FIVE

WOOD AND WATER, PART I

Tariff Timber

THE WOOD CRISIS OF ELEVENTH-CENTURY CHINA ENDED, NOT WITH an escalation of official forest oversight, but with an attitude of benign neglect, in large part because the initiative of private landowners substantially reduced the need for officials to intervene. Thanks to a salutary climate, fast-growing tree species, and sophisticated business practices, South China produced forest products in large quantities. It was also densely veined with navigable waterways, which made it easy to get timber to market. This nexus of sylvan and riverine endowments made it largely unnecessary for officials to regulate trees in the forest. Yet it would be going too far to suggest that China had no wood bureaucracy. Instead, Chinese states made up what they lacked in *forest* oversight with a sophisticated suite of offices to manage the *timber* supply. Chinese officials worked in several ways to harness the steady stream of wood already on the water. This chapter focuses on their primary tool to manage the wood supply: a fractional tariff that claimed a portion of each log raft that arrived at market for official use. In chapter 6, I turn to the most significant source of wood demand: the official shipyards, which worked together with the tariff offices to standardize and regulate commercial timber.

South China's wood-water nexus was far from a novel feature. Long before the development of timber plantations, Chinese empires shipped timber from the wood-rich south to the wood-poor North China Plain. Some of this shipping was in official hands, but much of it was conducted by private timber merchants. By the 960s, and perhaps long before, officials developed a tariff system to take advantage of this traffic in wood products. Leaving the difficult and dangerous work of lumbering and log rafting to specialists, the state set up customs stations specifically to tax bamboo and timber rafts. The tariff "drew a portion" (*choufen*) of these bulky materials at the very sites where they were most needed for shipbuilding and construction: at major river confluences and near large cities. With minimal official intervention, timber merchants sent regular flotillas of log rafts from the forests to the cities, resource streams that literally flowed toward sites of administration. As long as the state could draw off a fraction of these materials, it had no reason to invest in producing them itself. But the functionality of these tariffs depended on large, well-watered, wooded hinterlands, without which commercial taxes could not have provided timber in sufficient quantity to meet official needs.

Compared to China's broad woodlands and networked watercourses, the forests of Europe and Northeast Asia were highly fragmented. Atlantic powers like Spain, France, Holland, and England competed over a succession of logging frontiers from the Baltic to the North Atlantic and Caribbean and eventually the Indian Ocean.[1] Knowing that their overseas supplies could be cut off by blockade, these states worked to cultivate domestic timber and obtain logging colonies.[2] In central Europe, smaller states like Venice and the German principalities had even less purview to expand abroad, and they worked all the harder to maximize their limited forest resources.[3] In northern and eastern Europe, timber exports were a rare profit center that governments worked to monopolize.[4] Elsewhere, the Ottoman Empire, Korea, and Japan controlled unified territorial entities with rivers that diverged into different seas—different conditions leading to a similar fragmentation of timber oversight.[5] Only Holland, with its position astride both the Rhine and the North Sea, controlled converging shipping lanes like those in eastern China.[6] And indeed, Holland's leaders pursued a similar market-based solution to their timber supply problem. Yet even Holland's timber markets were a fraction of the territories controlled by Chinese empires.[7] With its large, forested territory and expansive shipping lanes, it is no wonder that

China followed a different tack in managing its timber supply than its smaller and more fragmented contemporaries.

Even as the specifics of the timber supply shifted repeatedly, with market cycles, changes of dynasty, and secular changes in forest oversight, the points of contact between producers and consumers remained relatively fixed, at a handful of depots at the major transshipment centers. At these customs stations, small staffs of bureaucrats issued licenses, calculated yields, and disbursed supplies to their respective bureaus. Working together with the shipyards and building offices, tariff officials standardized grades for lumber, roundwood timber, fuel, and other materials, gradually developing the types of specialized expertise that eluded their peers in the territorial bureaucracy. While the Song, Yuan, and Ming courts still conducted occasional logging operations to supplement the tariff, the interface between the customs stations and the plantation economy was so effective that they had almost no need for ongoing forestry offices. Market-based oversight, not territorial control, was the principal state intervention into the changing forest landscape.

EARLY DEVELOPMENTS

While it eventually developed a profound symbiosis with the plantation economy, the tariff system long predated the development of commercial tree planting. Its early history is somewhat murky, but the timber tariff probably developed from commercial taxes on wood products developed in the late eighth century. A major rebellion in 755–63 forced the Tang dynasty to cede control over large portions of the countryside to semi-independent military governors. To make up lost revenue, the post-rebellion Tang state imposed a number of new commercial taxes and monopolies, most notably on salt.[8] In 780, Tang officials also instituted a tax on forest products: "a ten percent tax on all bamboo, timber, tea, and lacquer in the empire, to be paid in normalized copper cash."[9] It is not clear how this tax was originally collected, but by the founding of the Song in 960, the bamboo and timber portion was assessed as an in-kind tariff on wholesale shipments. This tariff, called the "drawn portion" or "drawn disbursement" (*choufen*, *choujie*), mirrored both the name and the function of several other commercial taxes, including an assessment on certain mines and the tariff on foreign luxury goods imported via Guangzhou.[10]

