Industrial Landscapes in the Jura Mountains during the 19th Century : So Many Invisible Hands

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Jean-Marc OLIVIER
University of Toulouse
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Nineteenth-century industrialization did not always mean a transformation of the landscape. In addition to English industrial cities, with big brick buildings and smoking chimneys, there were also invisible industrialized spaces.

The Jura Mountains, a low range of peaks varying in altitude between 800 and 1500 meters, offer a beautiful example of this "soft industrialization". This phenomenon, consisting of cottage industries and small factories along the riversides, developed on both sides of the mountain range : the Swiss side[1] on the east and the French side on the west. This kind of production evolved without modifying the natural balance of the region, which remained essentially rural throughout the 19th century, with few towns exceeding 2000 inhabitants[2].

Nevertheless, an invisible industrialization certainly existed in these mountains. More precisely, there were two kinds of soft industrialization.

1) Small factories, Workshops and Smithies along the waterways

The hydraulic mills of the mountains remained modest because they used a system of bucket wheels (and not paddle wheels)[3], which took advantage of the weight of the water. This kind of hydraulic engine permitted the exploitation of even the slightest currents, but it prevented the development of larger mills because the flow of mountain streams was insufficient. Furthermore, frosts and low water levels frequently interrupted activity. However, the main deterrent to large-scale mill building was the inability to build new dams, which would have stopped operation of the mill wheels both upstream and downstream. From the end of the 18th century onwards, there were numerous small watermills along the streams and rivers, generally one every two hundred meters, and throughout France, the archives contain many complaints ? about illegal dam raising. Due to this limitation, the mills that were built remained small. The Bienne Valley, around Morez, France, provides an excellent example of this pattern of construction[4].

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[1] See Bergier (Jean-François), *Histoire économique de la Suisse*, Paris, Armand Colin, 1984, 376 p.
[2] See Brelot (Claude-Isabelle), " Un équilibre dans la tension : économie et société franc-comtoises traditionnelles (1789-1870) ", dans Fiétier (Roland) (dir.), *Histoire de la Franche-Comté*, Toulouse, Privat, 1977, p. 351-407.
[3] See Lami (E.-O.), *Dictionnaire encyclopédique et biographique de l'industrie et des arts industriels*, Paris, 1881.
[4] See Olivier (Jean-Marc), *Une industrie à la campagne. Le canton de Morez entre 1780 et 1914*, Salins-les-Bains, Musées des techniques et cultures comtoises, 2002, 131 p.

Not surprisingly, the actual towns along the waterways never came to resemble a standard industrial town like Manchester in England. One sees the same kind of rural landscape preserved on both sides of the Jura Mountains, but the preservation of these small mills did not necessarily mean obsolescence. For example, in Vallorbe (Switzerland), on the Orbe River, there were many small workshops where skilled workers produced the best files in the world. The types of files produced here were primarily used for clock making, and their small files for watch making were especially renowned.

There were many other innovations as well. For example, in 1827, Fourneyron invented the first turbine in a place very close to the Jura Mountains[5]. This invention, along with a number of older waterwheels already in existence, was involved the early production of electricity for the villages in the region from about 1880 until 1900. These small factories and workshops along the waterways were efficient, cheap and flexible. They were able to stop one kind of production and begin a new one very quickly. In order to maintain this efficient flexibility, however, they had to remain small, and as a result, they were unable to manufacture any heavy industrial products in any great quantity. Furthermore, sometimes they had to interrupt their activity due to an insufficient flow of water. Ultimately, however, such obstacles did not prove to be a deterrent because most of the area's production took place not in the mills themselves, but in private homes.

2) An Efficient and Invisible Domestic System

The residents of this area were mostly small landowners, few of them possessing more than five hectares. As such, these peasants needed to find other activities in order to augment their income, however these numerous small farmers resisted separating from their land. Using their technological knowledge and their free time in winter, they became nail makers, clockmakers, eyeglass makers, pipe makers, etc. Gradually they became increasingly specialized, and participated in a split-production system with fabrication divided into different stages. They worked at home on a workbench behind their living-room window. They used their hands, hand-held tools and small manual machines. In this way, they ultimately achieved mechanization without motorization.

The area around Morez provides a good example. Here, the farmers needed large quantities of nails for the wooden planks and shingles of their roofs. In order to produce them, they forged many short, sharp spring-like nails in their domestic smithies. Once this minor form of metallurgy was mastered towards the end of the 17th century, some blacksmith peasants were prepared to undertake production of large clocks for churches. Little by little, they reduced the size of the internal clock mechanisms, and some of them organized a split system of production amongst themselves without any putter-outers from the city (verlager). Eventually, during the 19th century, they were able to produce very cheap long case clocks called "comtoises" in Morez, and subsequently began making many different kinds of eyeglasses. In La Chaux-de-Fonds, they turned their attention to the manufacturing of watches. Close examination reveals this sort of production to be a true industry : during the 19th century the peasant clockmakers of the Jura Mountains annually produced more than

[5] It was in Pont-sur-l'Ognon, a small village in the Haute-Saône (one of the three French departments of the Franche-Comté, the two other departments are the Jura and the Doubs).

200 000 clocks and over a million watches per year for export all over the world[6]. Their merchandise became more and more elaborate while costing them less and less to produce.

Thus, we have here all the characteristics of the industrial revolution, except for the factory system with large industrial works and big towns. Even when the peasant clockmakers organized themselves and became real watchmakers, the towns retained the air of rural cities or countryside villages. La Chaux-de-Fonds still provides a good example of this kind of "urban" landscape[7].

