shift from direct—supply-side—intervention of the state to indirect—demand-side—coordination centered on a national agency.

Despite being an exception in a context of relative decline, the space industry has allowed Italy to keep open a channel of international collaboration and to connect with sources of technological advancement, which are essential to join a network of knowledge exchange. These exchanges caused the accumulation of technological skills in innovative companies, as in the cases of Aeritalia and Selenia. The two companies merged into the Italian national champion for space thanks to the guidance of state ownership that positioned them inside the process of European technological integration. They were led in different ways back to the only guide available, the state, with the composite group of companies in which it had a stake. Absent an organic and structured industrial policy—as well as a defined framework of technological research, lost in the bureaucratic government of science entrusted to the CNR—the formula of state ownership provided a stable framework for the dispersed technological skills of aerospace so that they could gather and organize themselves.

The second guiding element was actions from the demand side, an indirect strategy in the hands of the entrepreneurial state. The pivot of the new strategy was the ASI as a decentralized institution, i.e., as an intermediary of innovation. In this regard, the ASI has played a crucial role in the transition from a—barely—planned economy to a regulated market, at least in the space sector. This model made possible the combination of the advantages of the managerial autonomy of companies released from the burdensome direct influences of government bodies and political parties, with the advantages of coordinating a long-term policy of industrial and technological development with the government. Moreover, it overcomes the old logic of national champions, which conflicted with the process of European economic integration, and, even more, with the globalization of technology.

Clearly, the conditions that allowed this model to emerge are difficult to replicate in different sectors, which might have, for example, a different relationship with the state and its institutions, populated by SOEs or public bodies. However, it is necessary to note the apparent divergence of the space sector from the general context of Italian economic decline and the reduced innovative contribution of the country. Future research is invited to investigate the conditions that hampered other sectors from evolving and escaping the trap of economic decline. The space sector has strong connections with the government, yet it is not the only industry that enjoys a special relationship with the state, as many sectors in Italy are or were populated by SOEs. At the same time, the space sector is a technological industry that succeeded in a country that has notoriously low innovative performance, so future research may look at how these mechanisms work, or not, in other countries in other sectors. Although it is unlikely that an old model of development can be resurrected, the experience of the space sector shows that a new model that can overcome broader overall decline is not impossible.

## Acknowledgements

I am grateful to two anonymous reviewers for their insightful comments and to Erik Lakomaa and Mark Billings for their dedication and support. The author thanks all whose comments improved the paper.

## Works Cited


Amatori, Franco. 2011. "Entrepreneurial Typologies in the History of Industrial Italy: Reconsiderations." *Business History Review* 85 (1): 151-180.

Amatori, Franco, Robert Millward, and Pier Angelo Toninelli, eds. 2013. *Reappraising State-Owned Enterprise: A Comparison of the UK and Italy*. Abingdon, UK: Routledge.

Barbiellini Amidei, Federico, John A. Cantwell, and Anna Spadavecchia. 2011. "Innovation and Foreign technology in Italy, 1861-2011." In *Italy and the World Economy, 1861-2011 Conference, Rome, Banca d'Italia*, 12-15.

Barca, Fabrizio, ed. 1997. *Storia del capitalismo italiano dal dopoguerra a oggi*. [*History of the Italian Capitalism from the Post-War Period to the Present Day*.] Roma: Donzelli.

Barca, Fabrizio, and Sandro Trento. 1997. "State Ownership and the Evolution of Italian Corporate Governance." *Industrial and Corporate Change* 6 (3): 533-559.

Bellandi, Marco. 2007. "Industrial Discrtricts and Waves of Industrialization: A Rich and Contested Terrain." *Scienze Regionali* 6 (2): 7-33.

Benassi, Mario, and Matteo Landoni. 2018. "State-Owned Enterprises as Knowledge-Explorer Agents." *Industry and Innovation* 26 (2): 218-241.

Bianchi, Patrizio. 2013. *La rincorsa frenata. L'industria italiana dall'Unità alla crisi globale*. [*The Slowed-Down Race. Italian Industry from Unification to the Global Crisis*.] Bologna: Il Mulino.