The tariff depots of the early Song demonstrate the working of a system that was already fairly mature, and probably inherited from earlier regimes. Depots to collect and store bamboo and timber (*zhumu chang*) were located in the western suburbs of the capital, Kaifeng, as were yards collecting other bulk goods, including two coal depots (*tan chang*) and one for bamboo slats (*choushui bo chang*).[11] Each of these depots tapped a slightly different supply chain: bamboo slats came from a tax on merchant shipments (*choushui*); coal came from annual labor service quotas (*nian'e*); and the bamboo and timber depots collected timber cut by military and civilian corvée, bought by licensed merchants and eunuch compradors, and derived from tariffs on all commercial shipments throughout the capital region.[12] The receiving depots had counterparts charged with preparing timber for state use: a lumber-working yard (*shicai chang*) to measure and cut timber for construction and a lumber recovery yard (*tuicai chang*) to repurpose substandard timber as scrap wood, poles, or fuel. The lumberyards also had close relationships with the shipyards, and officials and laborers from one site were occasionally dispatched to assist at the others.[13] While the evidence is most extensive for Kaifeng, anecdotes suggest that similar yards were present in major cities throughout the empire.[14]

From the late tenth century onward, the state increased oversight of the supplies collected in its depots, especially in Kaifeng. In 993, the State Finance Commission (Sansi) ordered the capital customs station to establish standard grades of lumber.[15] Annals from the next few decades report figures for wood and timber tax receipts that were presumably collected in this way: 280,000 bundles of firewood and 500,000 loads (*cheng*) of coal in 997, and 3.6 million planks of wood and bamboo and 30 million *jin* (approximately 15 million kilograms) of charcoal, firewood, and reed fuel in 1021.[16] The latter report also includes government expenditures.[17] These comprehensive figures allowed leaders to plan and set policy. In 1010, the emperor ordered that a two-year supply of timber be retained for the repair of dikes and dams and the rest sold.[18] Two years later, he asked the Finance Commission to make a comprehensive analysis of official timber needs and cancel any unnecessary lumbering operations.[19] Starting in 1023, building projects had to be submitted to the State Finance Commission *before* being supplied with government materials (*guanwu*).[20] Gradually the information compiled at the tariff bureaus gave high officials greater leeway to plan for future expenditures.

While the bamboo and timber depots obtained supplies from multiple places, their most consistent source was a tax collected on log rafts as they were landed for wholesale. This tariff provided a ready supply of materials and also gave the state a way to manipulate the wood markets. By "drawing and disbursing" (*choujie*) wood from existing shipments, the state obtained fuel and lumber in the cities without having to undergo the expense of logging and rafting itself. The tariff also gave the state a mechanism to drive prices on the wood market. To encourage imports, officials could reduce or eliminate wood taxes to give merchants incentives to increase imports and lower prices. Examples of these interventions are scattered throughout Northern Song records.[21]

Nonetheless, the tariff was not without its faults. When tax rates were too high—up to 30 percent in the Northern Song—they provided a strong disincentive to imports and increased the price of timber. High duties also provided opportunities for official graft, as bribes were often far cheaper than the cost of the timber taken by the state. Anecdotal evidence points to a relatively large corruption problem: in 980, an astonishing number of high officials and imperial kin were implicated in a plot to import timber from the northwest without paying tariffs; in 1017, the State Finance Commission reported that the tax exemption on official timber imports had become a source of widespread graft; in 1080, prefectural officials were punished for skimming profits from the tax itself.[22] The concentration of oversight at urban markets also meant that the state had limited knowledge about conditions in regional woodlands. But despite these drawbacks, the bulk goods tariff was a net positive to the state, at the center of a highly functional system that generated timber for state needs without the central bureaucracy needing to concern itself with logging in the provinces.

REGULATING THE PLANTING ECONOMY

As detailed elsewhere herein, an invasion by the Jurchen Jin forced the Song court to retreat from Kaifeng in 1127, eventually decamping to the southern city of Hangzhou (Lin'an). Paradoxically, losing access to North China's forests enabled Song officials to greatly simplify the state's timber supply. Like Kaifeng, the new capital was located at a commercial nexus. But unlike Kaifeng, Hangzhou had direct access to the rich woodlands of South China, importing timber via the Qiantang River, Grand Canal, Yangzi River, and

coastal shipping routes. The layout of the city reflected these two sources of forest products: there were bamboo and timber depots in both the northern suburbs with access to the Grand Canal and Yangzi River and the southern suburbs on the Qiantang River.[23] Most other Southern Song cities had direct water access to at least one of the major timber trade routes.[24] The Hangzhou court also benefited from other regional development. For centuries, locals had constructed polders, seawalls, and canals throughout the Yangzi River estuary, leaving twelfth-century Jiangnan riddled with waterways enabling the easy transport of bulk materials, including timber.[25] The broad flow of resources was further enabled by expansion of the money supply through a paper currency called *huizi*, issued on a small scale in 1161, on larger scales in 1170, and during fiscal crises in 1205–8 and 1211. While condemned by both contemporaries and historians, increases in the money supply enabled the broader circulation of goods, including a large-scale flow of copper coins to Japan in exchange for timber, sulfur, and gold.[26]

