

Sylvan Enterprise and the Philadelphia Hinterland, 1790-1860

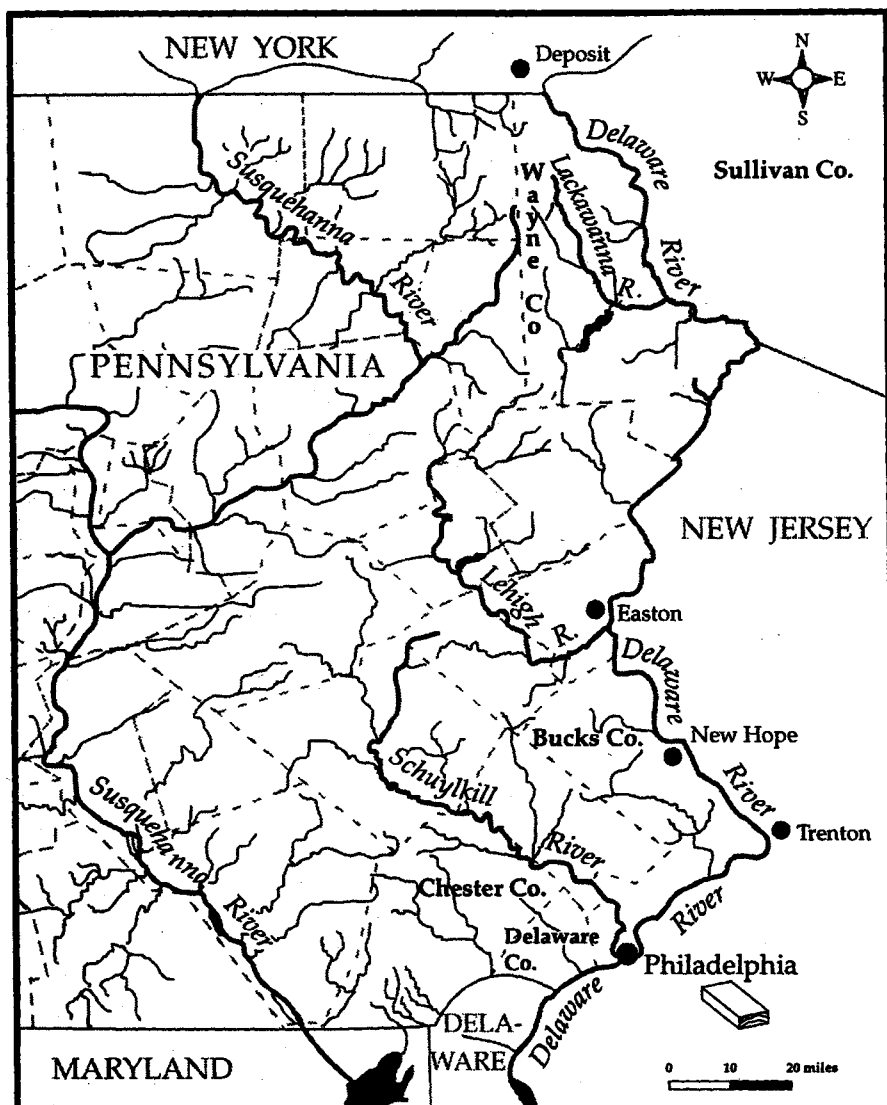
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Few scholars today would mistakenly isolate the growth of Philadelphia from its region. Recent scholarship has linked the fecundity and diversified agricultural production of the hinterland with the city's wealth in the eighteenth and early nineteenth centuries. Urban mercantile houses, shipbuilding trades, laborers and shopkeepers alike owed much of their prosperity to the surplus of surrounding farms. As an increasing number of city dwellers turned their labors to manufactures, Pennsylvania farmers provided as well for an expanding regional population. In turn, foreign trade through Philadelphia's ports in the eighteenth century, and American manufactures in the nineteenth, made consumer goods available to Pennsylvania farmers.¹

While our knowledge of regional and Atlantic trade continues to expand with respect to agricultural production, merchant networks, and manufactures, important sectors of the economy escape notice. One omission—an ironic oversight owing to its contribution to “Penn-sylvania” (Penn's Woods)—is the forest industry.² In the form of cordwood for fuel and lumber for manufactures and building, forest products were a major contributor to the region's economy. Harvesting trees enabled farmers to diversify production and send surplus to Philadelphia markets. The trade also provided opportunities for men of commerce to invest wealth made in urban ventures in the exploitation of rural resources. Entrepreneurs in the lumber business situated themselves in critical geographical locations and built wideranging organizational networks. When demand for canals, railways, and anthracite coal burgeoned in the early nineteenth century, many stood in ideal positions to profit from development. An examination of the lumber business, then, enriches our understanding of the Philadelphia hinterland and the city itself, and highlights important layers of overlap in these economies.

This article has three goals. First, it builds on the work of other scholars who have demonstrated the linkages between the agricultural abundance of the hinterland and the city of Philadelphia. For these purposes, I focus on lumber specifically, leaving aside cordwood (fuel) and wood products (e.g. turpentine). By the opening of the time frame of this essay, farms within reach of the Upper Delaware River and its tributaries sustained involvement in the economy by sending a mix of products to market.³ Farmers continued to look for commodities that would pay their cost in transport and labor, and complement the cycles of crop culture and husbandry.⁴ Timber harvesting used labor in the winter season, and logs and boards could be sold profitably



Supplying Philadelphia with Lumber

in Philadelphia. The trade was transformed in the nineteenth century, however, by a combination of business innovations, navigational improvements, and technological advances that made the lumber industry attractive to commercial investors.

Second, the examination of the lumber trade set forth in this essay documents the process by which forests—the “wealth of nature” as William Cronon has conceptualized it—were converted to capital. Its tale explicates the actors, networks, and informational and business structures involved in transforming

nature's abundance. (The story focuses here on supply rather than the shape, diversity, and increasing sophistication of consumption.) Tracing the exploitation of rurally-situated resources breaks down the disciplinary divide between the study of city and country and, as Cronon has argued, charts a regional history connected by "commodity flows."⁵

Finally, this article points to ways in which natural resource trades complicate an already complex narrative of economic change in the nineteenth century. On one hand, timber cropping was an agrarian undertaking. Like grain crops, it was captive to capricious natural phenomena (flood and draught, for example). On the other hand, it shared characteristics with manufacturing industries. I make this comparison keeping foremost in mind the revisionist perspective on industrialization that has emerged over the last two decades. Suggesting that the Lowell-type enterprise was but one manner of change, scholars now emphasize the enormous complexity of the process called "industrialization." Multiple paths of development, predominance of small, proprietary firms, staggered application of machinery, diversity of production sites, and critical contributions of a "business basis" are among the important markers of recent scholarship on America's early industrialism.⁶

Pennsylvania—true to its name—had abundant forests of many varieties of wood. At the height of the colony's maritime prominence, inhabitants exploited the resource commercially on an extensive scale. Participating in the Atlantic economy, vessels shipped more than four million feet of boards and scantling from Philadelphia in 1773 alone. In 1810, more than 2000 sawmills in the state produced nearly 75,000,000 feet of sawn lumber—a crop with the commercial value of \$628,000.⁷ Much was exported as barrel staves, shingles and scantling for house frames, cabinetmaking and various craft processes. The city also consumed huge quantities in shipbuilding, housing construction, tanning and fuel. The archetypical Philadelphia brick row house, for instance, used lumber as its principal ingredient by volume; it amounted to a fifth of the total building cost.⁸

Timber bound for the city grew in the Pennsylvania, New Jersey and New York counties touching the Susquehanna and Delaware rivers and their tributaries. In spite of plentitude, however, pressure from agricultural, manufacturing and commercial expansion soon strained supplies in reach of navigable waterways.⁹ A party reported in 1821, for example, that "the Number of Rafts [down the Delaware] have decreased [and] they must more & more . . . the Timber in most places is nearly all cut away. . . ."¹⁰

New Jersey contributed oak, chestnut, pine and cedar for consumption in Philadelphia and for export to international and coastwise markets. By the close of the eighteenth century, agricultural clearcutting and fuel consumption had deforested the southwestern part of the state bordering the Delaware