Bordo, Michael D. 2017. "The Operation and Demise of the Bretton Woods System; 1958 to 1971." National Bureau of Economic Research, working paper no. w23189.

Breznitz, Dan, Darius Ornston, and Steven Samford. 2018. "Mission Critical: The Ends, Means, and Design of Innovation Agencies." *Industrial and Corporate Change* 27 (5): 883-896.

Cardinale, Roberto. 2020. "The Industrial Policy Role of European State-Invested Enterprises in the 21st Century: Continuity and Change Across Phases of Domestic and Global Transformation." In *The Routledge Handbook of State-Owned Enterprises*, edited by Luc Bernier, Massimo Florio, and Philippe Bance, 179-200. Abingdon, UK: Routledge.

Chesbrough, Henry W. 1999. "The Organisational Impact of Technological Change: A Comparative Theory of National Institutional Factors." *Industrial and Corporate Change* 8 (3): 447-485.

Chesnais, François, Grazia Ietto-Gillies, and Roberto Simonetti, eds. 2003. *European Integration and Global Corporate Strategies*. Abingdon, UK: Routledge.

Clifton, Judith, Francisco Comin, and Daniel Díaz Fuentes. 2003. *Privatisation in the European Union: Public Enterprises and Integration*. Berlin: Springer Science & Business Media.

Colli, Andrea. 2002. *Il quarto capitalismo. Un profilo italiano*. [*The Fourth Capitalism. An Italian Profile*.] Venezia: Marsilio.

Colli, Andrea. 2019. "Networking the Market: Evidence and Conjectures from the History of the Italian Industrial Districts." *European Yearbook of Business History*, 75-92. Abingdon, UK: Routledge.

Colli, Andrea, and Alberto Rinaldi. 2015. "Institutions, Politics, and the Corporate Economy." *Enterprise & Society* 16 (2): 249-269.

Colli, Andrea, Alberto Rinaldi, and Michelangelo Vasta. 2016. "The Only Way to Grow? Italian Business Groups in Historical Perspective." *Business History* 58 (1): 30-48.

Colli, Andrea, and Michelangelo Vasta, eds. 2010. *Forms of Enterprise in 20th Century Italy. Boundaries, Structures and Strategies*. Cheltenham: Edward Elgar.

Crafts, Nicholas. 2013. "The Marshall Plan." In *Routledge Handbook of Major Events in Economic History*, edited by Randall Parker and Robert Whaples, 222-232. Abingdon, UK: Routledge.

Crafts, Nicholas, and Gianni Toniolo. 1996. “1945 Postwar Growth: An Overview.” In *Economic Growth in Europe Since 1945*, edited by Nicholas Crafts and Gianni Toniolo, 1-37. Cambridge: Cambridge University Press.

Crafts, Nicholas, and Gianni Toniolo. 2012. “‘Les trente glorieuses’: From the Marshall Plan to the Oil Crisis.” In *The Oxford Handbook of Postwar European History*, edited by Dan Stone, 356-378. Oxford: Oxford University Press.

Di Martino, Paolo, and Michelangelo Vasta, eds. 2017. *Ricchi per caso. La parabola dello sviluppo economico italiano*. [*Wealthy by Chance. The Parable of Italian Economic Development*.] Bologna: Il Mulino.

Di Martino, Paolo, and Michelangelo Vasta. 2018. “Reassessing the Italian ‘Economic Miracle’: Law, Firms’ Governance, and Management, 1950-1973.” *Business History Review* 92 (2): 281-306.

Esposito, Emilio. 2002. “Il settore aeronautico: accordi di collaborazione ed internazionalizzazione del ciclo produttivo.” [“The Aeronautical Sector: Collaboration Agreements and Internationalisation of the Production Cycle.”] *L’Industria* 23 (2): 291-318.

Eurospace. 2008. *Eurospace Facts & Figures*. ASD-Eurospace. Accessed June 2019. https://eurospace.org/eurospace-facts-figures-official-data-release/.