Through its superior resource endowments, the Hangzhou court was able to increase the availability of timber without recourse to the command economy. After the retreat to the south in 1127, there are almost no records of logging projects directly overseen by the Song state.[27] Instead, a virtuous cycle of trade brought ever more wood into the cities. More timber enabled the construction of more canals, warehouses, and especially more ships, which furthered future imports. By manipulating the timber tariff rates, the Southern Song state was generally able to maintain the wood reserves it needed for state purposes, achieve a steady source of general-purpose income, and stimulate the timber market in response to occasional crises. When additional wood was needed, the state dispatched officials to purchase it from wholesalers—either at urban markets or in timber-exporting regions—largely using paper money. In doing so, it increased both the volume of cash and the volume of timber in circulation.

During the opening decades of the southern court, rebuilding dominated policy and the court lifted tariffs across the board. As the Song armies continued to fight north of the Yangzi, the court reduced wood taxes to aid in rebuilding northern cities in 1128 and again in 1130.[28] While these measures did little to reverse the destruction of the north, the Southern Song court continued to use tax holidays to promote rebuilding. The court suspended taxes on transport materials for a year to aid the settlement of refugees in the south after the Jin wars.[29] When fires burned parts of Hangzhou in 1133 and 1140, the state excused building materials from commercial

taxes.[30] According to informal recollections, enterprising merchants took advantage of the tax holidays to import timber into the capital, alleviating the wood shortage and making huge profits.[31] The state likewise forgave taxes on wood imports to rebuild after fires or warfare in Yangzhou in 1135, Zhenjiang in 1150, Guangnan (Guangdong and Guangxi) in 1166, and Huainan in 1207 and 1209 and to alleviate other local shortages in 1203, 1231, and 1233.[32]

While officials used occasional tax relief to encourage wood imports, they otherwise preferred to keep the tariffs in place to supply government construction. In 1128, riverine jurisdictions in the middle Yangzi were ordered to construct nearly three thousand grain transport ships to supply the capital. When construction was delayed, the court redirected the timber tariff to provide the primary source of shipbuilding materials.[33] Tariff timber was also used to rebuild dikes in Hubei in 1153, to build housing for refugees in Huainan in 1162, and to build barracks and stables for soldiers in Chizhou and Jiangzhou in 1161.[34]

The Southern Song also addressed the corruption that flourished around the tariff. When an 1129 investigation revealed that some tax officials collected illegal surcharges on top of the regular tariff, all officials were required to report excessive fees or be held accountable for the same crime as those collecting illegal taxes.[35] In 1156, Hangzhou prefect Rong Ni discovered that tax officials and clerks were using official requisitions to force merchants to sell goods at discount. He ruled that henceforth any official purchase order should be refused and reported.[36] These reforms did not eliminate the abuse of official privilege—another investigation in 1178 revealed officials who forced merchants to sell below market price.[37] Nonetheless, it was now more difficult to use official position to force merchants to sell at or below cost.

Having targeted abuses among tax officials, court reformers turned to address corruption among official timber purchasers. A new 1160 regulation required that official timber buyers—previously tax free—pay the same commercial taxes as private merchants; abuses of rank to avoid taxes would be punished as a "violation of imperial command" (*weizhi*).[38] In 1162, the court extended the 1160 ruling to the military as well. In 1166, a cavalry officer dispatched to buy twenty thousand poles of timber requested that the wood be excused from taxes and tariffs. Superior officials refused his request on the basis of the 1162 order.[39] Two years later, another garrison requested a tax release on the timber to expand its barracks and stables. The court also denied this request, referencing the 1166 request as precedent.[40]

As it reformed the tariff system, the state tried to balance the need for revenue with the need to prevent graft and to keep high transaction costs from halting the flow of wood. By the early 1150s, the desire to hasten imports from the timber-rich areas led to a new policy to license merchants. In the fir-planting regions of Huizhou and Yanzhou, tax officials issued affidavits to timber wholesalers, allowing them to avoid all taxes en route, paying a single tax of 30 percent upon arriving at the capital at Hangzhou.[41] The elimination of repeated tariffs represented major savings for merchants trading at the capital. In 1173, one observer reported that timber bought in Huizhou for one hundred copper cash sold for two thousand at Hangzhou.[42] While this is almost surely an exaggeration, the establishment of a single tariff of 30 percent allowed merchants to charge a smaller markup and still make a substantial profit. By the thirteenth century, timber licenses were even used to regulate emergency tax forgiveness. In 1204, when yet another fire in Hangzhou led to an urgent need for construction materials, the Zhejiang Fiscal Commission granted timber merchants temporary licenses excusing one-third of the commercial taxes en route and the entire tax assessed at Hangzhou.[43] A similar, temporary permit was issued on shipments of building materials to Hangzhou in 1220.[44] These targeted, licensed tax breaks replaced the wholesale tax holidays used earlier in the dynasty.

