PRE-COLUMBIAN INDIAN FINANCE AND RECIPROCITY

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Draft 1
November 2019

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Abstract

More than 30 years of research has explored the image that Pre-Columbian American Indians were predominantly organized as small bands of a few extended families persisting as happy nomads in a land of plenty, their capital investments limited to the simple tools and other belongings they could carry with them. This research reveals that North American Indians were far more populous, prosperous, and capital intensive than this image would have us believe. The same is obviously true of the South American Aztec, Mayan, and Inka empires, but it is also true of lost civilizations in Amazonia and the Bolivian highlands. The question this essay addresses is how these American Indian groups financed their capital investment projects absent the banks, stock markets, insurance companies, and credit unions that support modern finance. One likely candidate is institutionalized reciprocity, which could have provided the foundation for vibrant capital markets and even fractional reserve banking.

PRE-COLUMBIAN INDIAN FINANCE AND RECIPROCITY

D. Bruce Johnsen*

I. Introduction

The traditional image of Pre-Columbian American Indians as "subsistence" hunter-gatherers lacking institutions such as private property or active markets has lost its cache. With a handful of exceptions, the image was one of small bands of a few extended families persisting through generations in makeshift huts living a happy nomadic lifestyle in a land of plenty, their capital investments limited to the simple tools and other belongings they could carry with them (Cicarelli 2012; Anderson & McChesney 1994). In truth, at least for some American Indian groups, this image was known to be false from the start, while for others it began fading with mounting archaeological, ethnographic, and historical evidence, and it has faded further with widespread deforestation and aerial photography, satellite imaging, and other revealing technologies (Mann 2005).

We now know this image was universally inaccurate. From inception, it was based on generalizations from the peculiar circumstances Europeans unknowingly encountered on first contact, most notably that the diseases they brought with them—smallpox, influenza, measles, malaria, and dysentery, among others—had raced ahead of them across both American continents. The resulting epidemics left behind native populations that were mere remnants of what they had once been (Dobyns 1966) but wild game populations and other resources notably plentiful (Mann 2005).

The obvious exceptions to the traditional image are the Aztec, Mayan, and Inka Empires, which are said to have rivaled Europe in technological sophistication, institutional development, architectural and engineering achievement, and sheer population. Far more

* I thank Ken Hirth for valuable discussions and Ellen Feldman and Dakota Maravelis for helpful research assistance.

obscure are the peoples of remote western Amazonia, the Amazon Highlands, and the Beni region of northern Bolivia (Mann 2005), where evidence of past prosperity revealed by aerial photography has until recently either been obscured by dense jungle or simply ignored. Somewhere in between are the Iroquois (Haudenosaunee) confederation of the northeastern U.S., the Mississippian peoples of Cahokia and its hinterlands, the Anasazi of the U.S. southwest, and the collected tribes of the Pacific Northwest coast of North America.

Like their southern neighbors, each of these groups made substantial long-lived capital investments to enhance their wellbeing, although this may not have appeared obvious to the Europeans who first encountered them. The central question for this essay is how they financed these capital investments. As far as we know, American Indians had no banks, no stock markets, no credit unions, and no insurance companies. Did they have equivalent institutions whose existence and function have simply been misunderstood or obscured by the ravages of time and the vacuum of epidemic depopulation? Keep in mind that investment financing typically carries with it valuable information that those in possession often prefer to keep secret; not seeing something doesn't necessarily mean it isn't there. For this reason, it strikes me as near truism that the incidents of statecraft are more likely to survive the ravages of time than those of the marketplace.

Capital investment involves inter-temporal decision-making, normally consisting of a condensed "project," which involves careful planning and an up-front investment, so-called "fixed" capital whose cost varies little or not at all with subsequent variations in the chosen level or rate of activity. The other side of the capital investment equation is the return. By definition, capital investment generates a flow of incremental income over time (possibly by reducing the ongoing or variable costs of performing an activity). At the moment a capital investment decision is made, the rational investor calculates the present value of the expected net income stream discounted at the appropriate interest rate. That is, he or she *capitalizes* the stream to arrive at a single lump-sum valuation. The rational decision rule is to undertake all investment projects whose capital value exceeds the up-front capital cost, another way of saying that rational investors maximize *wealth*. Capital investment is risky. If demand for the activity down the road turns out to be high, the fixed investment could prove wildly profitable but it could also be a big loser if demand turns

out to be low. What is more, time is of the essence. The longer the delay in completing the capital investment the later in time the return begins.

Take a simple example that apparently confronted North American Indians many times over. In a hostile world, a tribe might prefer to dwell in a safe place where its members can be sure to get a good night's sleep. Their important food and water source might be located some distance away, say half a mile. They can spend a portion of their daily manpower collecting water in buckets and carrying it home. At some point an enterprising (or lazy) member of the tribe might come up with the ingenious idea of building an irrigation canal that will dramatically reduce the cost of delivering water to camp. Capital investment occurs when the tribe commits to the project because it decides the discounted present value of reduced delivery costs exceeds the up-front construction cost in terms of buckets of water that otherwise could have been delivered to camp.[1]

Where does financing come in? An observer might look at the irrigation project and conclude financing is not an issue. No financing is needed if members of the tribe simply extend their workday until the project is complete. But this says only that they finance the project internally. The extra work could have been used in some other way to generate wealth. The forgone wealth is the fixed cost of financing the project, and in this case the investment project and the financing of the project are vertically integrated.

Capital investment, and financing, occurs writ small routinely in our everyday lives. Sitting in my study I pick up a book to read, but my reading glasses are nowhere to be found. I can struggle along with brain fog, or I can incur, and finance (reflected in the number of pages I could otherwise have read), the cost of going in search of my glasses. If I plan to read only a single page, it might be best to stay put, but the prospect of reading an entire chapter or more will send me searching. If instead my son wanders by, I might offer to take him for ice cream later if he brings me my glasses. In this case, my son makes the up-front investment in expectation of a future payoff. Or he might insist on payment up front, in which case he makes the investment but I finance the project. More generally,

[1] Innovation is not necessary to drive capital investment. The tribe might recognize early on that irrigation would be possible but they consider it a wealth-reducing investment given their limited daily demand for water and the alternative uses for their time. An alternative reason for undertaking the investment is that they anticipate a doubling of tribal population, rendering the capital investment a wealth-increasing project owing to scale economies that reduce average total cost.

if A contracts to deliver 1000 widgets to B in six months, cash on delivery, A finances the investment. If A insists on payment up front B finances it.[2] The contract involves two conceptually separate functions, production and finance.

The point of these examples is that capital investment, and project finance, might occur together but leave few if any traces of financing to outside observers. The more specialized the economy and the larger the project the more likely specialists will arise to provide financing, and the more observable project finance is likely to be. Haste is also likely to mobilize specialized financing. Depending on the circumstances, however, sophisticated methods of finance might nonetheless be opaque to outsiders. Is an ordinary gift just that, or the repayment of loan? Is the ransom of a captive what it appears to be, or is the captive a form of hostage collateral for a loan?[3] Is a granary simply a place to store grain, or the epicenter of a fractional reserve banking system?[4] Is an elaborate system of multi-lateral reciprocity between participating groups a beacon of social status, a mechanism for gift exchange, a system of social insurance, a method of enforcing property rights, a fractional reserve banking system, or all of the above?

