Rachel Carson Center
Perspectives

How to cite:

Bartoletto, Silvana. "Fossil Fuels Consumption and Economic Growth in Italy in the Last Two Centuries." In: "Energy Transitions in History," edited by Richard W. Unger, *RCC Perspectives* 2013, no. 2, 37–41.

All issues of *RCC Perspectives* are available online. To view past issues, and to learn more about the Rachel Carson Center for Environment and Society, please visit www.rachelcarsoncenter.de.

Rachel Carson Center for Environment and Society
Leopoldstrasse 11a, 80802 Munich, GERMANY

ISSN 2190-8087

SPONSORED BY THE

Federal Ministry of Education and Research

Deutsches Museum

LMU LUDWIG-MAXIMILIANS-UNIVERSITÄT MÜNCHEN

Silvana Bartoletto

Fossil Fuels Consumption and Economic Growth in Italy in the Last Two Centuries

During the last two centuries, both the size of the economy and the level of energy consumption have grown at a faster rate than the world's population. As a consequence, modern economies are able to produce goods and services on a scale inconceivable in pre-industrial economies. Even though energy has played an important role in the pattern of Italian economic development, it has only recently received the attention of historians of the Italian economy.

Energy was of central importance in the transition from the traditional to the modern economy. The introduction of new energy carriers and of engines able to transform energy into mechanical work was a necessary, although not unique, condition of modern growth in Europe and subsequently in the rest of the world. It is important, however, to consider differences between countries. While energy transition took place rapidly in northern Europe, especially in England and Wales, this was not the case in southern Europe. There, on the eve of the twentieth century, traditional energy carriers (firewood, water, wind power, fodder for animals, and food for humans) represented 70–80 percent of total energy consumed. In Italy, in particular, the contribution of traditional energy to total energy input didn't drop below 50 percent until just before World War II. Italy lacks domestic sources of fossil fuels and it is almost entirely dependent on external supplies. Energy dependence in 2009, for example, was about 84 percent.

Fossil fuels consumption in Italy had four main phases: the first, from 1861 to the eve of World War I, had a growth rate of slightly less than five percent per year; the second phase, corresponding to the Interwar period (1914–1945), had an overall growth rate of -1.34 percent; the third, from 1946 to 1973, had a growth rate of 17 percent per year; and the last phase, from 1974 to the present, had a growth rate lower than one percent per year.

The scarcity of energy resources has seriously affected the process of industrialization in Italy. Industrialization has followed a different path from countries like England, where the Industrial Revolution occurred much earlier. In fact, Italy has specialized

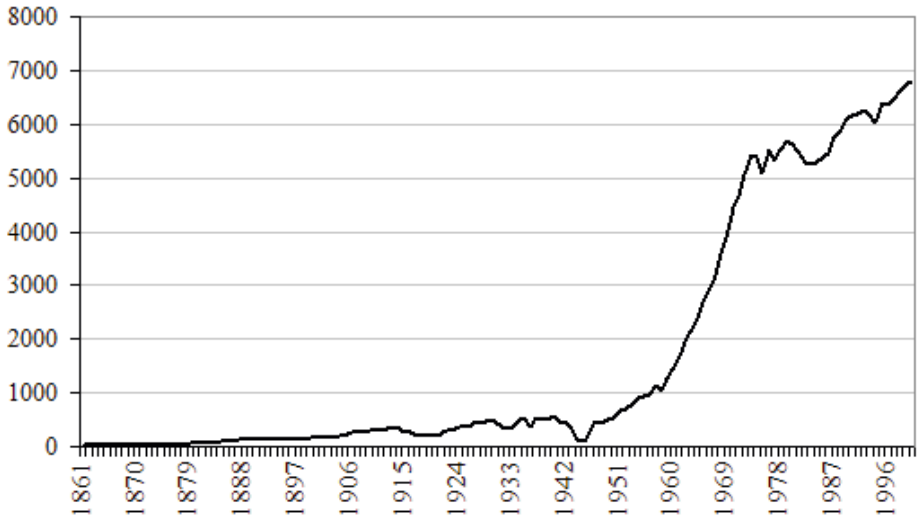

Figure 1: Fossil fuels consumption in Italy, 1861-2000 (Petajoules)

in industries with a high intensity of labor, which has been relatively abundant, and a low intensity of energy, which has been scarce relative to countries in northern Europe and North America. In 1910, the United Kingdom produced about 270,000 tons of coal per year, Germany 150,000, and Italy only 3,000. A census report for 1911 stated that about 58 percent of the total horsepower of Italian industries (1,603,836 hp) came from water power, while only 29 percent came from steam. Coal was imported from England at the beginning of the nineteenth century, or even earlier. At the time of Italian unification, coal imports, especially through Genoa, were increasing. The country's scarcity of fossil fuels resulted in fuel costs three to five times higher than in competing western European economies. Much of Italy's industrial growth from the 1880s to 1913 depended on the introduction of hydroelectricity, which expanded rapidly. On the eve of World War I, Italy was producing even more hydroelectricity than France. Until the 1960s, hydroelectricity in Italy was more important than electricity generated in thermal plants. Today, Italy is still the third largest producer of hydroelectricity in Europe, after France and Norway.

