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Power to the People: Energy in Europe over the Last Five Centuries (Astrid Kander, Paolo Malanima and Paul Warde, 2013)

Référence bibliographique

Astrid Kander, Paolo Malanima and Paul Warde, *Power to the People: Energy in Europe over the Last Five Centuries* (Princeton: Princeton University Press, 2013)

Résumé

Kander, Malanima and Warde's book aims to demonstrate the potential of energy statistics to understand the historical and economic evolutions of European countries since the Renaissance. During the last five centuries, successive energy transitions allowed an unequaled expansion of energy consumption, leading to our current dependence on fossil fuels. According to the authors, rises in energy consumption and economic growth seem strongly intertwined. Nevertheless, the authors' tendency to limit their analysis to neoclassical economic patterns represents the major questionable point of this book.

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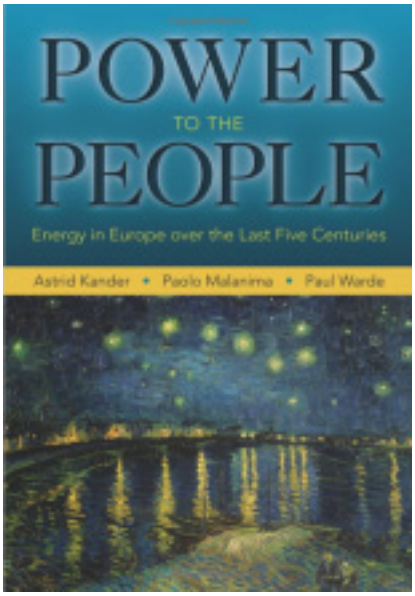

1 The economic history of Europe since the sixteenth century has already led to extensive historical research coverage with divergent analytical viewpoints. Kander, Malanima and Warde do not attempt to summarize this research. More precisely, they aim to offer a new narrative of the history of modernity through the lens of energy consumption. According to them, historians and economists did not sufficiently put the stress on the historical role of energy in the shaping of our modern economies. Yet "all things need energy, and all actions are transformation of energy" (p.1). This statement illustrates clearly the intellectual approach of this book. Inasmuch as energy is at the heart of every human activity and natural process, any economic production in a specific historical society takes place within a broader energy economy that characterizes this society. From this point of view, the history of human economies can be studied as a history of energy dependence. This book concentrates on modern times, since this short period in history represented a very specific moment in terms of energy consumption.

2 *Power to the People* is the result of an important work of data compilation achieved by the Long-Term Energy and Growth (LEG), an international research network dedicated to the production of comparable historical assets of energy consumption around the world (principally Western European countries). The database that served as a reference for this book is freely accessible online on www.energyhistory.com. It represents a very impressive and useful work for historians, since the compilation of such quantitative data allowing international comparisons over several centuries is always a tricky (and sometimes hazardous) task. With these data, the authors wish to illustrate the decisive role played by the energy factor in the evolution of European economies in the last five centuries.

3 The major center of interest of this book is to understand the links between energy consumption and economic growth since the beginning of modern times. The main argument of the authors is that modern development would not have been possible without successive historical changes in the energy model of European economies. As argued by Edward Anthony Wrigley,[1] the industrialization of Europe meant a structural shift from an "*organic dependent*" to a "*fossil fuel dependent*" economy. But as the title suggests, the authors also show an interest in the links between the last centuries' energy transformations and people's rising "*empowerment*". Following Timothy Mitchell's analysis,[2] Kander, Malanima and Warde suggest that the increase of energy consumption participated in people's emancipation over time. This went mainly through the political power brought to energy workers by the first industrial revolution, and also through the reduction of working time supposedly brought by the consumer society.

4 The book is divided into three sections, in accordance with the traditional chronology of economic modernity: pre-industrial economies (from 1500 to 1800), the first industrial revolution (from 1800 to 1900), and the second and third industrial revolutions (twentieth century). Each part was written by one of the authors, depending on their historical expertise: Paolo Malanima on pre-industrial times, Paul Warde on the first industrial revolution, and Astrid Kander on the

1 Edward A. Wrigley, *Energy and the English Industrial Revolution* (Cambridge - New York: Cambridge University Press, 2010).

