



Techno-Managerial Competences in Enrico Mattei's AGIP: A Prolonged Accumulation Process in an International Network, 1935-1965

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During Enrico Mattei's chairmanship, AGIP achieved important results in the natural gas business by completing a slow process of capabilities assimilation begun in the 1930s through the firm's activities abroad and its relationship with foreign technicians. During Mattei's years, through the ENI group, the company entered a new phase of development in Italy and especially abroad. Mattei paved the way for the evolution of the firm to a multinational dimension while keeping the characteristics (and the limits) that he had established just after the war. It took a younger generation of managers to bring the process to a successful conclusion. They abandoned certain "pioneering" policies and brought the company in line with international models in both technical and managerial skills.

The aim of my study is to record the way in which competencies were accumulated and developed in Azienda Generale Italiana Petroli (AGIP) while Enrico Mattei was head of the company in the decades after the Second World War. My hypothesis is that it is possible to explain a great deal about both the success and the failure of the Italian state-owned oil company in the postwar period by examining the suitability of its core

A version of this paper has been published in *Annali della Fondazione Luigi Einaudi* 37 (Florence 2003), and appears here by permission of the editor, Fondazione Luigi Einaudi (Turin) and of the publisher Leo Olschki press. Many thanks to Neil Bartholomew for helping me with the editing of this paper in English. I am of course responsible for all defects that remain in content and form.

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competencies to the needs imposed by the environment, first national then international.¹

I concentrate only on the mining business, for two reasons: first, for the oil industry in this period, the direct control of upstream phases was a key factor in determining the profitability of a firm. Competing successfully with the major operators depended on gaining direct access to crude oil supplies.² Second, Italy is almost wholly without oil reserves (the search for natural gas came later), so an “Italian” upstream industry was forced from the beginning to assume a “multinational” character, trying to find abroad both oil fields to exploit and specific competencies to facilitate operating in an unfamiliar sector. Also, although refining and commercial activity required scarce specific capabilities, the skills needed for oil drilling had no equivalent in any existing industry in the country, and so they could not be “naturally” created and absorbed from the national environment, but required a deliberate assimilation process from abroad. In this study I set out to describe the strategy employed for the acquisition of this expertise and the structures that AGIP built to achieve this evolution until its completion in the 1960s.

AGIP's efforts to catch up with international standards in technical and scientific skills and organization were boosted during Mattei's leadership of the company (1945-1962), but it would be a distortion to consider the whole process as confined to this short span of years. In fact, Mattei brought to a successful conclusion the first phase of a path of assimilation and innovation begun in AGIP's early years, and he also paved the way for new developments that were completed only by his successors.³ It therefore has been essential to extend the time span of my

¹ AGIP was set up in 1926; after 1953 it became a part of Ente Nazionale Idrocarburi (ENI) holding group and, until 1962, it was split into *AGIP Mineraria* (mining) and AGIP SPA (commercial branch). For the history of the whole group, see Charles R. Dechert, *Ente Nazionale Idrocarburi: Profile of a State Corporation* (Leiden, 1963). Enrico Mattei (1906-1962), son of a retired policeman, was born in one of the poorest regions of Italy at that time (Marche). He left school at fourteen to go work in a small local factory; despite his humble beginnings, by his thirties he had set up his own small chemical plant in Milan. During World War II he joined Christian Democratic partisans, becoming their general treasurer, and in 1945 he entered AGIP as partisan commissioner; he led the company until his death in a plane crash.

² For a history of the downstream Italian oil industry, see Giorgio Erberto Kovacs, *Storia delle raffinerie di petrolio in Italia* (Rome, 1964), and Fernando Amman and Augusto Ninni, eds., *L'industria italiana della raffinazione: Dinamiche tecnologiche ambientali e di mercato* (Milan, 1994).

³ The majority of books already published about the history of AGIP and ENI focus almost exclusively on Mattei's biography, so I chose to concentrate my survey on the firm itself. For information about Mattei, see Paul H. Frankel,

survey in order to connect AGIP's postwar transformation with the initial conditions that made it possible: the drilling experience in the 1920s and 1930s (which make up the contents of the first chapter). The second chapter deals with the period 1945-1958, when Mattei gained control of the company and led AGIP to its major success in the natural gas business. It is my intent to present the process as "resource driven," leaving aside the political elements that brought about (but did not determine) the rise of AGIP as a state-owned oil company.

The third chapter describes some of the hurdles that AGIP had to overcome in its growth in central-southern Italy and abroad.⁴ I intend to argue that it was during Mattei's era that AGIP completed its first steps toward creating a modern science-based enterprise: by the early 1950s, the firm had gathered a critical mass of technical competences and skills that were sufficient to guarantee success in natural gas exploration and exploitation in the Po Valley. This was essentially a domestic business, and no Italian competitors in the short term could match the concentration of resources collected by AGIP from the 1930s onward.⁵ The setting up of Ente Nazionale Idrocarburi (ENI) in a certain sense symbolized the dominant position that AGIP achieved in the gas business in northern Italy and marked the beginning of a new stage of expansion throughout the country and abroad.

For oil exploration abroad, AGIP's core competences proved not to be completely satisfactory, mostly with regard to the necessary organizational and managerial skills. This was the case partly because strong competition from well-established companies existed in the

Mattei: Oil and Power Politics (London, 1966), and Marcello Colitti, *Energia e sviluppo in Italia: La vicenda di Enrico Mattei* (Bari, 1979). Both authors worked in the company during Mattei's chairmanship and their works are more based on internal documentation than most subsequent publications.

⁴ For state-owned companies in Italy see Franco Amatori, "Beyond State and Market: Italy's Futile Search for a Third Way," in *The Rise and Fall of State-Owned Enterprise in the Western World*, ed. Pier Angelo Toninelli (Cambridge, England, 2000), 128-56; with regard to the competition among major multinational companies and ENI (and other national companies), see Leslie E. Grayson, *National Oil Companies* (New York, 1981); Edith T. Penrose, *The Large International Firm in Developing Countries: The International Petroleum Industry* (Westport, Conn., 1976), 142-44; Daniel Yergin, *The Prize: The Epic Quest for Oil, Money and Power* (New York, 1991), 501-5 and passim.

⁵ Methane could not be exported at this time and international operators were involved in the more promising race to gain control of oil fields in the Middle East. See John G. Clark, *The Political Economy of World Energy: A Twentieth-Century Perspective* (Chapel Hill, 1991), 99 and passim; Daniele Pozzi, "Tra New York e Fornovo Taro: l'occasione mancata della Società petrolifera italiana (1945-1953)," in *Imprese e Storia* 24 (luglio-dicembre 2001): 361-408.

international arena, which was not the case in the Italian natural gas business. Growth created the need for a new process of skills accumulation and learning, one that came to fruition only in the long run, after Mattei's death.

Finally, it is possible to trace an evolutionary process that shifted the strategic focus from practical-technical skills to technical-scientific, and, eventually, to scientific-managerial capabilities. AGIP became progressively the "brain" that programmed and coordinated mining activity inside the ENI group.

This evolution is demonstrated by the successive recruitment of technicians; and it is possible to identify, like geological layers, different "generations" of managers present during Mattei's years. But exactly like sedimentary layers, their relative disposition could change over time under the pressure of external forces. Moreover, the distinction between different "ages" is not always easy to see and often takes the form of a conventional definition. Overall, each generation is rooted in the previous one, which contributes to its training and to forming its view of the world.

It is impossible to explain the introduction of innovations without recognizing that they were embedded in a complex community of technicians, formed by years of close working contact and able to influence the process of assimilation profoundly.⁶

My work, taking a predominantly internal perspective, makes extensive use of the ENI group's archives in Rome and S. Donato (Milan).⁷ For chapter 3, moreover, I integrated the very limited records existing on the subject with a group of interviews conducted with former AGIP technicians who worked during Mattei's chairmanship. So far I have recorded 26 hours of interviews, and I am still collecting others. Parts of the paper thus should be considered as work in progress and, at the present stage, conclusions have to be taken as hypotheses.

The Drillers' Reign

When it was first set up, in 1926, AGIP was a commercial company, created by the government to break the oligopolistic market for petroleum products, which, in Italy, was entirely controlled by branches of the

⁶ For "communities of practice" see John S. Brown and Paul Duguid, "Organizing Knowledge," in *California Management Review* 40, no. 3 (1998): 90-111.

⁷ The ENI group recently began a complete reorganization of its archives, which could previously be surveyed only with difficulty. I employed documents from the group's central archives in Rome, Archivio storico di gruppo ENI [hereafter, As ENI]] and from AGIP mining branch's archives in S. Donato, Archivio storico AGIP [hereafter, As. AGIP]. After June 2003 ENI planned to concentrate all its archives in Pomezia (near Rome), so I use here the previous cataloguing, hoping it will provide a link to the coming one.

multinational oil companies (Società Italo Americana pel Petrolio, SIAP, for Standard Oil of New Jersey, and Nafta for Shell). AGIP had an interest in some refinery activities (dating from 1927, through a share in Raffineria Oli Minerali Società Anonima, ROMSA, a small company based in Fiume), but it had not directly owned a supply of crude in Italy or abroad. AGIP possessed no specific skills or resources in mining or drilling activities: in its early days its management was recruited mostly from the government authorities that managed the importation and distribution of oil products during the First World War, or from other industries. AGIP's first chairman, for example, was Ettore Conti, an important entrepreneur in the electricity sector. Nevertheless, AGIP's founders did not underestimate the importance of controlling crude oil sources directly, and early on they started a fierce struggle to ensure that AGIP had its own supplies.⁸

In the second half of the nineteenth century, Italy, after the United States, Russia, and Rumania, was one of the first countries in which the search for oil rose to an industrial level of activity. It is possible to find some similarities between Italy and the other early producer countries in the goals and characteristics of the first operators (with obvious differences of scale), but not in the industry's achievements. There were no extensive hydrocarbon reserves in Italy, and the few medium-size deposits presented too many geological and engineering problems to warrant exploitation by the small companies set up in the 1860s. The lack of crude confined the Italian oil industry to what was little more than a cottage industry, in which a population of small and even minute firms struggled to survive in the face of inadequate financial resources and without any opportunities for technical improvement.

