An Economic Analysis of the Historical Development of Wood Supply Systems in the Southern United States

by

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Abstract

Although there exists substantial literature regarding the historical development of the timber industry in the southern United States, few economic analyses have been performed regarding the development of southern wood supply systems. The authors employ a transaction cost model to explain how each of the significant participants of the forest products sector—lumber and paper mills—organized so as to utilize the wood resource by the most efficient means possible. Such factors as land availability, labor costs, technological development, and asset requirements are considered. Hypotheses are put forth that attempt to explain why the two industries developed different wood procurement strategies.

INTRODUCTION

A fundamental principle of economics, as has been put forth by such notables as Ronald Coase (1988), among others, is that firms organize so as to minimize transaction costs. The forest products industry that developed in the South is no exception. Beginning with the lumber industry, which migrated to the South from the Great Lakes states and New England in the 1870’s and 1880’s, and including the paper industry, which began investing heavily in the South in the 1930’s, 1940’s, and 1950’s, the development of the southern forest products industry is a story of institutional evolution.

One of the most critical economic aspects of productivity in the forest products industry is, of course, the supply of raw materials. The questions of where and how to procure stumpage are of critical importance to the forest products industry. The historical development of the two main groups in the forest products industry—sawmills and paper mills—and the current state of these two productive activities revolves around the pursuit of the most efficient means possible to procure wood from the forest and transport it to the mills. As one studies the development of the lumber and paper industries, it becomes apparent that the two activities, in their early evolution in the South, developed very different procurement strategies, which impacted the way each was organized, including the vertical structure of each.

In this paper, we examine the development of the lumber and paper industries from an institutional perspective. We develop our analysis along the lines of the factors of production, hypothesizing how institutional change and economic development influenced the organization of the southern lumber industry in the latter half of the 19th century and the southern pulp and paper industry in the first half of the 20th century.

A Factor Cost Comparison of the Lumber and Paper Industries

As one studies the development of the lumber and paper industries, an awareness of the different organizational tactics utilized by both becomes apparent. The lumber industry, to a large extent, established sawmills in prime locations - those that most readily had access to rail lines and the wood resource - and then purchased land fee simple, from which they harvested the virgin sawtimber. The paper industry also chose prime locations in which to build mills - locations which provided abundant water, plentiful labor and resource, and good transportation. However, the paper industry, to a much larger degree than the lumber industry, did not purchase massive amounts of land from which they procured pulpwood. Instead, the paper industry employed a third party wood dealer system. In those early days, wood dealers procured stumpage from dispersed land owners and insured its delivery to the mill. The dealer, then, became a locus of transaction costs. He contracted with the mill on a delivered price for stumpage, contracted with land owners to secure the stumpage, and contracted with producers (or loggers) to harvest the stumpage (Flick 1985). The wood dealer earned his profits by minimizing transaction costs faced by the other parties. However, the question remains: why did a wood dealer system develop to service the pulp and paper industry and not the lumber industry?

One can begin to find the answer by examining the two industries in the context of their development. We do that here by contrasting the two industries with regards to land, technology, and labor.

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Land

Following the Civil War, the southern lumber industry was still in its infancy. For the most part, small, locally owned mills dotted the southern landscape. In those days, mills located along larger waterways (Hickman 1962). By locating along waterways, logs could be floated from the harvesting operations to the mills. Finished lumber could be shipped via waterways overseas and to the Northern United States. The rich wooden treasure that was the southern forest went unnoticed by the great northern lumber interests - the "Lumber Barons" - for the first three quarters of the 19th century. However, as they depleted supplies in the New England and Great Lake states, the Northern lumbermen turned their attentions southward.

As they moved into the South, they found cheap, plentiful land that was concentrated into a few large ownerships. For example, when Georgia was admitted as a state, it ceded its western lands to the United States. This area was later to become Mississippi and Alabama. Therefore much of this land was in federal hands (Dodd 1974). Later, when Alabama was admitted to the union, the United States granted to each state "16th section lands", the proceeds of which were, at least theoretically, earmarked for education (Harris 1951). The state, finding it could fund little education with idle lands, sold much of its lands, as did the federal government. Many of the government - auctioned tracts were bought by speculators on behalf of the railroad and lumber industries. At this stage in the development of the industry, it found fee simple land purchases to be more efficient than trying to procure wood from land they did not own. In many cases the northern lumbermen purchased the land, harvested the large trees suitable for lumber, and then abandoned the land, moving on to the next prime timber location. The state would then reclaim the land, or perhaps squatters settled on it.

The paper industry, when it began its move into the South, did not face concentrated land ownership. The state governments of the South and the federal government had, for the most part, abandoned their policies of massive land disposal via auctions and patents prior to the arrival of the paper industry. Therefore, this industry would have had to purchase relatively small tracts of timberland from many small landowners, had it chosen to procure stumpage internally from its own holdings. This would have meant relatively high transaction costs compared to the lumber industry, particularly if it tried this procurement strategy before and during mill construction.

