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**Author(s):** Kuhlberg, Mark; Särkkä, Timo; Uusivuori, Jussi

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## **Chapter 13**

### **Technological Transformation in the Global Pulp and Paper Industry: Concluding Remarks**

#### **Mark Kuhlberg**

History Department, Laurentian University, Sudbury, Ontario, Canada

[mkuhlberg@laurentian.ca](mailto:mkuhlberg@laurentian.ca)

#### **Timo Särkkä**

Department of History and Ethnology, University of Jyväskylä, Finland

[timo.sarkka@jyu.fi](mailto:timo.sarkka@jyu.fi)

#### **Jussi Uusivuori**

Natural Resources Institute Finland

[jussi.uusivuori@luke.fi](mailto:jussi.uusivuori@luke.fi)

#### **Abstract**

The volume has provided us with illustrative, well-documented case studies of technological transformation in the global pulp and paper industry. The research has focused on the roles played by the availability of technology, knowledge, investments, and raw materials on the one hand and demand characteristics on the other, within local, regional, national and transnational

organisational frameworks. It has dealt with the relationships between technology transfer, technology leadership, raw material dependence, and product variety on a global scale. The investigation has followed the tradition of in-depth and rich historical descriptions based on primary sources and secondary literature. The research was motivated by the realisation that analysing the evolution of the global pulp and paper industry using a comparative method is a very revealing way of exposing its complexities and identifying some of the challenges it is facing today. This concluding chapter briefly summarises the key findings of the research and outlines potential avenues for pursuing future research.

## **Keywords**

Technology transfer; Papermaking; Pulp and paper industry

## **Conclusions and New Beginnings**

It is axiomatic that the speed and intensity of the industrialization process around the globe have been shaped by a wide variety of factors. For example, variables such as access to natural resources, the cost of and accessibility to transportation, government policy at the regional, national and international levels, demand characteristics and entrepreneurial and corporate strategies have all played a role – to different degrees – in determining both which countries adopted the latest industrial technologies and how they did so. By examining these dynamics, historians have been able to explain, for instance, why countries that shared the same continent or even a border experienced the phenomenon of industrialization in such fundamentally dissimilar ways.

This volume has engaged this broad subject and taken it from the macro to the micro level by focusing on the development of a single industry – pulp and paper – and the role technology played in its evolution in a number of diverse locations literally around the world and over the course of several historical periods. Our study has taken us from ancient China, for example, to assess the earliest methods of making paper, all the way to contemporary Portugal, which was visited in an effort to analyse the most recent steps in the process of nationalising its domestic pulp and paper industry. Similarly, the chapters in this volume have examined their stories in a wide range of environmental frameworks. At one end of the spectrum are countries such as Canada, Finland and Sweden in the Northern Hemisphere, which are well endowed with the fibre, found principally in the form of conifer forests, which emerged in the 1860s as the most important raw material for making pulp and paper. At the other extreme both geographically and environmentally are the lands “down under”, Australia and New Zealand, which we examined because their lack of conifers compelled them to search for new fibre sources and develop new pulp and paper technologies upon which they could base their national industries. Technology is the common thread linking all these stories, sometimes because the industry aggressively embraced it in a particular part of the globe and at other times because the opposite was true.

As a result of these analyses, this collected volume has made several important contributions to the literature about the history of the international pulp and paper industry in general and its adoption of technology in particular. Obviously, the departure point for such a study should be the long history of papermaking technology, which reaches back in time nearly two thousand years, and Chap. 2 has provided us with a sterling summary of this subject. The 11 case studies

that follow demonstrate, for example, that the industry's establishment and development in a particular location is dependent upon a unique set of factors that defies generalisation on the one hand and lends itself to it on the other. Consider the supply of raw materials available to and the location of a producer relative to markets. Australia (Chap. 10), New Zealand (Chap. 9) and Portugal (Chap. 6) were historically deficient in terms of the industry's traditional coniferous wood fibre resources and they were initially forced to satisfy their domestic demand for pulp and paper products through imports. Although this shortcoming was initially a hurdle to the establishment and growth of their domestic industry, government and industry cooperated to overcome their "fibre challenge" using various strategies at different stages of the twentieth century. In sharp contrast, a producer situated both amidst a bountiful supply of wood and power resources in Canada and within close proximity of an enormous market – the United States – remained surprisingly small because of a host of factors ranging from unfavourable policies implemented by local and foreign governments to the firm's adoption of a corporate culture that embraced monopoly capitalism. (Chap. 7)