Small companies worked for almost a century along all the Apennine chain (which runs down Italy from north to south like a backbone), but the main enterprises were concentrated in the hills of Emilia, the orogenic belt immediately to the South of the Po Valley sedimentary basin. This area offers numerous oil and gas shows, well known in the past, which made it possible to locate the first wells on shallow reservoirs almost without the help of geological and geophysical studies. The lack of coverage that created the shows, however, led to the dispersion of hydrocarbons in the air and thus to the rapid extinction of the fields.⁹

⁸ About AGIP's origins, see Matteo Pizzigallo, *L'AGIP degli anni ruggenti (1926-1932)* (Milan, 1984), 1-39.

⁹ The first steps of the Italian oil industry are delineated in Manlio Magini, *L'Italia e il petrolio tra storia e cronologia* (Milan, 1976), 13 and passim; Federico Squarzina, *Le ricerche di petrolio in Italia: Cenni storici dal 1860 e cronache dell'ultimo decennio* (Rome, 1958), 3 and passim; see also Daniele Pozzi, "L'introduzione della sismica a riflessione in Italia: Documenti," in *Energia per il territorio: L'avventura del metano dopo la scoperta di Caviaga*

The Italian oil industry of the time failed to evolve beyond a mere drilling industry, confined to shallow depths (the techniques were almost the same as those used in drilling water wells), with neither a scientific basis nor any linkage to downstream activity (refining and commercialization were usually carried on by separate operators). Internal production was marginal when compared with the Italian consumption of oil products, although the country based its energy balance on a coal-hydroelectricity paradigm in which liquid fuels accounted for a paltry 9.2 percent; in 1925 Italy consumed 1.19 million metric tons of oil (and more than 10.85 million of coal), and only 8,000 were produced internally.¹⁰

Furthermore, in such a peripheral industry, some technicians and workers improved their drilling skills and refined their competence working both in Italy and in other European countries (in the latter case, engaged by multinational enterprises). AGIP's mining branch likewise recruited its first technical staff and skilled personnel from the small drilling companies scattered along the Apennines. A good example of the typical technical figure trained in this period was Carlo Zanmatti: born in Travo (near Piacenza, one of the Po Valley's major cities) in 1896, he studied civil engineering and then joined his father in a family-owned company that produced drilling rigs and perforated wells. He was hired by AGIP in 1927 as a drilling supervisor's assistant; he acquired experience working for AGIP in northern Italy and abroad (in Iraq and Eritrea in the 1930s), and he rose in the company ranks until 1940, when he came to control all the mining operations as central manager.¹¹

In the 1920s interest arose in geological academic circles about the possibility of extending the search for oil from the Apennines to its foredeep, the Po Valley. Under the younger sedimentary rocks, geologists hoped to find favorable structures, similar to those existing in the Apennines, but with a greater ability to trap oil. Unfortunately, the stronger sedimentary coverage, which ensured the preservation of richer reservoirs, blinded surface geology and made ineffective the geophysical tools available at the time.¹²

(1940-1960), ed. Andrea Giuntini and Daniele Pozzi (Lodi, 2003). "Orogenic" refers to areas of extreme plate tectonic movement; "show" is surface observation of hydrocarbon deposits.

¹⁰ Joel Darmstadter, *Energy in the World Economy: A Statistical Review of Trends in Output, Trade, and Consumption since 1925* (Baltimore, Md., 1971), Tables I, X and XI.

¹¹ See As ENI, ENI, Direzione relazioni personale, b. 951 (1138 a), f: Schede personali dirigenti AGIP mineraria; Pio Reggi, *I pionieri nella ricerca del petrolio in Italia* (Parma, 1955), 21-22; Francesco Guidi, "L'uomo del grande cambiamento," in *Notiziario Interno AGIP*, 128 (maggio 1998): 31-34.

¹² Tiziano Rocco and Dante Jaboli, "Notizie sulle ricerche svolte dall'AGIP e dall'AGIP mineraria nella Pianura Padana," in *Convegno sui giacimenti gassiferi*

AGIP was unable to foresee any economic returns in the immediate future, but nevertheless it began studies in the Po Valley, mostly with a view to increasing long-term scientific knowledge of the Italian subsoil. This attitude deeply influenced the early nature of AGIP: there was little likelihood of any economic gain, so mining activities in the homeland were entirely financed by the state, which owned all the fields and machinery, and all AGIP's research programs had to be approved by the Ministry of Industry's Mining Committee (*Consiglio superiore delle miniere*). AGIP's mining activities were still concentrated almost entirely on drilling: the company received its schedule from the ministry and from a technical consultants committee, on which some of the most prestigious Italian geologists (for example, Cesare Porro and Mario Levi; Mario Anelli also worked for long time for AGIP as a consultant) served. They alternated their academic activities with consulting work for AGIP, but the scale of the industry was insufficient to stimulate the creation of services and competences related to petroleum geology, and AGIP's dimensions were too limited to encourage the development of autonomous resources in geology and geophysics inside the company.¹³

As a result, a single office embraced all the upstream activity controlled directly by AGIP. It depended on the Technical Department, which supervised all the engineering and construction units of the firm (mostly for refinery and distribution networks). The *Ricerche* service remained a small, secondary unit until the mid-1930s because of the lack of financial resources (with the absence of significant production, whole mining programs were still dependent on government financing) and the difficulty of setting up an independent techno-structure.

AGIP concentrated its efforts on acquiring its own crude supplies in other countries considered promising as sources for oil. To use companies created or bought for this purpose seemed to AGIP less costly than to create a suitable research structure in Italy, where studies were still at a very early stage.

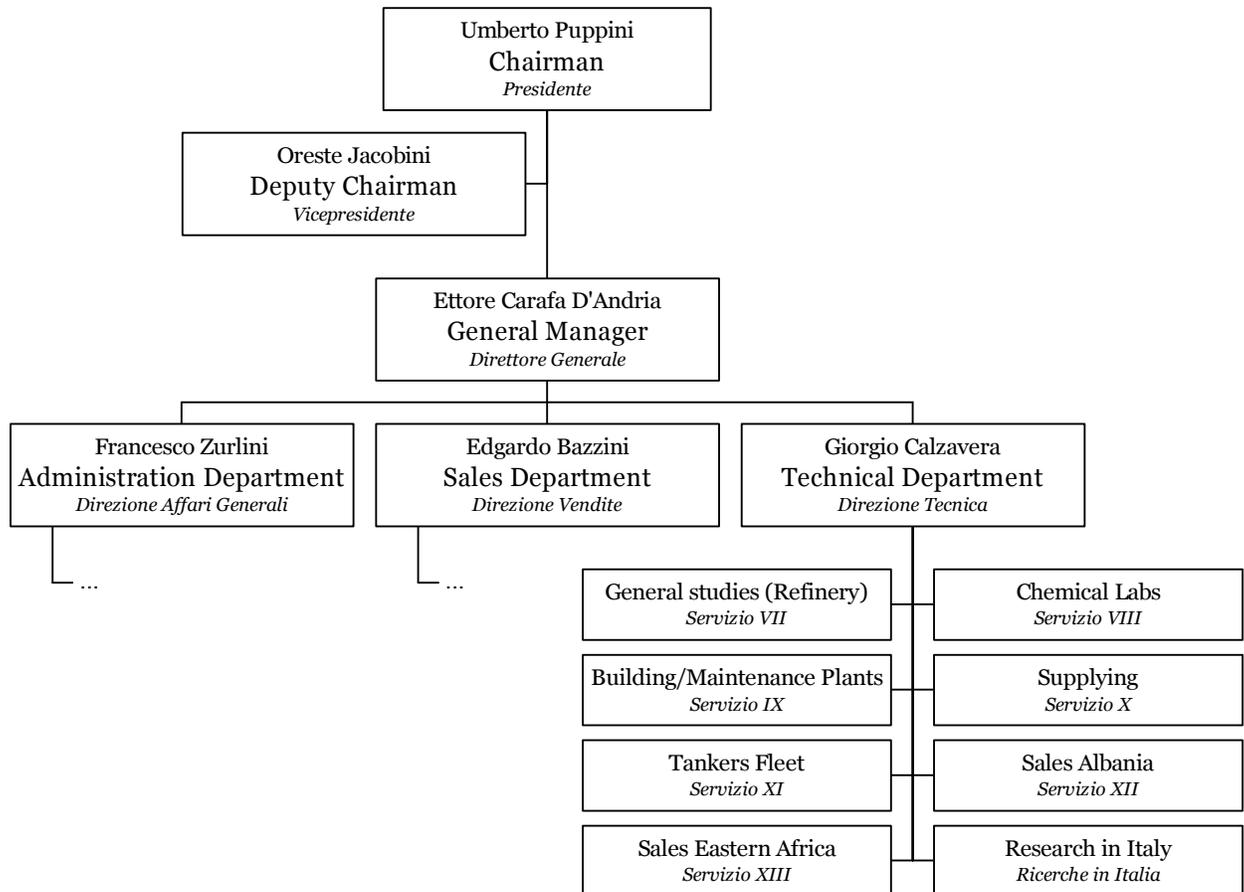
After the end of the First World War, it appeared that a new "oil bonanza" was starting in Rumania: the major multinational enterprises increased their activity in that country, and Italian leaders hoped to gain a strong position in the Rumanian oil industry even before AGIP came into being in 1926. The only way for AGIP to obtain permits for oil exploration in Rumania was to operate through a national company, so AGIP got a foothold in the country in 1927 by buying a major share of Prahova (AGIP also integrated vertically, acquiring shares in both a refining and a

dell'Europa Occidentale, ed. Accademia Nazionale dei Lincei, 2 vols. (Rome, 1957), 1: 53-54.

¹³ See As AGIP, scatola (sc.) 116-17; Magini, *L'Italia e il petrolio tra storia e cronologia*, 87.

distribution company, Petrolul Bukuresti and Atlas Petrol). Prahova succeeded in discovering some oil fields, and its production had risen to 115,000 tons in 1930, when an agreement among the companies operating in Rumania imposed quotas to combat falling prices after the 1929 world economic crisis.

