Changes in the Rhine Navigation in the First Half of the 19th Century: Technological Innovation and Institutional Transition

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Abstract

This study provides a new interpretation of the technological innovation and institutional transition on the Rhine River during the first half of the 19th century. For the first time, it has been realized that in order to explain the transport technique transition on the Rhine in the 19th century, it will be necessary to consider the institutional changes that accompanied the introduction of steam power on the Rhine. Moreover, the research aimed to analyze the influence of the introduction of steam power on the Rhine on the transport techniques and the transport volume, and the interaction between them.

1. Introduction

• The 19th century was the transition period in the Rhine river transport.
  • Transport volume drastically increased.
  • The transport system changed from a guild-regulated system to free navigation.
  • Transport techniques shifted from sail and animal towing to steam power.
  • Existing studies suggest two views on the causes of the increased transport volume:
    • Liberalization of the Rhine navigation systems
    • Introduction of steam power to Rhine navigation
  • How did these changes influence each other?

2. Purpose and Method

Purpose
  • To examine the influence of the transport systems and techniques on Rhine river transport.
  • To explain the reason for the gradual innovation of the transport system and techniques.

Research method
  • Comparative analysis of the transport volume data and the process of these historical changes in the transport system and techniques.

3. Preconditions

• Transport system
  Before the French Revolution, Cologne (lower Rhine) and Mainz (middle Rhine) were regional traffic centers of the Rhine river transport, and interregional transport shippers' guilds existed in these cities.

Regional transport
  • Regular barge services (contrast regularized)
  • Interregional transport
    • Irregular service (free route, but guild regulated)

These large services had market entry regulations. During and after the revolution, interregional transport was handled by an increasing demand for Rhine transport, and introduced regular services. Regular large services dominated Rhine navigation until the 1840s.

• Transport techniques

Sailing (Rhine delta, Mostly Animal (horse))
Towing Downstream (mostly sailing)
Towing Upstream (mostly sailing)

In this period, horse towing increased; however, towpaths and horse relay stations were inadequate.

4. Changes in Transport Volume

The trend in transport volume

Before 1811 (when the first Rhine navigation act was signed), upstream transport volume was slightly larger than downstream transport volume.

After 1811, the total transport volume drastically increased.

Nevertheless, the upstream increase was slower and weaker than the downstream increase in 1830s.

What was the influence of the limited towing power?

5. Changes in System and Techniques

Changes in techniques

Upscaling Ships
  • Before 1830 (in freight capacity)
    • Up to 12,000 (in freight capacity)
  • After 1830, max. 14,000

Introduction of steam power on the Rhine:
  • 1835

Steam Total

Steamship technology was reintroduced in the 1800s and was specifically invented in the 1850s. However, steam-powered transport was mainly used for the upstream direction, and downstream transport was still mainly sail. While steam technologies and steamship technology were introduced in the 1800s, the first steam-powered transport was not widely used. The transition from the conventional transport order to the new order of the steam age was more gradual and continuous.

Steam tugboats and steel barges were introduced in the 1830s. The introduction of steam power was previously considered. The introduction of steam power was previously considered. However, the introduction of steam power was previously considered. Therefore, the change in the transport technologies was both reciprocally affected processes.

6. Conclusion

• The liberalization of the Rhine navigation systems and the development of the transport technologies were both reciprocally affected processes.
• Therefore, the change in the transport system gradually progressed.
• Increasing transport also contributed to the later spread of steam power.
  • Regular transport continued, but during the 1830s, after steam tug ships had adequately spread, the traditional system completely gave way to the new steam system.