I agreed to write this paper partly in hopes of mobilizing the archaeological record to better understand whether, to what extent, and how Pre-Columbian American Indians made and financed capital investment projects. My quest has been humbling. First of all, identify exactly what facts are available in the archaeological record has proven daunting. Even the archaeologists most interested in markets have repeatedly told me that their discipline has traditionally avoided focusing on specifically economic issues, and so they have not gone looking for economically relevant evidence when conducting their digs. Presumably archaeological digs are subject to scarcity, so open issues in existing archaeological theory guide the investigation, narrowing the investigator's focus. Second,

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[2] See Kovacik v. Reed, 49 Cal. 2d 166 (1957). Also see Comment to Section 234 of the Restatement (Second) of Contracts. In many industries, customary terms require the widget buyer to pay within 45 days of delivery. Why does the seller provide this added financing bundled with the supply of widgets? The buyer could instead borrow from someone who specializes in lending. One explanation is that this arrangement allows the buyer time to inspect the widgets without fear of having to claw back a COD payment if the widgets prove defective. The seller's willingness to allow this provides credible information to the buyer that the widgets are likely to be sound because the seller puts his money where is mouth is. The informational role of finance helps explain why firms like General Electric gradually drifted away from productive and essentially became financial firms who provide information about the value of productive assets.

[3] See Oliver Williamson (????).

[4] See Willaims (1984) on Chicago grain merchants.

no doubt the evidence uncovered can fortuitously point to, refute, or fail to refute Post-Coasean economic theories, but such evidence may be scattered across the archaeological record waiting to be cataloged. This is beginning to change (Hirth & Pillsbury 2013 and Hirth 2016). My hope is that this paper will come to the attention of archaeologists and nudge them in the direction of including the economics of information and property rights in their list of theoretical possibilities.

The paper begins by briefly surveying the archaeological, ethnographic, and historical record of several Pre-Columbian American Indian groups to identify whether and to what extent they engaged in capital investment projects and how they might have financed them. I begin in Part I with the Aztec, Mayan, and Inka empires. Next, I look at the Haudenosaunee, the Mississippian, and the Anaszi peoples. I conclude by discussing the collected tribes of the Pacific Northwest Coast of North America, with which I am most familiar. These tribes relied heavily on sophisticated reciprocity relations, most notably the celebrated "potlatch" system of reciprocal gift giving. Elsewhere, I have proposed that potlatching was an institutionalized method of enforcing exclusive tribal property rights to natural resources such as productive salmon streams (Johnsen 1986, 2001) and possibly a system of fractional reserve banking (Johnsen 2014), both of which promote capital investment. Although reciprocity was most highly developed among the Northwest Coast (NWC) tribes (as far as we know), all the Indian groups listed above are known to have relied heavily on it.

Part II of the paper examines multi-lateral reciprocity, generally, as a mechanism for financing capital investment projects and, beyond that, as a system of fractional reserve banking. The discussion provides two revelations. First, it shows that multi-lateral reciprocity did serve as a financing mechanism among the Northwest Coast Tribes. Second, it shows that such a system's potential for fractional reserve answers a longstanding empirical and theoretical puzzle regarding the power of reciprocity to create trust.

I. Pre-Columbian Capital Investment and Finance

A. The Aztec, Mayan, and Inka Empires

The Mayan Empire flourished in southern Central America from the 5th through the 10th centuries. The Aztec, further to the north in the Basin of Mexico surrounding present day Mexico City, flourished from roughly 1400 to 1521. The Inka Empire (Tawantinsuyu), with a population estimated at 12 million, perhaps the largest and most extensive in the entire world at the time, flourished roughly concurrent with the Aztec Empire. All three were hierarchical in their political structure, in contrast to the egalitarian tribes we tend to think of as representing North American Indians. And all three empires clearly made extensive capital investments, including pyramids bearing an uncanny similarity to those in Egypt (see photos below). In addition, they fought large-scale wars of conquest, which in the European arena required the leader to borrow extensively from banks and other sources.[5]

When Hernán Cortés first encountered them in 1519, the Aztec (the Triple Alliance) had accumulated extensive capital, including breathtaking palaces and monuments, fully developed irrigation canals for agriculture, extensive transportation waterways, a glyphic writing system, vibrant markets, and established trading networks throughout the Basin of Mexico and beyond. Estimates put its Pre-Columbian population

[5] When Pizarro first arrived in what is now Peru, the Inka Empire had just concluded a bloody civil war said to have mobilized as many as 80,000 soldiers on just one side (Mann 2005). Archaeologists believe the Inka leaders finance these wars out of state granaries (Issac 2013, Hirth 2016). This is implausible. A war of such scale would be akin to a "black swan" event, and it would have been imprudent to lay in stores to cover it. More likely the contenders financed their projects by borrowing. Even if the state had accumulated this fantastic level of grain stores, it would have been economically foolish not to have lent it out to finance other capital projects under the condition that the state (or whichever contender controlled the state) could repayment insist on repayment on demand.

Mayan Pyramid

Aztec Pyramid

Inka Pyramid

at five to six million, with the population of the entirety of central Mexico estimated to have been close to 25 million, perhaps the densest in the entire Pre-Columbian world (Mann 2005, at 107).

By 1428, the Aztecs had become the sovereign people of central Mexico. They quickly extended their military rule over much of the region, and with tax revenue and tribute from the provinces they transformed the city of Tenochtitlan into one of the most magnificent ever seen (Farb 1968). By the time Cortés arrived in 1519, the population of Tenochtitlan is reported to have exceeded 200,000. As one chronicler observed, "[W]e were amazed [at] the great towers and buildings rising from the water, and all built of masonry. And some of our soldiers even asked whether the things we saw were not a dream" (Farb 1968, at 159). It is possible, but very unlikely that this came about incrementally as tax revenues arrived. Some kind of capital finance must have been at work.

After draining and irrigating much of the marshy valley in which Tenochtitlan sat, the area was divided into districts called *calpulli*. Each *calpulli* supported a semi-autonomous clan that had its own temple and maintained a school for the military training

of its young men. Each family within the *calpulli* worked its own scattered strips (usufructs) and paid taxes to higher-ranking members, who in turn paid taxes to the Aztec state.

A specialized merchant class known as the "vanguard *pochteca* conducted long-distance trade in the hinterlands at so-called "open ports" and sometimes beyond, which could be dangerous business despite the state's promise to punish malefactors. It appears they sometimes acted as agents for the nobility and sometimes as dealers on their own behalf. When acting independently, they paid tribute to the nobility in the form of trade goods. Long-distance trade to centers lying outside the zone of protection offered by the *Aztec* state was not only risky but it was no doubt capital intensive. Not surprisingly, the evidence shows that the *pochteca* provided financing on occasion, and perhaps financed others in the class through reciprocity.

Contemporaneous accounts say that the *pochteca* closely guarded their wealth. They often left for trading journeys and returned under the cover of darkness and did not necessarily use their own home to store what they brought back. A successful *pochteca* was compelled by social custom to host lavish feasts and to distribute his wealth to the nobility, distinguished soldiers, the *pochteca* community, the poor, and the gods, but with an expectation of reciprocity (Issac 2013, at 439-40, referencing Sahagún's *Florentine Codex*).