FIGURE 1
AGIP Organization Chart, 1936



Source: As. ENI, ENI, Pratiche dell'ingegner Verani Borgucci (Danni di guerra), b. 34 c (189 f), f. Schemi proposte organizzative, Ods 30/12/1936.

However, Rumanian law laid down that most of the crude should be refined in the country, so the cost of shipping products from the Danube area to Italy wiped out the competitive advantages that AGIP hoped to

obtain in its Rumanian field and failed to satisfy the Italian refineries' need for raw products.¹⁴

Activities in Rumania, though failing to resolve the Italian company's lack of crude, brought AGIP important advantages in competence accumulation. First, it became possible for the company to hire some Italian technicians who were already working in Rumania for multinational operators.¹⁵ Trained technicians were a very precious resource, so generally operations abroad made it possible to improve capabilities in mining by offering concrete training to AGIP's personnel in a country where the oil industry was more advanced than in Italy.

Workers and engineers engaged in the Italian "oil-producing" regions (mostly Emilia) sought contact with international operators and familiarized themselves with techniques and problems typical of the modern oil industry. For example, AGIP personnel in Rumania learned to use rotary drilling. Completely unknown in Italy, the system was becoming the standard in the international oil industry because it made it possible to drill deeper and faster than the traditional methods. The rotary rigs AGIP introduced into Italy during the 1930s made it possible to reach the deep reservoirs in the Po Valley and to exploit the large natural gas fields located near Lodi between 1942 and 1943.

In a number of respects the attempt to gain oil supplies in Iraq was similar to the Rumanian experience. The lack of political authority in the Middle East following the end of the First World War stimulated Italy to try to extend its political and economic interests in this area, in competition with the major powers.

In 1929 AGIP took part in a consortium, the British Oil Development Company (BOD), formed by a group of English businessmen to undertake exploration in an area previously under the control of the Turkish Petroleum Company (TPC). Later French, German, Swiss, and

¹⁴ For AGIP's early operations in Rumania, see Matteo Pizzigallo, *Alle origini della politica petrolifera italiana (1920-1925)* (Milan, 1981), 159-98; Pizzigallo, *L'AGIP degli anni ruggenti*, 41-68, Matteo Pizzigallo, *La "politica estera" dell'AGIP (1933-1940)* (Milan, 1992), 37-51. Documentation about Prahova and the other Rumanian affiliates are in As AGIP, sc. 1-18, 33-39, 63-69, 78-79, 92-101, 108-22, 128-33.

¹⁵ For example, in 1926 Mariano Amico, Italo Veneziani, and other engineers who worked in Rumania asked the Italian authorities to make a major direct commitment in the country and indicated their willingness to work abroad for an Italian company. Later, Amico headed AGIP's operation in Rumania and Veneziani in Iraq. In the second half of the 1930s, Veneziani founded SAIP, a drilling contractor company that was still working as contractor for AGIP until after the Second World War and that was merged into the ENI group in 1953. See AS. AGIP, sc. 92, doc. 6071; Mazzini G. A. Pissard, *Memoirs*, in possession of Associazione Pionieri e Veterani ENI, S. Donato, Mi, 141 and passim.

Dutch partners also entered into the agreement. Legal quarrels with TPC and negotiation problems with Iraqi counterparts postponed the beginning of operations until 1932: but AGIP began to contribute actively, employing its drilling technicians, including Zanmatti and Veneziani, in the exploration.¹⁶

The operations in Iraq likewise essentially brought AGIP an improvement in its competencies rather than an increase in its oil supplies. When the BOD identified some favorable structures in the Mossul region, around 1935-1936, AGIP could not provide the share capital needed to exploit the fields and withdrew from the BOD (which, in the meantime, had changed its name to Mossul Oil Fields). The Italian company suffered from the lack of hard currency that affected the whole national economic system and from the political isolation resulting from the Italian attack on Ethiopia in 1935.

From the second half of the 1930s, a plurality of factors led to profound changes in AGIP's upstream activity and in the structure of the mining units; the consequences of this evolution would be recognized only after the Second World War, when Enrico Mattei was managing the company.

First, as we have already seen, operations abroad (and, subsequently, in Italy) permitted the creation of a first core of competences, even though they were restricted exclusively to drilling, which now cried out to be deployed. Accumulated resources called for a re-direction of AGIP's programs, while the chances of using these skills abroad, in producer countries, were becoming more remote: the possibility of any international activity declined progressively after the 1929 crisis, the Ethiopian war (when the League of Nations imposed sanctions on Italy) and, finally, with the Second World War.

In the meantime, research and exploration in Italy, though without any significant economic success, had improved geological theory and the development of the Po Valley's deposits; at last, in the geologists' opinion, the likelihood of finding substantial hydrocarbon reservoirs in the Po's sedimentary basin was increasing. Nevertheless, the verification of the deposits needed not only skills and machinery for drilling, but also new geophysical resources to locate the wells in areas where surface geology could provide no help. AGIP undertook to apply the promising new theories, working with the geophysical techniques available in Italy at the time and trying out some new ones.¹⁷

¹⁶ See Pizzigallo, *L'AGIP degli anni ruggenti*, 173-217; Pizzigallo, *La "politica estera" dell'AGIP*, 1-35. A large amount of documentation about BOD is present in As AGIP, sc. 45-62, 70-77, 80-88, 133-46, 163-65.

¹⁷ See the report in As AGIP, sc. 6, doc. 506.

Finally, the Italian government exerted considerable pressure for a rapid exploitation of national mineral resources to achieve the nationalistic goals of self-sufficiency (autarky); the struggle to reach independence from imported fuels, though largely a propaganda campaign rather than a realistic economic objective, stressed the importance of pursuing the exploration of Italian subsoil and gave AGIP adequate resources to extend its range of operations. Moreover, in the autarkic economy, it became worthwhile to exploit natural gas and to use it as a gasoline surrogate. Methane had been discovered in the early days of drilling for oil, but until the 1930s it was almost always seen as a dangerous by-product or as evidence of the presence of liquid hydrocarbons. Unfortunately, the same political attitude diverted a good part of AGIP's better resources from the Po Valley, to expensive and futile exploration missions in the Italian colonies: Eritrea, Ethiopia, Somalia, and Libya.

With the convergence of all these forces in the second half of the 1930s, AGIP focused its energies on exploration in Italy, primarily in the Po Valley. The technical consultants committee was set up again in 1935 with a stronger presence of geophysical experts. Most important, new government financing enabled the company to strengthen the internal techno-structure with the appointment of some young geologists and engineers.¹⁸ The creation of AGIP's own scientific unit dated from around 1933-1934, but the rate of development increased at the end of the decade: Enrico Marchesini and Roberto Signorini were two of the first geologists employed full time by AGIP (between 1932 and 1934); Tiziano Rocco (b. 1908) had already been taken on in 1931 to form the first geophysical unit; Dante Jaboli (b. 1916) started to work for AGIP as a consultant in 1937; and the company was joined by Cesare Gavotti, civil engineer (b. 1912) in 1938, and by the geologists Lido Lucchetti (b. 1916), Carmine Loddo (b. 1912), and Renzo di Nasso in 1940.¹⁹ The geologist Giancarlo Facca appears in the internal documentation from 1937 onward, in connection with operations in Eastern Africa. The younger generation of technicians still maintained strong links with the academic world. Some of them had a degree or were assistants of the professors who made up the consultants

¹⁸ The new committee was made up of Professors Giorgio Dal Piaz, Michele Gortani (for geology), Emanuele Soler, Alfredo Pochettino, Francesco Vercelli, Paolo Dore (for geophysics), and Carlo Mazzetti (for chemistry); see As AGIP, sc. 20, doc. 1905; sc. 30, doc. 2659; Magini, *L'Italia e il petrolio tra storia e cronologia*, 87.

¹⁹ As ENI, Direzione relazioni col personale, b. 951 (1138a), f. Schede personali dirigenti AGIP Mineraria; As AGIP, sc. 19, doc. 1775; As AGIP, sc. 466 and 511; see also Magini, *L'Italia e il petrolio tra storia e cronologia*, 87.

committee, but their futures soon seemed tied to the company's growth rather than to academic careers.²⁰

Tiziano Rocco was chiefly responsible for the revolutionary renovation of geophysics that took place in the last years of the decade. He first realized the potential of a new technique widely used in the United States but almost unknown in Europe—the seismic reflection. By using sonic waves reflected by different layers, a seismic survey could reveal the Po Valley's hidden configurations that other geophysical systems could not “read.” Rocco understood that the only way to obtain a seismic team prepared to work in northern Italy was to import people directly from the United States (German scientists were also working on seismic surveys, but they were still at a theoretical stage). In the winter of 1938-1939 Rocco and Professor Francesco Vercelli (a member of the consultants committee) made a two-month journey through the United States, visiting geophysical contractors, oil companies, and research centers.²¹ They collected first-hand information about seismic methods and took the first steps toward hiring a Western Geophysical Company party who would be sent to Italy the following year.²² The journey also gave the young AGIP's geophysicists a chance to view a mature and completely developed oil industry, literally a “new world” compared to European (and even more with Italian) standards. American companies were obviously better equipped than AGIP, but the major difference was in the “spirit” that underlay U.S. operations. Rocco noted in his final report about the trip:

Those who have had the chance to stay, even for a short time, in contact with the American technicians have to recognize that their impressive results arise from luck but also from taking problems with a practical spirit and perseverance. We did not perceive superiority in intelligence, in culture, in techniques or in industriousness, but clever organization, coordination in operating, rational division of labor, straightforward administration and accounting.²³

²⁰ For example, Jaboli and Lucchetti were graduates of Bologna University; with Professor Gortani, Loddo was professor assistant at Cagliari University.

²¹ The final report of the mission is in As AGIP sc. 553, doc. 47781; partially reproduced in Pozzi, “L'introduzione della sismica a riflessione in Italia.”

²² Western belonged to Henry Salvatori, an Italian American entrepreneur who had visited AGIP's headquarters some years before and had met Rocco there. See Franco di Cesare and Francesco Guidi, “A Story of Two Men and the Beginning of the Italian Oil Industry,” in *First Break* 21 (Feb. 2003): 63-68.

