

# *The Revolution in Steel*

## 1. The origins

In a survey conducted in 1864 Francesco Giordano found Italy's relatively young iron and steel industry immensely backward compared with those of Britain, France, the United States, Belgium and Sweden. That year the charcoal-burning foundries scattered around the country turned out about 27,000 metric tons of pig iron, 3,500 tons of cast iron and 10,000 tons of refined iron. Italy accounted for a mere 0.5 per cent of world production, and its output came from obsolete plants whose smallness barred the introduction of coke-fired blast furnaces. The adoption of the Bessemer process, widely used elsewhere, was not even considered. Towards the end of the century, when Italy began making bar iron with open-hearth furnaces, these were fed with iron scrap, whereas producers abroad had already introduced full-cycle works in which the molten iron obtained from blast furnaces was poured directly into crucibles or converters and the resulting hot ingots went on to the rolling mill. In practice, the Italian iron and steel industry was distinguished by high production costs and the fragmentation of production among small units ill-suited to technologically advanced processes.<sup>1</sup>

According to Ernesto Manuelli, the modernization of the Italian steel industry only began in 1905 with the establishment of the Bagnoli works. The First World War, which required continuous supplies of iron and steel, stimulated production but left no room for the industry to adapt to the latest innovations in production technology. Nor was this possible during the post-war crisis, the Great Depression, the years of autarky and the Second World War.<sup>2</sup> Moreover, as a strategic industry, steel was always protected by a high tariff and thus lacked the spur of competition, although this did not preclude advances in output.<sup>3</sup>

The steel industry suffered extremely heavy damage in the course of the Second World War, owing both to British and American bombing and to sacking by the Germans as they retreated. When peace came, capacity was severely diminished; in 1945 output of pig iron was a mere 62,000 metric tons (including

<sup>1</sup> E. Manuel "Situation and prospects of the Italian steel industry", *Review*, XII, 6 (November 1958), p. 567.

<sup>2</sup> The figures for iron and steel output grew as follows (in millions of metric tons):

	1913	1929	1939
Iron	426,755	1,076,320	1,008,490
Steel	678,491	2,253,048	2,344,454

See Manuelli, "Situation and prospects", p. 568.

<sup>3</sup> In 1940, the year Italy entered the war, the industry had an estimated capacity of 4,600,000 metric tons. It produced 1,045,000 tons of pig iron, of which 881,000 with blast furnaces and the rest with electric furnaces, and 2,258,000 tons of steel, of which 1,504,000 with crucible furnaces, 746,000 with electric furnaces and 7,000 with a combination of the two processes. R. Colombo, "Situation of the Italian iron and steel industry", *Review*, V, 4 (July 1951), pp. 318-19.

5,000 tons produced in blast furnaces), while steel production was less than 400,000 tons.

## 2. Reconstruction

The long-delayed wave of innovation arrived with postwar reconstruction, ensuring the industry's rebirth and paving the way for robust expansion. Italian steelmaking was then based on the smelting of a mix of half iron scrap and half pig iron. Finsider, which through Ilva owned all of Italy's furnaces, continued making steel with this method immediately after the war. Indeed, in 1951 the proportion of scrap rose to 80 per cent, perhaps owing to the great quantities left by the war, in spite of the fact that the price of scrap had jumped from 13 to 37 lire a kilogramme since August 1950.

The first problem after the war was to rebuild or repair and reactivate damaged plant. The task was far from easy. The Piombino blast furnace began operating only in January 1951 and the third blast furnace at the Bagnoli (Naples) works in March of the same year. The rebuilding of the two furnaces in Cornigliano (Genoa) was completed at the end of 1952. The furnaces of the Finsider group<sup>4</sup> thus reached a total capacity of 1,184,000 metric tons: 480,000 with the two blast furnaces in Cornigliano, 360,000 with the three in Bagnoli, 240,000 with that in Piombino and 128,000 with the two in Cogne (Aosta). However, Finsider appeared disinclined to reactivate the other blast furnace in Piombino or the one in Servola (Trieste). Alongside this capacity, electric furnaces belonging to Falck, the largest private steelmaker, FIAT, Breda, Cogne and others were capable of turning out a total of 341,000 tons a year.<sup>5</sup>