Aztec nobility, somewhat like their English counterparts (Allen 2011), appear to have done little except to oversee the administrative apparatus of the state, marshal military operations, and conduct ceremonies and rituals. The nobility did not directly collect taxes and tribute, but delegated this function to specialized tributary collectors (*calpixque*), who are reported to have charged roughly 12% for their efforts (Gutierrez 2013, at 142). Taxes and tribute were collected in two basic forms, corveé labor and standard goods in the form of staple grains (primarily corn), cacao beans, craft goods, jade, gold, quetzal bird feathers, mantles, and bolts of woven cotton. The nobility also maintained and oversaw large warehouses to store grain, cotton cloth, cacao beans, and other items throughout the realm. Referencing Fray Bernardino de Sahagún's (1499–1590) *Florentine Codex*, Issac (2013, at 436-37), denies even a hint of borrowing and lending among the Aztec to finance capital investment. Others directly contradict this claim. According to one contemporaneous

report, "the caciques and tequitlato of the pueblo had to borrow forty-five pesos of gold from the *pochteca* of Mexico and Texcoco to pay their tribute. The interest asked from the *pochteca* of Central Mexico was at least 100 percent" (Gutierrez 2013, at 158). What is more, Issac (2013) tells the story of a *calpulli* resident borrowing against his usufructory rights in land and also that during times of famine children were sold into slavery but ransomed later (Issac 2013, at 437, and Hirth 2016, at 33). Others have observed that in Mayan times ranking nobles were held captive but appear to have regained their freedom and position following payment of ransom or tribute (Macanany 2013, at 238). It is a very real possibility worth investigating that nobles were pledged as captives from time to time as collateral for the repayment of a debt.

Issac (2013) recounts a story that suggests the nobility may have been engaged in fractional reserve banking in grain. Although Sahagún denied the existence of capital markets, he also claimed the nobility of Tenochtitlan held 20 years' supply of grain in his warehouse. Yet when Cortez laid siege to the city it fell into famine after only 75 days.[6] One possible explanation for this is that the nobility had issued warehouse receipts to storage grain in excess of the amount of grain actually in storage, much like Chicago grain merchants are known to have done in the mid-19th century (Williams 1984), and that the sum total of the warehouse receipts is what Sahagún observed rather than the amount of grain actually held in storage.

It is worth carefully investigating whether the Aztec nobility were engaged in financial intermediation of some kind. Their financial dealings may have been misunderstood or ignored by chroniclers of their time because, as even contemporary critics of financial intermediation naively argue, it produces nothing real. Indeed, for strategic reasons the nobility may have preferred their financial activities to remain *sub rosa* and were therefore content to be considered idle except for ceremony, ritual, and military affairs. There is no doubt the Aztec nobility held extensive stores of grain and other commodities, and given that their economy flourished fabulously, it is difficult to believe they failed to leverage their wealth in some way.

[6] Issac disputes Sahagúns' account of storage facilities centralized in Tenochtitlan, arguing that the royal granaries were located in the tributary city-states (Issac 2013, at 443).

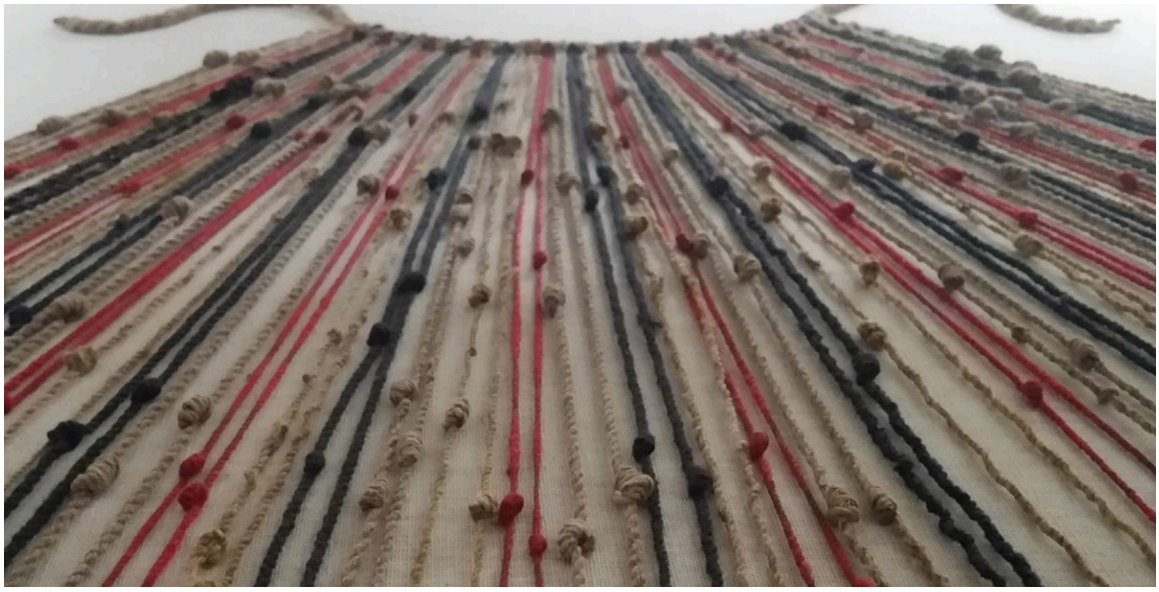
If so, my expectation is that the Aztec nobility must have issued warehouse receipt and had some reliable method of keeping track of who owed what to whom. A parallel comes from the Inka, who are said to have extracted tribute primarily in the form of corveé labor, and they apparently maintained large grain warehouses scattered through the realm, in part to feed the workers when a project took them away from their homes. An interesting and recurring artifact of the Inka system is the puzzling *khipu*—so-called "talking knots" (Mann 2005)—consisting of a long central rope with multiple and variously colored pendant strings tied to it. Along the pendant strings different types of knots were tied, and the pendant strings sometimes had shorter strings tied to them. Specialized keepers of the *khipu—khipukamayug*—apparently were responsible for creating and reading them. At least 600 *khipu* survived Spain's 16th century demand that they be destroyed for having contradicted Spanish accounts (Mann 2006, at 400).

Anthropologists and archaeologists, among others, have spent considerable time and attention trying to decipher both the function and meaning of the *khipu*. Their main conclusion is that the *khipu* are at the very least a means of numeric accounting, although in some cases they appear to convey qualitative rather than quantitative information Mann 2005, at 400). My hypothesis is that *khipu* served in part as a form of double-entry book-keeping and possibly also as bank records evidencing indebtedness in the nature of warehouse receipts, with grain held in storage likely to have been the underlying good. Lacking the wheel and functional beasts of burden, transportation in the extensive and rugged Inka Empire was slow, laborious, and costly (as well as in the Aztec and Mayan empires). Nobility who wanted to conduct transactions in distant places would much prefer to transfer warehouse receipts than grain itself.

Imagine an agent/trader who regularly travels between and trades in Town X and Town Z on behalf of his principal.[7] Given the benefits of specialization the principal might prefer this to traveling and trading on his own behalf. The problem is that the principal, being in some cases distant, has difficulty monitoring the agent. Double-entry book-keeping developed to resolve exactly this kind of agency problem. Possibly the *khipu*

[7] From time to time the "vanguard *pochteca*" apparently performed this agency function on behalf of the Aztec nobility, and also brought back reconnaissance from the hinterlands, while also trading for their own accounts (Hirth 2016). This kind of dual trading, as broker and as agent, makes monitoring an agent from a distance especially troublesome.

solved the same agency problem. The principal might set up a monitoring system in which the keeper of the *khipu* in Town X records the quantity and price of the goods the agent/trader left with. On arrival, the keeper of the *khipu* in Town Z records what the agent/trader arrived with. At the principal's choosing he can determine whether the accounts match by traveling with the *khipu* from Town X to Town Z and comparing the supposedly duplicate *khipu.*



Khipu

B. The Iroquois, Mississippian, and Anasazi Peoples

The six nations of the *Iroquois* confederacy of the northeastern portion of North America were the subject of a considerable historical record because Europeans encountered them before they were devastated by disease. Much less is known about the Mississippian and Anasazi peoples, although the Spanish did have contact with the remnants of the Anasazi in the 16th century.