²³ As AGIP sc. 553, doc. 47781. It is interesting to note that other Italian technical missions in these years also noticed that the American advantage lay more in organizational skills than in technical ones. See Duccio Bigazzi, “Strutture della produzione: il Lingotto, l'America, l'Europa,” in Bigazzi, *La grande fabbrica*

New needs and the growing importance of upstream activities at AGIP stimulated the creation of a more complex structure to manage them. The organization chart for 1939, the last year of normal operations before Italy entered the Second World War, shows a Mining Department on the same level as the other operating divisions. That department, headed by Carlo Zanmatti from 1940, probably enjoyed more autonomy than other areas, because upstream activities still had an independent accounts scheme (the result of the state financing system for research).

The changes in the company's structures and the internal development of highly skilled resources did not, however, alter the whole character of AGIP, which was still principally a drilling company with a small but significant (and quickly expanding) minority of laboratory-bound technicians; the co-existence between the young new arrivals in the company and the group of experienced drillers was not always simple. The higher managers in drilling were engineers, but a major part of AGIP's work force (and intermediate management too) had no formal qualifications but instead were trained during years of practical activity in Italy and abroad. They formed a tight-knit "community" that had problems communicating with the "graduate" group, which still suffered from a lack of on-the-ground experience and from close ties with the academic world. In 1943, R. Passega, a consulting geologist who had previously worked for Shell, warned against the gap between the two professional communities:

The technical staff handling oil fields development is artificially divided into two groups: geologists and engineers. There is a lack of communication and cooperation between them. In addition, the geologist often does not know the engineer's work well, and the latter provides the geologist with data that is too imprecise to solve drilling and exploitation problems. For his part, the engineer, who feels the lack of precision in this data, tries by himself to elaborate structural interpretations, which fail on account of an inadequate grounding in geology.²⁴

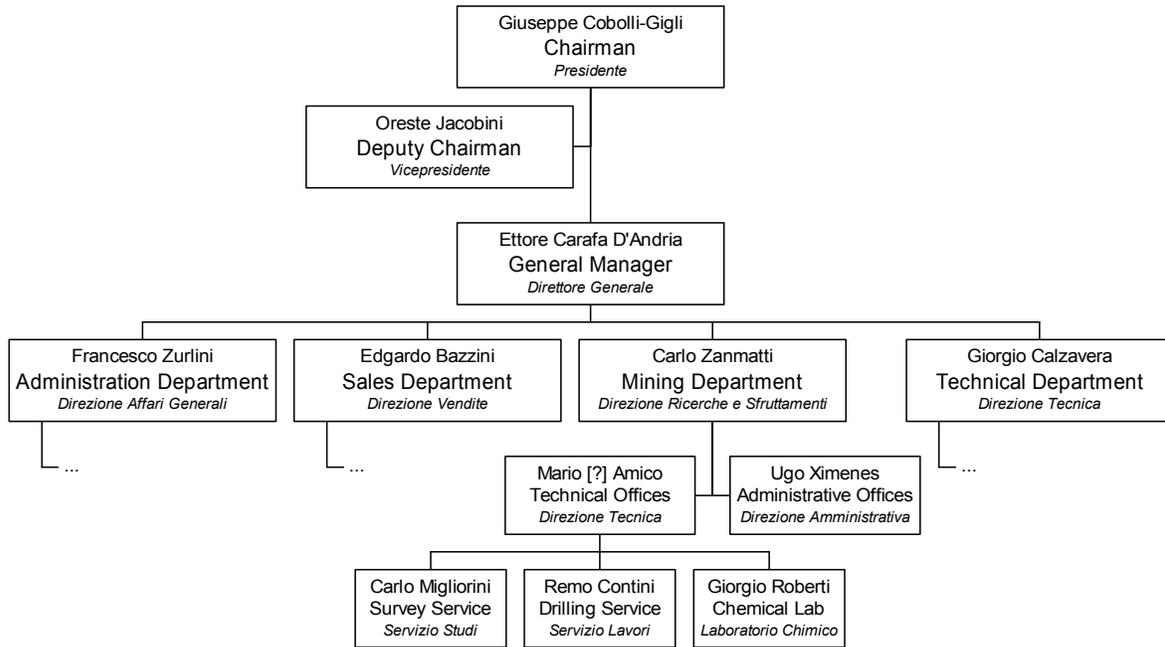
War changed the situation, strengthening some processes that had been implemented in the previous years and simplifying the range of growth opportunities. The Western Geophysical Company group started to work in the Po Valley in June 1940, but could stay in Italy only a few months. On leaving the country, the Americans left all their seismic devices to the AGIP technicians, who had just been trained in using them. The need to restrict activities to the most promising areas and, after the 1943

(Milan, 2000), 48; Nicola Crepax, "Adriano Olivetti: l'America in Italia durante il fascismo," in *Annali di storia dell'impresa* 12 (2001): 255-94, 255 and passim.

²⁴ As ENI, Anic, Jacobini, b. 10, f. 3, Osservazioni sui metodi tecnici e sui criteri organizzativi del servizio ricerche e sfruttamenti dell'AGIP.

occupation by Allied forces and the German army, to keep workers and machinery safe and away from the front lines drove AGIP to concentrate its operations more and more in a small area in the middle of the Po Valley

FIGURE 2
AGIP Organization Chart, 1939-1940



Source: As. ENI, ENI, Pratiche dell'ingegner Verani Borguucci (Danni di guerra), b. 34 c (189 f), f. Schemi proposte organizzative, Circolare 29 dicembre 1939.

between Milan and Piacenza. At the end of 1943, AGIP's head office moved to Milan, nearer the new centers of political power; all the employees who refused to move were fired—among them, Tiziano Rocco. Concentration in a small number of sites in the north of Italy and the need to work as a team in a complex and dangerous situation helped to forge a strong unity among the technicians and to develop a formidable loyalty to the company, which was the only guarantee of job security and an alternative to being forced to work for the occupiers or being deported to Germany.

In these hazardous circumstances, AGIP still managed to work almost regularly until 1944: the first seismic survey made it possible to locate some interesting deep structures near Lodi (30 km southeast of Milan), and in December 1942 AGIP set out to drill a well that reached a large gas reservoir the following year. Caviaga (as the field was called) was the first deep methane reservoir found in Europe; the discovery was made possible by the efficiency of AGIP's research structure, combining experience and skill in drilling with a scientific component of geophysics

and geology (during the war AGIP acquired skills in micro-palaeontology and in electric log techniques as well). But AGIP's technicians could not (or, more precisely, would not) bring in the Caviaga well during the troubled last months of the war, and their achievements remained secret until Italy was liberated in April 1945.

The Struggle for Natural Gas

At the end of the war, the Partisan Forces' Economic Commission (*Commissione economica CLNAI*) sent to AGIP Enrico Mattei, the former commander of the Christian Democratic party's partisans. His duty was to supervise AGIP's work force and assets until a completely new board of directors could be constituted in Rome.²⁵ The commercial branch in southern Italy had resumed work in spring 1944, under control of the Anglo-American authorities, but almost all the technicians in northern Italy were threatened with expulsion from the company as collaborators, because they had continued to work under the German occupation and its puppet fascist Salò government. High-level managers were particularly threatened (for example, Carlo Zanmatti, who became AGIP's chairman under the Salò Republic, was put on trial), but the whole techno-structure, built and preserved with such effort during the war, was at risk. Moreover, the crucial achievements in Lodi were almost unknown by the outside world and, in any case, were comprehensible only to a few experts. To public opinion, and even to some politicians, AGIP seemed to be just one of the many public agencies created by fascism, useful only for giving jobs to the regime's political cronies and thus fated to disappear in the new democratic Italy.²⁶

The company's whole technical community immediately set to work to demonstrate the importance of its contributions in order to guarantee AGIP's survival; its efforts were directed more toward Mattei than toward central management in Rome.²⁷ The latter consisted mainly of former Ministry of Industry officials, many of whom had already served in AGIP (or in the ministerial units connected with AGIP) before the war. Most of the new top managers had no real idea of the recent results achieved in the Lodi field, and in any case, they were too involved in immediate downstream and administrative problems to have time to handle the mining situation in northern Italy, which still seemed almost marginal. In addition, the general attitude of these old civil servants was not favorable

²⁵ Mattei started to work at AGIP on 30 April 1945; see As AGIP, sc. 21, doc. 1961. His first communications to the company are in As AGIP, sc. 20-21.

²⁶ See Frankel, *Mattei*, 40 and *passim*.

²⁷ See, for example, As ENI, ENI, Presidenza Mattei, Carteggio, b. 40, f. 1, sf. 4, *Situazione delle ricerche petrolifere nell'Italia Settentrionale*. Other reports are in As AGIP, sc. 522.

toward encouraging such an expensive and unpredictable activity as oil and gas exploration. Even when they realized the importance of the Caviaga field (probably during 1946), their programs were geared more toward ensuring the stability of the firm in its "early 1930s" form (centralized control, no independent mining division, preference for external consultants, a close relationship with the ministry) than toward fulfilling the full potential of new research methods in the Po Valley.

Mattei had no previous experience in the oil industry, but he appeared to be a better fit with AGIP's technical staff: he was a young entrepreneur (aged 39 in 1945, he owned a small chemical factory) and, above all, he was an ambitious member of the new political class that had begun to rule Italy just before the war. He belonged to the wing of the Christian Democratic party that tended to favor an active role for the state in the economic development of the country. In addition, Mattei's spontaneous nationalism struck a chord that resonated with the pride and expectations of AGIP's personnel, in the common aim to save and improve the most vital and promising part of the firm.²⁸

Carlo Zanmatti, although he had just been fired for supporting fascism, succeeded early on in gaining Mattei's trust (he was to become his right-hand man for upstream activities for the rest of Mattei's life). In May 1945 he began to send Mattei a great number of notes, proposing to liberate AGIP's active part from the burdens of the rest of the company; the project envisaged the creation of a new firm, completely self-supporting on the strength of the natural gas revenues.²⁹

In the meantime, AGIP's geologists strengthened Mattei's positive feeling toward the firm in a series of reports stressing that the Caviaga discovery was not a stroke of luck, but the result of a long learning-by-doing process as a consequence of which the company possessed an efficient technical structure and a sound research hypothesis to approach the complex Po Valley geological problem.³⁰

Mattei managed to gain complete control over AGIP as deputy chairman only in June 1948; he used his political influence (since the general elections on April 18, he had been a Member of Parliament) to impose a new, more favorable board of directors. Formally, he did not promote structural reforms as radical as those Zanmatti had proposed in

²⁸ For Mattei's biography before AGIP and his political views, see Colitti, *Energia e sviluppo in Italia*; Giorgio Galli, *La sfida perduta: Biografia politica di Enrico Mattei* (Milan, 1976).

