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"Every Tradesman Must Also Be a Merchant": Behavioral Ecology and Household-Level Production for Barter and Trade in Premodern Economies

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Abstract While archaeologists now have demonstrated that barter and trade of material commodities began in prehistory, theoretical efforts to explain these findings are just beginning. We adapt the central place foraging model from behavioral ecology and the missing-market model from development economics to investigate conditions favoring the origins of household-level production for barter and trade in premodern economies. Interhousehold exchange is constrained by production, travel and transportation, and transaction costs; however, we predict that barter and trade become more likely as the number and effect of the following factors grow in importance: (1) local environmental heterogeneity differentiates households by production advantages; (2) preexisting social mechanisms minimize transaction costs; (3) commodities have low demand elasticity; (4) family size, gender role differentiation, or seasonal restrictions on household production lessen opportunity costs to participate in exchange; (5) travel and transportation costs are low; and (6) exchange opportunities entail commodities that also can function as money. Population density is not a direct cause of exchange but is implicated inasmuch as most of the factors we identify as causal at the household level become more salient as population density increases. We review archaeological, ethnohistoric, and ethnographic evidence for premodern marketing, observing that the model assumptions, variables, and predictions generally receive preliminary support. Overall, we argue that case study and

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comparative investigation of the origins of marketing will benefit from explicit modeling within the framework of evolutionary anthropology.

Keywords Exchange · Barter · Trade · Central place foraging · Missing-markets · Economic anthropology · Human behavioral ecology

"There is also a great deficiency of a circulating medium. I have seen a man bringing on his back a bag of charcoal with which to buy some trifle and another a plank to exchange for a bottle of wine. Hence every tradesman must also be a merchant and again sell the goods which he takes in exchange" – The Voyage of the Beagle (Darwin 1989 [1839], p. 219).

Introduction

Recorded on November 10, 1834, Darwin's observation of barter was provoked by the Beagle's visit to the Chiloe and Chonos Islands off the south central coast of Chile. In a dour mood, Darwin described the climate as "detestable," the forests "impenetrable," and the inhabitants as "humble and industrious" but encumbered with technological arts in the "rudest state." Among the most important of the deficiencies he noted of the place and its isolation was a severe shortage of money and what he observed to be a poorly functioning economy, one reduced, as he saw it, to barter.

In the analyses that follow, we extend predictions derived from human behavioral ecology and development economics to analyze how socioenvironmental conditions shape incentives for household participation in barter and trade. We attempt to bring greater theoretical attention to a growing recognition that exchange was ubiquitous in the ancient world (e.g., Garraty and Stark 2010; Hirth and Pillsbury 2013b; Hughes 2011a) and to outline the conditions under which we would expect to find evidence for its origins. We approach this topic by analyzing factors that may incentivize or disfavor participation in exchange, factors like distance to market, costs to engage in barter and trade transactions, and the presence of commodities that can function as money. Our approach is bottom-up in that we model the circumstances that make production for barter and trade at a marketplace more or less profitable, thus more or less likely, for households (Hirth 1998, 2010). Our objectives are to predict conditions that favor the origins of premodern exchange and, for households not participating in existing markets, the changing conditions under which they should become participants.

Was barter always as inferior as Darwin's observation implies? What conditions shape the potential for extralocal exchange among a broad population of individuals who may be strangers to one another? Despite his grim view of the 19th century colonial economy of Chiloe and Chonos, what can we learn about the premodern adoption and persistence of barter and trade if we set out with contemporary analytical tools inspired by Darwin?

Problem and Objectives

Markets have been held responsible for the 18th century "great transformation" in Western Europe to a comprehensive price-setting economy (Polanyi 1944), in which not only goods but land, labor, and capital are fully commoditized. Whenever it emerges, market participation influences livelihood strategies, social differentiation, political economy, opportunities for economic development, and overall welfare. Precapitalist markets may have fostered craft specialization and urbanization, providing opportunities for elites to consolidate economic power and prestige, important elements of developing sociopolitical complexity (Hirth 2010, pp. 227–228). Blanton and Fargher (2016) identify markets as one of the most challenging venues in which humans solved large-scale cooperation problems, facilitating state emergence and expansion. Often viewed as elements in the development of greater economic efficiency, markets also have been linked to the degradation of both human well-being and the natural environment (Godoy et al. 2005; Henrich et al. 2010; Ziker and Schnegg 2005).