Over the course of a century, gradual, directed reforms made it significantly more difficult for officials to profit from loopholes in the tax and tariff system. While the tariff added to the cost of individual official timber requisitions, regulations stabilized the timber market in ways that benefited producers and consumers alike. By 1200, most bamboo and timber depots now collected the tariff in cash rather than in kind.[45] This suggests that the price of timber was stable enough that the state preferred to replace a guaranteed supply of building materials with general-purpose revenue. In some ways, the Southern Song benefited from the reduced size of its empire. Tariff reforms proceeded overwhelmingly by local initiative at Hangzhou and in a handful of prefectures upstream. The Qiantang River connecting Huizhou to Hangzhou developed as a particularly well-licensed marketplace for timber.

Outside of the Qiantang River system, records are less complete, but there are indications that tariff reforms proceeded as well. An 1158 order simplified the wood markets of Jianzhou, Fujian, by imposing a single category of commercial tax on all timber.[46] In 1196, an edict prohibited ethnic Chinese (Hanren) from entering the forests in southern Sichuan; instead,

they were instructed to "wait for the 'barbarians' [*man*] to bring planks and timber to the river and ship them to the waterways below Xuzhou to trade."[47] As the result of an investigation on excessive taxation, local administrations in border regions were required to publicly post rates for all categories of taxable goods, including timber.[48] As in Hangzhou, these reforms were largely undertaken on a local basis, but without the power of the court behind them they did not achieve the same levels of sophistication. Unlike the preceding Kaifeng court, which had to balance the oversight of several highly diverse streams of timber, the Hangzhou court focused overwhelmingly on regulating a single river valley, resulting in a far more coherent system of wood markets.

INTEGRATING EMPIRES, MERGING MARKETS

If the Southern Song was better able to regulate its smaller empire following the loss of the north, the Yuan faced precisely the opposite challenge: reintegrating northern and southern timber markets. For more than a century, North China had been rocked by warfare and emigration, first during the Jin invasion in the early twelfth century and again by the Mongol invasion in the early thirteenth century. During these periods of upheaval, officials resorted to the command economy to replace the materials previously acquired through commercial tariffs. Yet with the restoration of peace following the completion of the Mongol conquest of North China in 1234, they gradually returned to a more indirect system of taxation and oversight. While the section of the *Yuan History* on timber taxes is lost, the management of timber economies in Mongol North China can be at least partially reconstructed by reference to the bamboo monopolies. These monopolies worked in various ways: sometimes the state controlled production directly; in other cases, it had exclusive right to buy bamboo from private producers (monopsony). The state then sold bamboo to the public according to three categories with set prices. In 1267–68, the monopoly was reorganized as a system of licenses sold to private merchants; it was abolished entirely in 1285, shortly following the conquest of South China. The tenants of former state monopolies now paid a cash rent (*zu*) on state-owned bamboo forests instead of supplying bamboo, while private producers paid a cash tax (*shui*) rather than being forced to sell their production to the state.[49]

In South China, the Yuan benefited from far more continuities with the tariff oversight of the Southern Song. In the absence of centralized accounts,

these continuities can be reconstructed through local records. In Huizhou, Yuan administrators inherited and modified rates at a main prefectural tariff station—first converting to a cash tariff in 1278, then fixing its quota in 1284. In 1311, as Huizhou's primary wood markets along the Qiantang River diminished in importance, local officials closed the station. Yet they continued to operate smaller depots that taxed Huizhou's secondary wood market: the south-flowing rivers that supplied fuel to the Jingdezhen kilns.[50] The Zhenjiang tariff depot presents another case of continuity across the Song-Yuan transition. Collection of the tariff appears to have lapsed during periods of heavy fighting in the 1270s, but it was restored almost immediately and reorganized several times between 1287 and 1324. Revenues at Zhenjiang declined by about 10 percent in the early Yuan and then rebounded to more than twice their Southern Song peak.[51] Yuan officials also operated a long-standing tariff depot in Suzhou, about which details are not forthcoming.[52] Throughout Jiangnan, local officials were quite flexible in shifting tariff administration in accordance with local markets, with changes in the central administration having little impact on the functioning of county- and prefecture-level wood depots.

By the early 1300s, the Yuan state integrated the distinct northern and southern timber taxes into an empire-wide revenue stream.[53] In 1328—the only year with central records—taxes on lumber and bamboo were collected in parts of both the north and the south, but the figures reveal a hodgepodge of different policies (table 5.1).[54] The revenues collected in the north were quotas, probably based in forest rents, while the revenues collected in the south and at Beijing had no quotas and were probably from tariffs that varied depending on the volume of trade. This was the Yuan empire's broader legacy: the reincorporation of thriving regional wood markets into a single empire-wide revenue system.