²⁹ Notes sent from 8 May to 20 Oct. 1945, in As ENI, ENI, Presidenza Mattei, Carteggio, b. 40, f. 1, sf. 1. Ricostruzione di una nuova AGIP.

³⁰ See, for example, As ENI, ENI, Presidenza Mattei, Carteggio, b. 40, f. 1, sf. 4, Situazione delle ricerche petrolifere nell'Italia Settentrionale. Other reports are in As AGIP, sc. 522.

1945, but he operated pragmatically, reinforcing the business areas that offered the best opportunities for growth. So mining activity was still dependent on the technical department, as with the previous administration, but its personnel and its equipment were improved with new investment to speed up the exploration in the Po Valley and to bring in new gas wells. Moreover, Mattei established a direct link between the technicians in the field and the head office, promoting a Survey-Production Executive Committee (*Comitato tecnico Ricerche e Produzioni*, CTRP) in which he himself took part along with Zanmatti (as a consultant, since he had not yet been reintegrated into the company) and Ramiro Fabiani, a geology professor who was in AGIP's experts pool before the war.³¹

With this instrument, Mattei could directly control the development of a new strategy in the natural gas business: methane must not be a mere surrogate for gasoline (which, after all, represented a very marginal market niche in peace time), but a cheaper and more functional substitute for imported coal for the growing industrial activities in the north of Italy. Large reservoirs in the Po Valley allowed (or better, impelled) the creation of pipeline facilities reaching the major factories in northern Italy. That choice created a virtuous circle of growth: the major Italian firms expanded enormously between 1950 and 1960, so high profits from natural gas allowed an extension of the search for new fields (new deposits in Cortemaggiore and Ravenna were found), the development of pipelines, and the acquisition of new customers.³²

The CTRP managed the transition between the emergency period in the postwar years and a second phase of AGIP's development that was to lead to the creation of Ente Nazionale Idrocarburi (ENI) in 1953; the upstream activity had by now acquired an important position inside the firm. The next step would be to endorse its role (and also AGIP's) in the overall national economic system. The evolution adopted two parallel courses: that of exploiting to the full the capabilities core inherited from prewar AGIP and that of setting in motion a new wave of fresh resources accumulation.

³¹ The new board of directors set up CTRP during the 27 July meeting, Centro documentazione e informazione (CEDI), *Archivio storico. Verbali comitato tecnico ricerche e produzioni (1948-1949)* (S. Donato, Mi, 1991), 79 and passim.

³² For a review of the major strategic innovations introduced by AGIP, see Colitti, *Energia e sviluppo in Italia*, 195 and passim. As a result of AGIP's action, Italy followed the general European path from a coal-based energy paradigm to an oil-based one, with the considerable anomaly of a proportion of consumption satisfied by natural gas; in 1963 methane covered more than 11% of Italian energy needs, while in West Germany and in the United Kingdom it accounted for less than 1%. See Darmstadter, *Energy in the World Economy*, 188 and 655-56.

The CTRP's first acts aimed at resolving coordination problems in the research structure that had developed previously, more in response to day-to-day needs and opportunities than as a result of an explicit plan. In September 1948 Zanmatti and Fabiani visited Lodi's fields and reported:

Although most of the employees show goodwill and competence—some of them to a very high degree—the units do not seem completely efficient. Leaving aside the limited specific experience of some managers, we found fault with the deficiency of the organizational framework and, often, the lack of a clear demarcation of tasks. We blame particularly the inadequacy in the determination, collecting and recording of data.³³

In the two technicians' opinion, the major shortcoming was the lack of strong leadership in the research units on the operational level. Laboratories in Lodi and at northern Italian sites needed continuous supervision, which central management (located in Rome) could not handle directly. Moreover, the technicians formed a very close community, devoted to the firm and with a strong bond of loyalty to Mattei himself, but their unity was based mostly on an informal network of relations in which strong personal idiosyncrasies made themselves felt. Migliorini, who as senior geologist led the Survey Service (*Servizio Studi*) during the war, had left the company in 1946, and among the younger staff—Jaboli, Loddo, Facca, Lucchetti—some fierce rivalries persisted, without any particular figure emerging over the others. The situation was worse in geophysics: after Rocco left, the unit was coordinated by Camillo Contini, a brilliant scientist with a greater interest in theoretical studies than in practical applications.

In the first meeting of the CTRP, Zanmatti stressed the importance of finding a real leader for the Survey Service as soon as possible. The solution was found only in May 1951, with the reappointment of Tiziano Rocco, who remained in charge until 1968.³⁴ The CTRP became increasingly aware, in the following years, of the importance of the younger technicians; it promoted from simple white-collar positions to middle management rank some of the geologists and geophysicists taken on in the late 1930s.³⁵ This resolution reflected more accurately the reality of the firm, although it did not mean that coexistence among the leading

³³ CEDI, *Archivio storico (1948-49)*, 93.

³⁴ *Ibid.*, 86-87, 184 and 304.

³⁵ Jaboli and Lucchetti in April 1951, Loddo in Aug. 1956. See As ENI, ENI, Direzione relazioni col personale, b. 951 (1138a), f. Schede personali dirigenti AGIP Mineraria; Centro documentazione e informazione (CEDI), *Archivio storico. Verbali comitato tecnico ricerche e produzioni (1950)* (S. Donato, Mi, 1992), 55.

technicians, with their strong personalities, was always easy in the following years.³⁶

The CTRP directed its efforts not only at reorganizing AGIP's resources, but also at improving them. Around 1949, owing to the flourishing methane-related activity, a new generation of technicians joined the company; Professor Fabiani, because of his university connection, played an important role in enlisting new graduates. In the meantime, the company also engaged a number of qualified young people from technical colleges. In 1949 the Survey Service, strengthened by new personnel, was given a new organizational structure in Lodi.³⁷

The new generation of the 1950s was trained entirely in the postwar "Matteian" AGIP; they entered into a company in tumultuous expansion and felt a complete identification of their careers, AGIP's destiny, and the future of the country. Mattei's charismatic figure played an important role in developing such an outlook, but it was also the consequence of the first-rate technical grounding that AGIP offered (which could not to be found elsewhere in Italy), and of the traditionally strong AGIP *esprit de corps*.

New personnel were incorporated into the company structure after a rigorous period of training on the ground (nine months), but AGIP always promoted a continuous learning process for its technicians and workers, either directly controlled by the company or with the help of external partners (mostly foreigners). The result was the creation of a new set of core capabilities, brought into line with international oil industry standards; nothing comparable to this level of resources existed in Italy at the time. The internal competition with private firms in the struggle for the control of Po Valley natural gas was purely theoretical: AGIP was able to develop rapidly as the major (and virtually unique) operator in that new business sector, and many members of the latest generation of technicians just as quickly attained managerial positions (sometimes over older technicians).³⁸

One important element of AGIP's success in the methane business was the connection between the internal growth of resources and the

³⁶ The harsh relations among the major technicians are described in interviews: Mr. Francesco Guidi, S. Donato, Mi, interview with author, 23 Jan. 2003; Mr. Ugo Colledan, Cassina de Pecchi, Mi, interview with author, 3 Feb. 2003.

³⁷ To fill its organization chart, AGIP started to take on young people on short-term contracts with a system of training grants. The new system, initially used only for drillers, was extended to geologist and geophysics engineers after Nov. 1948; see CEDI, *Archivio storico ... (1948-49)*, 152-53, 245-46, and 286-87. See also As. AGIP, sc. 532, doc. 46620.

³⁸ The training procedures of various professionals are described in Mr. Egidio Egidi, Milan, interview with author, 16 May 2002; Mr. Luciano Davanzo, S. Donato, Mi, interview with author, 27 May 2002; Mr. Ugo Colledan, Cassina de Pecchi, Mi, interview with author, 3 Feb. 2003.

services brought by contractor firms. By using contractors, AGIP could expand its activities faster than it could increase its own resources, with a greater flexibility and without burdening itself with an oversized structure should the rate of growth decrease. Moreover, contractors, especially those from the United States, offered the opportunity to train AGIP personnel in new techniques without overextending already existing AGIP units.³⁹

The relationship with the Western Geophysical Company was resumed, thanks to the good personal relationships between the geophysical staffs of the two companies. Rocco himself worked for Western after February 1950, and in this role he operated as the company's consultant to AGIP until he rejoined the Italian company in July 1951. As a result, the dividing line between the two companies proved very faint; Rocco, though not yet rehired by AGIP, effectively coordinated the seismic survey works as the main geophysics expert in the company through a mixed committee composed, after June 1950, of both AGIP and Western technicians.⁴⁰ Moreover, all new geophysical staff were sent immediately after their appointment to the Western seismic teams for training. In Italy there was no university course for producing qualified geophysicists, so the Western-AGIP training scheme was the only answer to the company's need for specific competences.⁴¹

By 1953 AGIP employed two Western teams in Italy, but all four of AGIP's groups made use of Western equipment, and all AGIP geophysical staff members were trained by Western, using its machinery and methods. Years of close collaboration strengthened the liaison to the point where, for AGIP, it was almost unthinkable to use other seismic contractors—a situation that began to change only in the 1970s.

The consequences of AGIP's relationships with drilling contractors were less pervasive than was the case with Western; they enabled AGIP to reach Po Valley reservoirs more rapidly and provided some updates in techniques (and, above all, in machinery), but they did not influence the evolution of AGIP's drilling service, already firmly established through its prewar experience. An Italian contractor, Italo Veneziani's Società

³⁹ Managerial limits to the growth of the firm and the need for increased managerial services to allow expansion were stressed by Edith T. Penrose, *The Theory of the Growth of the Firm*, 3d ed. (1959; Oxford, 1995), 44 and passim, 201 and passim.