2 Timothy Mitchell, *Carbon Democracy: Political Power in the Age of Oil* (London - New York: Verso, 2011).

twentieth century. In each historical phase, the authors try to identify what were the scale and the economic drivers (mainly technological breakthroughs) of the energy transitions that participated in reshaping the world.

AN ENERGY HISTORY OF EUROPEAN ECONOMIES OR AN ECONOMIC HISTORY OF EUROPEAN ENERGY?

5 This question could seem rhetorical, but it is worth raising. In order to well understand Kandler, Malanima and Warde's book, whose economic reasoning is sometimes complicated to follow, it is important to identify their fundamental concern. And one could argue that the latter is more of an economic nature than an historical one. Of course, the authors do not forget to mention the multiple changes that accompanied the energy transitions in European ways of living and in social relations, but this is not the core of their questioning. Their concern is to understand how the energy resources and devices participated in the successive phases of economic growth. In order to do so, they borrow several economic concepts that allow them to write their narrative of the energy revolutions.

6 The most important of these notions is the "*development blocks*" as conceptualized by the Swedish economist Erik Dahmén.[3] It refers to a set of industrial products and technologies that are strongly interconnected in their economic development. They form a block in the sense that their economic path is codependent. For example, coal, steam engines and steel formed a major development block during the first industrial revolution because coal's success would not have happened without the steam engines' needs in coal. Those engines themselves needed cheap steel in order to be manufactured, and that would have been impossible without the new forging techniques using cheap coal. In order to follow the reciprocal influences of the products and techniques inside one development block, the authors study their reciprocal price dynamics over time.

7 Following the very classic narrative of industrial history, inventions and innovations play a major role in Kandler, Malanima and Warde's story. The rise of coal, oil and electricity relied on major technical and scientific breakthroughs such as steam and petrol engines, that the authors call "*macro-inventions*". But they also attach importance to more local, daily and small-scale innovations in the overall process of industrial revolution, in accordance with the research of historians like Joel Mokyr[4] or David Edgerton[5] pointing out the economic role of "*micro-inventions*" and the persistence of old techniques in the new world. The numerous micro-inventions that made it possible to adapt the steam engine to factory machines where almost historically as important as the invention of the steam engine itself.

8 As the intellectual reasoning of Kander, Malanima and Warde is of an economic nature, they use several concepts that enable them to illustrate the classical laws of the market. These are mainly the "*market suction*" and "*market widening*" notions. While the former allows us to understand the rise in price of a good that is necessary for a specific production process (for example oil required by engines), the latter explains how low costs of a resource or a technical device can stimulate the use of new energy forms.

9 Finally, in order to write their quantitative history of energy, the authors created several markers that allow them to link the historical energy consumption to economic figures. The most important of these markers probably is "*energy intensity*", defined as the ratio between the total energy consumption of a country and its gross domestic product (GDP). It is then a useful way to quantify how much energy was

3 Erik Dahmén, "'Development Blocks' in Industrial Economics", *Industrial Dynamics*, vol. 10, 1989, 109–21.

4 Joel Mokyr, *The Lever of Riches: Technological Creativity and Economic Progress* (New York: Oxford University Press, 1990).

5 David Edgerton, *The Shock of the Old: Technology and Global History* (New York: Oxford University Press, 2006).

necessary to produce an amount of growth at a given time and also to evaluate the evolution of the dependency of growth in energy consumption. The smaller this number is, the less energy is needed to produce the same amount of riches.

PRE-INDUSTRIAL ECONOMIES AND THE "PHOTOSYNTHETIC CONSTRAINT"

10 The particularity of Malanima's approach is to consider food as a primary energy source. This allows him to illustrate what he considers to be the economic limit of the energy systems of the pre-industrial agrarian societies. The majority of economic production was performed by human and animal muscles, themselves principally assigned to energy production. Indeed, most of working time was used in order to produce daily energy supplies: agricultural products for human nutrition, fodder for working animals, and firewood for heating. Moreover, the low fertility of European soils required the cultivation of bigger areas compared to other parts of the world. Wind and water-mills were very important as the only sources of non-muscular mechanical energy. They played an important role in the daily life of village communities. But quantitatively speaking compared to cereals, fodder and wood, wind and water represented only a very small amount of the total energy consumption.