The Anasazi occupied the region around Four Corners (Arizona, Colorado, New Mexico, and Utah) from roughly 100 B.C. to 1300 A.D. and were the fore-runners of what we now know as the Pueblo and Hopi tribes. Theirs was primarily an agrarian economy,

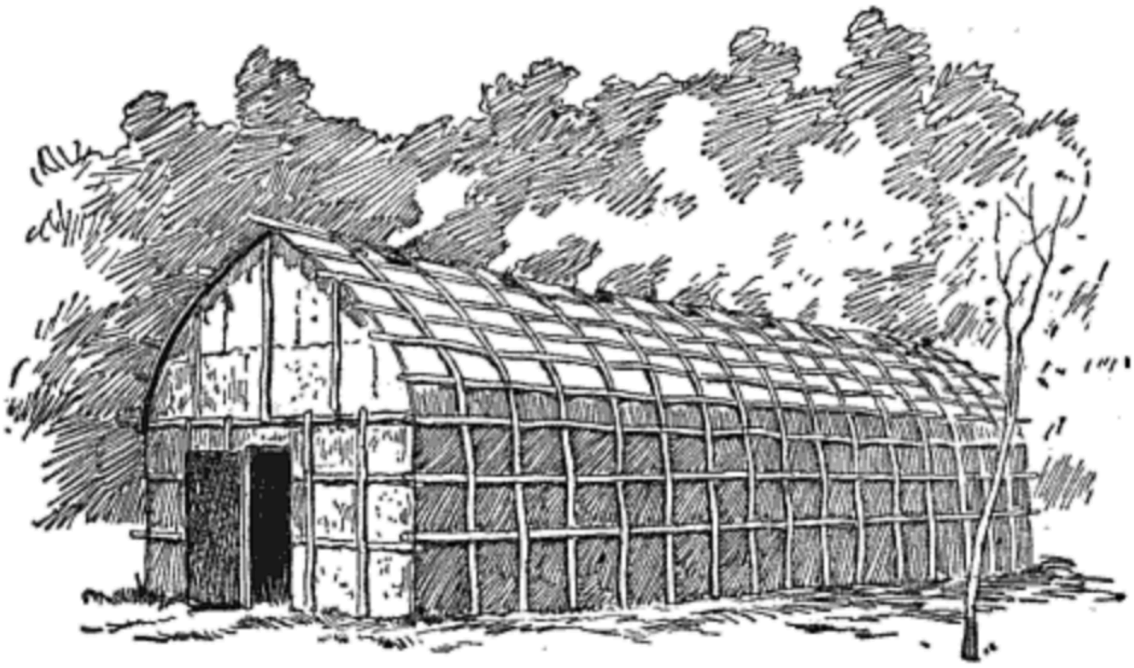
supported through the construction of elaborate irrigation works (Cicarelli 2012, at 93). They also developed and built above-ground and cliff-ledge pueblos. Both architectural forms clearly involved substantial capital investment. The Anasazi had

Anasazi Cliff Pueblo

Anasazi Reservoir and Irrigation Works

largely disappeared by the time the Spanish arrived. The puzzle is what caused their disappearance. Flood, drought, and over-harvesting of timber for fuel have all been proposed.

The Iroquois or Haudenosaunee confederation consisted of the Cayuga, Mohawk, Oneida, Onondaga, Seneca, and Tuscarora tribes. These tribes erected log fortifications surrounding entire villages, which often contained a number of spacious Iroquois longhouses built of wood frames and shingles, enclosing some 20,000 cubic feet, and providing space for several families. In addition to these obvious capital investments, the tribes also regularly set fire to forested areas to clear them of brush to improve their suitability for hunting and agriculture (Cicarelli 2012, at 90). Since the benefits might not be realized for several years, and the land would be relatively unproductive until then, the decision to burn an area was a capital investment. They also relied on extensive reciprocal gift giving (Johansen 2005, at 129-30). Reports of the early Thanksgivings suggest that the Indians sometimes used this occasion to provide the settlers with gifts necessary to see them through the winter. The settlers expressed dismay when the givers later expected return gifts.

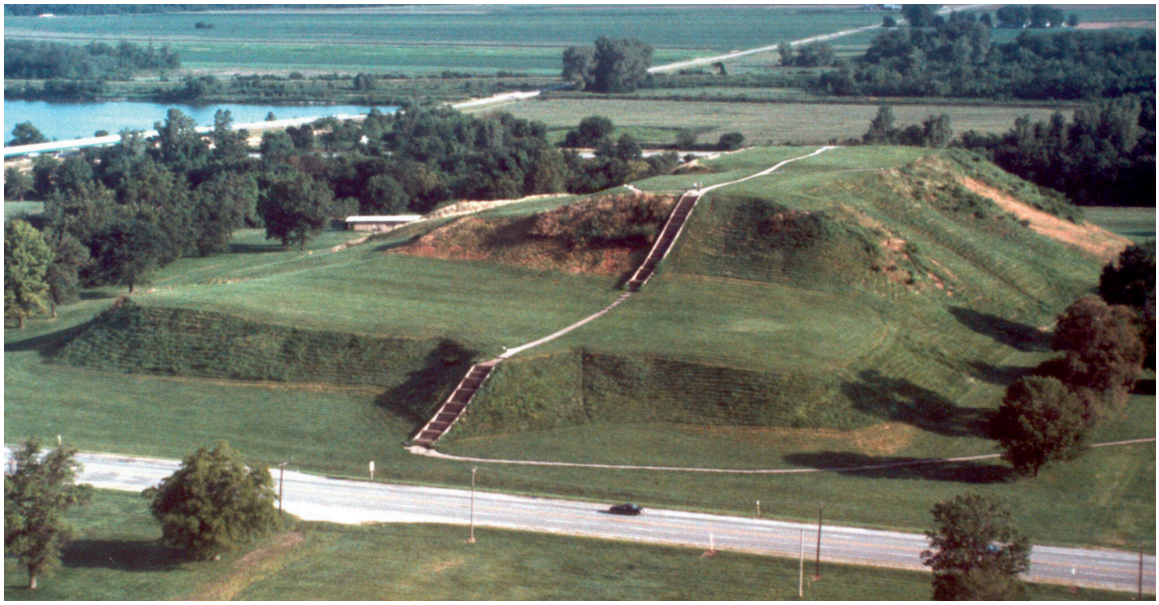


Iroquois Longhouse

Capital investment by Mississippian peoples came in the form of monumental mound architecture reminiscent of the great stone pyramids. Although these mounds are scattered from the Gulf of Mexico to Canada and the Great Plains to eastern Florida, the largest and most spectacular are found at the confluence of the Mississippi, Missouri, and Illinois rivers near what is now East St. Louis. Of these, the famous Monks Mound is the largest and most spectacular. Larger than the Great Pyramid of Giza, it sits at the epicenter of a once elaborate city of mounds and other monuments known as Cahokia that flourished from roughly 900 to 1250 A.D. with a population estimated at 15,000. The following passage should lay to rest any doubt that mound construction qualifies as a capital investment project:

> Building a ring of mounds with baskets or deerskins full of dirt is a long-term enterprise. During construction the workers must eat, which in turn means that other people must provide their food. Such levels of planning are ordinarily thought to kick in with the transition to agriculture (Mann 2006, at 292).