River. The southeastern region where the Pine Barrens lay, however, continued into the nineteenth century to provide a rich source of pine and oak.¹¹ Indigenous cedar was bounteous. Whereas by 1765 observers found the swamps of New Jersey "much worked out," new growth soon reinvigorated the trade. By the 1820s, "hundreds of men were employed in the swamps cutting . . . cedar."¹² Even more important to the Quaker City, however, was lumber from the northwestern section of the state. Already by the mid-eighteenth century, oak, walnut, maple, ash, tulip, hemlock, birch and pine traveled through the streams and sawmills of the region to southern markets on the Delaware River. But choice timber disappeared quickly, and by the 1850s major forests in this region, too, were exhausted.¹³

Scarcity and regional competition shifted the search for timber into other areas. As accessible forests declined, transportation projects opened more remote growth to exploitation. In the late 1820s, canals linked Susquehanna traffic, initially routed toward Baltimore, to Philadelphia. An Upper Delaware River tradesman worried that his stock offered "no pine of a Quality equal Susquehanna," a wood easy to work and straight of grain. (He sent white oak and hemlock for fences instead.)¹⁴ Concurrent development by the Lehigh Coal and Navigation Company facilitated shipments down the Schuylkill River. Between 8,400 and 14,800 tons of lumber passed annually through one branch of its network, the Schuylkill Canal, from 1832 to 1850.¹⁵

An unknown amount of lumber entered the city overland. Nearby Delaware and Chester counties fed local needs, but also sent surplus to Philadelphia buyers.¹⁶ The yard of Hugh McIlvain, located on the west bank of the Schuylkill across the Middle Ferry in 1798, lay on roads leading from adjacent counties. Production from the family sawmill in Delaware county probably comprised much of McIlvain's stock, which reached the yard by wagon, or by shallop on Ridley Creek and the Schuylkill River. As local timber sources diminished, mills in Delaware County even drew material from other places, sawed it to standard dimensions, and carted the boards to Philadelphia.¹⁷

Changing consumer tastes and limitations of Delaware Valley timber encouraged imports and coastwise trade. By the late eighteenth century, ports in South America and the West Indies shipped mahogany and rosewood. Tradesmen at Indian River on the Delaware Bay sent pine, and those in North Carolina shipped diverse woods to the Quaker City.¹⁸ In the 1820s, fecund forests and lower costs induced merchant William Wagner to build sawmills in North Carolina and ship varieties of cut lumber to Philadelphia.¹⁹ When the city built its ice house in 1833, its contractor had to send as far as Port Deposit, Maryland for the requisite type and length of plank.²⁰

Substantial intervals between harvest and retail sale tied up massive funds; few concerns could stretch capital and credit over the entire process. Managerial constraints, given activities distant by hundred of miles, also limited inte-

gration under single firms. Consequently, owners of timber sources, sawmill operators, transporters, urban lumber yard proprietors and major consumers (e.g. house and ship builders) functioned generally as distinct entities throughout the early decades of the nineteenth century.²¹ (Sole proprietors, limited partners, and self-employed men predominated.) Sawmillers might own a portion of the timber they sawed but cut substantial amounts on shares or commission for other individuals. Millers arranged transport with independent raftsmen, who bargained for short stints. Upriver sawmill owners depended on raftsmen or designated agents to sell their merchandise to lumber dealers in Philadelphia. Merchants, in turn, transported lumber to board yards for storage, seasoning and sale. A few family enterprises or mercantile partnerships sometimes supported a principal in Philadelphia to manage orders and sales.²² On the whole, however, the different facets of lumbering remained independent.

Proprietors of sawmills before mid-century fell mainly into two groups. They were either agricultural producers, or merchants with diverse commercial interests. In the Upper Delaware region in 1835, for instance, farmers owned about sixty percent of extant sawmills. Both small and large landowners combined integrated lumber production and other commercial milling with crop cultivation. Lawyers, merchants, businessmen and the like, both absentee and local, accounted for the remaining investors.²³ These categories, however, should not obscure the variety of millers within them. A number of family-owned mills, for example, straddled both designations. Passing from generation to generation, family enterprises often accumulated earnings and reinvested fortunes in multifarious commercial and industrial undertakings.²⁴

Three farmer-millers illustrate the range of agriculturalists within the first set. Henry Sampson of Wayne County, near the northern border of Pennsylvania, farmed an 111-acre tract. The "lumberman" also owned a quarter interest in a sawmill, where in 1842 his share of the annual crop awaited transport to market.²⁵ Sawmilling was a lucrative business that Samuel Preston, a gentleman farmer from the same region, also interwove with raising crops. Meanwhile, he explored his property for deposits with extractive value.²⁶ David Taylor may have begun business much as Preston. Sometime around the 1830s, this farmer operated flour mills in Bucks County. Taylor also speculated in lumber tracts, and built sawmills near the Susquehanna River.²⁷

Lewis Coryell exemplifies the sawmill operator with wideranging commercial investments. At his riverside seat of New Hope, Bucks County, Coryell enjoyed an ideal location from which to capture the trade of northern Pennsylvania and New Jersey. Beginning around 1814 and spanning the next several decades, Coryell operated or held part interest in several sawmills on the Delaware River. His machinery provisioned major customers, among them the U.S. Navy Yard at Philadelphia. Trade in cotton, iron manufacturing,

anthracite coal investments, canal and railroad contract building, and state banking added to Coryell's diversified portfolio.²⁸

Coryell likely grew up in the sawmill business, and in a region where trade knowledge was solidly established. He could rely on the accumulated capabilities of local operators and the refinements of tested (but evolving) technology. Entrepreneurs active in new logging areas, however, often exhibited marginal preparation. Lure of opportunities in the lumber business outstripped the supply of skilled mechanics, especially those on the cutting edge of technology—so to speak. Scale and success of the New Hope mills accorded Coryell expertise and reputation that novices sought out. One James Hopkins, the "Manager at Mr. Burrs Sawmills" in the Susquehanna Valley, revealed stark ignorance of machinery and its cost, selection of an ideal millsite, and necessary labor and wages. Hopkins wrote Coryell and bade the merchant reply to his specific questions, and also address "[a]ny other matters which would enter into . . . the subject. . . ." So inexperienced was Hopkins in sawmilling, that he conceded he lacked "the requisite knowledge to go into a particular inquiry." Although "Manager" of the enterprise—the owners of which likely were absentee men of commerce—Hopkins further requested Coryell use "common language as I am not acquainted with the technical terms of that branch of business."²⁹

Coryell's response, had it survived, might have reflected the hard won experience of Daniel Parry and his partners (one of whom was Coryell himself). Between 1821 and 1823, Parry oversaw the initial stages of the "Lackawaxen Establishment," a commercial operation several times more costly than that of a farm mill. The first two years of building the dam, digging the raceway, equipping the saws with new "Iron Gears &c," and outfitting the laborers with tools, rustic housing, and "spirits" amassed a debit of \$2300. During start-up, the mill sawed little lumber but drained capital reserves. Such a circumstance prohibited farmers and other small capitalists from entering the business. Men of manifold assets who were partners in the "Lackawaxen Establishment," however, could abide the expensive wait. In witness to the potential of the enterprise, the partners bought insurance on the site from a New York City house.³⁰

Ongoing repairs and the replacement of equipment often followed initial investment in the building of the mill. For "accidents and charges arising from delays," one proprietor recommended budgeting twenty-five percent of operating costs.³¹ Broken pitman wheels, collapsed dams, and cracked support beams cost for replacement parts and expert labor. These incidents also resulted in lost time in sawing, particularly during peak season when a mill often operated day and night.³²

Generally, however, after mill construction, the miller's attention focused on the supply of timber trees. Harvest from his own forest provided one

source of raw material for a miller. Samuel Preston, for instance, had "traversed the Mountains abundance & viewed the Quantities & Situation of my Timber. . . ." In designating the trees "timber," historian William Cronon has observed, in his mind a miller had already abstracted nature's cornucopia into a commodity for far reaching markets. Preston's example underscores this point, as he proceeded to catalogue mature trees. "[G]ood Chestnut enough to make one or two Rafts of Logs of good size," red oak, poplar, sugar (maple), black birch and hemlock trees caught the landowner's notice. A running account of the expense to send timber to market and the prices each type could fetch accompanied Preston's pragmatic survey.³³

Timber purchases were a second source vital to mills, especially to business ventures. Few proprietors had the financial wherewithal to purchase inexhaustible acres of woodlot, yet a well managed operation depended upon continuous supply during peak season. Coryell, for instance, tapped diverse channels. He contemplated the outright purchase of acreage owned by the wealthy Chew family, or whether to "[crop] the timber on shares."³⁴ To secure trees, he frequently trekked "up the river" or "journey[ed] to the Poles"—the latter a comical reference to trips to Jersey swamps for cedar trees.³⁵ Coryell also sawed logs that other men consigned to him, either for their personal use or for sale in Philadelphia. In so doing, he used his established networks to market the modest seasonal production of area farmers.³⁶ One Chester County resident recalled yet other common arrangements, likely particular to regions where the bulk of lumber was consumed locally. Proprietors milled for neighbors, who left "Logs Sufficient to pay for what Sawing . . . Done."³⁷ Alternatively, an individual could pay "for the use of [the] Saw Mill" to cut his own boards.³⁸