Technology

There was no gasoline technology and therefore no developed highway system during the heyday of the southern lumber industry. During the 1800’s and early 1900’s it relied on steam technology to harvest and transport its logs. Once lumbermen purchased land, they built "spur lines" or crude railroad lines in order to transport man and machine to and from the woods. Steam locomotives provided the engine by which woods workers and their equipment were moved to the woods. When enough wood had been harvested it was loaded onto rail cars, again with steam technology, which powered the loaders. In the forests of the lumber industry, harvesting and transportation operations were relatively capital intensive, requiring heavy monetary outlays in order to get the wood from the forest to the mill, compared to the paper industry. The paper industry’s capital was spent, for the most part, in the mill itself. There is a much more complex transformation involved in deriving paper from wood than lumber from wood. Therefore, complex equipment had to be employed in the manufacture of paper. For the lumber industry, the transformation of logs to lumber was relatively easy and required less sophisticated and expensive equipment.

In addition, by the time the paper industry arrived in the South, an extensive transportation system had developed, including rail lines, waterways, and especially highways (Dodd 1974). Technology had advanced beyond steam-driven machinery and into the fossil fuel era of gasoline and diesel-powered machinery. The paper industry did not have to invest in massive amounts of technology in the field. They did not have to create their own transportation system as did the lumber industry; and because the technology was more accessible to others outside of the paper industry itself, there did not exist transportation economies as existed during the lumber era.

Labor

Because of the technologies used in the woods and in the mills, each industry, lumber and paper, had differing labor requirements. Since capital expenditures were oriented heavily in "field" technology for the lumber industry, they required high quality, skilled workers outside the mill. A knowledgeable labor force was needed to establish and maintain rail systems and the steam locomotives which operated on them, as well as operating the steam-powered equipment in the woods. The lumber mill
worker, on the other hand (with the exception of several skilled workers that operated the machinery) was not as skilled relative to his brethren on the railroads and in the woods. He performed basic, menial tasks such as stacking and moving lumber.

For the paper industry, however, the relatively skilled worker was required to operate the complex machinery within the mill itself, while the unskilled worker operated a chainsaw or drove a pulpwood truck in the woods. However, as has been stated earlier, the pulp and paper industry divested itself of as much harvesting activities as possible.

Another factor that contributes to the differences in organizational behavior between the lumber and paper industries is the legal environment in which each operated. During the 1800’s, a period of “true” laissez-faire existed in the United States, particularly in the South. Virtually anyone could be hired to work under any condition. There were few, if any, labor laws with which to contend. Courts looked favorably upon business activities and only rarely looked to the “deep pockets” in cases of potential employee liability from tortious actions. There was no minimum wage, nor maximum allowable amount of hours per week in which one could work, nor any administrative agencies to inspect for working conditions. There were no unions in the South in the 1800’s. Lumber mills operated under conditions of nearly total freedom. They could employ labor cheaply and utilize it to maximize profits unhindered by administrative rules and regulations designed to benefit workers.

The 1930’s and 1940’s, however, saw the rise of the Administrative State in America. Government, via authority of the Interstate Commerce Act, commenced regulating all aspects of industrial activities. These regulations imposed transaction costs on the paper industry, particularly in the form of labor regulations, that the lumber industry did not face.

The Internal Revenue Service developed more stringent requirements in order to prove that a worker was not an employee, in which case the mill would not be required to pay various taxes (income, FICA) on behalf of an employee.

Courts, also, began casting a more favorable light on the doctrine of respondent superior, and looking to the “deep pockets” of employers to provide remedies for tortious actions of employees.

These new rules and regulations enforced by multitudinous administrative agencies and courts had a dampening effect on the paper industry’s incentive to employ personnel necessary to procure stumpage internally.

Thus, we have the rise of the dealer system in the pulp and paper industry, whereas one existed only to a very limited degree previously. Because the lumber industry could purchase land cheaply from concentrated ownerships, was capital intensive in the procurement side of production, and had a cheap labor supply, it procured stumpage internally by purchasing timber land fee simple and harvesting from its own land. The pulp and paper industry, on the other hand, faced a widely dispersed land ownership in the 1930’s and 1940’s, required intensive capital outlays in the mill, and required a good labor force for its mill production, not for the procurement of wood input. In addition, the pulp and paper industry faced labor costs in the form of regulations that the lumber industry did not face; therefore, it procured wood input externally, by utilizing the wood dealer. The integration decisions, based on technological and legal determinism, seem clear.

However, Oliver Williamson (1985) states that “…decisions to integrate are rarely due to technological determinism but are more often explained by the fact that integration is the source of transaction cost economies.” Technology is only fully determinative of economic organization if and only if there is but one decisive technology and only if that technology requires a unique form of organization.

One might argue that in the latter half of the 19th century and the early years of the 20th century, the steam technology employed by the lumber industry was decisive and therefore constituted a specific organizational makeup in order to maximize profits and reduce risk. The lumbermen faced enormous procurement costs, in relative terms.