Indeed, Cahokia sat in rich bottomland that provided ideal growing conditions for maize, which dominated its economy. Researchers have puzzled over the purpose of the mounds since the middle of the 19th century, although their ubiquity was not recognized until the advent of aerial photography. Archaeologists discovered six finely bedecked bodies interred in a few Cahokia mounds, but most mounds have shown no signs of being designed and built for use as tombs or anything else in particular. Were they defensive fortifications? Large piles of refuse accumulated over the centuries? Apparently these



Monks Mound

hypotheses have been rejected. There is no doubt religious and political leaders occupied and possibly dwelled atop some of the mounds. They were also used for ceremony and ritual. But claiming their function is ritualistic is a non-explanation unless we have a substantive explanation for ritual itself (Mann 2006, 347). Researchers' inability to explain the mounds' function reportedly led one noted archaeologist to suggest, half jokingly, that "the motive for building them could have been the act of construction itself" (Mann 2006, at 291).

This suggestion strikes me as a penetrating if unintended economic insight rather than as a joke. The mounds may have been examples of reputational, or trust, capital by an emerging ruling class whose function was to serve as a quality-assuring bond. As agriculture began to dominate prehistoric peoples, specialization took hold, and with it came political hierarchy and a ruling coalition whose function was to collect taxes and administer the state. The problem is that everyday citizens, who are busy with their own specialized activities, have a great deal of difficulty determining whether the ruling coalition is performing their function well, poorly, or not at all. That is, state administration is an "experience good," the failure of which may not be apparent until it is too late (for example, flood control is poorly planned,[8] food stores are allowed to spoil, security is

[8] Consider the levees around New Orleans on the eve of Hurricane Katrina.

neglected, the money supply is devalued, social mores are poorly followed, the fisc is implicitly leveraged with hidden promises,[9] etc.). The rulers' temptation might be to cheat by shirking or skimping on administration or simply by stealing. Unless the problem can be overcome, no one trusts the prospect of deferring to a ruling class and specialization never takes hold.

The well-known Klein-Leffler (1981) model shows how the mounds may have overcome the trust problem. In their model, consumers (the citizens of Cahokia) promise to pay the seller of an experience good (the ruling coalition) a premium income stream in perpetuity above its opportunity cost of delivering a high-quality product (diligent state administration), but only as long as it performs as promised. Since it takes time to discover poor performance, the present value of the premium income stream must exceed the one-time gain to the ruling coalition from cheating. As a matter of self-interest, the ruling coalition will provide diligent administration. But this leaves them with a surplus. Competition between rival coalitions requires the winner to make a sunk capital investment—to post a bond—for which the premium stream provides only a normal rate of return (think McDonald's Golden Arches). If the rulers are caught cheating they are tossed out and lose both the premium income stream and their bond. The more difficult it is or the longer it takes for the citizens to detect cheating, the larger both the premium stream and the bond must be.

The critical characteristic of the bond is that it can have no value to the deposed ruling coalition in the event they cheat. Investments in artwork, gold jewelry, fine clothing, scientific knowledge, or other transportables simply won't work to assure quality because it would allow the rulers a prospect of cheating, recovering their investment, and then fleeing. Monumental architecture has exactly this sunk quality. As described, the model solves a one-time problem, but the underlying mechanism cannot be used to explain a recurrent situation.

Conditional on the bond being sunk, it should take the form that has the highest possible value to the citizenry. Mounds, pyramids, temples, and other public goods that celebrate a culture's history and value system through ritual seem like reasonable

[9] Consider the alarming financial condition of many municipal pension plans.

candidates. This functional model gives substance to the formalistic explanation anthropologists have offered, reflected in the following passage:

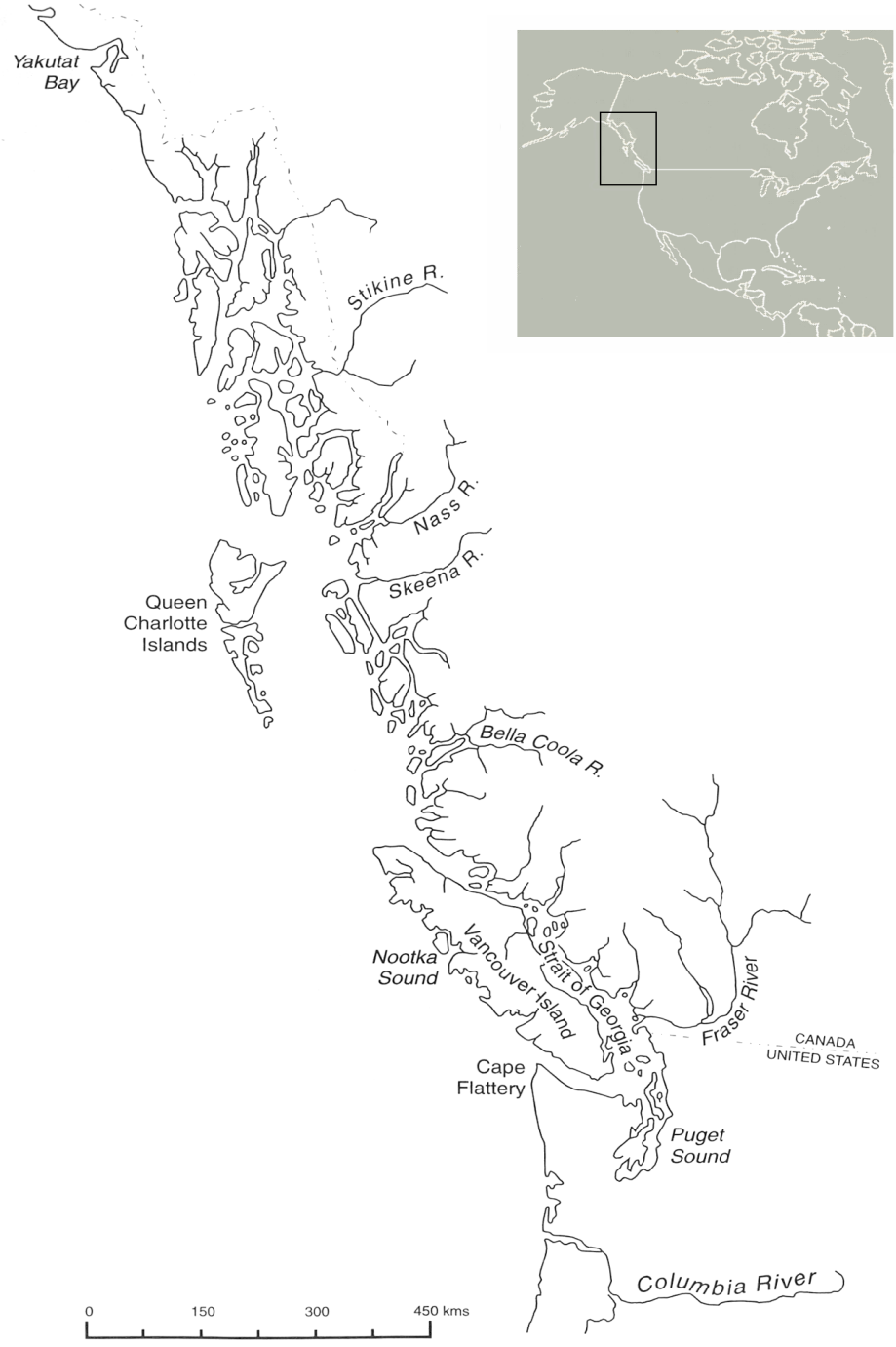
> Monks Mound and the Grand Plaza were integral to community definition and creation. Their construction gave structure to the community, simultaneously emphasizing the chiefs power and the scale and permanence of the community and providing a centralized location for ritual activities (Dalan et al. 2003, at . . . . Monks Mound and the Grand Plaza were built to inspire, inform, and dominate. By means of sheer scale and the appropriation of life/death symbolism, Monks Mound established the legitimacy and strength of Cahokia's ruling elite (Dalan et al. 2003, at 187).