Although price-setting markets in modern economies have been well studied, the *origins* of human exchange behavior in premodern conditions have not (Blanton and Fargher 2016). For reasons of intellectual history (Blanton and Fargher 2016, pp. 74–78; Feinman and Garraty 2010; Garraty 2010), anthropologists and archaeologists have been slow to develop theoretical models for predicting how people begin to separate consumption from production to participate in mutually beneficial exchanges beyond the local group. Consequently, we lack approaches that examine how factors such as transaction costs, access to money, and the embeddedness of exchange relations in sociocultural norms affect market participation (Hann and Hart 2009; Orlove 1986). As a result, the origins of market exchange are obscure, explanations of missing-markets are incomplete, and the persistence of barter alongside trade even in money-based economies constitutes a puzzle.

Market-type forces have been recognized as affecting the behavior of nonhumans, such as the effect of supply and demand on mate selection (Noë and Hammerstein 1995; Patricelli et al. 2011). But marketing in commodities, often conducted in market places—physical settings in which individuals gather to participate in multiple types of material exchanges—appears to be a hallmark of our species (Feinman and Garraty 2010; Garraty 2010). Marketing sensitive to supply, demand, and value is evident well back into prehistory (Blanton 2013; Blanton and Fargher 2010; Feinman and Garraty 2010; Garraty 2010; Hejeebu and McCloskey 2000, 2004; Offer 1997). In late prehistory, marketplaces are widespread. In their survey of 30 premodern states, Blanton and Fargher (2010, p. 221) find that 26 feature significant commercialization; in the remaining four it is minimal although "not entirely absent."

Our objective is to adapt the basic analytical strategies of human behavioral ecology and behavioral economics to provide simple graphical models for exploring the circumstances that would promote or suppress household participation in exchange. Following attention to definitions, we describe a predictive model

for barter and for trade and then review archaeological, ethnohistoric, and ethnographic reports for evidence that confirms the importance of the variables the models incorporate. A short theory section follows in which we consider the manner in which behavioral ecology contributes to existing archaeological theory on market origins. A final section delineates known limitations to the approach being advocated.

Basic Terms and Concepts

We begin with basic definitions (see also Feinman and Garraty 2010; Hirth and Pillsbury 2013a). We define a *market* broadly as a socioeconomic context, either a place or a system, that facilitates the voluntary exchange by individuals of alienable commodities. For reasons arising within the fraught intellectual history of economic anthropology (Feinman and Garraty 2010), we insist that markets are social as well as economic phenomena. The commodities might be material items, land, labor, capital, or intellectual property, although our focus here is primarily on material commodities because these are most readily evident in archaeological data and perhaps also the earliest foci of marketing behavior. *Market exchange* is a transaction in commodities, with two linked features: it is sensitive to conditions of supply and demand, which gives rise to exchange equivalencies that represent relative value or, in the case of a money-dominated system, relative price. In using this definition, we follow others (Feinman and Garraty 2010; Hirth and Pillsbury 2013a; Stark and Ossa 2010) who cite Pryor (1977, p. 31) for the original, but we do so without Pryor's qualification that the impact of supply and demand be "highly visible." In seeking evolutionary origins, we must be open to nascent beginnings and gradual development, to dynamics just barely present or visible. Feinman and Garraty (2010, p. 171) note that this condition of visibility implies that relationships governing shifts in quality, relative price, supply, and demand of goods are perceptible to those participating in the market.