The other major problem facing Italian iron and steel was that of raw materials. Even before the war, attempts had been made to replace iron scrap with ore, and in 1938, for example, the industry had used some 900,000 tons of Italian pyrite and 450,000 tons of imported iron ore and ferromanganese. After the war these attempts were taken up again and intensified. In 1950 the industry used 270,000 tons of imported iron ore, 465,000 tons of domestic ore and 300,000 tons of pyrite calcines.<sup>6</sup> An agreement was signed with the French government for 800,000 tons of iron ore a year to be shipped from Algeria, and an import agreement was also reached with Spain. The overall goal was to secure annual imports of 1,500,000 tons, a quantity equal to that obtained from domestic mines and pyrite calcines.

Still, in 1950 and 1951 the Italian steel industry was not unduly concerned about augmenting its production, given the modest level of per capita steel consumption: 60 kilogrammes, compared with 650 in the United States, 400 in

<sup>4</sup> Ilva (Bagnoli, Piombino, Servola), Acciaierie Cornigliano and Cogne (Aosta).

<sup>5</sup> Colombo, "Situation of the Italian iron and steel industry", p. 318.

<sup>6</sup> *Ibid.*, p. 319.

Britain, 300 in France. Its chief objective was instead a significant reduction in costs. There appeared to be two principal means of achieving this: upgrades to plants and lower fuel costs, the latter apparently within reach thanks to the discoveries of natural gas in the Po valley.<sup>7</sup>

### 3. Membership of the European Coal and Steel Community

A major impetus for modernization and competitiveness came several years later with Italy's participation as a founding member of the European Coal and Steel Community. As remarked earlier, Italy was at a disadvantage vis-à-vis its partners in the ECSC as regards domestic supplies of coal and iron ore.<sup>8</sup> There was also a chasm between Italy and the others from the standpoint of steel output.<sup>9</sup> Italy accounted for just 1.65 per cent of world production, ranking eighth.<sup>10</sup> Aware of Italy's relative weakness, the government submitted the question of the Sulcis coal basin in Sardinia to the ECSC's High Authority. Under a competitive regime the high cost of Sulcis coal threatened to price it out of the market, which would lead to the closure of mines and mass redundancies. The ECSC agreed to make monthly contributions equal to 50 per cent of the resulting balance-sheet losses during the period it would take for the mines to be modernized.<sup>11</sup>

The start-up of the ECSC had immediate repercussions on the Italian steel industry, applying the brakes to the two-year upturn in production, above all to the detriment of the smaller companies, and confirming the steelmakers' apprehensions over Italian membership of the Community. The government appealed again to the High Authority and an agreement was signed under which steelworks and coal mines were granted customs protection for a two-year period running from May 1953, to allow them to replace obsolete plants and convert production. The import duties envisaged, however, were those already agreed

<sup>7</sup> Discussed above in Chapter VIII, Section 5.

<sup>8</sup> See Chapter III, Section 3.

<sup>9</sup> The figures for steel production in the ECSC in 1952 are shown below (output in thousands of metric tons):

	Number of steelworks	Output
Italy	129	3,535
Germany	126	15,806
Belgium	41	5,067
Luxembourg	7	3,001
France	137	10,867
Saar	6	2,823
Netherlands	4	685

Note that Italian steel production had grown in the two previous years; it had amounted to 2,362,000 tons in 1950. See Manuelli, "Situation and prospects", p. 571.

<sup>10</sup> F. Peco, "Progress of the Italian steel industry", *Review*, VIII, 2 (March 1954), pp. 152-53.