C. The Northwest Coast Tribes

As already noted, reciprocity was practiced widely throughout the Americas prior to 1491. Nowhere does the record suggest that it was more highly institutionalized than among the NWC Tribes, who inhabited the many islands, fjords, inland waters, and riverways of the rugged North Pacific Coast, from Yakutat Bay at the northern end of the Alaska panhandle to the Columbia River on the Washington-Oregon border. Although they had no central government, up and down the coast the chiefs of various tribes held recognized exclusive tribal property rights (ETRs) to identified territories and their natural resources. Most notable of their resources were the then-prolific stocks of Pacific salmon that used the rivers, streams, and lakes for spawning and as nurseries for the young. The tribes harvested them during the late summer and early fall months as the salmon migrated upstream to spawn. When the fishing the harvest was finished and the dreary NWC winters set in, the people had time for visiting, feasting, dancing, and potlatching.

One characteristic of fish stocks, including Pacific salmon is that, as harvesting effort increases from zero, the sustainable biological stock of fish initially increases, then levels off, then decreases. The ideal harvesting decision for a wealth-maximizing owner involves optimizing over harvesting effort and the sustainable catch. Tribal chiefs were

widely known to possess a *corpus* of secret knowledge about how best to manage their resources to create wealth.



The Northwest Coast

During the prehistoric and early contact period the tribes were very warlike and possessive of their territories. Wars were sometimes waged to annihilate an entire group to gain possession of its salmon streams and other resources, to seek revenge for prior wrongs, or simply to pillage, plunder, and take slaves (Drucker 1965). As time marched on, the tribes began to replace warfare with potlatching.

Potlatching has been described as "the ostentatious and dramatic distribution of property by the holder of a fixed, ranked, and named social position to other position holders" with the expectation of return gifts at a later time (Codere 1959, 63). Any failure by a ranking titleholder to reciprocate or any shortfall in the amount of the return gift raised the potlatch rank and social prestige of the more generous party and lowered that of his rivals. The level of formality and the extent to which different tribes kept track of the balance of potlatch gift distributions probably varied across the culture area, but relative success in potlatching was the primary basis for social prestige throughout. Among the Southern Kwakiutl tribes there were 658 named and number potlatch ranks based on the participants' historical success, which was memorialized in oral histories recounted at every potlatch.

Potlatching appears to have been multilateral rather than bilateral. A representative potlatch consisted of a weeks-long winter ceremony arranged by a tribal chief and his tribe hosting another tribe or tribes. Both hosts and guests danced for days or weeks, and the chief hosted lavish feasts during which the guests bore witness as he asserted various privileges, likely for the purpose of justifying his claims to resources such as productive salmon streams. At the conclusion of the ceremonies the chief distributed gifts to his guests, with the value of the gifts increasing according to the recipient's social prestige. Having accepted these gifts without objection, guests were estopped under potlatch law from disputing the chief's claims at a later time.

My hypothesis is that potlatching was a substitute for violence in enforcing ETRs. Even under stable environmental conditions there would always have been a tendency for one tribe to encroach on others' territories—the standard tragedy of the commons outcome. But local environmental shocks would have dramatically increased the tendency for unfortunate tribes to encroach on their more fortunate neighbors. If Tribe A is in the good

state of nature with a strong salmon run when Tribe B's run is poor, Tribe B's labor productivity peacefully fishing its home territory may become dangerously low, while Tribe A will face ample productive uses for its scarce labor. The resulting differential in relative productivities gives Tribe B a comparative advantage in violence, even though in an absolute sense it may be the weaker tribe (Johnsen 1986, Anderson and McChesney 1994). For tribe B, the forgone opportunities from the credible threat of violence are lower than for Tribe A. If Tribe B is economically rational, its tendency will be to violently encroach on Tribe A's territory.

Owing to the positive wealth effect of long-term capital investment, Tribe A should be willing and able to compensate Tribe B to leave in peace. What is more, unless resource productivity is perfectly correlated across space the situation is reciprocal; Tribe A knows it is likely to find itself in the poor state at some point and in need of sharing in Tribe B's bounty. Costly violence is avoided, and all tribes are better off compared to open access.

Evidence that tribal chiefs owned designated resource sites in the sense of being able to exclude others is beyond question. But exclusive tribal property rights were no doubt costly to define and enforce. One especially troublesome cost associated with ETRs must have been stream-specific risk owing to local environmental shocks. Even within fairly close geographic proximity, rivers along the NWC can be affected differently by snowpack, flooding, drought, and variations in salinity or temperature, which can markedly affect salmon abundance for years to come. Tribe A's decision to attach itself to a specific place meant it would have to suffer any resource failure in that locality owing to both stochastic variation and the success or failure of its own husbandry efforts. In this sense, exclusive property rights create risk for the resource owner that would otherwise be washed out under open access. They hold owners accountable for bad outcomes and reward them for good outcomes, whether or not of their own making.

According to the standard risk-return trade-off in economics, there must have been some offsetting benefit to the tribes in the form of higher expected returns for them to willingly bear this cost. The opportunity to make capital investments to increase the long-run productivity of salmon stocks free from intrusion by rival tribes is the likely benefit.

An important question is whether the tribes actually had access to wealth enhancing investment projects other than minor tweaks in the intensity of their fishing effort. It is

implausible, as some cultural anthropologists have claimed, that the tribes lacked understanding of the anadromous character of Pacific salmon. In Drucker's words "it is doubtful whether the Indians understood the life cycle of these fish, . . . or connected the spawning with the tiny new-hatched par, or these with the adult salmon" (Drucker 1955, 154). Yet as early as 1868, Sproat reported that "[i]t is common practice among the few tribes whose hunters go far inland, at certain seasons, to transport the ova of the salmon in boxes filled with damp mosses, from the rivers to the lakes, or to other streams" (Sproat 1868, 220).

Incurring the cost to transplant fertilized ova would have made little economic sense unless the tribes knew salmon return to their natal streams to spawn. Otherwise, the costs would have fallen on those doing the transplanting, while other tribes would have enjoyed most of the benefits when the offspring returned indiscriminately across streams. What is more, the investment probably consisted of more than simply gathering fertilized ova and transporting them to a barren stream or lake. Any stream that was barren of salmon would probably have been so because of physical obstacles to their migration. Such cases would have required some kind of re-engineering of the stream bed before transplanting could succeed, which of course would have involved a substantial capital investment.

Although the tribes' salmon harvesting technology included dip nets, spears or harpoons, drift nets, etc., the fish weir was the most sophisticated. Construction of a weir involved a substantial capital investment. In many cases fence weirs were built to span an entire stream. The only way for salmon to pass was to enter a holding trap, giving attendants complete discretion over how many and which salmon were allowed to continue on to the spawning beds.

Other scholars of NWC tribes have begun uncovering evidence that they were far more sophisticated than once thought. One recent study reports that the advent of satellite imaging has identified an extensive system of rock retaining walls along the low-tide mark of the many inland waterways throughout the coast (Williams 2006). The author concludes that the tribes purposely engineered what she calls clam gardens by building these walls to allow the adjacent beach to backfill with biogenic sand, gravel, and shell debris ideal for promoting clam growth. In her view, as in mine, they built their prosperity through ongoing capital investment.