A timber property "ritely taken care of . . . will last many years," averred Benjamin Stickney, overseer of an Upper Delaware River mill. Stickney derided his employers for leasing out timber land in return for a portion of the sale of the crop (as Coryell contemplated). "I think you do rong to let it out on Shares or for Rent," he opined. "[I]t will be less Expense for a man to get the Logs close on the Bank of the Crick than to hall them a half mile or a mile. . . ." Consequently, Stickney warned, men without "an intrust" in the property would fell even immature trees, leaving "wat is left" susceptible to fire, wind and "rott." Proper forestry methods, the overseer implied, answered the long-term financial goals of the investors. "[T]heir is Pine Enough to last 12 or 15 years and do a good business and their is also a good quant[it]y of Hemlock and Oak . . ."—but only, of course, if the owners abandoned shortsighted governance.³⁹

Seasons and weather dictated the rhythms of lumbering into the second half of the nineteenth century. Climate touched each segment of the trade:

chopping trees, hauling logs to a waterway or directly to the mill, sawing timber, and transporting lumber to market. Loggers felled trees in the winter, before the sap ran.⁴⁰ By mid-January 1819, Samuel Preston explained, his "Boys" had "cut abundance of Logs of different kinds. . . ."⁴¹ They cleared two miles of road on which timber could be "run up the Mountain" and thence to the river, dragged by oxen- or horse-drawn chains and sleds.⁴² (Alternatively, some operations used run-ways, "made for the purpose of running logs down the mountain to the river."⁴³) But as Preston maintained, crews "want[ed] Snow before much can be done at halling."⁴⁴ Another winter the farmer's preoccupation returned. This time, however, "the Ground none froze but wet & muddy under [a foot of snow] so far it indicates an unfavourable Winter for any kind of halling Lumber."⁴⁵ Freezing temperatures and abundant snow could prove exasperating, even a quarter century later. "[T]he Snow is verry deep," explained a sawmill manager in March 1843. "I think it is three ft and some say three and a half and their was never known to be more ice in the River and Streemes." Cumulative conditions hindered workers from getting logs into the nearby creek for transport to the mill.⁴⁶

As late as the 1850s, Pennsylvania mills operated predominantly on water power. An appropriate level of rainfall, enough to release a continuous moderate flow into the race, was necessary to power a waterwheel. Combined with seasonal trends that influenced supply, sparse precipitation shut down mills four to eight months in each year.⁴⁷ "[N]o Mills doing any Thing in these parts," Preston observed, and consequently "there will be but little Lumber sent down next Spring. . . ."⁴⁸ "[W]e have no Water to Saw," he echoed at a later time.⁴⁹

River transportation of the sawn logs also depended on water levels that changed with season, snow- and rainfall. Traders needed high water in the spring to float produce to the mill and thence to market. Looking ahead one January, Preston declared himself to be "fully determined . . . to send plenty of something down" in the approaching spring, "hoping the Clouds will in future afford more resources for Water than they have done for 8 Months past."⁵⁰ One April, an Easton, Pennsylvania newspaper heralded the opening of the trade. It pronounced the Delaware river "in fine rafting order, and immense quantities of lumber pass this place for Philadelphia, where they will no doubt have use for it, judging from the number of buildings erected this spring."⁵¹ Freshets signaled both the spring rush of water for transport, and potential disaster to riverfront property (including mills) and lumber rafts. "[I]f we wait until late to Raft," a foreman warned his employer, "we may miss a Freshet and if Rafted and lay in the Water over Summer you know is a damage."⁵² While one millowner tallied losses from "the raft which was stuck fast . . . in the Spring Freshet," another warned "that if there comes a Fresh the People had rather run" to avoid rafts "stuck last Spring."⁵³ Millers received enough

letters notifying them that rafts, bearing their marks, had been lost or recovered to take freshets seriously.⁵⁴

By summer, low water plagued dealers and buyers with long and costly delays. Waiting impatiently in Philadelphia early May, a customer demanded that if his order "cannot be brought down by water it must be by land." Another likewise urged Lewis Coryell one July that "[i]f the River continues to be low . . . a few miles of carting will take the lumber to a landing from whence it may be transported. . . ."⁵⁵ Come late November, merchants had no goods to steer downriver, "the season . . . now nearly at an end."⁵⁶ Preston reasoned one mid-December that no more rafts "will be put in this Winter. . . ."⁵⁷ But the close of navigation fluctuated (and reflected origination points). In another year, a Delaware County miller forecast as late as the first of the same month that "[i]f it was an open faull," the customer could anticipate delivery of his shipment "before Christmas."⁵⁸

Gauged to the condition of the stream and density of the wood, the raft a miller sent to market contained generally from 15,000 to 50,000 feet of sawn lumber. The amount of feet that could be milled from one tree varied widely, depending on the type, maturity and quality of the tree. A raft this size might contain the product of fifty to 200 logs (trees).⁵⁹ Raftsmen stacked lumber twelve or sixteen feet in length in crosswise layers, piling it to one foot or more in thickness. They lashed links together to form a raft measuring from 100 to 200 feet long, and sixteen to thirty-six feet wide. In normal transport, the cut lumber that comprised the raft remained wet for a period of weeks, but nonetheless arrived merchantable in New Hope, Trenton or Philadelphia. Laths, boards, grain, cider or other commodities topped the conveyance.⁶⁰

A crew of three to six skilled pilots could handle a raft. Distance and raft size determined compensation. (Raftsmen also included cost of return in their charges.) For the venture in 1819, Preston complained, steersmen "talk of 40 dols for a single Raft & 60 for a double besides their Expences say 30 dols more. . . ."⁶¹ The accounts of an Upper Delaware merchant in New York roughly correspond to Preston's figures.⁶² Yet another miller supposed that "[r]afting, and every contingent charged included, [from the Lackawaxen River 175 miles] to Philadelphia, and delivering" accounted for half the cost of bringing lumber to market.⁶³

Rafts reached the city at the Delaware river wharves above Vine Street and, by the late 1820s, at the Schuylkill River docks near Market Street.⁶⁴ At the piers, retailers negotiated on-the-spot with raftsmen for the purchase of shipments. A dull market could compel crews to idle for weeks in the city.⁶⁵ Delegating negotiations to rivermen left the distant miller vulnerable to their ability and integrity. Frequently, the raftsmen exhibited great skill and discretion in arriving at a good price for his employer's wares, and in anticipating market swings, scouting out buyers, and informing the miller of prices and

opportunities. Consequently, a miller might rue "sending novices with lumber." Or, the employer might point to an unscrupulous raftsman who represented the lumber as his own to borrow money on its security, or pocket the sale proceeds outright.⁶⁶

Rather than vest trust in raftsmen, a sawmill owner might subscribe to prior arrangements with urban dealers. An Indian River miller reported in 1797 that "[s]everal of the Philadelphia Mercht have been here to ingross My best stuff"—much as Lewis Coryell would "journey to the Poles" two decades later.⁶⁷ Agreements could mean exchanging the personal relationship and product-specific knowledge raftsmen possessed for dealer expertise in urban commercial markets. Brokers sought—as Philadelphia-based James Verree explained to a New Hope sawmiller—to "advance both yours and my interest." Verree offered to "effect sales of any articles [the miller] may have in this market," including three million feet of lumber awaiting spring navigation. As a "merchandise broker," Verree expected a fee of one half of one percent for any sale he engineered.⁶⁸

Lumber of dimensions previously communicated to the miller was delivered cut to standard sizes. It sold as boards, scantling or plank, the distinctions based on thickness and width.⁶⁹ Exceptional work—public buildings, ship timbers—required custom lengths and woods. The bank that architect William Strickland designed and superintended, for instance, called for singular varieties, quality and sizes, which he communicated to New Hope miller Coryell.⁷⁰ By the mid-eighteenth century, producers, house and ship builders had arrived at conventions for lumber dimensions. Thereafter in routine construction, for example, a bill of dimensions served widely as an order form for standard timber cuts—an understanding evident in the language of craftsmen.⁷¹ Efforts to standardize quality, though more subject to individual judgment than size, also emerged in the trade. For instance, the three grades of pine—cull or "cullin" (the poorest quality), common and panel—were classifications long in use but only officially instituted in 1831.⁷²