<sup>11</sup> M. Vaglio, "The European coal and steel pool and the Italian economy", *Review*, VIII, 2 (March 1954), pp. 165-66.

at Aneey by all the members of ECSC: a maximum of 15 per cent on coal and 22 per cent on iron and steel.

The ECSC was scheduled to be fully operative in 1958; with customs protection in the last two years of the transition set to be negligible, Italian steel would have to be competitive even before the deadline. Achieving this was no doubt facilitated by the fact that participation in the Community allowed Italy to buy unlimited quantities of raw materials at international prices, both from other ECSC members and, where advantageous, from others, as happened in 1953, when U.S. coal prices collapsed.

#### **4. The modernization of the steel industry**

The necessity of vying with the big steelmakers of northern Europe accelerated the building and modernization of plant. The new facilities were acknowledged to be high-yielding and employed state-of-the-art technology, as exemplified by the Lecomelt furnaces and new Thomas plants installed at Bagnoli or the rolling mills at Cornigliano, capable of turning out 750 tons of steel a day. The sector's overall capacity was expected to reach 6,700,000 tons by the end of 1954.<sup>12</sup> Its structure consisted of 61 small firms each producing less than 100,000 tons a year, 11 medium-sized firms with output ranging between 100,000 and 500,000 tons, and four large firms producing more than 500,000 tons each and 3,400,000 tons in the aggregate. The four largest companies were projected to account for 51 per cent of total capacity; together with the medium-sized firms, whose capacity was expected to reach 2,200,000 tons, the proportion was forecast to rise to 84 per cent. However, since Italy had joined a Community capable of producing some 40 million tons, there was nothing monopolistic about this structure.<sup>13</sup> Furthermore, the upgrading of production now allowed Italian industry to turn out a series of special products, such as strips, coils, wires, sheets and tubes, that could readily find a market. In short, contrary to the industry's fears, membership of the ECSC had not meant disaster. The ECSC's framework of a vast market, high competitiveness and international cooperation fostered the rapid technological progress and growth of Italy's steel industry.

#### **5. New processes and output growth in Italy**

The introduction of full-cycle production, from ore to finished steel, product specialization and the construction of a new works in Cornigliano for sheet-steel products accelerated the industry's radical transformation. Iron and steel output grew beyond all expectations. In the five years following the birth of the ECSC

<sup>12</sup> Peco, 'Progress of the Italian steel industry', p. 156.

<sup>13</sup> *Ibid.*, pp. 157-58.

steel output nearly doubled, rising incomparably faster than in the rest of the Community and outpacing steel-making powers such as the Soviet Union, the United States and the United Kingdom.<sup>14</sup>

Per capita consumption of steel in Italy grew from 84 kilogrammes in 1952 to 136 in 1957, more than the corresponding increases recorded in the rest of the Community, the United Kingdom, the United States and the Soviet Union.<sup>15</sup> Equally important, in 1956 Italy's balance of trade in steel showed a surplus in volume terms (of around 80,000 tons) for the first time ever. Another surplus was recorded in the following year, suggesting that the prospects of exports in the medium and long term justified further investment in plant. The possibility of building steelworks in Vado Ligure, Apuania and Taranto was mentioned.<sup>16</sup>

Examining the Italian steel industry in a worldwide context, Ernesto Manuelli stressed that steel consumption was rising everywhere. Total consumption had grown from 117 million tons in 1946 (30 per cent less than in the peak years before the war) to 215 million in 1952 and 360 million in 1962 – in short, world production had more than tripled. In 1962 the United States was still the leading steel producer, with 90.750 million tons, followed by the Soviet Union (76.300 million), the European Community (72.722 million), Japan (27.440 million), the United Kingdom (20.822 million), Canada (6.530 million), India (4.920 million), Australia (4.260 million), and Sweden (3.601 million). In the Community, Federal Germany ranked first with 32.563 million tons, followed by France (17.232 million), Benelux (11.354 million) and Italy (9.488 million, up more than 50 per cent in six years).<sup>17</sup>