TABLE 5.1. Bamboo and timber taxes, 1328

	QUOTA WOOD	QUOTA BAMBOO	NONQUOTA WOOD AND BAMBOO
Capital region	676 poles	2 poles	9,428 poles (73 wood; 9,355 bamboo)
Henan	58,600 planks	269,695 poles	1,748 poles
Jiangzhe	—	—	9,355 poles
Jiangxi	—	—	590 poles

Source: Schurmann, *Economic Structure of the Yüan Dynasty*, 160–62.

In the 1350s and 1360s, much of China was again plunged into chaos, as the millenarian Red Turbans revolted against Yuan rule. When Zhu Yuanzhang emerged victorious from the Red Turban wars in 1368, his young Ming dynasty depended on the continuation of Yuan tariffs. Until 1380, the Ming revived, retained, and expanded the cluster of timber depots in Jiangnan to benefit from the regional economy. In Suzhou, Ming officials added five new customs stations to the prefecture between 1367 and the early 1370s. With six customs in a single prefecture, this was clearly an epicenter of the timber trade. In 1377, the six bureaus reported total receipts of more than 62,000 poles of timber; 922,000 poles of bamboo; 215,000 *jin* of large firewood (approximately 100,000 kilograms); 158,000 *jin* of charcoal (80,000 kilograms); and nearly 8,000 bundles of smaller fuel, reeds, and hay.[55] Many other local and regional tariff stations, including those in Huizhou and Hangzhou, continued to operate after the disruptions of the wars died down.

FROM AUTARCHY TO INFLATION

If the first decade of Ming rule saw a revival of both the timber trade and the timber tariff, Ming monarchs soon put their unique stamps on the system. Once government was firmly established at Nanjing in the 1370s, Zhu Yuanzhang made clear his ideals for local self-sufficiency and ended the short-lived continuity with Yuan tariff institutions. His vision was not just to make local governments self-sufficient; Zhu intended for even larger projects to be supplied directly from local resources. Zhu wanted Nanjing's fuel supply provided locally and levied labor service on two nearby counties to provide the three thousand laborers necessary to cut and transport reed fuel from islets in the Yangzi River to the capital.[56] He conscripted transport ships from private households along the rivers or constructed them through irregular levies of timber and labor.[57] Even for large and concentrated needs, Zhu preferred to obtain supplies locally and through direct levies.

Having established the principles of self-sufficiency for his government, Zhu Yuanzhang even tried to eliminate the tariff system entirely. In 1380, he issued an edict closing all customs stations in the empire.[58] It is highly doubtful that this order was ever carried out universally as stated. Nonetheless, Zhu's other policies greatly disturbed the thriving markets in the lower Yangzi region, so there was less commerce to tax anyway.[59] But despite Zhu's best efforts to make his capital self-sufficient in resources, it proved

impractical to run an empire under self-imposed autarchy. In 1393, he changed the tariff system again, probably as the oversimplified supply lines established in the previous two decades failed to provide enough materials. Perhaps recognizing either the need or the opportunity to tax the extensive Yangzi River timber trade, he established tariff stations at two locations near Nanjing, one at Longjiang (figure 5.1) and one at Dashenggang.[60] Yet even as Zhu reestablished customs stations, he portrayed them as part of a continued drive toward self-sufficiency. The same year he established Longjiang as a tariff station, Zhu designated it as the primary site for building transport ships for the Yangzi River.[61] Regulations required that Longjiang shipwrights rely almost exclusively on materials obtained through the tariffs.[62] Hangzhou also established a customs station specifically to collect timber for building transport ships for the lower section of the Grand Canal.[63] As a further indication of their intended purpose, these new customs were overseen not by revenue officials, or by the Bureaus of Construction or Transport, but by the Bureau of Military Farms (Tuntian Qingli Si), an office otherwise tasked with making the military self-sufficient.[64]

FIG 5.1 Night rain on Longjiang customs. Detail from a woodcut depicting a large flotilla of logs moving along a river. The original caption reads, in part, "Southwest of the city walls, outside the Yifeng Gate, is a ford and customs station to tax timber from Hunan and Sichuan for use in building official ships." Image from *Nanjing Illustrated* (Jinling tuyong; 1624). Courtesy of the Library of Congress, Chinese Rare Book Digital Collection.

Like their Northern Song and Yuan precursors, and unlike the specialized customs stations of the Southern Song, Ming tariff offices collected materials from a variety of sources, including direct goods levies as well as the bamboo and timber tariff. The tariff was the most important source of timber and other building materials, but its fuel receipts were supplemented by a specialized reed tax (*luke*) on households living along the Yangzi River.[65] As in the Song, inferior building timber was also repurposed as fuel. These combustibles were distributed to the imperial household, government offices, and state workshops according to fixed grades and quotas.[66] In 1391, the Ming court established official plantations in the hinterlands of Nanjing to provide a direct supply of ancillary shipbuilding materials like tung oil, palm fiber, and lacquer.[67] These goods were also shipped to the two main customs depots, which issued reports on stock and inflow every ten days and disbursed materials to various government workshops based on these figures.[68] Accounts were summarized monthly and forwarded to the Board of Works annually.[69] Only in case of shortfalls in the tariff materials could additional supplies be requisitioned, either by purchase or by state-supervised logging (*caiban*).[70]