⁴⁰ CEDI, *Archivio storico... (1950)*, 111, 150, 158, 272, 280 and 281; As ENI, ENI, Direzione relazioni col personale, b. 951 (1138a), f. Schede personali dirigenti AGIP Mineraria.

⁴¹ Mr. Francesco Guidi, S. Donato, Mi, interview with author, 23 Jan. 2003; Mr. Paolo Cella, Milan, interview with author, 29 Jan. 2003; Mr. Ugo Colledan, Cassina de Pecchi, Mi, interview with author, 3 Feb. 2003.

Anonima Italiana Perforazioni (SAIP), could bring to AGIP nothing more than a quantitative improvement in drilling operations. SIAP was employed mostly in the drilling of producing wells, a relatively simple operation. Better opportunities were offered by the Santa Fé Drilling Company.⁴²

AGIP contacted the American contractor through Veneziani and a certain Mr. Blyck, an American technician encountered during the BOD combine. In October 1949 two National 75 rigs arrived in Italy with their respective crews. The American drillers remained in Italy until 1952 (by contract, the rigs then passed to AGIP), working in mixed crews in order to train the Italian personnel. In the memories of drillers who worked with the Santa Fé crew, the most important innovations consisted of the new rigs themselves, which were faster and more powerful than the prewar version, rather than any new skills introduced by their American colleagues. The collaboration with Santa Fé was quite brief (and apparently not completely satisfactory in the eyes of the Italian partner); AGIP continued to buy new drilling equipment from the United States in the following years, but did not engage other foreign work teams.⁴³ In some ways, improvement in drilling skills, which AGIP already firmly possessed, was brought about by the technical evolution of machinery, which the company could follow on its own without importing services but only equipment. In any case, what proved fruitful for the continued upgrading of drilling competence was the direct contact with the American machinery suppliers. In his first journeys to the United States in the first half of the 1950s, Mattei had the chance to meet many important American oil industry business leaders and to establish friendly personal relations with some of them (a shared passion for fishing, for example, strengthened his friendship with H. W. Cardwell).⁴⁴

*Some younger Italian technicians (including the few who could speak English) travelled to the United States periodically to acquire, with the help of AGIP's suppliers, practical experience in dealing with specific problems; this gave the company an international perspective, which, though limited to a part of the firm, was very rare for Italy at the time.*⁴⁵

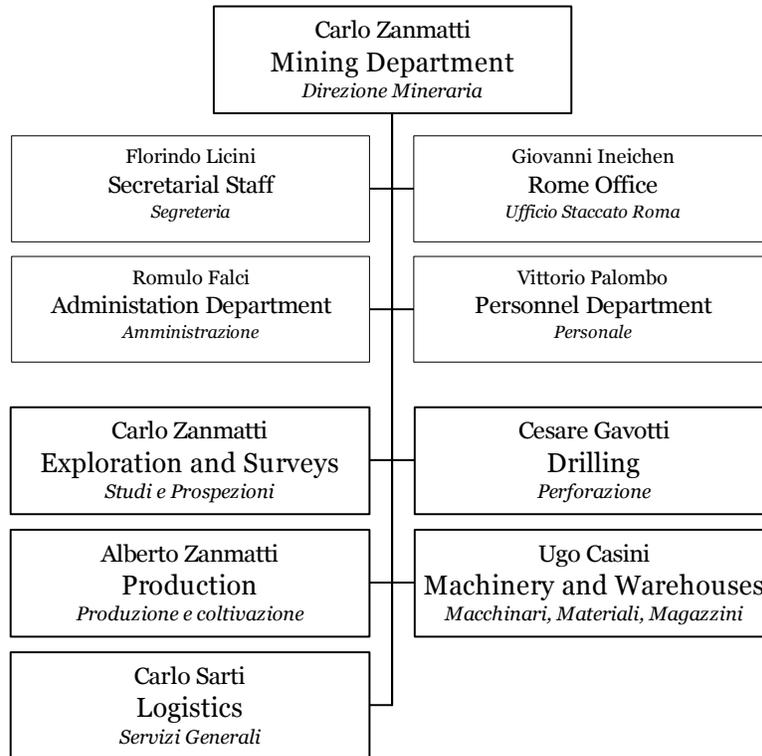
⁴² CEDI, *Archivio storico...* (1948-49), 176-81 and 291-92.

⁴³ See Centro documentazione e informazione (CEDI), *Archivio storico: Verbali comitato tecnico ricerche e produzioni (1952)* (S. Donato, Mi, 1992), 20-21 and 49-50; Mr. Luciano Davanzo, S. Donato, Mi, interview with author, 27 May 2002; Mr Bazzana and Mr Darin, S. Donato, Mi, interview with author, 27 June 2002.

⁴⁴ Mr. Cardwell, who had visited AGIP in 1939, invited Mattei in the United States in May 1951; As. ENI, ENI, Presidenza Mattei, Viaggi, b. 33, f. 1.

⁴⁵ Mr. Egidio Egidi, Milan, interview with author, 16 May 2002; As. ENI, ENI, Direzione relazioni col personale, b. 951 (1138a), f. Schede personali dirigenti AGIP Mineraria.

FIGURE 3
Mining Department Organization Chart, 1950



Source: CEDI, *Archivio storico... (1950)*, 177.

The growth of research resources made necessary a parallel evolution in the formal organization of AGIP; in 1950 a new Direzione mineraria was created, headed by Zanmatti and based in Milan.⁴⁶ The new Mining Department acted virtually as an independent company, with its own personnel and administrative offices. It therefore seemed logical to sanction the autonomy of upstream activity in 1953 by transforming the department into *AGIP Mineraria* (AGIP Mining) under the new ENI holding.

The creation of ENI was in some ways the crowning of the upstream evolution that had begun in the second half of the 1930s; the new public holding, of which Mattei was chairman, received fresh financing from the state and, above all, saw its exclusive right to explore and develop all the

⁴⁶ CEDI, *Archivio storico... (1950)*, 177; As. ENI, ENI, Ods AGIP 1945-1957, b. 1F78 (1833), Ordine di servizio n. 329; As. ENI, ENI, Ods-Circolari AGIP, b. 1FE6 (1924), Circolare n. 335.

Po Valley officially recognized by law. The new law guaranteed a de facto situation in which AGIP Mineraria was the only operator that could manage the natural gas industry in the region economically; methane revenues gave the ENI group a core of stable profits on which to plan an ambitious new wave of expansion.

Going beyond the Po Valley

In a classified report in 1950, Giancarlo Facca noted the need to plan in the immediate future the next path of growth for the company. Exploration in the Po Valley would become routine, shifting from research to production, and AGIP's skilled resources would soon be free for new employment. The geologist proposed exploration in central and southern Italy and activities abroad as possible ways of making full use of the company's capacities.⁴⁷ AGIP (Mineraria) followed both these suggestions in extending its scope of action.

The extension of activities outside the Po Valley provided an opportunity for smoothing out some frictions in the company's technical community. Facca, whose ambition to achieve a central position was frustrated by Rocco's return, became head of Società mineraria centro meridionale (SOMICEM), a new company in which AGIP Mineraria controlled almost the whole share capital, created in 1954 to extend exploration throughout the Peninsula.⁴⁸

SOMICEM experimented with some interesting organizational solutions, mostly the fruit of Facca's own intuition. The company was completely new, so it took a part of its personnel from AGIP, but, for the most part, it engaged new young specialists who were very early on put in executive positions. The company had smaller and simpler structures than AGIP and gave more decision-making autonomy and responsibility to the peripheral units, in part because its activities were scattered in a large area that covered the whole of central-southern Italy. The most interesting innovation was that the company was almost exclusively a coordination and data analysis center: seismic activity was put entirely in the hands of Western teams, and SOMICEM did not possess any drilling unit of its own, but used AGIP as a contractor.

Unfortunately SOMICEM's experimentation was not backed up by industrial success; although Facca demonstrated brilliant skills as a communicator and introduced some interesting innovations, he suffered from a substantial lack of technical capabilities for handling exploration. In 1959 ENI judged it unprofitable to keep SOMICEM in action and merged it with AGIP Mineraria. Facca left the group, and AGIP hired the

⁴⁷ As AGIP, sc. 531, doc. 46572.

⁴⁸ See ENI, *Relazioni e bilancio al 30 aprile 1955* (Rome, 1955), 47.

whole of SOMICEM's personnel (with obvious integration problems in the early stages).⁴⁹

Facca also played an important role in the first attempts to expand research abroad. In 1952 changes in international relations made it possible to resume exploration activities in some of the former Italian colonies. Facca had been involved in the missions to Eritrea before the war, and he led the first mission in Eastern Africa in 1954. Political problems with the Ethiopian federal government, to whom Eritrea authorities were subordinate, and opposition by the Sinclair Oil Company forced this campaign to limit exploration to Somalia, which was a less promising area, but was still under Italian authority under a United Nations mandate. The explorations in Eastern Africa proved completely fruitless, and by 1963 AGIP had abandoned the region.⁵⁰

A second and more effective series of attempts to expand abroad upstream took place in the second half of the 1950s. The initiative came almost entirely from Mattei's inner staff rather than from AGIP's technical community. In 1955 AGIP took a share in the International Egyptian Oil Company (IEOC), which owned some exploratory fields in Egypt, and in 1957 AGIP signed an important agreement with the National Iranian Oil Company (NIOC) to start exploration in areas not yet under the Iranian consortium's control.⁵¹

It is very difficult to find records about the negotiations that led to the two agreements, but it is probable that only the top management of the ENI group was involved in them. The most prominent figure in ENI's international relations area was Attilio Jacoboni. After July 1957 he headed a special unit in AGIP Mineraria called E-section, and he was at the same time one of the chairman's consultants in ENI. After 1958 he operated exclusively as a member of Mattei's staff. In AGIP Mineraria there existed a Foreign Department, run by Cesare Gavotti (and then by Egidio Egidi), which led operations in the new activities abroad, but without any chance of guiding the company's foreign strategy, which was determined centrally by Mattei and his assistants.⁵²

The internationalization process was a turning point in AGIP's (and ENI's) history, although it had just begun at the time of Mattei's death in October 1962. The demise of ENI's founder slowed the development of an

⁴⁹ Mr. Francesco Guidi, S. Donato, Mi, interview with author, 23 Jan. 2003; Mr. Ugo Colledan, Cassina de Pecchi, Mi, interview with author, 3 Feb. 2003; Mrs. Maria Adelaide Chierici, S. Donato, Mi, interview with author, 9 April 2003.