11 Pre-industrial societies were characterized by their predominant use of reproducible energy sources. Until the 18thC. coal represented an insignificant energy source for heating in European countries, except in England where land-scarcity led to a growing consumption of coal from the sixteenth century onwards. According to Malanima, this predominance of vegetal energy systems in pre-industrial societies was a major barrier to economic growth. There were physiological limitations to the increase of human and animal work yield – also implying severe constraints on transport capacities –, and the possibilities of increasing the agricultural productivity were very limited. As a consequence, pre-industrial economies were very sensitive to temperature and climate variations. Nevertheless, the introduction of new crop varieties from America (potatoes, maize, etc.) and the generalization of crop rotation techniques made it possible to compensate population growth from 1500 to 1800.

12 Malanima's account draws a very rigid or static picture of these three centuries of economic and technical history. For him, "*the agricultural energy basis of past civilizations was the main obstacle to their economic progress*" (80). The inelastic availability of cultivable lands, and the competition between agriculture, pasture and forest activities almost made economic growth impossible.

COAL AND THE FIRST INDUSTRIAL REVOLUTION

13 According to the authors, coal was what allowed European economies to free themselves from the organic energy constraint. The majority of wealth created was no longer the result of the work of muscles, but of machines. Warde puts the stress on a particularity of this new energy system centered on coal, steam power and steel: steam engines made it possible to deploy an amount of power that no previous organic energy converter was able to give. Then steam engines did not only replace human and animal work, they multiplied the production capacities of industrial economies, bringing growth possibilities unknown until then. This growth was also supported by the "*transport revolution*" brought about by steam ships and locomotives. And this new economic growth implied an important increase in the European energy consumption in return.

14 Britain appears at the heart of these dynamics. For the authors, this is mainly because of her historical advantage in coal consumption. The technical innovations that led to industrial steam engines were firstly developed there because of her needs in deeper mine digging. The development block formed by coal, steam engines and steel progressively opened the way to easy availability of cheap energy for countries with sufficient coal deposits. This radically transformed the geography of wealth production on global and national scales. Inside countries, industrial cities with high concentrations of workers became the

core of the production of riches. At an international level Britain, as the most industrialized country and the first European coal producer, clearly played the leading role in the nineteenth century economy. National differences in coal deposits and in the transition dynamics to an industrial economy led to an international and combined division of labor. Even if there were no close links between total energy consumption and income in a cross-country comparison for this period, it appears that the income of a country was clearly linked to the share of coal in its total energy consumption. In other words: nations seeking important growth rates had to go through a coal transition for their industrial and/or transport development.

15 Warde insists on both the positive and negative side effects of this energy revolution, in terms of pollution and social changes. In particular it implied a major reorganization of productive processes, with the imposition of a strong discipline on workers, no longer useful for their muscular strength but for their ability in monitoring machines. For the authors, this could be characterized as a "*labor saving*" process. In return, with their new and vital economic role, coal workers were able to gain new social rights and to impulse the emergence of workers' organizations.

16 Warde also puts the stress on the fact that this coal revolution like the following energy revolutions did not imply the end of the organic energy system. Agriculture was even able to win important productivity rates at the end of the nineteenth century with the development of synthetic fertilizers. And animals still played a vital role for short-distance transport on agricultural fields and in cities. But from a quantitative point of view, organic forms of energy had become insignificant during the nineteenth century.

OIL, ELECTRICITY AND THE INFORMATION AND COMMUNICATION TECHNOLOGIES IN THE 20TH C.

17 The twentieth century was characterized by two industrial revolutions and new development blocks studied by Kander. Like the previous ones, they strongly contributed to the rise in energy consumption and the change in the positioning of the countries. Quantitatively speaking, coal continued to represent an important part of European growth during the whole of the twentieth century. But oil and electricity made it possible to diversify energy sources and brought new domestic and industrial usages.

18 The development block formed by oil and the internal combustion motor radically transformed the geography of energy supply on a global scale, with the economic emergence of the USA. The liquid nature of oil also allowed more flexibility in its provision. For the authors, the oil development block is centered on the transport domain. It made a new transport revolution possible with cars, fuel ships, and planes. Internal combustion engines created a market suction for oil, that finally ended in a market widening dynamics with the necessity to find other outlets than petrol for crude oil (chemistry, heating, etc.).