Despite their ostensible role in promoting a self-sufficient, planned economy, the tariff stations sat astride extremely active wood markets. Nanjing tariff regulations list a total of thirty-two different categories of goods, including six varieties of roundwood timber, two of cut boards, five of bamboo, and four of fuel. In contrast to contemporary northern markets, the Nanjing timber market was dominated by just two types of tree: fir and, to a lesser degree, pine. The river customs also favored fir with a preferential tariff rate. While most timber and semifinished wood products were taxed at 20 percent, the highest-value fir timber and several kinds of cane and bamboo were taxed at the lowest rate of one-thirtieth (3.3 percent), the going rate on most commercial products.[71] This 3.3 percent tax on fir was only one-tenth the rate assessed at Hangzhou in the twelfth century, yet Nanjing still appears to have been able to meet most of its timber needs through this tariff. This suggests that the Jiangnan timber market had grown substantially since the Song.[72] Despite Zhu Yuanzhang's initiatives to promote a planned and self-sufficient agrarian economy, timber markets continued to flourish. Building on the foundations established in the Song, plantation-grown conifers were the dominant species on the market.

As detailed elsewhere herein, Zhu Yuanzhang's chosen successor was soon deposed by a junior son, Zhu Di, who reigned as the Yongle emperor.

As Yongle moved the capital to his seat at Beijing, he set up timber yards to supply it. In 1407, five bamboo and timber depots were built in a ring around the city, each taxing a discrete transport route. The most important of these stations was at Tongzhou, where canal traffic from the south was offloaded.[73] In 1413, the state set tax rates for the Beijing depots, naming fifty-one different categories of bulk goods, including eight types of timber, four of cut boards, and twelve of fuel. As at Nanjing, the overwhelming majority of goods—including most timber and fuel—were taxed at 20 percent. Lime, mineral coal (*shitan*), fir timber, and several other goods were taxed at the lower rate of two-thirtieths (6.7 percent).[74] Beijing's market catchment incorporated a far greater range of timber species than Nanjing's: conifers such as pine and cedar imported from the north and northwest, hardwoods (especially fruitwoods) cut in the Central Plains region, and shipments of southern species like China fir. The Beijing fuel market was even more complex, including several types of crop wastes; two grades of mineral coal (*shitan* and *meizha*, the latter referring to coal fragments); several grades of fuelwood; and wood charcoal.[75] Even as fir dominated southern timber markets, northern supplies of fuel and timber remained complex, provided by multiple biomes, species, and institutions.

While Zhu Yuanzhang had failed to end tariffs by fiat in the 1380s, the system regressed significantly as a less-intended consequence of state policy in the 1420s and 1430s. Following the death of the Yongle emperor in 1424, his successors ended many of the extractive policies of the early Ming, while other institutions failed during the economic decline that followed. In Shaoxing alone, fourteen customs stations were closed in 1425. At least four of these had been run expressly for the purpose of collecting timber and bamboo.[76] Between the Xuande reign (1426–35) and the 1460s, Huguang, Jiangxi, and Zhejiang Provinces built their own transport ships to avoid the cost of sending materials to the main yards in Nanjing.[77] This suggests that customs stations were shuttered in these provinces or were independent of central oversight. The one exception to this general trend was a new customs depot established at Zhending in 1436 to supply logs directly from the Western Hills to Beijing.[78] Otherwise, there is a near total lack of customs records for the next two to three decades, an absence that parallels administrative retrenchment across the board in the mid-1400s.[79] In 1497, a Board of Works official was unable to identify *any* staff dispatched to the Hangzhou branch office prior to 1466.[80] Jiujiang, another particularly well-documented customs station, has no records of the period from 1429 to 1449.[81] While absence

of evidence must be addressed carefully, there are strong circumstantial reasons to believe that the second quarter of the fifteenth century saw the near-total devolution of market oversight south of the Yangzi. With deeply depressed markets, there was little timber trade to tax and little reason for the state to staff its river customs. The shuttering of customs stations was a de facto acknowledgment of these autarkic conditions.

With the gradual recovery of markets in the 1450s and 1460s, customs stations began to reappear. In 1449, a eunuch was sent to oversee the Jiujiang station in an attempt to generate revenue for the privy purse from the booming middle Yangzi trade.[82] In 1457, a censor sent to Hunan to deal with a tribal rebellion revived tariff collection there as well, establishing a customs station at a princely estate as an expedient measure to raise timber to build warships.[83] After a period without central state management, the Board of Works resumed oversight of the Hangzhou customs station in 1466.[84] In 1471, the state reestablished customs stations at the major transshipment points in the south, including Wuhu, Huzhou, Jingzhou, and Taiping, and formalized oversight at the Hangzhou and Jiujiang stations.[85] The following year, a garrison commander named Wang Li, probably an official at the military shipyards in Nanjing, suggested distributing new grades for bamboo and timber to these stations, and the Board of Works dispatched officials to oversee them.[86]