Conforming length, width, thickness and quality to standards, rural sawmillers and urban lumber merchants were able to conduct business effectively over great distance. Personal networks and public avenues of market information further facilitated trade. Upriver men such as Preston and Coryell monitored prices and supplies through trusted raftsmen, active correspondence with associates, and print communication. Though they frequently lacked distinct orders, dealers shared a current awareness of the state of the market in Philadelphia. A modest mill owner on the Lackawaxen in 1842, for example, subscribed to the Philadelphia *Saturday Bulletin*, as well as the *New York Observer* and the *Easton Centinel*.⁷³ A nearby Sullivan County, New York miller watched prices in New Hope (and presumably Philadelphia), declaring that "he woul[d] not raft until he know[s] w[h]at the price of Lumber was and

if it was low he woul[d] not Raft at all."⁷⁴ The seasonal character of the business was both boon and bane to millers, who could draw conclusions from previous steps in production. Knowing snowfall, for example, Preston could alert tradesmen in other regions to forthcoming opportunities in Philadelphia that would stem from shortage or glut of supply. Dependency on weather, however, also manifested the futility of many a season's labors.

Profits earned by sawmill proprietors are difficult to assess. Getting the lumber to market, including cutting, hauling, sawing, rafting, and canal freight fees, accounted for approximately thirty to sixty percent of the price charged for lumber at the wharves. Investment in timber tracts, sawmill and dam construction, frequent equipment repairs, and damage in transport raised expenses. Moreover, an estimated loss of \$.50 to \$1.00 per thousand board feet occurred in transit.⁷⁵ In an exceptional year—one in which weather and demand cooperated—millers might reap a net gain of more than fifty percent exclusive of outlay for timber trees. (But in an exceptionally bad season, millers stood poised on the brink of bankruptcy.)

Tradesmen who purchased the lumber engaged laborers for "throwing out" the rafts, or unbinding them, and sorting and stacking pieces on the docks. Cleaning mud off the boards—now long immersed in water or repeatedly drenched and dried—and spotting damage may have been part of the task. Unloading at the dock added twenty or thirty cents in labor to the cost of each thousand feet.⁷⁶ Few lumber dealers owned wharves, so rent for space to unload the shipments meant yet another ten to twenty cents per thousand feet.⁷⁷ Hauling charges of approximately 32 cents per thousand to most points within the city increased the merchant's expenses nearly \$1.00 each thousand feet before lumber arrived in his yard.⁷⁸

Partnerships characterized a majority of lumber mercantile enterprises. Shared ownership thwarted succession problems fatal to family firms by staggering personnel changes over time. Replacement of partners at intervals secured the experience and reputation of the older principal for the benefit of the firm. It also allayed capital drain by enabling one associate to leave when the other had reached a secure mid-career position. Staggered succession is evident in name changes. The firm trading as (John) Britton & (Samuel) West in the last decade of the eighteenth century became (Jonathan) Conard & West in the early 1800s, and Conard & (John) Lancaster after another decade. In 1823 house carpenter Moses Lancaster bought Conard's partnership interest, and cousins John and Moses Lancaster traded under the name J & M Lancaster. In 1826, when John retired, Moses operated the yard as Moses Lancaster & Co. The company name reflected the participation of two additional associates, including a son-in-law of Moses Lancaster.⁷⁹

Lumber mercantile enterprises in Philadelphia drew frequently on family networks and capital. Artisanal training was not requisite to advancement,

and women even occasionally headed yards. As investors or as active managers, women bridged gaps in male succession and ensured the survival of the business.⁸⁰ The concern of Ashmead & Croskey may have been typical of yards in which women participated. Neither of the company's original founders was in copartnership by 1832, when Elizabeth Croskey and Joseph Clay conducted the enterprise. Elizabeth retained the yard her husband had run until his death in 1829. Their son Henry, a fifteen-year-old clerk at the time of his father's decease, assumed management ten years later.⁸¹

Holding onto a viable business could determine the prospects of a young man like Henry Croskey. Stock and fixtures made entering the trade expensive. Boards, lot rental, and investment in "[l]umber yard Strips Horse and Carts Good will," stable, and counting house required several thousand dollars.⁸² Turnaround was slow, as lumber needed to be seasoned for upwards of one year between arrival and sale. Moreover, "yard Room" for storage, as one observer noted, "[c]omes high hear."⁸³ An excess of \$15,000 was the valuation of McMullin's board yard in 1828, when it was "nearly all consumed by fire." Destroyed property in portions of two other Delaware River yards touched by fire totalled a like sum. Comparably, in 1833 two house carpenters invested \$9,000 in a lumber business, anticipating \$5,000 more by adding a third partner to the enterprise.⁸⁴

This latter example points to the ability of some mechanics to become material suppliers, that is, men of capital. At the turn of the nineteenth century, a sizable minority of (former) house and ship carpenters headed lumber yards. The transition can generally be linked to career stage—for example, penultimate to retirement, when a man might seek respite from physical labor—and to at least modest prior success. Many artisans in related trades saw "lumber merchant" as the occupational step above master status, or as a pursuit compatible with building.⁸⁵ Annual income sufficient to ensure middle class gentility—a minimum of \$1000 according to one lumber yard proprietor in 1842—also attracted venturers.⁸⁶ Although after the early nineteenth century fewer lumber yards appear to be run by men of artisanal origins, some carpenters continued to try the business. A correspondent for the fledgling credit agency R.G. Dun & Company reported in 1853 that the lumber partnership of John Barr and Peter Gould benefitted because "B[arr] was a carpenter which gives him some advantage[.]" In spite of the considerable capital typically invested in lumber enterprises, Barr & Gould reputedly "had not much of any means when they com[men]c^d but have done a g'd bus[iness.]"⁸⁷ Similarly, the principals in Jacob Binder's lumber concern were "carpenters by tr[ade]" also involved in building and contracting, from which they drew capital.⁸⁸

For men with no capital, however, upward mobility in the trade increasingly meant creating intermediary roles in the lumber commission business.

The "Commission Merc[h]ant," a broker explained in 1843, found buyers, reported sales to the owner, delivered the goods and collected bills. The name partner in David B. Taylor & Company demonstrated the potential of commission sales. Taylor had once amassed wealth through lumber trading and milling, but lost it all and filed bankruptcy under the federal law of 1841. A few years later, he "com[mence]^d the Sale of Lumber in a sm[all] way on Commⁿ." By 1856, an R.G. Dun agent believed the firm worth about \$40,000.⁸⁹

Henry Croskey—the young man who inherited his father's lumber business after its stewardship by his mother—reputedly introduced consignment operations to the Philadelphia market in 1842. He thereby altered distribution and wholesale organization of the trade. In place of deals made at the docks by raftsmen (or the need to engage individual agents), Croskey systematized sales of Lehigh and Susquehanna shipments. The merchant "made it known throughout the lumber region that he was prepared to receive consignments of lumber on commission and attend to all the details of sale as agent for the owners."⁹⁰ Over the next two decades, the method succeeded in placing the wholesale dealers at the forefront of the commission lumber business. Traders charged a cumulative seven to ten percent for handling, insuring and selling lumber. In addition, they advanced credit to milling operations to finance new machinery, further guaranteeing them the production of associated mills.⁹¹

Enough concerns conformed quickly to Croskey's system to make him and many of his followers enormously wealthy.⁹² In 1864, an R.G. Dun report estimated his riches at "considerably over 100m\$ [\$100,000]." By 1875, Croskey may have even been worth in excess of \$250,000. He based his success thereafter no longer on sales of actual lumber, but on "Lumber paper."⁹³ Croskey captured the quintessence of a capitalist (R.G. Dun ledgers, in fact, describe Croskey and his partners as "Capitalists," not lumber commission merchants). The capitalist moved from retail lumber sales, where he made his profit directly from the product, to commission trading, where he extracted his gain from his activities as intermediary. Finally, Croskey severed connections to the product itself, and enjoyed his profit from the speculative opportunities of a commodities market.⁹⁴

Croskey's innovation in the commission business took advantage of increased lumber production and new regional supplies. Following 1835, millers markedly advanced output. Successive modifications to the milldam throughout the nineteenth century reduced leakage and harnessed more power. Alterations to the log carriage diminished unwanted wobbling, and augmented the speed and number of saws a mill could run. By midcentury, use of the circular saw, which featured replaceable teeth and a sharper blade, further increased efficiency. Horizontal waterwheels, adopted in the Upper Delaware

