

UNIVERSITY OF WISCONSIN
 Department of History
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History 103

CHINA'S ECONOMIC TRANSFORMATION
 8th - 14th Century

The Causes of the Medieval Revolution which made the Chinese economy after about 1100 the most advanced in the world.

I. The Agricultural Revolution

"Between the eighth and the twelfth centuries Chinese agriculture was transformed. Some improvements came in the north; thus it was early in this period that better milling machinery led to the widespread cultivation of wheat in place of millet. The main arena of progress, however, was the south. Mastery of the techniques of wet-field rice cultivation allowed a great southward migration into this previously little developed area that became, . . . , the dynamic driving force behind an era of economic revolution."¹

A. Preparation of the soil, planting, and weeding

"Farmers learned to prepare their soil more effectively as the result of new knowledge, improved or new tools, and the more extensive use of manure, river mud, and lime as fertilizers." (p. 118)

1. New Knowledge

"Woodblock printing, invented in the ninth century, contributed greatly to the spread of new methods. Practical treatises were published, written in simple language and often illustrated with woodcut pictures of tools and appliances." (p. 114)

2. Improved or New Tools

- a) The development of the Kiangnan plough for wet-field rice farming.
- b) The improved deep-tooth harrow enabled the ploughman to alter the depth of the furrow as desired.
- c) "The invention of a weeding-rake in Kiangnan eased this painful and time consuming task." (p. 121)

B. New seeds and multiple cropping

"Strains of seed were introduced which either gave heavier yields, or resisted drought better, or else by ripening more rapidly made it possible to grow two crops a year on the same land." (p. 118)

1. New Seeds

"In the later T'ang dynasty, and in the Sung dynasty, there was an impressive increase in the range of rice seeds available to the farmer. The most famous of these was the Champa rice from Vietnam . . . Other new strains were created by selective breeding; and by Sung times almost all of the types

¹Mark Elvin, The Pattern of the Chinese Past (London: Eyre Mathuen Limited, 1973), p. 113. Other citations throughout this outline, indicated by their respective page numbers, are from this same source.

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CHINA'S POPULATION

1 A.D.	59,000,000
Later Han	56,000,000
280	16,000,000
606 (Sui)	46,000,000
753 (before An Lu-shan rebellion)	52,000,000
764 (after An Lu-shan rebellion)	17,000,000
907	50,000,000
11th Century	100,000,000
1400	65,000,000
(1560 Sweet potato introduced; 1574 Maize introduced to Yunnan; 1700 Irish potato introduced.)	
1700	150,000,000
1794 (peanuts introduced in 18th century)	313,000,000
1850	430,000,000
1953	583,000,000
1984	1,000,000,000

in use before the middle of the T'ang had disappeared and had been replaced by new ones. Thus a southern Sung gazetteer for the county of Ch'ang-shu in the lower Yangtze delta lists twenty-one kinds of moderate gluten rice and ten miscellaneous varieties as being cultivated there." (p. 121)

2. Multiple Cropping

"The southwards migration of wheat into the rice region . . . became of real economic significance under the Northern Sung The new early-ripening rice meant that double cropping, both of rice with rice and of rice with wheat, could be extended. In the far south double and even triple cropping of rice was almost universal." (p. 123)

C. Water Control

"A new level of proficiency was reached in hydraulic techniques, and irrigation networks of unprecedented intricacy constructed," (p. 118)

1. Reclamation Projects

"It was in Sung times that the Sang-yuan polder at the junction of the West and North Rivers in present-day Kwangtung was started. So too was the main work of opening up the P'u-t'ien plain in Fukien and the Ning-po plain in the Liang-che, with dams to prevent the tidal influx of salt water from damaging the soil, and up-country storage reservoirs to catch and store the rapid seasonal flows of water of the hills Some of these polders were opened up by the government and reached twenty-eight miles in circumference," (p. 124-125)

2. Hydraulic Devices

"Various devices were used for moving water, whether for drainage or irrigation. The simplest of these such as the counterbalance bucket or 'well-sweep', were found almost universally," (p. 126)

- a) The square-pallet chain pump and the noria came into more extensive agricultural usage in Sung times.
- b) The sluice-gate and the treadle water-pump were also more widely used in Sung agriculture.