There were many other examples of cottage industries with homeworkers in the Jura Mountains : Le Locle (watch making), Sainte-Croix (production of music boxes), Fleurier, etc. on the Swiss side. The most complicated watches were manufactured in the Joux Valley, a very rural area with no towns whatsoever[8]. On the French side, were a number of industrial villages, for instance Montécheroux, whose inhabitants made pliers, nippers and cutting-nippers for clockmakers and watchmakers[9]. Lamoura, with its many diamond-cutting workshops, provides an example of a different sort of specialization. In all these locations, however, the same social and technological background lead to the same sort of soft industrialization.

3) The Reasons for this Development

Between 1780 and 1914, the peasant farmers of the Jura Highlands who had more than a single occupation developed this kind of soft industrialization, relying solely on waterpower and working from home in order to stay on their land. They had just been freed from the manorial right of "mainmorte", and were keen to stay in their recently cleared pasturelands ; they were opposed to leaving the countryside for large, distant, towns.

Moreover, as they belonged to the Jura "Iron Crescent" and were used to coping with long periods of self-sufficient seclusion in winter, they readily embraced technical culture. In Morez, for example, three proto-industrial cycles successfully developed : nail-making (late 18th century until early 19th), clock-making (1820-1880) and eyeglass-making (1860-1914…). This success is accounted for by the efficiency of a split-production system, also called "établissage", and by the existence of long-lasting trade routes used for exporting the large, round Gruyère cheeses. From the 1880s onwards, Morez eyeglasses, which were both light and inexpensive, were being sold throughout the world[10].

The impetus for this successful development was a social one. The varied occupations of peasant-farmers maintained the balance between humans and land, and gave birth to several

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[6] See Mayaud (Jean-Luc) and Henry (Philippe) (dir.), *Horlogeries. Le temps de l'histoire*, Neuchâtel/Besançon, Annales littéraires de l'université de Besançon, 1995, 276 p.

[7] See Barrelet (Jean-Marc) and Ramseyer (Jacques), *La Chaux-de-Fonds ou le défi d'une cité horlogère, 1848/1914*, La Chaux-de-Fonds, Éditions d'En Haut, 1990, 214 p.

[8] See Jequier (François), *De la forge à la manufacture horlogère (XVIII^e-XX^e siècles). Cinq générations d'entrepreneurs de la vallée de Joux au cœur d'une mutation industrielle*, Lausanne, Bibliothèque historique vaudoise, 1983, 717 p.

[9] Other example in Brelot (Claude-Isabelle) and Mayaud (Jean-Luc), *L'industrie en sabots, la taillanderie de Nans-sous-Sainte-Anne (Doubs). Les conquêtes d'une ferme-atelier aux XIX^e et XX^e siècles*, Paris, Garnier et Pauvert, 1982, 278 p.

[10] Exportations were decisive in the production growth, see Verley (Patrick), *L'échelle du monde. Essai sur l'industrialisation de l'Occident*, Paris, Gallimard, 1997, 713 p.

rural small businesses. The young peasants easily got part-time small jobs that did not require them to leave the family farm. They wanted to stay in an open society where it was possible to get money rapidly (with a good invention, for example) in order to buy some plots and become small landowners. To be an independent proprietor was the main objective in this rural society.

The relative freedom of the mountains was another important factor. In the plains, natural conditions led to closed-village settlements and a three-field system of cultivation. In such a situation, the peasant community was bound by a net of legal and customary servitudes[11]. This was entirely different from conditions in the Highlands. In these areas of dispersed farms, there were no rigidly regulated collective economic units to impose limits on settlement and building ; even before 1789, this situation existed because the lords were usually very far away, particularly during the winter season. As such, the peasants had the free disposition of their land. Even better, many of them were free to become entrepreneurs. They envisioned and developed an entirely rural alternative to the standard city-based system of centrally controlled division of work (the putting-out system)[12].

In conclusion, it is clear that all these industries were "invisible", largely because they produce small things in very small towns or in the countryside. Nevertheless, it ought to be recognized that these rural industries created the same amount of wealth per capita as the English or German factories did. However, this form of soft industrialization did so in a different and less traumatic way. Soft industrialisation protected and preserved peasant farms, the large rural population, and traditional production of high quality, labour-intensive goods. This process highlights another accomplishment/ facet/ aspect of industrial society, of which other examples existed elsewhere : knife making in Thiers, hat production in the Pyrénées or in the Tarn and Garonne, as well as perfumery around Grasse, etc. Many historians have underestimated these independent rural industries[13] because they were invisible in the landscape and in the archives[14], but their importance should not be undervalued.

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[11] See Braun (Rudolf), " The impact of a cottage industry on an agriculture population ", in Landes (David S.) (Ed.), *The rise of capitalism*, London/New York/Toronto, MacMillan, 1966, p. 54-64.

[12] See Olivier (Jean-Marc), " L'industrialisation rurale douce : un modèle montagnard ? ", *Ruralia*, n° 4, 1999, p. 11-22.

[13] These cottage industries are completely different from tne Franklin Mendels proto-industialization model (see, Mendels (Franklin), *Industrialization and population pressure in XVIIIth century Flanders*, Thèse soutenue devant l'Université du Wisconsin, 1969).

[14] Most of the time, the great statistical inquiries during the 19th century forgot the cottage industries, for example, they entirely fail to mention the 3000 clockmakers and spectacle makers in Morez area (See *Statistique de la France*, industrie, tome I, 1847, p. 158-161).