⁵⁰ As. AGIP, sc. 185-86, 479-80, 1997-1998; sc. 134, doc. 9452; sc. 301, doc. 1491; sc. 356, doc. 25161-67.

⁵¹ Frankel, *Mattei*, 115-18; Giulio Sapelli and Francesca Carnevali, *Uno sviluppo tra politica e strategia: ENI (1953-1985)* (Milan, 1992), 34-35.

⁵² As ENI, Ods ENI n. 33, 69; Ods AGIP n. 67, 82, 156.

international dimension and changed some aspects of the firm, but to see this evolution as a “betrayal” of the original mission would be a misreading of the events.

ENI suffered, in the last years of Mattei's chairmanship, from a severe misbalance between its capacity to produce or acquire new resources and the needs imposed by an accelerated rate of development in new areas of business. Even leaving aside the diversification process into other businesses, more or less related to the core mining activity (petrochemicals, nuclear energy, and so forth), the ENI group's investment in upstream soared; in a short period the range of operations widened dramatically, stimulated by rapid changes in the international oil industry. The second half of the 1950s marked the beginning of a crisis in the postwar equilibrium that had been established by the major companies in the Middle East. The rise of Arab nationalism and the emergence of new operators (ENI among them) contributed to instability, creating greater opportunities for a larger number of operators but at the same time bringing more unpredictability.⁵³

Mattei's talent for creating good relations with the leaders of producing countries led ENI first to Egypt and Iran, as already mentioned, and then to Morocco (1958), Libya (1959), Sudan (1959), Tunisia (1961), and Nigeria (1962). With the exception of Iran, which, in 1962 produced 3.3 million tons of oil, explorations in the majority of these countries had either just entered an operational phase or were still in a preliminary state when Mattei died.⁵⁴

Moreover, downstream activity was unable to achieve a significant profit margin, constrained by the unfavorable structure of the Italian refining industry and by the increasing competition in the oil products markets. The burden of sustaining the growth of new activities thus fell entirely on the natural gas revenues, which were dependent for their increase on the development of new fields, improvements in the pipeline network, and the “creation” of new customers.

The need for a rapid response to the new opportunities reduced the possibility of developing a homogeneous system of managerial innovation, but did not impede the introduction of some important novelties.

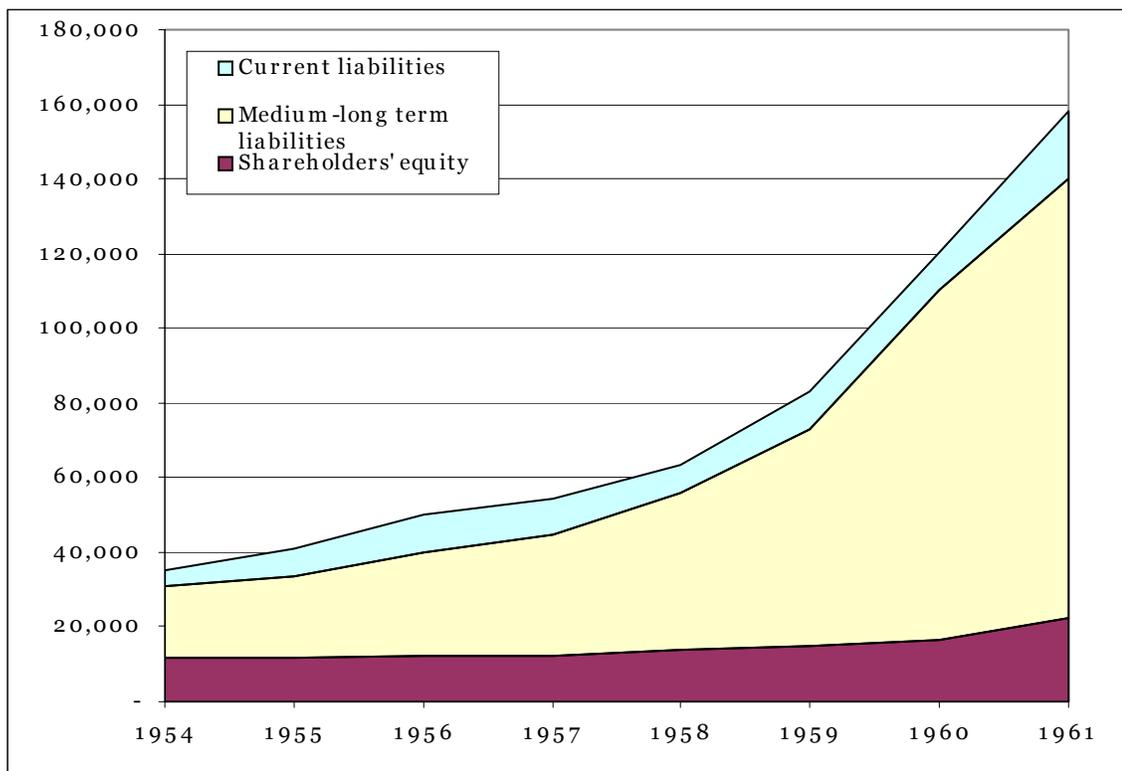
In the second half of the 1950s AGIP Mineraria remained essentially the result of the victorious struggle to find and control the Po Valley's natural gas reservoirs. The company had grown through a pragmatic process of stimulus-response, following the need for a rapid expansion of activity in a permanent “emergency” situation. The company

⁵³ Penrose, *The Large International Firm in Developing Countries*, 67 and passim.

⁵⁴ Magini, *L'Italia e il petrolio tra storia e cronologia*, 132-33; Sapelli and Carnevali, *Uno sviluppo tra politica e strategia*, 34-35.

still included some units outside the main business (for example, some refining activities) created during the run for Padan hydrocarbons. Overall, the personnel preserved a strong sense of unity and proudly felt themselves to be a close community of “pioneers.” “Going beyond the Po Valley” was not only a technical or a political step, but implied a profound change in the firm’s culture.⁵⁵

FIGURE 4
AGIP Mining’s Financial Statements
(million lira)



Sources: Elaboration from official annual reports, 1954-1961.

Extending its strategic range beyond an area that had permitted significant success in the past is usually a difficult step for an upstream oil industry, where preliminary studies and explorations are costly investments, specific for each region, that have to be made in advance. Furthermore, operating skills are not easily transferred to other contexts, which differ in

⁵⁵ See Mr. Aldo Cangiano, Rome, interviews with author, 11 June 2002 and 13 Feb. 2003; Mr. Paolo Cella, Milan, interview with author, 29 Jan. 2003.

their physical, logistic, or political elements. It was accordingly impossible for AGIP to transplant strategies and mental habits that had been successful in the Po Valley to the Middle East or to Africa without making some substantial changes.⁵⁶

A first attempt to gather new competences followed the same strategy that had been used to improve technical services—namely, a close relationship with an external partner. Mattei himself realized the need to bring the ENI group into line with international standards not only in knowledge and technical skills, but also in managerial culture. During his trips to the United States, ENI's chairman saw the organizational solutions adopted by the oil industry there and so decided to hire a consulting firm to make ENI as similar as possible to its international partners and competitors.

By 1956 a group of Booz Allen and Hamilton (BAH) consultants was at work in the offices of the ENI headquarters in Rome. This was an extreme novelty for Italian business: the country had tried out the Taylorist and Bedeaux approaches to scientific management in the 1930s, but war had put an abrupt end to reflections about industrial organization at a very early stage.⁵⁷ The most recent American management theories were unknown in Italy in the 1950s, and the problem of organization was seen generally as an aspect of work force control at the shop-floor level (Henri Fayol's studies, too, were to become totally familiar only in the 1960s). As was true for the whole of Europe, the Economic Recovery Program was a powerful avenue for innovations in managerial culture, and it offered the American consulting companies the means to get a foothold in European business. In Italian state-owned enterprises, ENI and then Istituto di Ricostruzione Industriale (IRI) led the process with a precocious "Americanization" of their structures.⁵⁸

ENI and BAH began a very close collaboration; the American company did not have an Italian branch (the only European division was in Paris), so it created its own offices inside the ENI group. In the Rome

⁵⁶ A good example of the strength of path dependence in the oil business is the difficulty that AIOC encountered in switching from a "single country" strategy to an evolved multinational structure after the Iranian crisis. See James Bamberg, *British Petroleum and Global Oil, 1950-1975: The Challenge of Nationalism* (Cambridge, England, 2000), 13, 68, and passim.

⁵⁷ Giulio Sapelli, "Gli 'organizzatori della produzione' tra struttura d'impresa e modelli culturali," in Sapelli, *Economia, tecnologia e direzione d'impresa in Italia* (Turin, 1994), 173 and passim.

⁵⁸ See Matthias Kipping, "American Management Consulting Companies in Western Europe, 1920 to 1990: Products, Reputation, and Relationships," in *Business History Review* 73 (Summer 1999): 190-220; Giuliano Faliva and Ferdinando Pennarola, *Storia della consulenza di direzione in Italia* (Milan, 1992), 54 and passim.

headquarters a Management Techniques Department (*Direzione per la tecnica direzionale*) was set up, headed by Thomas C. Quackenboss and his assistants, and similar units were established in every operating group under the holding company. In addition, ENI introduced management courses for its staff and, eventually, a management studies institute (since July 1958, *Istituto direzionale e tecnico ENI*, then IAFE, in S. Donato, near Milan), also controlled by BAH consultants.⁵⁹

Although in this way ENI undoubtedly introduced radical innovation into Italian organizational thinking, it is very difficult to measure the practical impact that BAH's consultancy had on the firm itself and on its upstream units. The American consultants acted in three principal ways: through the reform of company structures with new organization charts, the training of personnel in management courses, and the introduction of a job evaluation system that embraced the whole enterprise, from top management to the workers.