We hypothesize that a market oriented wood supply system, in the case of the early southern lumber industry, was unfeasible, because the transaction costs associated with procuring from different landowners, as opposed to procuring from one’s own land (make versus buy) were too high. There are several reasons for this. Recall that the federal and state governments owned much of the land in the South prior to the lumber industry’s migration. Recall, also, that speculators had bought much of the prime land (Hickman 1962). Some purchased on the behalf of the lumber industry, some did not. Those who did not anticipated the migration of the lumber industry and purchased the land in pursuit of higher profits earned from the sale of land to the lumber industry. There seems to be no consideration on the part of any of the land holders to form a wood supply industry to furnish lumber mills with wood, rather than merely sell the land and timber to the mills themselves. Likewise, no
independent, third party organized as a middleman to purchase wood from land owners and sell it to the mills.

One might assume that this is the natural result of transportation economies; however, we think that this is only minor, for any of the three possible parties of exchange could capture transportation economies. For example, the resource owner could just as easily transport the wood to the mill by building spur lines from his land to the mill. What works one way should be able to work the other. In this case, the returns to the land owner would include the costs of establishing and maintaining rail lines. The land owner could also provide the labor and equipment. In this case all the mill would have to do is transact to secure wood as it came to the gate from land owners that were supplying it. The same situation holds for a third party system. A dealer, instead of a mill, could perform all the intermediate functions and capture returns associated with transportation, equipment, and labor. Thus, any of the three parties should be able to realize transportation economies. However, only the mill attempted to realize these economies. This would seem to eliminate the argument for technological determinism. Why, then, did the lumber mills, to a large degree, purchase land and timber (make) rather than procure it using outside systems (buy)?

The answer has to lie in the relative transaction costs associated with the make or buy decision. If we assume that the harvesting of sawtimber stumpage and the transportation of that material can be performed by any of the potential contracting parties, and we further assume that the mill chooses not to make, but rather to buy the resource, are there not “hazards” associated (from the land owner’s or wood dealer’s point of view) with performing these functions? The answer, we hypothesize, is yes, there are risks. In the early years of the southern lumber industry saw mills were likely widely dispersed, with each striving to choose a location not only in which there were efficient transportation potentials, but also where there was as little competition as possible from other mills. If mills located closely to one another, they would have to compete for such essentials as land, timber, labor, and freight rates. As long as it was physically possible, we hypothesize that lumber mills dispersed spatially so as to avoid not only the competition from one another, but particularly the transaction costs associated with that potential. Therefore, if a landowner who did not sell his land to Mill A was located too near that mill, and not close enough to Mill B and/or Mill C to inflict competitive strategies upon the mills, that landowner was “hostage” to Mill A. Mill A could exercise monopsony power over the land owner, which, in effect, would mean low prices received for his timber. This situation raises the transaction costs of transacting with the mill, from the land owner’s perspective, since governance costs of insuring that complex contracts were fulfilled would be high for the landowner. Thus we see high transaction costs faced by the landowner in this alternative wood supply system.

However, it is also possible that the mill faced “hazards” as well. These risks lay in the potential of landowners to organize and withhold the resource. In this case, where there were few landowners (with governments being the largest landowner), it would be much easier to cartelize and attempt to extract rents from the mill. Thus the mill also potentially faced higher hazards in the buy scenario than in the make scenario. The central problem was one of contracting completely in order to clearly define property rights, which is necessary in order to maintain efficiency. In the case of the lumber industry buying instead of making the resource (procuring instead of owning), the transaction costs rose relative to the transaction costs associated with fee simple land purchases. Therefore, the incentive for both the buyer of wood (sawmill) and the seller of wood (land owner) was to engage in fee simple land sales, implying simple, standard, relatively inexpensive contracting processes with associated low transaction costs.

For the pulp and paper industry, the opposite was true. The paper industry did not face the “hazard” of land owners potentially cartelizing in order to restrict the supply of wood and raise its price. Land holdings were dispersed and smaller than they were in the 1800’s. The paper industry, therefore, faced relatively lower transaction costs arising from lower risk associated with procuring externally through a wood dealer system.

CONCLUSION
The early development of southern wood supply systems mimics the development of many other industrial institutions in the United States in that technology does, indeed play a role in determining firm structure; however, it is but one factor and normally does not, in and of itself, determine how a firm will organize. The main reason firms organize is to minimize transaction costs, of which a given state of technology can be a contributing variable. Using a transaction cost approach, we have analyzed why each of the prominent early southern forest products industries-paper and lumber-developed
substantially different wood supply systems.

The lumber industry of the 19th century faced a very different economic environment from that faced by the paper industry in the 20th century. Each industry's organizational development revolved around land, labor, technological, and legal factors contributing to the transaction costs each industry faced. The lumber industry faced concentrated land ownership, required quality labor in the field, operated under legal conditions of laissez-faire, and required relatively little transformation of the raw material into finished product. It therefore procured wood internally through ownership of the resource and the land upon which it grew. The paper industry faced dispersed land ownership, required quality labor in the mill, operated under considerably more legal restrictions and required substantial raw material transformation into finished product. Each organized to minimize transaction costs, and each prospered under its resulting organization.

Literature Cited