In the late 1400s, the economic situation shifted markedly as silver flooded the markets, and the price of timber rose rapidly. Having previously switched to collecting silver, some depots switched back to collecting timber in kind to offset inflation in the cost of timber.[87] At Hangzhou, officials collected timber and bamboo for use on-site, but also began to sell overflow, taking advantage of rising timber prices to fund other projects.[88] By collecting timber in kind, the value of the tariff grew with inflation and with the growing scale of the timber trade. By the mid-1500s, the timber collected at the Hangzhou customs had a face value two and a half times greater than in the 1400s.[89] Part of this increase was due to inflation in timber prices. Figures from the official shipyards at Nanjing suggest that the price of timber increased by more than 70 percent between the 1490s and 1545.[90] Yet even accounting for inflation, the tariff offices collected more materials. By rough estimate, the volume of timber traded at Hangzhou doubled in the first half of the 1500s.[91]

Nonetheless, the return to in-kind tariffs was probably both localized and temporary. By the sixteenth century, government expenditures were all

on the rise, and the promise of general-purpose silver revenue was too much to pass up. Records from Jiujiang, a major station taxing the middle Yangzi, give a rough sense of how the tariff worked at high-volume customs stations of the mid-Ming. For large timber rafts, officials calculated the linear size by summing their length, width, and depth.[92] Merchants paid a rate of 4.862 taels of silver per linear *zhang* (approximately three meters, or ten feet).[93] Smaller shipments were taxed by the log: 0.003 taels per pole under one *chi* in circumference (approximately one-third meter, or one foot); 0.007 taels per pole between one and two *chi*; and 0.04 taels per pole larger than two *chi*. For bamboo rafts, officials established a standard depth of one *chi*—considered equal to three poles of bamboo—and a standard length of two *zhang*. Then they counted the width in poles and estimated the total number of poles based on the standard length and depth. Each pole was then taxed at a rate of 0.002 taels. The tariff office charged the same per-pole rate on smaller bundles of bamboo.[94] This system allowed rapid calculation of the silver tax on the large rafts of wholesalers, while also permitting greater precision in taxing the smaller shipments of lesser merchants.

Officials in emerging timber markets in the south and west also established new customs stations. Because the same ships that carried salt upstream often returned with shipments of forest products, many of these new stations were initially founded to oversee the government salt monopoly before expanding to tax timber as an ancillary source of income. The locus classicus of this salt-timber nexus was a pair of customs stations established in southern Jiangxi, a major timber frontier in the Ming. In 1510, Wang Zhi, a low-level military official, proposed to establish customs offices in southern Jiangxi in order to finance the regional military garrison. Two stations were set up, one in the military-administrative region of Nan'an and another in the civil prefecture of Ganzhou. While Wang Zhi's career is otherwise lost to history, a far more famous figure soon arrived. Wang Yangming (also known as Wang Shouren) would later rise to fame as the most important Neo-Confucian philosopher of the Ming. But in 1516, he was a pacification commissioner (*xunfu*) dispatched to deal with poor governance and revolts in the Ganzhou region. Wang Yangming's inspection revealed that the tax stations were badly mismanaged: individual shipments were often taxed twice, once at Nan'an and again at Ganzhou, and officials often accepted bribes. Wang instituted better oversight, and considered closing the Nan'an station entirely, touching off a decades-long debate. Ultimately, customs were too important as a source of revenue in this otherwise

poor and unruly region, and both stations were maintained through the rest of the dynasty.[95] By 1620, the local economy had grown to such an extent that even the Ganzhou station collected its timber tariff in silver rather than in kind. Pooled with other commercial taxes, regional officials used this silver to meet the full range of expenses, including the *purchase* of timber for construction and shipbuilding.[96]

The records of the Ganzhou customs also fill in the picture of expanding timber markets. By the seventeenth century, even Ganzhou produced plantation-grown fir in smaller sizes—generally under a two-foot circumference. By this point, Ganzhou timber producers had the facilities to process fir logs into square-cut (*fang*) and board-cut lumber (*ban*), but the prefecture also taxed "free-floated" timber (*qingshui liu*) of far greater size than the plantation-grown fir. These larger logs were probably cut from old-growth woodlands and then floated downstream piecemeal, unlike the timber shipped in rafts from tree farms. Other types of trees were also sold in up to four-foot circumference. Alongside the evidence in chapters 2 and 3, this further demonstrates the spread and elaboration of timber planting and processing across the interior south. By 1620, Ganzhou—an unruly frontier a century earlier—was increasingly well integrated into the Yangzi River timber markets. While loggers still cut from the natural growth, plantation-grown fir now made up a growing proportion of timber exports.