Fauri, Francesca. 2010. “Big Business and Italian Industrial Policies after World War II.” In *Forms of Enterprise in 20th Century Italy*, edited by Andrea Colli and Michelangelo Vasta, 112-131. Cheltenham: Edward Elgar Publishing.

Fauri, Francesca. 2021. “The Italian State’s Active Support for the Aeronautical Industry: The Case of the Caproni Group, 1910-1951.” *Business History Review* 95 (2): 219-247.

Federico, Giovanni. 1999. “Harmful or Irrelevant? Italian Industrial Policy 1945-1973.” In *Policies for Competitiveness. Comparing Business-Government Relationships in the ‘Golden Age of Capitalism*, edited by Hidetake Miyajima, Takeo Kikkawa, and Takashi Hikino, 309-335. Oxford: Oxford University Press.

Felice, Emanuele. 2015. *Ascesa E Declino. Storia Economica d’Italia*. [*Rise and Decline. Economic History of Italy*.] Bologna: Il Mulino.

Felice, Emanuele, and Giovanni Vecchi. 2015. “Italy’s Modern Economic Growth, 1861-2011.” *Enterprise & Society* 16 (2): 225-248.

Gallino, Luciano. 2003. *La Scomparsa Dell’italia Industriale*. [*The Demise of Industrial Italy*.] Torino: Einaudi.

Gerschenkron, Alexander. 1962. *Economic Backwardness in Historical Perspective: A Book of Essays*. Cambridge, MA: Harvard University Press.

Hall, Peter A., and Kathleen Thelen. 2009. “Institutional Change in Varieties of Capitalism.” *Socio-Economic Review* 7 (1): 7-34.

Holland, Stuart. 1972. *The State as Entrepreneur: New Dimensions for Public Enterprise: The IRI State Shareholding Formula*. London: Weidenfeld and Nicolson.

*IEEE Earthzine*. 2013. “Contributions of the Italian Space Agency to Science and Exploration.” August 8. Accessed June 2022. https://earthzine.org/contributions-of-the-italian-space-agency-to-science-and-exploration/.

ISTAT. 2019. *Rapporto Sulla Competitività Dei Settori Produttivi 2019*. [*Competitiveness Of Manufacturing Sectors Report 2019*.] Rome: ISTAT. Accessed December 2021. https://www.istat.it/it/files//2019/03/RapportoCompetitivit%C3%A0_2019_nota_stampa.pdf.

Landoni, Matteo. 2017a. *L’Agenzia Spaziale Italiana. Tra stato innovatore e dimensione europea*. [*The Italian Space Agency Between Entrepreneurial State and European Dimension*.] Bologna: Il Mulino.

Landoni, Matteo. 2017b. “Innovation Policy in Progress. Institutional Intermediation in Public Procurement of Innovation: Satellite Telecommunications in Italy.” *R&D Management* 47 (4): 583-594.

Landoni, Matteo. 2018. “Corporatization and Internationalization of State-Owned Enterprises: The Role of Institutional Intermediaries.” *International Journal of Public Sector Management* 31 (2): 221-240.

Landoni, Matteo. 2020a. *L’impresa spaziale italiana. Dall’intervento pubblico all’innovazione tecnologica*. [*The Italian Space Enterprise. From Public Intervention to Technological Innovation*.] Bologna: Il Mulino.

Landoni, Matteo. 2020b. “Knowledge Creation in State-Owned Enterprises.” *Structural Change and Economic Dynamics* 53: 77-85.

Landoni, Matteo, and dt ogilvie. 2019. “Convergence of Innovation Policies in the European Aerospace Industry (1960-2000).” *Technological Forecasting and Social Change* 147: 174-184.

Mazzucato, Mariana. 2013. *The Entrepreneurial State: Debunking Public vs. Private Sector Myths*. London: Anthem Press.

MacKenzie, Niall G., Stephen Knox, and Matthew Hannon. 2022. “Fast Breeder Reactor Technology and the Entrepreneurial State in the UK.” *Business History* 64 (8): 1494-1509.