Valley by the late 1840s, extended the operation of the mill two to three months each year by running on smaller water flows. By 1850, improvements in waterwheel and sawing technology nearly doubled production of the average sawmill.⁹⁵

Erratic water flows owing to seasonal and weather variations long restricted locations of millsites. Developments in steampower transformed that dependence. As early as 1820 "Steam Saw Mills" operated in Philadelphia.⁹⁶ Scattered steampowered concerns ran in Pennsylvania by the 1840s, such as the one lumber merchant Edward Yardley managed in Clinton County. Yardley, whose mill stood adjacent to the Susquehanna, might have found the powerful river a terrific location for transporting lumber, but too potent to run a waterwheel.⁹⁷ But until 1860, the majority of the region's sawmills continued to operate on waterpower. Where streams could be harnessed, and so long as timber was available near water, incentive to install costly and fuel consuming machinery was minimal. Expense of steampower worked against the comparative cheapness of watermills and the ability to integrate seasonal milling with agriculture. With gradual adoption, however, steampowered mills accelerated deforestation. A watermill sawed about two to four acres of timber trees per annum, or one hundred acres over 25 years. A steampowered mill processed logs at more than three times that rate.⁹⁸ Moreover, slow consumption and the costs associated with hauling led watermill owners to bypass small trees in favor of mature growth. (Mill overseer Benjamin Stickney, as noted earlier, associated strongly the longevity of a milling concern with forest management.) Whereas older practice encouraged the natural regeneration of forests, the expense and singular focus of steampowered mills drove investors to clearcut entire tracts before abandoning a location.⁹⁹

Steampower also caused a shift in the personnel engaged in milling, hastening out the farmers and extending the sphere of commercial investors. To install machinery run on steam and to move it every eight years (the point at which surrounding forest would be consumed) added great expense to an enterprise. Because a steam engine could run year-round, moreover, an establishment employed two crews of men working simultaneously—one in the field getting the materials to the mill, and the other sawing lumber.¹⁰⁰ Continuous ventures required constant attention to labor management, operating capital, repairs and technological upgrades, sales and transportation. Steampowered mills called for full-time professional oversight.

To guarantee a steady supply of logs to an undertaking with high equipment costs and full-time labor force, investors sought to eliminate seasonal transportation problems. Prior to mid-century, lumber tradesmen focused on public works to improve transportation. Samuel Preston, for example, maintained a prodigious correspondence with state political figures and regional mill owners. He lobbied incessantly for projects to improve the navigability

of the Delaware and its tributaries, voicing support as well for steamboats to travel local waterways. Lewis Coryell joined forces with entrepreneurs in the anthracite trade to press for river projects, and contracted for railroad construction. Thomas and William Hunt epitomize the associations between milling and public works. In 1835, both partners led a concern that combined lumber and "[w]estern transportation business."¹⁰¹

In spite of widespread enthusiasm over transportation projects, railroads had minor immediate impact on the lumber trade as a means of conveying product to market. In depleting raw materials, however, rail construction during the 1830s and 1840s, and contemporary plank road building, drove local demand. Measures to increase sawing efficiency and manufacture railroad and plank materials eventually yielded outputs beyond the ability of millers to raft the commodity to market. By 1872, an estimated forty percent of Upper Delaware lumber found its outlet by railroad. Nevertheless, the bulk of material continued to be carried by river even in that late period.¹⁰²

The retail end of the lumber trade in Philadelphia also became more capital intensive. By the mid 1830s, planing mills competed with lumber yards by incorporating both features—stocking and processing—into one enterprise. A planing miller, according to venturer Mark Richards, engaged in "the buying of boards in the rough—sawing, stripping, planing, ploughing and grooving them. . . ." Like other entrants to the business, the proprietor had no previous connections with the lumber trade. Richards began as a novice shortly before 1834, already "extensively engaged in cotton manufacturing in Philadelphia . . . also in the making of iron." A \$70,000 loan he procured to finance iron manufacturing speaks to the capital Richards and like investors in planing could marshal. Consider also Mark Richard's son Edgar, who "purchased lumber in North Carolina and had it worked" at a Philadelphia planing mill for a one-time profit of \$4000. The return spurred the younger Richards, whose business was otherwise in French silk imports, to combine the purchase of lumber with processing and selling it.¹⁰³ Commercial experience unrelated to the lumber trade, then, characterized planing millers closely. One observer made an essential distinction in noting that the principals of a certain planing establishment "[a]re mechanics, not merchants. . . ."¹⁰⁴

The cost of such a venture—the machinery for planing, patent assignments to use it, and litigation to defend exclusivity—surpassed that of a traditionally organized lumber yard. In 1837, rights to a planing machine with tonguing-and-grooving capability sold for \$10,500—a sum excluding the expense of building the apparatus (upwards of \$3000).¹⁰⁵ In 1850, the steam-powered planing mill of George B. Sloat in Kensington reported \$50,000 invested in the business. Purchasing white pine lumber, Sloat was able to produce flooring valued at \$200,000. Long-established yards, even if they

chose to innovate, labored under high entry costs and restricted access to new technology.¹⁰⁶ Proprietors guarded rights to Woodworth's Patent Planing Machine in particular, which presumably enabled one holder to amass a fortune of \$300,000 in a few short years. His son benefited from the patent as well, and was able to "plane boards cheaper than others." Consequently, however, "[m]ost of our mills are opposed to him," a correspondent wrote R.G. Dun & Co.¹⁰⁷

Capital consolidation in sawmilling and retail lumber yards occurred gradually, and was by no means complete by the Civil War. Indeed, the stalwart survival of farm sawmilling throughout nearby counties and of small lumber concerns within Philadelphia testifies to the staggered pace of change. The direction of that shift, however, is evident. In forest cutting and milling, as well as retail lumber yards, the capital threshold of entry into the trade rose severalfold in the antebellum years. Capital demands precipitated mainly by technological innovations squeezed out or barred most small entrepreneurs. Standardization of quality and dimensions worked in concert with the rise of commission traders and wholesalers to facilitate further consolidation of the trade. In sylvan enterprise, by mid century fewer farmers diversified agricultural production by milling, and fewer artisans translated craft experience into lumber retailing.

In several ways, the lumber trade at mid-century mirrored production in manufacturing sectors. Proprietary capitalism enjoyed continued importance in the region, and older technologies persisted beside new mechanical and commercial innovations in diverse sectors of the economy as well as in lumber. Principals in the lumber business had been a diverse lot, a conglomeration of independent operators who each specialized in one phase of the business. Rarely—until mid century—did they combine stages of production and distribution. In this respect, they resembled artisan-manufacturers in textile, garment, and furniture production who used specialization, custom work and subcontracting to reduce capital demands and risks.¹⁰⁸ Lumber men reacted to the extension of markets and national competition inaugurated by improved transportation and information flows. An informal system of selling material in Philadelphia worked well enough during the heyday of Atlantic shipping. By the 1840s, however, the expanded scope of areas from which supplies came, and competition from other ports called for innovations in distribution and sales. A classification system for grading lumber endeavored to make the product as uniform as ready-to-wear clothing. Middlemen carved out new opportunities by linking producers with wholesalers; some forged close capital and organizational ties with distant mills. By the Civil War, operations increasingly resembled vertically integrated corporations, subsuming production, distribution, and sales under one organization.¹⁰⁹

In sum, capital, technologies, business organization, and standardized products transformed the forest into a merchantable commodity in ways comparable to production in manufacturing. The story of natural resource exploitation adds to an already complex historical understanding of nineteenth-century economic change. The tale of sylvan enterprise should not be confined within rural or urban disciplinary boundaries. Rather, it must be understood as integral to economic developments of the region anchored by Philadelphia.