D. Trade and Specialization

"Commerce made possible more specialization in crops other than the basic foodgrains, and so a more efficient exploitation of varying resource endowments." (p. 118)

"Expanding markets for all sorts of agricultural produce led farmers to move away from self-sufficiency as an objective and to concentrate instead on growing those crops which did best in their own particular area, with a corresponding rise in efficiency and output." (p. 128)

II. The Revolution in Transportation and Communications

"The greatest economic impetus was given by the growth of river and canal shipping. It was at this time that ways were found to pass through or around previously unpassable difficult places in

rivers. In consequence, a number of hitherto separate waterway systems were now linked into an integrated whole, and formed the foundation for the nationwide market which emerged at this time." (p. 139)

A. Water Transportation

1. "By Sung times, Chinese junks had become very much more sophisticated. They were built with iron nails, and water-proofed with the oil of the t'ung tree, a superb natural preservative. Their equipment included watertight bulkheads, buoyancy chambers, bamboo fenders at the waterline, floating anchors to hold them steady during storms, axial rubbers in place of steering oars, outrigger and leeboard devices, oars for use in calm weather, . . . , sounding lines for determining the depth, compasses for navigation, and small rockets propelled by gunpowder for self-defense." (p. 137)
2. "The invention of the double lock in the eleventh century may also be regarded as a means of easing passage past a difficult point." (p. 140)

B. Overland Routes

"By Sung times, however, not only were a good number of city streets paved with stone slabs, but surfacing inter-city routes with bricks or stone seems to have been quite common." (p. 132)

C. Communications

1. The government postal system enabled the capital of the middle Chinese Empire to communicate with the most distant city of any importance within eight to fourteen days.
2. "Relay hostels, with horses and food for travelling bureaucrats, were set up along all main roads and some of the lesser roads as well," enabling the government to move officials and documents more efficiently around the empire. (p. 134)

"Courts for the Forwarding of Memorials' at the capital; . . . served for the two-way transmission of information, orders and requests. The officials in charge of these courts privately copied out important government documents, relating both to the area concerned and to the empire as a whole, and circulated them to their masters. This practice in due course developed into an official gazette issued by the Sung government, the world's first national newspaper."

III. Economic Developments

A. Monetary System

1. Coinage

The Sung government undertook the task of restoring a unified copper currency throughout the empire.

2. Paper Money

"By the end of the eleventh century paper money had spread into much of north China; and under the Chin and the Southern Sung governments in the twelfth century it became established on a regular basis in both north and south." (p. 159)

3. Credit

"During the period of the later T'ang and the Five Dynasties the private sector also produced a number of paper credit instruments. Deposit shops stored cash, gold and silver for a fee, and would honor cheques drawn against these funds by a depositor. Both they and the gold-and-silver-smiths issued promissory notes which in the course of time came to be used much like money." (p. 156)

B. Commercial and Urban Expansion1. Commerical Expansion

"The Chinese rural economy was becoming linked with the market mechanism. Trade was no longer just the supplier of luxuries, but also the provider of necessities. A large interregional traffic developed in staples such as rice; and a 'national market' appeared in the sense that many local products, such as particular types of paper, became both nationally known and nationally available." (p. 166)

a) A National Internal Customs Network

"By 1077, under the Sung, there were about two thousand customs houses for such transit and sales taxes, and the number increased with time." (p. 167)

b) Commercialized peasant economy

Increased contact with the market made the Chinese peasantry into a class of adaptable, rational, profit-oriented, petty entrepreneurs. A wide range of new occupations opened up in the countryside. In the hills, timber was grown for the booming boat-building industry and for the construction of houses in the expanding cities. Vegetables and fruit were produced for urban consumption. All sorts of oils were pressed for cooking, lighting, waterproofing, and to go in haircreams and medicines. Sugar was refined, crystallized, and use as a preservative. Fish were raised in ponds and reservoirs to the point where the rearing of newly-hatched young fish for stock became a major business. Paper production soared as a result of the demand from the printing industry and a bureaucratic government. Besides being used for books, documents and correspondence, it was also employed for money, for articles of clothing, for lampshades, for wrapping and for toilet-paper. Hemp, ramie, and silk textiles were produced in countless villages. Growing mulberry leaves became in itself a profitable undertaking, and there were special markets for mulberry saplings. Peasants also made lacquer goods and iron tools." (p. 167)