On the other hand, this volume's chapters have made it clear that a few observations apply to practically all the disparate stories told here. For example, war was both a short term curse but long term blessing for many pulp and paper makers, and the conflicts noted herein certainly highlight how necessity is truly the mother of invention. Chap. 11 deals with British India's pulp and paper industry and underscores how the shortage of raw wood pulp available during the First World War back in the United Kingdom was the impetus behind its producers searching for alternative supplies of raw materials, and how their quest led them to India and its enormous stock of bamboo. This was the precursor to a colonial policy that sought first to foster the

development of the colony's native pulp and paper industry and later efforts by both domestic and British firms to develop the technology to process this fibre into marketable paper products. Similarly, Chap. 3 assessed how war dealt producers located in Finland short term pain but long term gain. That country's pulp and paper makers were forced to grapple with the profound challenges wrought by the Second World War and the enormous burden represented by paying reparations to the Soviet Union in its wake. Nevertheless, these trying circumstances precipitated strong cooperation between the Finnish government, the country's universities, and its industrial sector, and the result saw Finland emerge as a global leader in the development and production of the technology used by the pulp and paper industry. Furthermore, Chap. 4 demonstrates how the conflicts in the Middle East during the 1970s – and the consequent oil crises – compelled producers in Sweden to develop biofuels in an effort to wean themselves off fossil fuels. This was the fillip to a period during which players in the country's industry – and the collective industry and government – began working together to develop new technology; cooperation not competition in research and development became their mantra. The capstone achievement in this regard was the development of a greener product to meet a new market demand, a breakthrough that vaulted Sweden's firms to the upper echelon of the world's pulp and paper producers. Finally, Chap. 12 explored international shipping of the industry's raw materials and its products. In doing so, it illustrated how location near both fibre sources and markets decreased in importance during the latter part of the twentieth and early twenty-first centuries as a result of the technological developments in – and subsequent dramatic reduction in cost of – seaborne transportation. Although this observation can be made about many industries during this period, it strikes a particularly resonant cord with the pulp and paper sector.

Nevertheless, the study has raised as many questions as it has answered, and in doing so it has created the opportunity for myriad future studies of the global pulp and paper industry. This volume's focus on technology has underscored the industry's capital-intensive nature and the paramount role that financing has thus played in its development. Although often a difficult subject to unravel, there is fertile ground to be ploughed in the future in terms of examining the different sources of capital – both public and private – that have been tapped to support investment in the industry and the relationship between financial backers and company policy. Similarly, many of the profiles presented here have mentioned the existence of cartels and sales associations in the pulp and paper industry, another subject that has been relatively unexamined in this field. In addition, this investigation has highlighted the enormous role that government policy – on the regional, national and international levels – has played in influencing the establishment and growth of the industry around the world. This, too, is a subject that merits a separate study.

From an economic and policy point of view, it would be interesting to analyse the question of what have been the obstacles that have prevented a more profound division of labour to take place in global pulp and paper industries. It seems that the history tells us that the competitive advantage paradigm has not been completely valid in the international trade of pulp and paper products. We have seen successful cases of paper industries in cultural, economic and natural conditions that defy the likelihood of encountering such examples. A future analysis could look into, for example, the question of what role government policies – in the form of protection or according the industry strategic status – played in developing a domestic pulp and paper industry to replace a country's former reliance on imports. Furthermore, the role of exchange rate

regimes and policies in the evolution of the global pulp and paper industry might warrant a closer analysis. It has been heavily influenced by international trade and foreign direct investments and by changes in the currency alignments between economic zones. On the other hand, there are cases in which national exchange rate policies have been influenced by the economic performance of domestic pulp and paper industries; Finland is perhaps the most obvious example of this latter phenomenon. In this instance, it would be interesting to see – as some have suggested – that the value of the Finnish domestic currency prior to adopting the common Euro-zone currency – was determined to a large extent by the competitiveness of its pulp and paper industry.

To conclude, this study has revealed several obvious reasons for an in-depth study of the political economy of the world's pulp and paper industry. It has also revealed that analysing the history of this industry by using a comparative method is a valuable way of exposing its historical complexities and the challenges it is facing today and will probably confront in the future. Through its comparative analysis, the investigation's scientific results have increased our knowledge and understanding of the global pulp and paper industry both historically and in the present day. Furthermore, an obvious, and perhaps the most important, outcome of this volume is the enhancement of collaboration among the contributors to this project. The research network involved ensures that the research subject is addressed within the on-going international academic discussions and thus allows for the utilisation of the research results in the most efficient way. (E.g. in terms of utilisation and interaction with potential end-users and beneficiaries of the research; new collaborative structures and networks; researcher mobility; future publications; potential new, innovative research openings).