Analysis

Not only subterranean forests: Wood consumption and economic development in Britain (1850–1938)

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A B S T R A C T

This paper analyzes wood consumption in Britain over the period 1850–1938. We calculate the apparent consumption of wood, taking into account both net imports of wood and the home harvest. We then develop some quantitative exercises that correlate wood consumption with GDP, with prices of wood and iron (as an alternative material to wood) and with other measures. The main conclusion is that, although wood had lost its economic centrality after the energy transition, wood consumption continued to grow in Britain both in absolute and relative terms, showing a positive elasticity to GDP superior to the unit. This result allows us to reach a more complete understanding of the socio-metabolic transition associated with the Industrial Revolution. Britain faced the increase in wood demand by relying almost entirely on imported wood, reinforcing the idea that the decoupling of economic growth from land use must to be handled with care, and should be observed not at the national level but on a global scale. Although British economic development was to a great extent focussed on what has been called the “subterranean forests” of coal, it simultaneously supported large tracts of surface foreign forest.

1. Introduction

Although, as is evident, the forest is much more than a storehouse of timber, wood has been – and to a significant extent continues to be – the main economic product obtained from forests. Therefore, the evolution of wood use throughout history can provide interesting keys to a better understanding of the criteria and the specific ways in which forests have been exploited. As is well known, the economic uses of wood changed radically as industrialization spread throughout the western world. In Early Modern Europe, wood was a key element in the economy, since it was the main source of energy for daily life and for the operation of many industries. It was also the essential raw material in the manufacture of many products. As Ward (2006) has pointed out, wood can be considered, at that moment, as an “avenue to understanding much of the needs, tensions, conflicts and attitudes of the day”. Furthermore, according to Moore (2010a), the access to wood reserves was one of the key elements in explaining the success – and the failure – of European Empires at the dawn of the Capitalist Era.

With industrialization, new materials and sources of energy, in the form of fossil fuels, entered the economic system, diminishing the importance of biomass-based energy systems (Wrigley, 1988; 2010). This was one of the main elements of a process that has been described by some authors as a change in the social metabolism of economies (Fischer-Kowalski and Haberl, 1993; Krausmann, 2001; Krausmann and Haberl, 2002; Krausmann et al., 2003). From then on, energy came from what has been called the “subterranean forest” of coal (Sieferle, 2001), through which modern economies could be decoupled from the supply of energy coming from the surface of the land (Krausmann et al., 2008; Krausmann et al., 2009).

Nevertheless, do those changes mean that wood consumption declined with industrialization? Could we thus speak of a wood de-materialization associated with modern industrial growth? Was industrialization just a matter of the subterranean forest? In an earlier work (Iriarte-Goñi and Ayuda, 2008), we analyzed the evolution of wood consumption in Spain throughout the first and second industrial revolutions, discovering two salient facts. On the one hand, the importance of wood in relation to GDP tended to decrease (through the decline in firewood consumption); but on the other hand, the total consumption of wood continued to increase (via the increase of wood used as a raw material) and the elasticity of wood as a raw material (with respect to GDP) had a positive sign. Consequently, the economic pressure on forests also increased, as industrialization continued to develop in Spain.

The basic objective of this paper is to revisit that topic for the British case, to see whether or not the most developed economy in the world in the 19th century followed a trend similar to that of the Spanish case. Our basic hypothesis is that, far from producing a wood dematerialization
process, British economic growth from 1850 to 1938 required increased quantities of imported wood. From this perspective, the British industrialization process was not only a question of subterranean forest, but also a question of forest exploitation abroad.

In Section 2 of this paper, we calculate the apparent consumption of wood in Britain, taking into account both net imports of wood and an estimation of the home harvest. In Section 3, we develop some quantitative exercises correlating wood consumption with GDP, with prices of wood and iron (as an alternative material to wood) and with other measures. In Section 4, we discuss the effects of economic growth on the use of wood, the forces driving the substitution – or not – of this material, the effects of technological change applied to wood itself, and the effects of growing consumption on forest exploitation. The paper finishes with concluding remarks.

2. An Estimation of British Wood Consumption

Our interest lies in the account of wood, in physical terms, as part of the biomass material flow entering the economic system. British Statistics do not include annual data on wood until the 1940s. Before that date, one way to approximate that measure is to calculate “apparent consumption” following the formula: consumption = wood imports, minus wood exports, plus home grown wood. Our series of net imports include imports and exports of solid wood and imports, minus wood exports, plus home grown wood. Our series of parent consumption that date, one way to approximate that measure is to calculate with prices of wood and iron (as an alternative material to wood)

From 1885, but statistics only report systematic annual data from that date on. The United Kingdom did not export pulp wood during this period. The conversion of original measures of wood and pulp wood from the source to cubic meters, has been done following ratios provided by Zapata (2001).

2. Data on imports and exports of solid wood have been extracted from the British Statistical Abstracts of the years 1850–1938. Imports of pulp wood began before 1885, but statistics only report systematic annual data from that date on. The United Kingdom did not export pulp wood during this period. The conversion of original measures of wood and pulp wood from the source to cubic meters, has been done following ratios provided by Zapata (2001).

3. From 1900 to 1913 the annual average of net imports of solid wood was 13.3 million m³. From 1920 to 1938 was 14.8 million m³.

4. The benchmark years are: 1854, 1905, 1913, 1924 and 1938. For sources and methods see Appendix A. See also DT-AEHE, 1107 (http://www.aehe.net/publicaciones/documentos-trabajo.html).

5. The IOU (intensity of use) proposed by Labys (2004) is used here in the same way that Krausmann et al. (2009) used the term “resource intensity” and is defined as cubic meters of wood per unit of GDP. It should not be confused with energy intensity. In monetary terms, the value of wood related to GDP ranged from 1.8% in the period 1871–1875 to 1.2% in the period 1934–1938.


7. The index of building construction has been taken from Mitchell (1980).

3. Some Quantitative Exercises

Chart 2 offers our estimation of British wood consumption in the long run, taking into account both net imports and home wood harvested. Chart 3 combines that data with British population and British GDP.

In absolute terms, wood consumption in Britain increased 6-fold between 1850 and 1913. The use of wood in physical terms related to GDP (IOU) remained almost constant in spite of the evident growth in GDP during the period. Regarding population, wood consumption per head rose from 0.2 to 0.7 m³ during the period. All these variables show two differentiated behaviors over time. While in the period between 1850 and 1913 absolute growth, as well as relative growth, had a relatively stable evolution, from wartime on we are faced with much more noticeable fluctuations, strong growth followed by periods of decline. In any case, after the war, absolute as well as relative consumption was somewhat higher on average.

In order to analyze this evolution in more detail, we calculate a function of consumption that allows us to calibrate the elasticities of wood consumption (WC) with regard to GDP and also with regard to wood prices (WP) and those of a substitute material such as iron (IP).6 We have also included an index of building (IB) in an attempt to capture the possible effects of building cycles on timber consumption.7 The model is limited to the period from 1871 to 1936, since...
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