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Notes

1. For literature on the eighteenth-century Middle Atlantic region, see Wayne Bodle, "Themes and Directions in Middle Colonies Historiography, 1980-1994," *William and Mary Quarterly*, 3rd series, 51 (July 1994): 355-388; John J. McCusker and Russell R. Menard, *The Economy of British America, 1607-1789* (Chapel Hill, NC: University of North Carolina Press, 1985). See also Diane Lindstrom, *Economic Development in the Philadelphia Region, 1810-1850* (NY: Columbia University Press, 1978); Thomas M. Doerflinger, *A Vigorous Spirit of Enterprise; merchants and economic development in revolutionary Philadelphia* (Chapel Hill, NC: University of North Carolina Press, 1986). On the New Jersey hinterland and its relevance to Philadelphia trade, see Peter O. Wacker and Paul G.E. Clemens, *Land Use in Early New Jersey: a historical geography* (Newark, NJ: New Jersey Historical Society, 1995).
2. McCusker and Menard underline the significance of forest products in the export trade of the Middle Colonies. *Economy of British America*, 198-99.
3. James Lemon and Peter Wacker have stressed the complementary aspects of clearing land of timber to plant crops, and marketing the trees to contribute to the viability of mid-Atlantic farming in the eighteenth century. James T. Lemon, *The Best Poor Man's Country; a geographical study of early southeastern Pennsylvania* (Baltimore, MD: Johns Hopkins Press, 1972), 199-205; Wacker, in Wacker and Clemens, *Land Use in Early New Jersey*, 69-78.
4. In contrast to Sellers, I see eighteenth-century Upper Delaware farmers within reach of Philadelphia intent on producing more than "surplus" for the market, making decisions about labor and capital allocations intent on selling market commodities. Farmers in the hinterland of Philadelphia anticipated Sellers' "market revolution" by several decades. Charles Sellers, *The Market Revolution: Jacksonian America, 1815-1846* (New York: Oxford University Press, 1991); compare Lemon, *Best Poor Man's Country*, esp. 150-183 and Doerflinger, *Vigorous Spirit*, 77-122.
5. William Cronon, *Nature's Metropolis: Chicago and the Great West* (NY: W.W. Norton, 1992), 7-8, 148-206.
6. Bruce Laurie, *Working People of Philadelphia, 1800-1850* (Philadelphia, PA: Temple University Press, 1980), 3-30 treats the diversity of productive settings in Philadelphia. Walter Licht, *Industrializing America: The Nineteenth Century* (Baltimore, MD: Johns Hopkins University Press, 1995) summarizes key aspects of the multifaceted character of industrialization. For metropolitan industrialization, see Sean Wilentz, *Chants Democratic: New York City and the Rise of the American Working Class, 1788-1850* (New York: Oxford University Press, 1984). Thomas C. Cochran lays out a "business basis for industrialization" in *Frontiers of Change: Early Industrialism in America* (New York: Oxford University Press, 1981), 17-37, 116-127. Historians of technology in particular have chipped away at discussions of technological and economic change focused on large-scale textile manufacturing. Merritt Roe Smith, *Harpers Ferry Armory and the New Technology* (Ithaca, NY: Cornell University Press, 1977); Judith A. McGaw, *Most Wonderful Machine: Mechanization and Social Change in Berkshire Paper Making, 1801-1885* (Princeton, NJ: Princeton University Press, 1987). See also Philip Scranton, *Proprietary Capitalism; the Textile Manufacture at Philadelphia 1800-1885* (Philadelphia, PA: Temple University Press and Cambridge University Press, 1983); Francois Weil, "Capitalism and Industrialization in New England, 1815-1845," *Journal of American History* 84 (March 1998): 1332-54.
7. William B. Marsh, *Philadelphia Hardwood, 1798-1948; the Story of the McIlwains of Philadelphia and the business they founded* (Philadelphia, 1948), 13; Alfred Philip Muntz, "The Changing Geography of the New Jersey Woodlands, 1600-1900" (Ph.D. dissertation, University of Wisconsin, 1959), 104; James Elliott Defebaugh, *History of the Lumber Industry of America*, 2 volumes (Chicago: The American Lumberman, 1906), 1: 476ff, 527.
8. Harry J. Hartley, "A History of the Lumber Industry in Pennsylvania to 1900," (M.A. Thesis, Penn State College, 1926), 3-6, 22-23; Joshua Sharples, "Account and Day Book,"

Historical Society of Pennsylvania [hereinafter "HSP"]; Joseph Trotter, "Account of Cost of New House Fourth Street near Green Street," 1829-30, HSP.

9. Hartley, "History of the Lumber Industry," 2-26; Defebaugh, *History of the Lumber Industry*, 2: 496-507, 530-542, 575-590.

10. Samuel Preston to Lewis S. Coryell, June 26, 1821, Lewis S. Coryell, Correspondence, [hereinafter "LSCC"] HSP. As partial justification for increasing their prices, the Carpenter's Company claimed in 1805 that the "stuff," or lumber, they could then obtain required more labor, "it being in general so much worse." Carpenter's Company, *Articles of the Carpenters Company* (Philadelphia, 1805).

11. By 1794 the southeastern region contained 165 mills, probably intermittent operations. Muntz, "Changing Geography," 150.

12. Muntz, "Changing Geography," quotations at 154 and 156. Cedar trees take sixty years to mature.

13. *Ibid.*, 197-201.

14. Preston to Coryell, December 15, 1821, LSCC. Susquehanna white pine forests were characterized by straight and dense growth (100,000 board feet per acre), and could be harvested at less cost than sparser woods. Marsh, *Philadelphia Hardwood*, 27-28.

15. Carolyn Cooper, "A Patent Transformation: Woodworking Mechanization in Philadelphia, 1830-1856," in Judith A. McGaw, ed., *Early American Technology: Essays in the Social History of Making and Doing Things from the Colonial Era to 1850* (University of North Carolina Press, 1994), 278-327, 283.

16. Cooper, "Patent Transformation." A fair proportion of the lumber production of Delaware and Chester counties was probably directed to the Wilmington, Delaware and Chester and West Chester, PA markets. See correspondence between Peter Crouding and George Read II, R.S. Rodney Collection, Historical Society of Delaware.

17. Cooper, "Patent Transformation"; Marsh, *Philadelphia Hardwood*. In 1810, the combined sawmill production of Delaware and neighboring Chester counties still surpassed that of a major contributor, Northumberland county. Tench Coxe, *A Statement of the Arts*

and Manufactures of the United States of America for the Year 1810 (Philadelphia, 1814). By 1826, the number of sawmills in Delaware County alone had actually increased. "Report of the Committee of Delaware County, On the Subject of Manufactories, Unimproved Mill Seats, &c.," *Delaware County Republican*, November 1 and 8, 1833; Robert P. Case *et al.*, *A Survey of Mills in Delaware County, Pennsylvania, 1826-1860* (Media, PA: Delaware County Community College and Delaware County Historical Society, 1994).

18. Defebaugh, *History of the Lumber Industry*, 1: 552; Joseph Watson and Josiah Bunting, Receipt Book, 1821-25, Swarthmore Friends Historical Collection.

19. Letters received, William Wagner Papers, 1827-28, Wagner Free Institute, Philadelphia.

20. *Hazard's Register of Pennsylvania*, January 25, 1834.

21. See also Cronon, *Nature's Metropolis*, 164-171.

22. In the 1850s, for example, the senior member of Lippincott, Phillips & Mann had been "a lumber man on the Susquehanna." After a short stint selling for several mills, Lippincott focused on the "Sale of his own Lumber as it comes from the 2 Mills" which his sons continued to run. Philadelphia, PA Vol 2, p. 378, R.G. Dun & Co. Collection, Baker Library, Harvard University Graduate School of Business Administration [quoted by permission of Dun & Bradstreet and hereinafter cited as "RG Dun & Co."].

23. Robert Kuhn McGregor, "Changing Technologies and Forest Consumption in the Upper Delaware Valley, 1790-1880," *Journal of Forest History* 32 (April 1988), 69-81; Cooper, "Patent Transformation."

24. See, for example, a discussion of the Leibert family. Deposition of Henry K. Paul, August 19, 1829, Case of Abraham Weaver, OC 19667, Montgomery County Register of Wills and Orphans Court, Montgomery Country Archives.

25. The material awaiting transport represented approximately one fourth the annual output of a mill powered on the common vertical flutter wheel. Sampson's would have been a particularly productive mill, yielding slightly (half an acre) more than McGregor estimates

a vertical flutter wheel would have cut in a year. Henry Sampson, Case No. 760, Federal Bankruptcy Act of 1841, U.S. District Court, Eastern District of Pennsylvania, [hereinafter "USDC ED PA"], National Archives, Philadelphia Regional Branch; McGregor, "Changing Technologies." See also Diane Lindstrom's calculations of agricultural specialization by county (1840). Her figures suggest the importance of the lumber trade for producers along the Delaware River. Lindstrom, *Economic Development*, 142-43.

26. Preston to Coryell, September 4, 1818, LSCC.

27. After losing his mills to bankruptcy in the early 1840s, Taylor moved to Philadelphia and engaged in the commission lumber business, confusing a simple categorization of mill owners. Philadelphia, PA Vol. 2, p. 100, RG Dun & Co.