A MILLENNIUM OF MARKET OVERSIGHT

Bulk goods tariffs were the focal point of interventions into wood markets under the Song, Yuan, and Ming dynasties, yet even this six-century span understates the continuities of timber market oversight. The basic tariff institutions were innovated as early as 780 and continued along similar lines for another two and a half centuries of Qing rule.[97] While specifics varied, the basic continuities across more than a millennium are truly astounding. Tariffs enabled state offices to ensure their own wood supplies, and to shift the price of wood for private consumers, all without requiring direct oversight of the diverse and changing forests of their empires. By collecting and taxing the trade in timber and fuel, tariff depots both responded to existing conditions and created new markets. Timber depots were consistently placed at natural confluences along major shipping routes, with the most important offices in the suburbs of the capitals: Kaifeng, Hangzhou, Nanjing, and Beijing. The state's high demands for timber and fuel made each of

these cities the most important wood markets in their respective empires and the centers of state oversight.

Tariff policies changed in response to both politics and market conditions. In periods with well-functioning markets, the tariff was used to collect timber and fuel for state use. When the economy was especially cash-rich—as in the late Song, mid-Yuan, and mid- to late Ming—tariff officials generally taxed rafts in cash or silver instead of collecting timber directly. This allowed them to use tariff receipts for more general budgetary needs, although runaway inflation occasionally led administrators to return to collecting timber in kind. In periods of conflict or autarchy, including the Song-Yuan wars of the 1270s, the late Yuan wars of the 1350s and 1360s, and the post-Yongle depression of the 1420s and 1430s, wood markets collapsed, and tariffs were suspended. Rulers and administrators could also use timber tariffs to change the terms of the economy. Song officials used tax holidays and licenses to encourage wood imports and lower prices for urban consumers. Yuan magistrates continually adjusted their tax collection to reflect market conditions and maximize revenue. In the early Ming, Zhu Yuanzhang imposed a policy of self-sufficiency and closed customs stations for ideological reasons. Officials in the mid-Ming revived contracts and licenses as pragmatic means to manage suppliers in a vibrant and fast-changing marketplace.

The functions played by bulk goods depots also depended on the regional arrays of institutions involved in provisioning the state with timber, fuel, and other materials. In the Northern Song, Kaifeng's depot stacked together timber logged by military supernumeraries in the northwest, civilian corvée in the north, merchant lumber teams in the south, and tributary chieftains in the southwest. By contrast, Hangzhou's two main depots in the Southern Song relied overwhelmingly on merchant-supplied timber. This pattern of northern command economies and southern merchant capital was repeated in the Ming. Nanjing, which functioned as the seat of government for South China, was supplied largely, but not exclusively, by taxing merchant timber. Meanwhile, Beijing, in the north, assembled a wide variety of corvée-, merchant-, and military-logged materials, with each of its five bulk goods depots facing a different regional supply.

Finally, timber tariffs changed the use of regional forests and responded to changes in supply. In the early Song, the Kaifeng timber depot brought together a huge variety of tree species, including pine and cedar from the northwest and fir and an astonishing variety of subtropical broad-leaved

trees from the south. By the early Ming, Nanjing's Longjiang depot focused overwhelmingly on grading and taxing just two types of southern conifers—fir and pine. By marking fir as the premium timber species, tariff regulations recognized that it was both desirable and widely available; by granting a preferred tax status, bureaucrats only encouraged the further development of fir plantations. Yet while the state's oversight of wood markets helped transform China's regional forests, this effect was largely indirect, in the form of standards for size, species, and grades of timber and fuel that were largely provided by other parties.

While the tariff bureaus were not principally responsible for the growth of the market for timber, they clearly benefited when the supply of wood and timber grew. What is more, tariff data provide some of the best insights into this market. While there are no continuous series of tariff data (at least not until the mid-Qing), scattered anecdotes and figures allow some very rough estimates of its growth. Based on the fluidity of Southern Song tariff collections, the timber supply may have doubled during the twelfth and thirteenth centuries. The very limited Yuan data suggest that timber production in Jiangnan grew by another 50 percent during the early fourteenth century. Ming Nanjing's wood market may have been five to ten times the size of Southern Song Hangzhou's. After a substantial downturn in the second quarter of the fifteenth century, the timber market matched or exceeded its previous peak by the late 1400s, and probably doubled again in the early 1500s. While very approximate, these estimates correspond with the greatly expanded territory put toward timber production documented in chapter 2. It was this unprecedented expansion in China's forest economy that allowed Huizhou's merchants to go from regional timber producers in 1150 to empire-spanning financiers in 1600. Indeed, the booming timber trade in sixteenth-century China is almost reminiscent of nineteenth-century commodities markets in the Atlantic world—the economy that produced many of Europe's and North America's modern business practices.

As timber markets expanded, the tariff system became more and more significant to state revenues and almost the only locus of official wood oversight. Chinese states did continue to dispatch logging teams, principally to provision the naval shipyards and the Imperial Construction Bureau. The strategic importance of warships, and the symbolic importance of palaces, meant that high officials supervised these projects long after deciding that official logging was obsolete for other purposes. But as the fir growers of South China became more effective at producing high-grade timber, as

merchants developed standards in collaboration with shipyard and construction officials, and as the frontier of old-growth trees receded, the state gradually abandoned these logging projects as well. By the end of the sixteenth century, even the naval shipyards and the Imperial Construction Bureau got their timber primarily on the market, not in the forest.