

HISTORY OF GOODS TRANSPORTATION

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Contents

1. Introduction
 2. Prehistory of Goods Transportation
 3. The Middle Ages and the Development of Trade Economies in Europe
 4. From 1500 to 1780: The Age of Sail, Worldwide Exploration, and Gains from Trade
 5. The Impact of the Industrial Revolution on Goods Transportation, 1780–1870
 6. Defining the Role of Modern Government: Goods Transportation from 1870 to the Present
 7. Conclusion
- Glossary
Bibliography
Biographical Sketch

Summary

We explore the evolution of permanent human settlement and its relationship to the comparative transportation advantage of locations. A related historical theme explored at various points in this section is that many major improvements in goods transportation technology were driven by military considerations. A crucial point often overlooked in the history of transportation is that at those points in time when transportation technology underwent radical changes to improve and expand goods trade, subsequent modifications to legal and business institutions designed to further facilitate trade can often be identified as well.

Since the Industrial Revolution, government intervention in freight transportation and infrastructure has been justified for a number of political and economic reasons. However, government intervention in goods transportation markets appears less justifiable than in the past. While care must be taken to protect modern legal and societal institutions that encourage fair and efficient transactions, there is probably less rationale for government intervention in goods transportation markets than at any other time in human history.

1. Introduction

The history of goods transportation closely parallels the history of civilization. The desire to create a viable transportation system to move people and goods is directly related to humanity's eventual transition from a nomadic existence of hunters and gatherers to the sedentary existence of an agrarian society. The evolution of major cities

and all permanent human settlement can be traced to the comparative advantage of places with respect to goods trade. This locational advantage is derived from the ease with which goods and people can be transported and traded with respect to other important locations.

Advances in goods or freight transportation have always been inspired by a desire for new markets or improved transportation routes between trading nations. A common theme explored at various points in this section is that major improvements in transportation technology have often been driven by military considerations. And at those times when transportation technology changed, important modifications to legal and business institutions designed to further facilitate trade can also frequently be identified. In some instances, these institutional shifts led to more extensive changes to the structure of goods transportation than the initial technological shift.

2. Prehistory of Goods Transportation

For the first 2–3 million years of human existence, primitive societies were composed of hunters and gatherers living in what we would today recognize as subsistence. As humans evolved, human power, on foot, was the only method available to transport life necessities to where they were needed. In fact, early nomadic human tribes did not often need to transport food and water over long distances. Instead, tribes moved along with food and water sources, as humans shifted and settled until water and food needed to be found again. As civilization slowly became agrarian, agricultural settlements were established near fresh water sources like inland rivers or lakes. Water sources served two basic economic needs. Water was an absolute necessity for growing food and sustaining human lives, and offered increasing mobility to expanding sedentary communities.

The development of a human civilization dependent upon water sources was complementary with the first major revolution in goods transportation. This was the development of water-borne movement, an activity that appears to predate agrarian society. At the most basic level, a need to catch fish using paddled rafts enabled early societies to hunt for food across a reasonable distance over water. Effective fishing and hunting territory was increased with the development of the sail as a supplement to waterborne travel. The best estimates place the invention of the sail at around 2000 BC in Polynesian societies based in eastern Asia that lived and moved around enormous bodies of water.

On the ground, the invention of the wheel, attached to a cart probably sometime around 3000 BC by the Sumerians, radically transformed early nomadic societies. Up to that point, goods movement was limited to what could be loaded onto large domesticated animals, such as camels, horses, or oxen. As is well known, the invention of the wheel changed the nature of human existence. In the first instance, it led to the building of carts and wagons that could transport more goods than were necessary for the well being of the traveler. In this manner, the first steps were taken towards the transition of human civilization from mere subsistence to a barter or trade-based economy. With the use of the wheeled cart pulled by humans or animals, individuals could now grow more food than they needed themselves. This process allowed barter and trade with other

individuals for other food or materials. The only barrier to the use of a cart for barter was that the animal, cart, and wheel combination functioned much more efficiently if a smooth dirt or stone trail was available.

The Romans were the first civilization to develop an identifiable road network to facilitate conquest and movement throughout the growing empire. They were also the first civilization to use a more efficient means of land propulsion in the form of horses on a widespread basis. In this era, larger goods were moved by boat and oar through a network of the known navigable rivers of Europe and Asia. But the Roman road network also allowed the development of the *cursus publicus*, a messenger service that facilitated communications throughout the vast empire. Tellingly, as the Roman Empire declined, so too did the efficiency of the *cursus publicus*; the direct impact of transportation capital (i.e., road) deterioration on the productivity of transportation has not changed over the course of human history. Ultimately, the importance of permanent settlement and the development of land transportation networks waned for the next 1000 years as Western civilization moved into the Dark Ages and the pre-Renaissance era.