Italian oil imports started in 1864. Oil remained of secondary importance until the 1950s, when it surpassed coal as a source of energy. Use increased rapidly until 1973 and slowly declined thereafter. Natural gas was already used at the end of the nine-

teenth century but did not become important until the 1950s, surpassing coal in the 1970s. In 1973, fossil fuels represented about 88 percent of total energy consumption. The oil price shocks of the 1970s had a significant impact on the Italian economy, causing a slowdown in the growth of energy consumption per capita. This was, however, only temporary, because oil consumption soon picked up speed, albeit at a lower growth rate than before. By the eve of the energy crisis of the 1970s, oil was the most important source of energy. In 1973, oil accounted for 82 percent of total consumption, coal for 6 percent, and natural gas for 11 percent. The contribution of oil later fell to 54 percent in 2000 while natural gas rose to 37 percent.

Nevertheless, modern energy consumption in Italy is still lower than in other European countries, and lower than the European average. The differences evident in Italy's pattern of growth have led historians to emphasize the elements of weakness and backwardness it presents, rather than those of originality and strength. While this pattern of low energy consumption distinguishes Italy from the northern and central European countries, it resembles that of other Mediterranean countries such as Spain.

The passage from an economy based on traditional energy sources to one based on fossil fuels had significant environmental consequences. The rise in fossil fuel consumption has led to an immense increase in carbon dioxide emissions, producing one of the most serious environmental problems of our time: global warming. Changes in the composition of the energy basket have an important effect on CO_2 emissions, because different energy carriers emit different amounts of CO_2. The historical transitions from firewood to coal, oil, and gas in the primary energy supply can be summarized as a gradual transition from fuels with low hydrogen/carbon ratios to fuels with high hydrogen/carbon ratios. The more hydrogen relative to carbon, the more energy is obtainable with fewer emissions. For traditional energy carriers such as firewood, this ratio (H/C) is 0.1:1; for coal, it is 0.5:1 to 1:1 (depending on the type of coal); for oil, 2:1; for natural gas, 4:1.

Carbon dioxide emissions from fossil fuels consumption rose from three million tons in 1870 to 444 million tons in 2000 (fig. 2). The increase in emissions was particularly stark after the Italian takeoff of the 1950s. Between 1950 and 1973 emissions rose from 46 million tons to about 400 million tons, with an average growth rate of 11 percent.

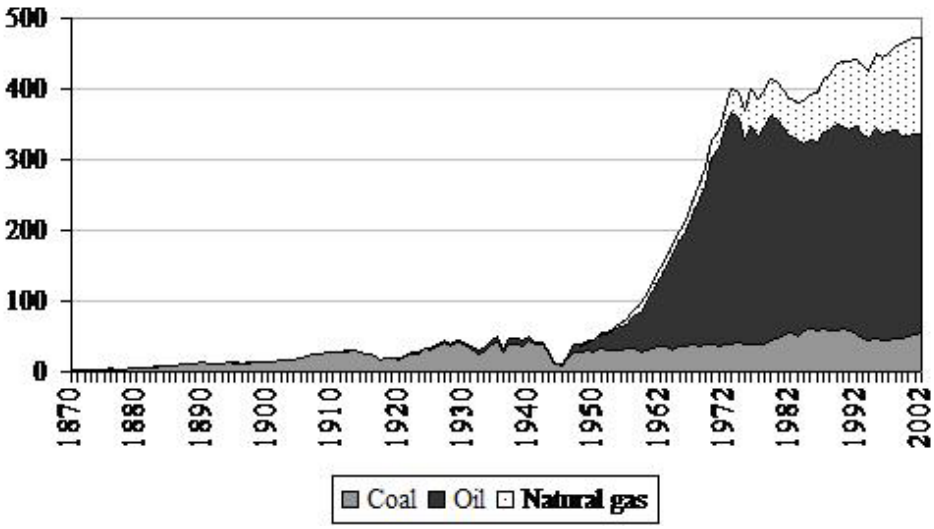

Figure 2: Total CO_2 emissions in Italy 1870–2000 (million tons)

Recent estimates indicate that proven reserves of fossil fuels are likely to be inadequate to sustain the potential growth of the world economy to the end of the present century. Moreover, in Italy the role of renewable energy sources, including wood and geothermal energy, is still marginal. In 2009, renewable energy sources accounted for about eight percent of total primary energy consumption. The transition to fossil fuels, which was the basis of modern growth during the last century, now risks triggering a new Malthusian trap if there is not a reduction in dependence on fossil fuels and encouragement for the development and consumption of alternative energy sources.

Further Reading

Bartoletto, Silvana. 2010/2011. "Energy and Economic Growth in Europe: The Last Two Centuries." *Rivista di politica economica* 99/100: 57–75.

———. 2011. "Energia e Ambiente in Europa (1800–2010)." *Rivista di Studi sulla Sostenibilità* 2: 59–78.

———. 2012. "Patterns of Energy Transitions: The Long Term Role of Energy in the Economic Growth of Europe." In *Past and Present Energy Societies: How Energy Connects Politics, Technologies and Cultures*, edited by Nina Möllers and Karin Zachmann, 305–33. Bielefeld: Transcript Verlag.

Bartoletto, Silvana, and Mario del Mar Rubio. 2008. "Energy Transition and CO_2 Emissions in Southern Europe: Italy and Spain (1861–2000)." *Global Environment* 2: 46–81.