In the opinion of Eugenio Cefis (Mattei's main assistant in these years and his successor as chairman), the most important achievement of the structural renewal was to introduce a new organizational philosophy, in which organization charts reflected functional relations between units and effective lines of control. Previously in the company, the significance of charts had been more to define relations among managers as people, giving them a juridical rather than an organizational meaning. The establishment of an impersonal system of roles and functions was also the goal of the job evaluation system. The ENI group had based its early growth on individual charismatic figures in each area of business; creating new structures that were less conditioned by the company's troubled history was a necessary step toward establishing conformity with international standards.⁶⁰

Even so, it is difficult to determine whether the structural innovations introduced were sufficient to stimulate a real evolution inside the operating units. AGIP Mineraria possessed a strong identity that could be altered only superficially by changes in formal structures. In the memoirs of the upstream managers, it is difficult to find even one reference to the influence of the BAH consultants on the company's organization.⁶¹ The job evaluation system is remembered almost exclusively because it worsened the retributive position of some laboratory

⁵⁹ As ENI, Ods 33, 59 and 60.

⁶⁰ Mr. Eugenio Cefis, Milan, interview with author, 21 Feb. 2003.

⁶¹ Mr. Aldo Cangiano remembered that when Zanmatti received the new AGIP organization chart, he immediately thought of dismissing AGIP's organizational unit, which, in his opinion, had already completed its function. Mr. Aldo Cangiano, Rome, interviews with author, 11 June 2002 and 13 Feb. 2003.

employees (geologists), whose worth the system could not assess correctly because it was too rigid and unable to embrace upstream specificity.⁶²

Neither were technicians enthusiastic about management courses. Resistance was stronger among the older members of the company, whereas the younger ones appreciated some specific innovations presented by the American teachers (primarily new accounting techniques). The general feeling, though, was that the lessons were too theoretical and not sufficiently linked to specific problems in the oil industry. Italian personnel also blamed the teaching system (for example, the use of case studies), and the relationship with the consultants themselves was not always straightforward.⁶³

So, AGIP Mineraria generally gave formal support to the “Americanization” process, but still ran upstream activities following its own logic. The technical community kept its system of relationships and its hierarchy, based on a habit of working in close contact, and tried to adapt it to the challenges posed by growth by favoring an evolution that developed among themselves rather than by adopting reforms imposed from above.⁶⁴

The BAH proposals could not make much more than a superficial impact on the rest of the ENI group; even ignoring the difficulty involved in adapting American managerial theories to the Italian context, ENI itself contained some elements that slowed down the process.

First, ENI's development rate increased dramatically after 1958-1959, both in dimension and in the scope of activities, creating a continuous “emergency” situation that worked in opposition to the implementation of a rationalization process. All the managerial resources were absorbed in the expansion process, which the company's unpredictable future made a pragmatic approach necessary.

Innovation took place in individual areas, without creating a new organic and complete cluster. After 1955 the group's accounting system was radically changed, with the introduction of a standard form for all the

⁶² Mr. Francesco Guidi, S. Donato, Mi, interview with author, 23 Jan. 2003; Mrs. Maria Adelaide Chierici, S. Donato, Mi, interview with author, 9 April 2003.

⁶³ For example, in 1958, with a letter to the Institute's dean, the members of “Group B” criticized the lack of strong ties between courses and a concrete operational background; see As. ENI, ENI, Iafe, b. 8AD (859A), f. Preparazione corsi direzionali 1958-59 (A-E). Some doubts about the immediate usefulness of the courses emerged in the interviews as well: Mr. Egidio Egidi, Milan, interview with author, 11 March 2003; Mr. Giorgio Ruffolo, Rome, interview with author, 14 Feb. 2003.

⁶⁴ For example, the geologist consultant Passega connected some managerial innovations with the new sedimentology studies he introduced in the second half of the 1950s. See interview Mrs. Maria Adelaide Chierici, S. Donato, Mi, interview with author, 9 April 2003.

operating companies and an advanced system of accounts consolidation, internally developed by ENI's Economics Studies Service.⁶⁵ Cost analysis and planning for mining could not be brought under control until the beginning of the 1960s, when an Investments Programming Office was created in AGIP as part of a wider supervision system for the whole group.⁶⁶

Traditionally, upstream evaluated its programs by considering only physical entities: AGIP Mineraria's annual reports usually mentioned the number of kilometers of seismic lines recorded, the number of meters drilled, the tons or cubic meters produced, while giving no attention to the economic significance behind these concrete dimensions. In some ways, this was a consequence of the emphasis that had been placed on technical skills at AGIP since the 1930s: the key factor of success had always been the critical mass of competences in the core business rather than administrative skills. Only in some 1963 reports do we find introduced the concept of "discovery cost" for evaluating whether or not resources should be concentrated in one region of exploration rather than in another.⁶⁷

To a certain extent, the role of Mattei himself went against the managerial culture he tried to introduce into the group and strengthened the traditional mental habits among the technical components. Even during BAH's consultancy, ENI maintained a very centralized system of power, in which the chairman personally pulled all the strategic strings. Anglo-American commentators criticized the group for being closer to a one-man firm than to a modern enterprise. In some ways, the complete identification between ENI and its founder was both the strongest element facilitating rapid expansion and the most serious obstacle to developing adequate managerial resources to sustain growth in the medium term.⁶⁸

For example, negotiations with producing countries were managed at the chairman's level, and AGIP management handled only specific technical items, without developing any legal skill. Mattei's death forced

⁶⁵ A 1955 handbook on implementing consolidated accounts (by Professor Ettore De Dominicis) is in As ENI, ENI, AGIP Servizio amministrazione, b. 1688 (984a). See also Giorgio Ruffolo, Rome, interview with author, 14 Feb. 2003; Antonio Benedettini, *I bilanci consolidati nei gruppi dell'IRI e dell'ENI* (Pisa, 1969).

⁶⁶ Created in July 1961 and managed by Riccardo Zucchelli, As ENI, Ods AGIP n. 156.

⁶⁷ Report by Zucchelli and Benelli, in As AGIP, sc. 526, doc. 46315.

⁶⁸ ENI is described as "Europe's biggest experiment in one-man management of a public enterprise" in "ENI after Mattei," in *Management Today*, Oct. 1966. Edith Penrose too defined ENI as "the most colorful" of all the companies that entered the international petroleum arena before the Second World War; Penrose, *The Large International Firm in Developing Countries*, 142. A very negative view of Mattei and his "power" is in Dow Votaw, *The Six-Legged Dog: Mattei and ENI: A Study in Power* (Berkeley, Calif., 1964).

the upstream techno-structure to develop its own negotiation services, spurred on by the need to upgrade old contracts and to carry on negotiations with new partners.

The high level of centralization could solve problems related to the lack of managerial resources or speed up urgent decisions, but it restricted the widening of directional responsibility in the whole structure. As a consequence, many technical figures (especially among the 1930s “generation”) failed to evolve beyond their original professional core capabilities. The most significant example is perhaps Tiziano Rocco, who in all his work experience in the ENI group preferred to remain purely a technician and was content to lead the Survey Service rather than aspire to higher positions.

The outlook of the youngest generation of technicians recruited in the early 1950s wave of development was different. They were trained in a more complex and more evolved environment, compared with the one familiar to their predecessors. Mattei acted for them as a sort of shield that protected their first experiences in the international oil industry rather than as an obstacle to their growth. Then, in the absence of a strong leader like Mattei, they had the advantage of more independence and responsibility when they took on higher managerial roles.⁶⁹

Mattei's unexpected death on October 27, 1962, deprived the company of a unique talent while ENI was stretched to its limits, following a variety of expansion paths without any prospect of significantly increasing its resources in the short term. To avoid disaster, the firm had to slow its rate of growth (which had already fallen in Mattei's final year) and to re-think to a certain degree its whole strategic vision.⁷⁰

Egidio Egidi, a 39-year-old engineer hired in 1949 by Mattei himself, took control of mining. Upstream technicians were in a position to demonstrate the need to carry on exploration abroad (until this moment quite profitless) in spite of the difficult financial situation.⁷¹ Less pressed by the need for rapid growth and deeply convinced that the top priority was controlling costs, upstream managers had a chance to consolidate the processes begun in the early 1960s.

ENI achieved its first significant successes in mining in the second half of the 1960s (in Libya, Nigeria, and the North Sea). These were the result of a continuous upgrading of technical competences as well as of achieving high standards in administration. AGIP participated in joint ventures with Phillips and Shell, demonstrating beyond all question its ability to operate as a mature international actor on the world oil scene.

⁶⁹ Mr. Aldo Cangiano, Rome, interview with author, 13 Feb. 2003; Mr. Egidio Egidi, Milan, interview with author, 11 March 2003.

⁷⁰ See ENI, *Relazioni e bilancio al 30 aprile 1963* (Rome, 1963), 83-89.

⁷¹ Mr. Egidio Egidi, Milan, interview with author, 11 March 2003.

At the end of the decade, Egidi made a decision, almost paradigmatic, to detach from AGIP all drilling activities, which passed to the Società Anonima Italiana Perforazioni e Montaggi (SAIPEM, the ENI group company that had developed from SAIP). For 1969, SAIPEM was to operate as a contractor, bidding in competition with private operators to obtain contracts from AGIP. This decision represented a tuning point for a company in which drilling had been the core around which all the other competences had evolved; the drillers who had to move from AGIP to SAIPEM saw it as a humiliation and rebelled violently.⁷²

Mattei paved the way for the evolution of the firm to multinational dimensions while maintaining the characteristics (and the limits) that he had established just after the war. But it took a younger generation of managers to bring the process to a successful conclusion by choosing to abandon certain “pioneering” policies and to bring the company in line with international models. They completed the slow transformation process from an empirical to a scientific structure that AGIP had started in the 1930s. Mattei himself was conscious that he could not handle the complete development of ENI as a multinational. Once he told Egidi, “I ask for trouble in bringing you young people to sit around the table, but now it is for you to learn which cutlery to use.”⁷³

⁷² Mr. Egidio Egidi, Milan, interview with author, 16 May 2002; Mr. Luciano Davanzo, S. Donato, Mi, interview with author, 27 May 2002; Mr. Aldo Cangiano, Rome, interview with author, 11 June 2002.

⁷³ Mr. Egidio Egidi, Milan, interview with author, 16 May 2002 (recorder turned off).