c) National Commerce

"These local markets were the foundation of a national hierarchy of higher markets linking almost the entire Chinese economy. There were three main regions: north China, centred on K'ai-feng; south China, centred on the complex of cities north and

south of the T'si Lake; and Szechwan, centered on the cities of the Ch'eng-tu plain. Within each of these regions there was, in Sung times, an increase in economic interdependence between localities, particularly in staples such as grain and cloth." (p. 170)

d) International Trade

"There was also a flourishing international trade, especially with Japan and South-east Asia. To the latter China exported copper and iron goods, porcelain, silks, linens, chemicals, sugar, rice and books, receiving in exchange spices and other exotic items." (p. 171)

1. Urban Expansion

"The economic advances just described culminated in an urban revolution. Throughout eastern China, cities spilled out from within their walls and spawned suburbs until the original nucleus was all but lost in the surrounding conurbation." (p. 175)

IV. Military Development

"The economic revolution which underpinned the Sung empire allowed it to maintain the most formidable military machine that the world had yet seen. By 1040 the regular army amounted to 1.25 million men; and the state armaments industry set up to equip it was one of the earliest examples of standardized mass production. Even at the beginning of the dynasty, the Bow and Crossbow Department at the capital was turning out 16.5 million arrowheads a year. By 1160 the yearly output of the Imperial Armaments Office, not including provincial production, came to 3.24 million weapons. Body armour was manufactured in three regulation styles to the extent of several tens of thousands of sets annually. The supply system, based on canals, was excellent. In some years six million piculs or more of grain were brought from the south to the capital, and on this basis a central army of over 300,000 men was supported in the immediate vicinity of the capital. The main forces on the northern frontiers were equally enormous: 300,000 soldiers in Hopei to face the Khitan, and 450,000 in Shensi to counter the Hsi'hsia." (p. 84)

V. Technological and Scientific Advancements

"From the tenth to the fourteenth century China advanced to the threshold of a systematic experimental investigation of nature, and created the world's earliest mechanized industry. A few examples will illustrate the range of these achievements. In mathematics, a general technique was found for the solution of numerical equations containing any power of a single unknown. In astronomy, a new level of observational accuracy was achieved with the casting of much larger instruments and the perfection of hydraulic clockwork. In medicine, a start was made upon systematic anatomy with the dissection of cadavers; more precision was attained in the description of diseases; and a vast number of new remedies were added to the pharmacopoeia. In metallurgy, coal (and coke possibly) was used for the extraction of iron from ore. In warfare, gunpowder changed from a material for fire-works into a true explosive; and flame-throwers, poison gas, fragmentation bombs

and the gun were invented. At the same time there was an increasing tendency to try to relate existing theoretical systems more closely with the mass of empirical information collected in the preceding centuries, most notably in pharmacology and chemistry.

This period was the climax and also the end of many preceding centuries of scientific and technical progress. Its foundation, above all else, was the art of woodblock printing, invented in the ninth century and in general use by the tenth. The dissemination of ancient scientific texts inspired scholars to master and surpass the achievements of antiquity. It also created a nationwide community of scientific discourse, and helped to democratize knowledge by making personal instruction from a master less essential." (p. 179)

Reflective of the technological advances was the textile industry. "Some time in the Northern Sung dynasty a machine was perfected for reeling silk . . . In the thirteenth century, the reeling machine was adapted for the spinning of hemp thread . . . This machine was clearly not very efficient, but if the line of advance which it represented had been followed a little further, then medieval China would have had a true industrial revolution in the production of textiles over four hundred years before the West." (p. 194-198)

VI. Summary

". . . ., the higher economic productivity achieved in Sung times had reduced the financial strain of imperial government. To this we may add the perfection of new techniques of political control, such as the civil service examination system, serving to reduce the costs of control per head of population. By making both high office and local privileges accessible almost exclusively to those with official academic degrees, a way was found to absorb the energies and the ambitions of the able and condition them ideologically through the curriculum at their own expense and wish. Further, the high level of military technology fostered by the wars between the Sung, the Chin Tartars and the Mongols was bequeathed to the Ming empire, leaving it, on the disintegration of Mongol power, without serious rivals in eastern Asia." (p. 92-93)

Why China after about 1350 failed to maintain her earlier pace of technological advance while still, in many respects, advancing economically?