28. LSCC.

29. James Hopkins to "The Owner of the Saw Mills at New Hope on the Delaware" [Lewis S. Coryell], October 8, 1818, LSCC.

30. Daniel Parry, "Account Book, Lackawaxen Establishment," 1821-[1835], Bucks County Historical Society.

31. Defebaugh, *History of the Lumber Industry*, 2: 500.

32. Parry, "Account Book"; S.D. Hulce to M.R. Hulce, April 12 and 19, 1846, Hulce Family Papers [hereinafter "HFP"], George M. Lauman Collection, Cornell University; for example, Eli Kirk to William Wagner, December 18/19, 1827, January 8 and 22, and February 15, 1828, and David S. Jones to William Wagner, December 26, 1827 and March 30 1828, Letters received, William Wagner Papers.

33. Preston to Coryell and Hugh Ely, January 13, 1819, LSCC, emphasis added; Cronon, *Nature's Metropolis*, 151-3.

34. Benjamin Chew, Jr. to Coryell, January 12, 1833, LSCC.

35. Maris to Coryell, December 9, 1814; William Strickland to Coryell, April 19, 1819, LSCC.

36. William Maris to Coryell, December 9, 1814; Isaac A. Chapman to Coryell, April 8 1817, LSCC. Deposit, New York lumber merchant M.R. Hulce similarly bought both

logs and milled lumber from local farmers. Hulce, who sold on both the Philadelphia and New York markets, owned a store in Deposit from which he oversaw the rafting and sale of lumber. He frequently travelled to Philadelphia, overseeing the sale of his rafts and likely those of his rural neighbors and customers. HFP, particularly Boxes 1-3.

37. Deposition of Patrick McKelvie in *Reed v. Smith* [1799], Affidavits, Depositions and Interrogatories [hereinafter "ADI"]. James Smith sawed in the spring, "his dam being Usually Let Out Every Summer." Deposition of John Pyle, *Bar v. Smith*, 1799, ADI. See also Deposition of Joseph Pennock, *Baily v. Jones*, 1797, ADI, Chester County Court of Common Pleas, Chester County Archives and Records.

38. Parry, "Account Book". The mill owner collected a fee of \$1 per 1000 feet of boards. In Maine by the early 19th century, another arrangement—"jobbing" or contract cutting and hauling—was already widespread. Richard G. Wood, *A History of Lumbering in Maine* (Orono, ME: University Press, 1935), 42-45. There are hints that similar arrangements were used in Pennsylvania.

39. Benjamin Stickney to Joseph D. Murray, March 25, 1843, Correspondence, Griffith MSS, Murray Family Collection, 1837-53, HSP.

40. David Evans to John Dickinson, March 12, 1804, Logan Collection, HSP.

41. Preston to Coryell and Ely, January 13, 1819, LSCC. Waterways, where possible, were also used to transport logs to the mill. Wood, *History of Lumbering*, 96-99.

42. Preston to Coryell and Ely, January 13, 1819, LSCC.

43. *Philadelphia Gazette and Daily Advertiser*, May 1, 1833.

44. Preston to Coryell and Ely, January 13, 1819, LSCC.

45. Preston to Coryell, December 15, 1821, LSCC.

46. Stickney to Murray, March 25, 1843, Correspondence, Griffith MSS.

47. McGregor, "Changing Technologies," 75; Louis C. Hunter, *A History of Industrial Power in the United States, 1780-1930. 3 volumes. Volume 1: Waterpower* (Charlottesville: University Press of Virginia, 1979-1985).

48. Preston to Coryell, October 15, 1818, LSCC.
49. Preston to Coryell and Ely, January 13, 1819, LSCC.
50. *Ibid.*
51. *Easton Argus*, April 17, 1829, quoted in *Mechanics' Free Press*, April 25, 1829. See also *Poulson's American Daily Advertiser*, April 16, 1833.
52. Stickney to Murray, March 25, 1843, Correspondence, Griffith MSS.
53. Parry, "Account Book"; Preston to Coryell and Ely, December 12, 1818, LSCC; see generally Anthony F.C. Wallace, *Rockdale; The growth of an American Village in the early Industrial Revolution* (NY: W.W. Norton, 1972), 374-80.
54. J.W. White to Coryell, April 14, 1830, LSCC; see also HFP for numerous instances of stuck rafts, for example Chesley Yauman to M.R. Hulce, June 24, 1847; Silas D. Hulce to MR Hulce, October 3, 1845.
55. Strickland to Coryell, May 8, 1820; Robert Ralston to Coryell, July 12, 1822, LSCC.
56. [Josiah] White and E[rskine] Hazard to Coryell, November 22, 1822, LSCC.
57. Preston to Coryell and Hugh Ely, December 12, 1818, LSCC.
58. Crouding to George Read, Dec 1, 1797, R.S. Rodney Collection, George Read II.
59. Based on averages of several mills reporting in Montgomery and Philadelphia Counties, U.S. Census of Manufactures, 1850, National Archives Microfilm. Lumber is measured by the thousand feet, and is assumed to be a board foot unless "foot running" or linear foot is specified. A board foot is a length of board one inch thick, 12 inches wide, and one foot in length, whereas a running foot is the actual length of a piece of lumber without regard to thickness or width. To calculate board feet, multiply pieces by thickness [inches] by width [inches] by length [feet], and divide the result by 12. Kornelis Smit, ed., *Means Illustrated Construction Dictionary* (Kingston, MA: R.S. Means Company, Inc., 1985). Bills of lading for the Lehigh Coal & Navigation Company suggest that, during the month of July 1838, a log (or tree) supplied approximately 170 feet of lumber by board measure. Bills of Lading, Lehigh Coal & Navigation Company, in Correspondence of Joseph D. Murray to Thomas Murray, Griffith MSS.
60. Preston to Ely, Coryell et al, February 18, 1818; Preston to Coryell, June 13 and December 15, 1821, LSCC; Earl J. Heydinger. "Lumber and Its By-Products," *Bulletin of the Historical Society of Montgomery County, Pennsylvania* 10 (1955): 16-30; M.R. Hulce to S.D. Hulce, June 12, 1843, and S.D. Hulce to M.R. Hulce, April 26, 1848, HFP.
61. Preston to Coryell and Ely, January 13, 1819, LSCC.
62. Account, 1832, M.R. Hulce, and Bill of Hiram Hulce, 1846, HFP. The 1846 bill suggests that rafting charges were approximately \$1 per diem plus expenses.
63. Quoted in Defebaugh, *History of the Lumber Industry*, 2: 499-500. His calculations included cutting, hauling, and saw hands' and manager's wages.
64. Lindstrom, *Economic Development*.
65. J[ohn] Finch, *Travels in the United States of America and Canada*. . . (London, 1833), 304; Gasherie Radeker to M.R. Hulce, April 18, 1849, HFP.
66. M.R. Hulce to F.S. Truman and S.D. Hulce, May 3, 1842; Gasherie Radeker to M.R. Hulce, April 15 and 18, May 4, 1849, HFP. The price lumber commanded at market depended on its type, cut and quality. At the Delaware River wharves in the 1820s, for example, rafts brought \$6 to \$10 per thousand feet for white pine, and approximately \$10 for white oak, \$16 for ash, and \$8 for hemlock. Defebaugh, *History of the Lumber Industry*, 2: 579.
67. James Clayton to George Read, November 6, 1797, R.S. Rodney Collection, George Read II; Strickland to Coryell, April 19, 1819, LSCC.
68. James Verree to Joseph D. Murray, March 13, 1843, Correspondence, Griffith MSS.
69. Board referred to pieces not more than 1 1/4" thick and 2 inches or more wide. Scantling applied to general sizes and widths, including small pieces two inches thick and less than eight inches wide, or not more than five inches square. The latter term could also refer to any squared hardwood not of standard dimensions. Plank measured from 2 to 4 inches in thickness and 6 inches or more in width.

Smit, ed., *Means Illustrated*; Frederic H. Jones, *The Concise Dictionary of Construction* (Los Altos, CA: Crisp Publications, 1991).

70. Strickland to Coryell, May 7, 1819; see also January 3, 1828 for specifications regarding the U.S. Marine Asylum, LSCC.