## 6. The developing countries and the steel industry

Large-scale steelmaking, once characteristic of the industrial countries, was also becoming established in developing countries such as Brazil (with 2.5 million

<sup>14</sup> Steel production (in thousands of metric tons):

	1952	1957	% increase
France	10,867	14,096	30
Saar	2,823	3,461	23
Federal Germany	15,806	24,507	55
Belgium	5,098	6,267	23
Luxembourg	3,002	3,493	16
Netherlands	685	1,185	73
Community	41,816	59,796	43
United Kingdom	16,700	22,047	32
United States	84,500	102,047	21
Soviet Union	34,500	51,000	48

See Mantelli, "Situation and prospects", p. 572

<sup>15</sup> *Ibid.*, p. 576.

<sup>16</sup> *Ibid.*, pp. 577-78.

<sup>17</sup> E. Manuelli, "Present structure of world steel industry and setting-up of steel plants in underdeveloped countries", *Review*, XVIII, 6 (November 1963), p. 417

tons), Argentina and Turkey. In Manuelli's opinion, the need for abundant capital, a high level of technical skills and, above all, a market large and affluent enough to ensure immediate absorption of output meant that the industrial countries would continue to dominate the sector. The developing countries would, at most, be able to establish mills for basic, mass-market items that could be turned out even in smallish production units and sold directly on the local market.

Inevitably, this would cause a contraction in their imports of such products from the industrial countries.<sup>18</sup>

For quality steels, by contrast, no drop in the industrial countries' exports was expected; on the contrary, the developing countries' imports were likely to grow.<sup>19</sup> Manuelli concluded that the traditional steelmaking powers thus stood to gain by helping the newcomers start up their own steel production.<sup>20</sup>

## **7. Industrial output and steel output**

There was no sign of a let-up in the growth in world steel production, which had leapt from 120 million tons in 1945 to 530 million in 1968. The curve of world steel output correlated closely with that of total industrial output, the latter sometimes outperforming the former.<sup>21</sup> This correlation was not coincidental. Steel was used in residential building, public works, transport and communications, capital goods, agricultural and mining equipment, and constituted the foundation of progress. The more the economy developed, the more steel it produced, and vice versa. Proof of this progress was the fact that between 1950 and 1968 the world had consumed upwards of 6 billion tons of steel goods, more than had been consumed from the dawn of history to the Second World War.

Since steel consumption depended on the level of economic development, it was obvious why the United States, Germany, Sweden or Japan consumed more than, say, Pakistan or Egypt, and why Italy's per capita consumption had risen from 60 kilogrammes in 1950 to 200 kg in 1960 and more than 300 kg in 1968. Over the same period Italy's steel output had grown from around 3 million to 17.4 million tons, at an average rate of more than 10 per cent. Output looked set to reach 20 million tons and per capita consumption 370 kg in 1969.<sup>22</sup>

## **8. Coastal steelworks**

With such high production figures, the Italian steel industry had become increasingly dependent on imported ore. In 1968 Italy, like the Netherlands,

<sup>18</sup> *Ibid.*, pp. 421-24.

<sup>19</sup> *Ibid.*, p. 425.

<sup>20</sup> *Ibid.*, p. 426.

<sup>21</sup> E. Manuelli, "Expansion of world steel industry and economic and social development of peoples", *Review*, XXIV, 1 (January 1970), p. 15.

<sup>22</sup> *Ibid.*, p. 16.

imported all the ore it used.<sup>23</sup> As in other major steel-producing countries, import dependency made it necessary to build steelworks on the seaboard. The technology was also revolutionized: from the introduction of rolled steel in the thirties, to that of the rapid conversion of pig iron into steel through the LD process in the fifties, to the spread of steel casting in the late sixties. Along with these radical innovations, the allied technologies changed too. Production was automated and, in order to take advantage of economies of scale, the capacity of the steelworks was augmented so that each could turn out 10 million tons, i.e. more than Britain's total output at the start of the Second World War.<sup>24</sup>