I. Theory of Empire

"In 960 the Chinese empire was largely reunited by T'ai-tsu, the founder of the Sung dynasty, the final touches being added after his death by his younger brother T'ai-tsung. The conditions which made this later empire both possible and permanent . . . was that an economic and technological revolution reduced the burden of the imperial administrative superstructure, increased the efficiency of the Chinese war machine, and created enough economic integration to be a real obstacle to renewed political fragmentation." (p. 69)

". . . , empires tend to expand to the point at which their technological superiority over their neighbors is approximately counterbalanced by the burdens of size. 'Size' . . . conceived mainly in terms of the time and cost of communications over the vast distances involved, The burdens of size consist mainly in the need to maintain a more extended bureaucracy with more intermediate layers, the growing difficulties of effective co-ordination as territorial area increases, and the heavier cost of maintaining troops on longer frontier lines further removed from the main source of trustworthy manpower and supplies . . . that empires tend to expand to an equilibrium point at which they can just maintain their full extent, it follows that, internally, their social institutions are likely to be under a continual strain. The critical factor, particularly evident in the Roman and early Chinese empires, is usually the heavy cost, relative to the total output of food and goods, of maintaining the administrative superstructure, and of providing the soldiers and supplies necessary for imperial security. Inevitably there is harsh taxation; and this in turn tends to induce social and political changes that undermine the fiscal soundness of the state. Typically, the peasant cultivator is impoverished and forced to sell his land. The need to find a haven from the tax-collector leads him to seek for patronage or protection from the powerful, evading public exactions at what is often the cost of his personal independence. As wealth, especially landed wealth, accumulates in the hands of a few persons, the government's revenues fall." (p. 19)

"The Chinese must on the whole have managed to keep one step ahead of their neighbors in the relevant technical skills, military, economic and organizational." (p. 20)

"In traditional China the complex of factors making for fragmentation, (external conquest and political fragmentation), never operated strongly over a long enough period of time to create enduring disunity. Two other causes also contributed to this . . . 'geographical unity' . . . (following) the revolution in transport and communications . . . Cultural unity also had to be created. It began perhaps, in 213 B.C. with the destruction of local records by the first emperor, a deliberate act of policy aimed at extinguishing local loyalties. It continued for more than a millennium with the Han Chinese colonization of the south; and included the re-sinification of the north on two occasions: Nonetheless, by about 1400 or 1500 both geographical and cultural unity had clearly acquired significance, even if less fundamental than the technological factors which had made them possible." (p. 21-22)

II. The Decline of Empire

A. Migration, resources and productivity

". . . . an economy in which an expanding frontier had played an important part had begun, in terms of people and resources, to 'fill up'." (p. 204)

"Exploitation of the major resource frontier which the south constituted probably gave a dynamic impulse to the medieval Chinese economy; and when it was gone this dynamism likewise ebbed and vanished." (p. 211)

B. Increasing isolation from the non-Chinese world

"During the period of the medieval economic revolution, China's contracts with southern Asia, the Islamic world, and even the east coast of Africa, were expanded through foreign trade. Geographical and anthropological knowledge of the outside world surged forward. Numerous foreign merchants settled in China's coastal cities, some of them even attaining government office. The period of decline coincided with a government policy of reducing contracts between Chinese and foreigners, and of stopping private ventures overseas by Chinese merchants." (p. 215)

C. The changing conception of natural phenomena

"Interest in systematic investigation was short-circuited by a reliance on introspection and intuition. There were therefore no advances in science to stimulate advances in productive technology." (p. 204)

D. The high-level equilibrium trap

". . . . in late traditional China economic forces developed in such a way as to make profitable invention more and more difficult. With falling surplus in agriculture, and so falling per capita income and per capita demand, with cheapening labor but increasingly expensive resources and capital, with farming and transport technologies so good that no simple improvements could be made, rational strategy for peasant and merchant alike tended in the direction not so much of labor-saving machinery as of economizing on resources and fixed capital. Huge but nearly static markets created no bottlenecks in the production system that might have prompted creativity. When temporary shortages arose, mercantile versatility, based on cheap transport, was a faster and surer remedy than the contrivance of machines. This situation may be described as 'high-level equilibrium trap'." (p. 314)