19 According to Kander, the electricity and electric engines development block was revolutionary because of the "*modularity*" of electric power: it can be produced by many primary sources of energy (water, coal, nuclear, etc.) and electric motors can perform a great diversity of tasks from factories to houses. The fluidity of the new energy system can be illustrated by the reaction of the European countries after the two 1970 s' oil shocks: they witnessed a diversification of their energy primary sources with a relative decline in oil consumption and a rise in nuclear electricity and natural gas consumption.

20 Like the coal development, the oil and electricity emergence required many technical inventions and innovations that led to major efficiency gains in terms of energy use. But as during the nineteenth century, the total energy consumption did not stop rising. From 1800 to 1970 innovations in energy savings always meant more energy consumption. But according to Kander the period after 1970, characterized by the Information and Communication Technologies (ICT) development block, is historically remarkable in the sense that it witnessed a reduction of energy intensity and a stabilization of energy consumption per capita.

This point is probably the most interesting and groundbreaking argument of the book. Kander rejects any interpretation of this energy intensity reduction in terms of "dematerialization" of Western economies. For the author, this phenomenon must be understood as the power-saving effect of the generalization of microelectronic devices in industrial and domestic uses. These devices would have permitted a reorganization and a rationalization of production processes that strongly helped to save energy. Furthermore, the growing specialization of European industry in light manufacturing rather than raw industry would also have permitted to reduce the amount of energy needed to produce the same amount of riches.

A (NEO)CLASSIC NARRATIVE OF EUROPEAN INDUSTRIAL HISTORY?

21 Kander, Malanima and Warde's book represents both an impressive overview of the most important research work on history of energy in Europe, and a challenging attempt to re-inject the energy factor into the historical economic analysis. Not only do the authors propose a quantified history of energy consumption and dependence in the European countries. They most importantly offer an economic framework of interpretation (development blocks, market suction and widening, energy intensity) that allows them to link their quantitative energy data to growth figures. But behind this original approach, the narrative of modernity offered by the author follows the most classic historiography on industrial revolution. Modern economies were profoundly reshaped by a series of technical revolutions in the energy domain that inevitably led to the emergence of our industrial world.

22 At first, it may seem difficult to characterize the authors' framework in terms of economic analysis: development blocks and the role of innovations evoke Schumpeter's economics, while the interpretations in terms of market suction and widening look more like classical Smithian economics. But in the end, the authors clearly opt for a neoclassical analysis. Price dynamics are the main factor of the evolution of the last centuries' economies. Path-breaking innovations and micro-inventions in the energy domain were historically important because they made it possible to impulse the new market dynamics (widening of demand, price fall, etc.) that radically transformed our modern societies. According to the authors, the basic laws of the market were the real agents of the historical energy transitions. This represents an important limit of this book, because its narrative strongly tends to depoliticize and naturalize energy history over the last centuries, as if there were no winner and loser of these transitions. Yet for several decades now, important works on social history of science and technology put the stress on the fact that no technical evolution ever went without protests and the reinforcement of political and economic interest for some people.[6]

23 Another limit of this book is its restriction to a West European geographical scope. This would not be a problem if the author only intended to produce a statistical survey. But the point here is to make a whole analysis of European economies in the chosen historical period. Even in the sixteenth century, European economies had begun to be integrated into global networks of trade and production. Is it really meaningful then, to link European countries growth rates (a more and more international phenomena since the sixteenth century) to national energy consumption data? For example, the authors did not take into account the food consumption of slaves on the American continent, while their work in cotton production strongly participated in shaping the West European economies from 1600 to 1800. And for the current period, the authors' interpretation of the power saving phenomena in European countries is strongly questionable. With the current globalization of industrial production, the international division of labor and the strong co-dependency between every national economy, does it really make sense to attempt to link national growth products with national energy consumption data?

6 Langdon Winner, "Do Artifacts Have Politics?", *Daedalus*, vol. 109/1, 1980, 121–36; François Jarrige, *Technocritiques : Du refus des machines à la contestation des technosciences* (Paris : La Découverte, 2014).

On a global scale, energy consumption has not stopped growing since 1970. And would it be possible for European countries to currently experience such an energy saving phenomena, if Asian energy consumption had not risen remarkably since 1970?