Millward, Robert. 2011. “Public Enterprise in the Modern Western World: An Historical Analysis.” *Annals of Public and Cooperative Economics*, 82 (4): 375-398.

Musacchio, Aldo, and Sergio G. Lazzarini. 2014. *Reinventing State Capitalism: Leviathan in Business, Brazil and Beyond*. Cambridge, MA: Harvard University Press.

Nelson, Richard R. 1994. “The Co-Evolution of Technology, Industrial Structure, and Supporting Institutions.” *Industrial and Corporate Change* 3 (1): 47-62.

Nuvolari, Alessandro, and Michelangelo Vasta. 2015. “The Ghost in the Attic? The Italian National Innovation System in Historical Perspective, 1861-2011.” *Enterprise & Society* 16 (2): 270-290.

Pagano, Ugo, and Sandro Trento. 2003. “Continuity and Change in Italian Corporate Governance. The Institutional Stability of One Variety of Capitalism.” In *The Italian Economy at the Dawn of the XXI Century*, edited by Massimo Di Matteo and Paolo Piacentini, 177-211. Abingdon, UK: Routledge.

Posner, Michael V., and Stuart J. Woolf. 1967. *Italian Public Enterprise*. Cambridge, MA: Harvard University Press.

Ramaciotti, Laura. 1999. “Il settore aerospaziale: alleanze strategiche e globalizzazione.” [“The Aerospace Sector: Strategic Alliances and Globalisation”.] *L’Industria* 20 (3): 489-509.

Riggs, Frederick W. 1956. “Public Administration: A Neglected Factor in Economic Development.” *The Annals of the American Academy of Political and Social Science* 305 (1): 70-80.

Rinaldi, Alberto, and Michelangelo Vasta. 2012. “The Italian Corporate Network After the ‘Golden Age’ (1972-1983): From Centrality to Marginalization of State-Owned Enterprises.” *Enterprise & Society* 13 (2): 378-413.

Saviotti, Pier P. 2005. “On the Co-Evolution of Technologies and Institutions.” In *Towards Environmental Innovations Systems*, edited by K.M. Weber and J. Hemmelskamp, 9-32. Berlin: Springer.

Segreto, Luciano. 1999. “Modelli di controllo del capitalismo italiano dalla banca mista a Mediobanca (1894-1993).” [“Models of Control in Italian Capitalism from the Mixed Bank to Mediobanca (1894-1993).”] *Rivista di Storia Finanziaria* 2: 13–27.

Storm, Servaas. 2019. “How to Ruin a Country in Three Decades.” *Institute for New Economic Thinking* 10. April 10, 2019. Accessed June 2022.

https://www.ineteconomics.org/perspectives/blog/how-to-ruin-a-country-in-three-decades.

Toninelli, Pier A. 2004. “Between State and Market. The Parabola of Italian Public Enterprise in the 20th Century.” *Entreprises et Histoire* 37: 53-74.

Van Ark, Bart and Nicholas Crafts, eds. 2007. *Quantitative Aspects of Post-War European Economic Growth*. Cambridge: Cambridge University Press.

Vonyó, Tamás. 2008. “Post-war Reconstruction and the Golden Age of Economic Growth.” *European Review of Economic History* 12 (2): 221-241.

Von Tunzelmann, Nick. 2003. “Historical Coevolution of Governance and Technology in the Industrial Revolutions.” *Structural Change and Economic Dynamics* 14: 365-384.

Zamagni, Vera. 2009. *Finmeccanica. Competenze che vengono da lontano*. [*Finmeccanica. Skills that Come from Afar*.] Bologna: Il Mulino.

Zamagni, Vera. 2018. *L'economia italiana nell'età della globalizzazione*. [*The Italian Economy in the Age of Globalisation*.] Bologna; Il Mulino.

Zecchini, Salvatore. 2016. “Criticità nella politica per l’innovazione dell’Italia.” [“Critical issues in Italy's innovation policy.”] *L’industria* 1: 119-166.