The social benefit of the potlatch among the tribes was the ongoing surplus it generated resulting from reciprocity's role in creating trust. The surplus included both the expected increase in resource productivity and the benefits of portfolio diversification each tribe enjoyed. The discounted present value of this surplus stream across all tribes was their common wealth.

The conditional reciprocal obligations potlatching created can be seen at the very least as simple loans, a form of debt financing. When one tribe found itself in the bad state, for example, it had a choice. Should it engage in depensatory fishing by harvesting heavily to sustain itself in the short run and suffer the consequences down the road from allowing few too salmon to spawn, or should it engage in compensatory fishing by harvesting lightly now and allowing sufficient spawning to restore the run? Although wealth enhancing, the latter choice could result in substantial near-term deprivation for the tribe absent the ability to borrow through the potlatch system.

That potlatch obligations sometimes went unreciprocated is no more troubling than that some current-day borrowers occasionally default on their loans. Today, lenders generally minimize the resulting losses by pre-screening a borrower's credit history, by insisting on contract terms that limit moral hazard, and by holding a diversified portfolio. Potlatch ranking bears an uncanny resemblance to today's credit histories and as a prestige barometer probably limited moral hazard. And, of course, it allowed the tribes to diversify stream-specific risk.

Ethnographic reports leave little doubt about the tribes' commercial sophistication or potlatching's role as their credit market. Most fundamentally, this is demonstrated by the tribes' immediate and widespread adoption of the Hudson's Bay blanket as the medium of exchange. As Boas describes it . . .

> [T]he unit of value is the single blanket, now-a-days a cheap white woolen blanket, which is valued at 50 cents. The double blanket is valued at three single blankets. These blankets form the means of exchange of the Indians, and everything is paid for in blankets or in objects the value of which is measured by blankets. When a native has to pay debts and has not a sufficient number of blankets, he borrows them from his friends and has to pay the following rates of interest:

> For a period of a few months, for 5 borrowed blankets 6 must be returned . . . for a period of six months, for 5 borrowed blankets 7 must be returned . . . for a period of twelve months or longer, for 5 borrowed blankets 10 must be returned . . .
>
> When a person has a poor credit, he may pawn his name for a year. Then the name must not be used during that period, and for 30 blankets which he has borrowed he must pay 100 in order to redeem his name . . . .
>
> The rate of interest . . . varies somewhat around 25 per cent, according to the kindness of the loaner and the credit of the borrower. For a very short time blankets may be loaned without interest. (Boas 1966, 78)

Among other things, this passage reflects the normal upward sloping yield curve (that is, longer term loans required higher periodic rates of interest), the notion of compound interest, and the charging of an interest rate premium to reflect higher default risk. It also suggests that borrowers were sometimes required to post collateral, in this case in the form of their name. Because the name often gave the bearer certain valuable rights, including in some cases title to specific resource sites, pawning it was a serious matter. No doubt the interest rates reported above were somewhat circumstantial, because elsewhere Boaz and others refer to rates of interest as high as 100 percent (Boas 1966, 78).

The act of pledging an asset as security for a debt, with the borrower retaining possession of the asset and the lender having a right to seize it, is known in modern law as hypothecation. It is unclear in the earlier passage whether the pawning of a name amounted to hypothecation, but in any event the tribes achieved hypothecation with cold forged, artistically engraved copper plates known as "coppers." According to Boas:

> Still more complicated is the purchase or the gift, however one chooses to term it, of a "copper." All along the North Pacific Coast, from Yakutat to Comox, curiously shaped copper plates are in use, which in olden times were made of native copper, which is found in Alaska and probably also on Nass River, but which nowadays are worked out of imported copper. The front of the copper is covered with black lead, in which a face, representing the crest animal of the owner, is

> graven . . . . [C]oppers have the same function which bank notes of high denominations have with us. The actual value of the piece of copper is small, but it is made to represent a large number of blankets and can always be sold for blankets. The value is not arbitrarily set, but depends upon the amount of property given away in the festival at which the copper is sold. On the whole, the oftener a copper is sold the higher its value, as every new buyer tries to invest more blankets in it. Therefore the purchase of a copper brings distinction, because it proves that the buyer is able to bring together a vast amount of property.
>
> The purchase of a high-priced copper is an elaborate ceremony. . . . The trade is discussed and arranged long beforehand . . . . The buyer offers first the lowest prices at which the copper was sold. The owner declares that he is satisfied, but his friends demand by degrees higher and higher prices, according to all the previous sales of the copper . . . . Finally, the amount offered is deemed satisfactory. Then the owner asks for boxes to carry away the blankets. These are counted five pairs a box, and are also paid in blankets or other objects.
>
> . . . This whole purchase is called "putting the copper under the name of the buyer." (Boas 1966, 84-85)

This passage reveals a credit market involving hypothecation, with the seller of the copper being the borrower and the buyer being the lender. The successively higher prices paid for coppers may have reflected repayment of principal plus accumulated interest. The copper served not only as collateral for the loan, but it reflected tangible evidence of indebtedness that could be sold off in the secondary market, an important feature in a world where low resource productivity could randomly strike any tribe in the system.

The market for coppers was multilateral in the sense that third parties were free to buy one for a negotiated price. In a system subject to multilateral resource variability, exclusive reliance on bilateral transactions would have been cumbersome. There was no guarantee the original seller would be in the good state when the original buyer later found itself in the bad state. It appears the copper owner could exercise a kind of put option against any other chief, including the original issuer (Boas 1897, 345-46), whose trusted family crest was inscribed on the copper for identification (Boas 1966, 82).

In essence, a copper appears to have been a kind of communal demand note. At any time, with due notice, the current owner could demand that the target chief buy the copper for a price higher than any price it had previously commanded. If the target of the offer declined, he lost social prestige. Remarkably, the prices at which the copper sold in the secondary market would have reflected participants' expectations regarding the originator's investment success; a reliable market signal generated in arm's-length transactions. The prices paid for the copper may also have served as a signal of the buyers' confidence in the profitability of the seller's intended capital investments, thus serving an informational function.

Though this is the only evidence I have come across, it suggests that the originator was the ultimate guarantor of the loan. If the originator declined, he lost status and the seller gained status. Alternatively, if the originator had used the loan proceeds to undertake profitable investment projects he would be able to buy the copper back with interest and extinguish the debt.

There is little doubt the tribes' used the potlatch system, including the creation and transfer of coppers, as a credit market to finance capital investments including improvements in salmon streams and stocks. But this leaves a puzzle. If every blanket loaned created a debt of equal present value, why did the tribes so steadfastly refuse to give up potlatching when Canadian authorities moved in earnest to suppress it (Cole & Chaikin 1990)? Extinguishing potlatch debts would have been a zero-sum game. The winners more or less would have offset the losers. The tribes' stubborn and nearly unanimous resistance to the ban suggests that something worse than a zero sum game was in the making.

My hypothesis is that the potlatch system was more than a simple credit market, it was an informal system of fractional reserve banking. If so, it would have allowed the tribes to expand their money supply well beyond the number of blankets in circulation or storage. The resulting availability of added credit would have helped finance profitable investment projects that would otherwise have gone unfunded. The prospect of a potlatch ban therefore would have been devastating, in the same way that dramatically raising bank reserve requirements would today. We might expect similar devastating effects on the Inka

economy from having destroyed most of the *khipu* if, indeed, they served a fractional reserve function.

The essence of fractional reserve is re-hypothecation, in which the collateral is re-used by the borrower/depository to back additional loan. As a result of re-hypothecation the number of blankets promised for repayment would have vastly exceeded the number of blankets in the community. The wholesale cancelation of potlatch debts would have contracted the money supply, drying up credit, restricting capital investment, and dramatically reducing the common wealth.