3. The Middle Ages and the Development of Trade Economies in Europe

Through the Middle Ages in Europe, transportation networks stagnated for a variety of reasons. Road networks throughout the continent were based upon old Roman Empire paths and thoroughfares. Road construction was infrequent because overland travel was still difficult and costly relative to the value of transported goods. However, one advance in technology made during this time was the development of draft harnesses, most likely borrowed from the Chinese Empire. This allowed horses or mules to pull heavier weight more efficiently, meaning that the animal could perform labor for longer periods of time.

While the Romans had constructed inland canals in parts of Europe to facilitate military needs, the relative inefficiency of land travel compared to travel by water during the Middle Ages led to the reestablishment of some of these inland canal systems. As early as the 1100s, inland canal systems were operating in England. Another more commercially viable canal system was developed in the Po River valley in Italy, around the middle of the thirteenth century. Relatively bulky goods could be moved through these inland water networks using small sailing ships known as cogs. By contrast, the lack of a road network was a problem for much of western and southern Europe, where inland waterways were uncommon.

This era also saw the development of human society beyond tribal classes into collectives referred to by the old Roman Empire as cities or states. Legal institutions to protect property rights were not yet common. Moving goods to trade over longer distances was risky because the goods might be seized. Thus, it was necessary for merchants to protect goods as they were moved from settlement to settlement. Seizure of traveling assets by robbers, noblemen, and kings alike was a way of life in medieval Europe. That the practice was commonplace is evidenced by the fact that nobility of the time frequently claimed a legal right to oversee goods seizure in their territory. This was often accomplished not by outright seizure of merchant property by the nobles but

through a system of taxes or tolls issued to travelers passing through a kingdom. Not surprisingly, the first European nation state to establish such control over its full territory was England. Land and water transportation were taxed and protected by the monarch. Compliance with this process ensured that trade throughout England was accomplished in relative safety compared to continental Europe.

Tolls or payment for the right to conduct maritime trade in a kingdom were collected in ports of call or harbors. Compared to land travel, tolls were readily collectable on the well-established routes of inland waterways. Thus waterborne traffic was often subject to repeated and high levels of tolling in Europe and Asia. By the early 1300s, there were 35 tolls on the Rhine River alone, and rose to 60 tolls by 1500. Indeed, the burden of inland waterway tolling on bulky goods such as grain and salt became so excessive in some places that more costly overland travel by horse and wagon often became the mode of choice for merchants. (Parry writes that the cost of carriage by land at this time was roughly twelve times the cost of carriage by water.)

In *The Origins of Western Economic Success: Commerce, Finance and Government in Pre-Industrial Europe*, Kohn describes the burden of tolls collected from many different jurisdictions.

...there was considerable competition in the Middle Ages for the North-South traffic between the two zones of European trade. One major route passed through Switzerland, the other through France; although the French route was nearly three times as long, it avoided the Alps and made more extensive use of inland waterways. When trade began in the eleventh century, most traffic took the more direct Swiss route. However, rising tolls in the twelfth century shifted the balance towards France...

Violence and seizure of assets at sea were more difficult to police. In many places and for extended periods of time, water piracy was sanctioned by the developing states of Europe. While some early city-states such as Venice had piracy under relative control locally, longer trade routes over larger bodies of water were harder to monitor. Therefore, the design of early ships was dictated by the need to protect freight from piracy. On longer voyages, freight capacity had to be traded off against the addition of crew to ward off attack. Organized convoys were another way to ward off attack, but carried the risk of logistics problems. It was often difficult to get a convoy of fully freighted ships organized all at the same time. Rowed ships, or galleys, were more amenable for convoying, and were very maneuverable. Sailing ships were more productive (freight tons per sailor) but less maneuverable and thus difficult to keep in convoy. A nation's ships were especially vulnerable to random piracy in time of war, and wars were a frequent occurrence.

The development of reliable accounting and banking systems in both Holland and England would greatly improve economic prosperity by helping to establish firm property rights in commercial transactions. But it was not until the advent of a coordinated state system in Europe that could afford to build and maintain transportation infrastructure that transportation technology began to adapt to growing and more distant economic trade opportunities. Adaptations included the development

of better carriages and steering to benefit from improved roads, and the incorporation of better sailing technology using less labor to take better advantage of trade over pirate-free waters.

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Biographical Sketch

James Nolan has a BA in Economics from Concordia University in Montreal, an MA in Economics from York University in Toronto and a PhD in Economics from the University of California at Irvine. His transportation research covers various modes at both the national and international level. He is currently a tenured professor and the Transportation Chair in the Department of Agricultural Economics at the University of Saskatchewan in Canada.