71. Within the week "I expect to have the bill for the residue of the roof handed to me" from the master builder, the agent for the U.S. Mint informed Coryell. The merchant was then to use the bill, or order, to cut the pieces. Samuel Moore to Coryell, July 24, 1830, LSCC. *Hazard's Register* 5 (1830): 311 reported that "several two story framed houses, all ready to be placed in the most eligible situation" and "finished and complete in all their parts" had arrived in Pottsville by canal. The report hoped that its "Philadelphia friends" would "find the venture to yield such profit as to induce them to fill our return boats with similar cargoes." These prefabricated frames underscore the standardization of framing parts in building. See also Edwin T. Freedley, *Philadelphia and its Manufactures . . . in 1857* (Philadelphia: Edward Young, 1859).

72. Cull commanded about two-thirds less than "pannel" (the best boards), while prices for common occupied the middle range. Defebaugh, *History of the Lumber Industry*, 2: 579.

73. Moses Bross, Case No. 841, Federal Bankruptcy Act of 1841, USDC ED PA.

74. Stickney to Murray, March 25, 1843, Correspondence, Griffith MSS.

75. Defebaugh, *History of the Lumber Industry*, 2: 499-500; Wood, *History of Lumbering in Maine*, 142.

76. Watson and Bunting, Receipt Book [1822, 1823]; Moses Lancaster, Receipt Book [1828], HSP.

77. County Tax Assessment Ledger, Kensington (East), 1826, Philadelphia, Philadelphia City Archives and Records; Watson and Bunting, Receipt Book [1821, 1822].

78. Watson and Bunting, Receipt Book [1821-23].

79. The firm genealogies are reconstructed from a number of mechanics lien cases, receipts, and city directories over a period of time.

80. For example, Rebecca Steward Wilmer was

a partner in the firm of Steward & Wiltberger in 1813. And Elizabeth Workman, in 1829, carried on the business with partner and son William at the yard her deceased husband had established. DSB, Sep term 1813, No. 16 and March term 1829, Nos 44-47, District Court of the City and County of Philadelphia, Philadelphia City Archives and Records.

81. *Croskey and Clay, trading as Ashmead & Croskey v. Coryell and Jackson*, 2 Wharton 223 (Pennsylvania Supreme Court, 1837). Elizabeth Croskey was the daughter of John Ashmead, probably one of the original founders of the lumber concern, and could have inherited an interest in the business (in addition to marrying into it). George D. Croskey, 1829 No. 192, Recorder of Wills, Philadelphia County; Charles Morris, ed., *Makers of Philadelphia; an historical work* (Philadelphia: L.R. Hamersly & Co., 1894), 203. For a related discussion of women in the construction trades, see Christopher Powell, "Widows and others' on Bristol Building Sites: Some Women in Nineteenth-Century Construction," *The Local Historian* 20(2) (May 1990), 84-87.

82. Lancaster, Receipt Book; John and Moses Lancaster, Lumber Day Book, 1823-1829 [Moses, 1838-1841], HSP.

83. Crouding to Read, December 28, 1797, R.S. Rodney Collection, George Read II. In 1823 one concern paid \$350 rent—the equivalent of the sum to rent a genteel residence for one year—for two board lots on Pine and 8th streets. Watson and Bunting, Receipts; John F. Watson, *Annals of Philadelphia, and Pennsylvania, in the Olden Time*, revised Willis P. Hazard, 3 volumes (Philadelphia, 1909), 1: 229.

84. *Mechanics' Free Press*, August 23, 1828 and May 22, 1830; Daniel T. Glenn, Insolvent Petition, September 5, 1835, Philadelphia Court of Common Pleas, Philadelphia City Archives and Records. When Love & Pickering prepared to compensate their creditors in 1834, they anticipated assets would remain even after debts of more than \$14,000 were cleared. Misc Book AM1: 707 (March 5, 1834), Philadelphia City Archives and Records.

85. Donna J. Rilling, "Building Philadelphia:

real estate development in the City of Homes, 1790-1837" (Ph.D. dissertation, University of Pennsylvania, 1993), 101-110; see also Stuart M. Blumin, *The Emergence of the Middle Class: social experience in the American city, 1760-1900* (NY: Cambridge University Press, 1989). 86. Bill in Equity, *Cochran v. Perry*, Dec Term 1842, No. 2, Equity Cases, Philadelphia Court of Common Pleas.

87. Philadelphia, PA Vol. 2, p. 356, RG Dun & Co.

88. *Ibid.*, p. 354.

89. *Ibid.*, p. 100.

90. Morris, ed., *Makers of Philadelphia*, 203.

91. Traders charged 50 cents per thousand feet for handling the lumber, $\frac{1}{2}$ to 1 percent for insurance, and a sales commission of five percent. Marsh, *Philadelphia Hardwood*, 45. Defebaugh suggests that some Philadelphia merchants owned their own upstate sawmills to supply their board yards, but his time frame is obscure. Defebaugh, *History of the Lumber Industry*, 2: 575-590.

92. There were interesting exceptions. As late as 1853, for instance, a particular port inspector in Philadelphia still "[s]ometimes [sold] for raftm[e]n." Report on William F. Blackman, Philadelphia, PA Vol 2, p. 408, RG Dun & Co.

93. *Ibid.*, vol. 2, pp. 349 and 356; see also Reports on Taylor, p. 100, and M. Trump & Sons, p. 424.

94. Cronon argues that for the nineteenth-century lumber industry in the Midwest, individual properties of lumber "made it less suited to the speculative needs of a futures market" than, for example, grain. Cronon, *Nature's Metropolis*, 177-78. Croskey's trade in "Lumber paper" suggests that a lumber futures market—uninstitutionalized—did develop in Philadelphia. The evidence is inconclusive, however, as "Lumber paper" may refer rather to the loans that wholesalers and commission merchants made to sawmills.

95. McGregor, "Changing Technologies," 74; Alfred J. Van Tassel, *Mechanization in the Lumber Industry* (Philadelphia, Works Projects Administration, Report No. M-5, March 1940), 1-12.

96. Assessment for John Naglee on his "Wharf and Steam Saw Mill," County Tax Assessment

Ledger, East Northern Liberties (unincorporated), 1820. The mill may have run steam machinery on anthracite coal. See Robert B. Gordon, "Custom and Consequence; Early Nineteenth-Century Origins of the Environmental and Social Costs of Mining Anthracite," in McGaw, ed., *Early American Technology*, 240-77. See also D.W. Cox to Coryell, September 2, 1825, LSCC; County Tax Assessment Ledger, Kensington (East), 1826; Cooper, "Patent Transformation."

97. Edward Yardley, Case No. 1568, Federal Bankruptcy Act of 1841, USDC ED PA.

98. McGregor, "Changing Technologies."

99. VanTassel, *Mechanization in the Lumber Industry*, 9.

100. *Ibid.*; McGregor, "Changing Technologies"; Hunter, *History of Industrial Power. Volume 2: Steam Power*.

101. Thomas Hunt, Case No. 1684, Federal Bankruptcy Act of 1841, USDC ED PA. By the late 1800s, the requirements of milling machinery and private railways led to a consolidation in the lumber trade that bore close resemblance to mass production industries. VanTassel, *Mechanization in the Lumber Industry*, 9-12.

102. McGregor, "Changing Technologies."

103. Mark Richards, Case No. 521, Federal Bankruptcy Act of 1841, USDC ED PA.

104. Report on Wilson & Lavender, Philadelphia, PA Vol. 1, p. 274, RG Dun & Co.

105. Cooper, "Patent Transformation"; James M. Patton, Case No. 1201, Federal Bankruptcy Act of 1841, USDC ED PA.

106. U.S. Census of Manufactures, 1850, Philadelphia County; Cooper, "Patent Transformation."

107. Report on Wilson & Lavender, Philadelphia, PA Vol. 1, p. 274 and Report on J.P. Wilson, Vol. 2, p. 22, RG Dun & Co. Carolyn Cooper also finds that carpenters and lumber merchants generally resented the "upstart newcomers" involved in introducing the Woodward planing machine. Cooper, "Patent Transformation," 303; Gregory K. Clancey, "The Cylinder Planing Machine and the Mechanization of Carpentry in New England, 1828-1856" (M.A. thesis, Boston University, 1987).

108. Scranton, *Proprietary Capitalism*;

Wilentz, *Chants Democratic*, 107-142.

109. The classic work on the development of vertically-integrated corporations is Alfred D. Chandler, *The Visible Hand: the managerial revolution in American business* (Cambridge, MA: Belknap Press/ Harvard University Press, 1977). By linking lumber enterprise with vertically-integrated companies, I do not mean to suggest that large corporations were the typical business organization in the nineteenth-century Philadelphia regional economy.

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