Was potlatching an informal system of fractional reserve banking? In the absence of more evidence, one way to test the hypothesis is to determine whether the necessary pre-conditions for fractional reserve were present. Four conditions suggest it was. The first is the existence of a good, such as gold or grain, whose quality most market participants can identify at fairly low cost (Alchian 1977). There is little doubt the Hudson's Bay blanket met this condition for the NWC tribes.

Second, there would have to be some mechanism to memorialize indebtedness. For ordinary potlatch transfers the tribes' oral histories accomplished this, but coppers were tangible evidence of indebtedness, and they circulated among the tribes just as we would expect of commercial paper today.

Third, there would have to be some provision for storing blankets. Most fractional reserve banking systems have relied on specialized, centralized storage, but this would not have been necessary. Among the tribes, storage was widely distributed across the populace. The record is clear that every house and every family held uniform cedar boxes of blankets, "five pairs a box." These boxes could be found in the tribes' family long-houses stacked in an orderly way to partition rooms for household members. This explains why it took time for a chief to assemble the blankets necessary to host a successful potlatch, as it would have required him to call in loans from numerous borrowers.

The fourth and final condition necessary for fractional reserve banking is trust. In the case of London's goldsmith-bankers and Chicago grain merchants, trust accumulated over the long course of dealing. Trust is much more likely to arise in the context of repeat transactions between known parties. The potlatch system appears designed to have created

and maintained trust, both as a credible promise against encroachment on others' resource sites and as a bond of creditworthiness.

One final factor that would point to potlatching as system of fractional reserve is direct evidence of an expansion of the money supply. Statements by Boas clearly demonstrate an expanded money supply, as well as the devastation the potlatch ban would likely bring. In his words:

> The economic system of the Indians of British Columbia is largely based on credit, just as much as that of civilised [sic] communities . . . . The Indian has no system of writing, and therefore, in order to give security to the transaction, it is performed publicly. The contracting of debts, on the one hand, and the paying of debts, on the other, is the potlatch. . . . This economic system has developed to such an extent that the capital possessed by all the individuals of the tribe combined exceeds many times the actual amount of cash that exists. That is to say, the conditions are quite analogous to those prevailing in our community: if we want to call in all our outstanding debts, it is found that there is not, by any means, money enough in existence to pay them, and the result of an attempt of all the creditors to call in their loans results in a disastrous panic from which it takes the community a long time to recover.
>
> . . . The sudden abolition of this system—which in all its intricacies is very difficult to understand . . . destroys therefore all the accumulated capital of the Indians. It undoes the carefully planned life-work of the present generation, exposes them to need in their old age, and leaves the orphans unprovided for. What wonder that it should be resisted with vigour [sic] by the best class of Indians, and that only the lazy should support it, because it relieves them of the duty of paying their debts (Boas 1898, 681-82).

II. The Financial Role of Reciprocity

Part I showed that many American Indian economies supported substantial capital investment, whether in the form of palaces and pyramids, monumental mounds, wars,

stockades and longhouses, irrigation networks and pueblos, or husbandry of prolific salmon stocks. The Aztec and Inka empires were so advanced and existed on such a large scale that I believe they must have had some kind of banking, even if they lacked formal banks. What form financing took has yet to be discerned. One possible form common to all these American Indian groups was formalized reciprocity along the lines of the potlatch.

Experimental economists have emphasized the power of reciprocity in building trust, enforcing property rights, and otherwise coordinating human relations (Ortmann, Fitzgerald, and Boeing 1999, Berg, Dikhaut, and McCabe 1995). They remain puzzled about exactly why reciprocity is so powerful, however, based on the predictions of their theoretical models. The benefits of direct reciprocity—B and C reciprocate and develop trust—to two parties fail to resolve the puzzle. Even by including the possible benefits of indirect reciprocity—A observes B and C reciprocating and so his trust in both increases—the puzzle remains.

Johnsen (2016) proposes the novel hypothesis that formalized reciprocity can develop into fractional reserve banking that expands the available supply of capital. Assuming return obligations from reciprocity can be adequately memorialized and therefore enforced, if these obligations could be hypothecated and the return payment obligations replicated and transferred to multiple parties—A gives to B, and B then owes A, but A transfers his right to collect from B to C, D, and E—we have the fundamental conditions for fractional reserve. As with fractional reserve banking, all that is necessary is that the probability any borrower calls in his claim at a particular time is sufficiently low that the lender's resources are never exhausted. The amount of financial capital in the system goes up, the cost of borrowing goes down, and more capital investment projects get done.

Traditional descriptions of fractional reserve banking focus on the simple case of a goldsmith storing gold in his bank vault for multiple clients. He memorializes their claims to demand repayment as notes that can be transferred to other account holders in exchange for the real assets that constitute an investment project. Ordinarily, the new note holders do not demand their gold but in turn transfer their notes to other account holders for real assets. Seeing a bunch of gold sitting idle in this safe, the goldsmith lends some of it to others by issuing negotiable notes allowing the bearer to demand payment from the bank.

But these note holders seldom cash in for gold, and so it goes, with the constructive amount of gold in the system available for real investment projects expanding. As long as the participants have access to profitable investment projects the system is sustainable. Rather than the banks clients paying for safe storage, the banker pays them periodic interest for the use of their gold.

In this description a central banker sits at the center of a hub-and-spoke arrangement involving multiple bilateral relationships rather than being one of many participants in a multilateral system such as potlatching. Given the dissimilarities in the two systems, one might be skeptical that a multilateral system can support fractional reserve. The answer is simple. In the real banking system there is more than one bank. If the clients of Bank M want to transact with the clients of Banks N, O, and P, then these banks must establish what is called "correspondent" relationships that can work in any direction. These correspondent relationships are simply another term for trust, and the system itself is multilateral, just as with potlatching. I do not know for a fact, but I consider it likely that certain chiefs in the potlatch system took on the specialized role of bankers to lesser chiefs within the narrower sub-tribe.

III. Directions for Research

The potlatch-as-fractional-reserve hypothesis strikes me as an entirely plausible explanation for how Pre-Columbian American Indians financed their investment projects. But plausible is a far cry from more likely than not and light years from certainty. Testing the hypothesis will require an extensive examination of the historical, ethnographic, and archaeological record, keeping in mind that people who have a real investment project in mind normally want to keep it secret lest onlookers infer their magic and attempt to duplicate it. Artifacts might not be as they seem.

Indeed, one troublesome problem is that the lender, having been apprised of the borrower's intended investment as a condition of the loan, undertakes the project himself. Indeed, Barzel (1992) shows that this problem was solved during the Middle Ages by the separation of bankers from real investment projects. We all know that Christians were not allowed to lend money at interest, but he shows that neither were Jews allowed to undertake

real investment projects. Instead, Jews specialized in banking and could be therefore be trusted not to appropriate their clients' real investment projects. Did a similar separation exist among the NWC tribes? Or did they lend blind, not knowing the borrower's intended project. Such a system might work as long as the lender had the option of waging ware "to annihilate an entire group to gain possession of its salmon streams and other resources, to seek revenge for prior wrongs, or simply to pillage, plunder, and take slaves."

My hope is that this paper will come to archaeologists' attention and lead them to keep post-Coasean economic theory firmly in mind as they go about their work. Spirited collaboration across disciplines has the potential to unlock important secrets, but only at the cost of shattering established orthodoxy. The recent trend by some archaeologists to study ancient markets, and by necessity to take economic theory more seriously, is encouraging.

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