Towards the end of the sixties Italy already had furnaces capable of producing up to 6,000 tons a day and steelworks with LD converters able to produce 350 tons a day, along with hot-rolling mills with a capacity of more than 5 million tons a year.<sup>25</sup> Italy now ranked seventh worldwide and third in the Community. In turn, the latter's share of world steel output had risen from 32.1 per cent in 1950 to 33.7 per cent in 1968, overtaking the American, whose share declined from 49.5 to 26.9 per cent. Over the same period the Soviet Union's share increased from 14.7 to 26.9 per cent and that of Asia from 2.6 to 17.1 per cent.<sup>26</sup>

## **9. Ore from overseas**

Quality increased along with quantity. Manuelli observed that the introduction of lighter steel made it possible to slash the amount of steel used in some projects. A case in point was the Empire State Building, which would have required just over half as much steel if it had been built in 1969 instead of in 1931.<sup>27</sup>

As steel prices were considerably lower compared with 1960, the outlook was for further growth in demand. At the conference of the International Iron and Steel Institute in 1967, the consensus forecast was that steel consumption would rise to 700 million tons by 1975.<sup>28</sup> This would create ore-supply problems, the more since mining had diminished in the European Community between 1960 and 1968, whereas ore production had increased considerably in the Americas, the Soviet Union, Australia, Africa (above all in Liberia, South Africa and Mauritania) and, to a lesser extent, Asia.<sup>29</sup> The growth of iron mining in places far removed from the major steel production centres involved an enormous increase in maritime transport. The expected further rise in consumption entailed expenditure on prospecting and mine development totalling an estimated \$18

<sup>23</sup> *Ibid.*, pp. 16-17.

<sup>24</sup> *Ibid.*, p. 17.

<sup>25</sup> *Ibid.*

<sup>26</sup> *Ibid.*, p. 18.

<sup>27</sup> *Ibid.*, p. 19.

<sup>28</sup> *Ibid.*, p. 20.

<sup>29</sup> *Ibid.*, p. 25.

billion by 1980 and between \$25 billion and \$40 billion until the end of the century. Massive capital spending was also expected for intercontinental transport, which was forecast to rise from 600 million tons in 1970 to 1 billion tons in 1980 and to between 1.4 and 1.8 billion tons at the end of the century. The consumption of coal was also expected to increase, though not as much as that of iron ore, given the use of other energy sources. This, in turn, would bring about major investment in coal mining and shipping.<sup>30</sup>

## 10. The crisis in the steel industry

The revolution under way in Italy and the other steelmaking countries, involving the selection of plant sites, technologies and the scale of production, also saw a good number of new producers enter the market. As a result, in 1973 output already exceeded the 700 million tons forecast for 1975. Even so, production was unable to satisfy the demand for some products.<sup>31</sup>

However, if 1973 was an excellent year for the world steel industry, it was not one for Italy's producers.<sup>32</sup> Apart from the impossibility of augmenting investment because of the impact of the oil crisis on macroeconomic and sectorial conditions, the Italian steel industry was unable to make up for the losses caused by strikes in the early months of the year and by a sizable increase in wages, which boosted the incidence of labour costs to 20 per cent by the end of 1972. It was penalized above all by the fact that the wage increases it had granted between 1965 and 1972 had been among the highest in Europe, equal to those recorded in Germany and the Netherlands, countries with a far more robust industrial structure, almost double those in the United States and much larger than those in France and Luxembourg.<sup>33</sup> In the event, the oil crisis caused a slowdown in steel production, although this was considered a short-term development that would give way to renewed expansion in the long run.

<sup>30</sup> *Ibid.*, pp. 22-28.

<sup>31</sup> F. Manuelli, "Where is the world steel industry heading?", *Review*, XXVIII, 2 (March 1974), pp. 103-104.

<sup>32</sup> *Ibid.*, p. 104.

<sup>33</sup> *Ibid.*, p. 107.