OTHER POSSIBLE NARRATIVES FOR THE ENERGY HISTORY OF EUROPE

24 The Kander, Malanima and Warde's limitation to a classical economics analysis too strongly restrains the understanding of the relations between energy and economic transformations since the sixteenth century. Some research tracks will here be suggested in order to diversify the narratives that can be drawn from the data compiled by the authors. These proposals are inspired by recent research in critical history of science and technology, such as Christophe Bonneuil and Jean-Baptiste Fressoz's work on the Anthropocene.[7] Each of these narratives shares the same approach: they do not analyze energy transitions as the achievement of an inevitable economic process opened by technical innovations. On the contrary, they believe that energy transitions were the result of political choices and very individual economic interests.

25 Firstly, we could think of another reading of the relations between emancipation and energy. This story would then be centered on the historical struggles against and for energy transformations. For example, it seems obvious for the authors to consider firewood as a commodity since the sixteenth century. However, research in social history such as Edward Palmer Thompson's on forest-wood in Britain[8] clearly demonstrated that the emergence of wood as an economic commodity was the result of several decades of social struggles about the imposition of a wood market. This was rendered possible with the strengthening of the repressive modern states. Land and wood scarcity "for the people" in England was the result of a long process of land and forest appropriation and enclosure with state support. Coal emergence and the industrialization of European economies would have been impossible without these severe political measures, that allowed the making of the urban working class. If energy transitions had always meant empowerment for the people, there would have been no Luddite movements in the nineteenth century, nor current struggles for environmental justice. Furthermore, one could argue that the energy intensity reduction phenomena described by Kander at the end of the book are much more related to the emergence of ecological struggles in the years 1970 than it is to ICT devices. Confronted with growing concerns about environmental destruction and climate change, European countries have been progressively pushed into presenting a lower carbon dioxide emission profile.

26 Another way to reinterpret the history of energy in Europe since 1500 would be an attempt to link the long term energy series provided by Kander, Malanima and Warde to the question of the emergence of the modern states. As many works in economic history or in history of science and technology demonstrated, those modern states were strongly involved in pushing technological development as a way of increasing their power.[9] From this point of view, economic markets are not just abstract entities but they result from very concrete state economic policies. During the last five centuries energy resources were not only commodities but also a central means for European states in order to affirm their economic and military superiority. The cheapness of coal in nineteenth century England had a lot to do with canal construction by the state in order to allow coal transport. And European electricity would not have proved profitable

7 Christophe Bonneuil, Jean-Baptiste Fressoz, *The Shock of the Anthropocene: The Earth, History and Us* (London, New York: Verso, 2017).

8 Douglas Hay, Peter Linebaugh, John G. Rule, Edward P. Thompson, Cal Winslow, *Albion's Fatal Tree: Crime and Society in Eighteenth-Century England* (London, New York: Verso, 2011 [1975]).

9 As examples for the British and French cases, see Eric H. Ash, *Power, Knowledge, and Expertise in Elizabethan England* (Baltimore, London: Johns Hopkins University Press, 2004). Philippe Minard, La Fortune du colbertisme. État et industrie dans la France des Lumières (Paris: Fayard, 1998).

without the huge state investments in electrical infrastructure and nuclear devices. And the control of energy resources was one of the priorities of European countries' imperialistic policies throughout the nineteenth and twentieth
27 centuries.

Many other narratives could be drawn from Kander, Malanima and Warde's book. One of these would be to follow the evolution of the concept of energy during the historical period chosen by the authors. The latter do not examine as historians the scientific notion that they use to construct their data, as if it was obvious that firewood of the sixteenth century, muscle-work from seventeenth century horses, coal of the nineteenth century and electricity from a twentieth century nuclear plant were commensurable things. This in fact is the result of a long-time evolution in the history of ideas, that was strongly linked to the technical evolutions that the authors describe in their book. Nevertheless, those possible alternatives in the reading of the last five centuries' energy history do not invalidate the serious work of Kander Malanima and Warde. They just remind the readers about the necessity of not restraining the understanding of energy consumption history to a market dynamics. In any case, *Power to the People* and its numerous figures and graphs remain a very useful reference for anyone interested in the history of energy consumption over the last five centuries.

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