Market exchange does not require money or a marketplace. Consistent with our focus on origins, we are discussing marketing as an economic activity—not to be confused with the fully commoditized and pervasive market economy that emerged in Europe in the 18th century. Equivalencies may be more-or-less conventional, perhaps regulated by political authorities, or they may be contingent on negotiation between buyer and seller. More likely, they represent some combination of these possibilities. A *marketplace* is a physical location in which individuals conduct exchange transactions; the commodities themselves may, but need not, be present.

Barter is commodity-for-commodity market exchange without the intermediary use of money; *trade* is market exchange entailing the use of money. Despite the opinion of Graeber (2014), the ethnographic literature that we draw on throughout abounds with accounts of commodity exchange without money or the necessity of debt relationships (cf. Chapman 1980). *Exchange* we treat as a gloss for either barter or trade. *Money* is a medium of exchange that functions for payment, as a measure or store of value, and unit of account; it may be represented physically, e.g., shell beads, or abstractly in the form of balances (Melitz 1974). *Transaction costs* are any

of the variety of nonproduction costs imposed on a buyer or seller to successfully complete an exchange. Transaction costs may be as diverse as fees to enter a marketplace, the risk of being cheated, or time spent searching for an exchange partner. Because of their importance to the early development of market exchange in material commodities (Stanish and Coben 2013, p. 425), we separate the travel costs to and from a marketplace from other transaction costs in our barter model.

Our modeling approach begins with the assumption that households are fully self-sufficient; they consume only their own production and all of their production is for home consumption. Households in fact are never this isolated (Mayer 2013), but the fiction is analytically useful as a starting point. In development economics terminology, this makes the household economy *nonseparable*; its production and consumption decisions are structurally entailed in one another (de Janvry and Sadoulet 2006); autarkic is an equivalent term (Mattison and Sear 2016). Focused on modern economies, development economists typically begin from the assumption that households are nonseparable due to market failures, the missing-markets we define just below. As evolutionary anthropologists, we begin from the assumption that nonseparable consumption and production is the prior or baseline condition, and the emergence and spread of market exchange among households is what requires explanation.

Finally, we note that a market or marketplace may exist within reach of a household, but it is said to be "missing" from the perspective of that household and a particular commodity if conditions make it advantageous for the household to produce and consume endogenously rather than participate. The term thus implies that some proportion ($> 0\%$) of the population of households is nonseparable or autarkic for at least some commodities; if the nonseparable proportion is 100% then the market is purely hypothetical. Conceptualized in this manner, we can use the missing-market model to examine the primary evolutionary origins of market trade from the perspective of households by specifying the conditions that facilitate the transition from a hypothetical to an actual market or marketplace. Further, we can examine the secondary adoption and thus spread of marketing behavior by households once a market is extant, as nonseparable households diminish in frequency.

Central Place Marketing

We begin with a simple model from central place foraging (CPF) theory to assess the benefits and costs to a household faced with the decision to engage in barter. CPF assumes that an individual seeks to maximize net rate of food acquisition at a home base, when she must forage in a distant patch and then return home. Because this trip takes time, there are opportunity-cost trade-offs contingent on value of the foraging patch and the distance that must be traveled to reach it (Kaplan and Hill 1992). A key difference of the present analysis from typical foraging models is that the value gained from the trip is tied to the goods that can be obtained in exchange: "The value of a thing is just as much as it will bring" (Sahlins 1972, p. 278).

CPF models successfully predict contemporary (Bird and Bliege Bird 1997), historical (Glover and Towner 2009), and archaeological (Beck et al. 2002; Bettinger

et al. 1997; Bird 1997; Cannon 2003; Zeanah 2002) foraging behavior, although exceptions occur. For instance, some central places in the Great Basin were located to optimize women's foraging efforts rather than men's big game hunting (Elston and Zeanah 2002; Elston et al. 2014). CPF has been adapted by archaeologists to account for field processing (Bettinger et al. 1997; Metcalfe and Barlow 1992), which can elevate the utility of the return load by leaving behind low-value portions of the resource being harvested.

Household production for exchange at a central place market entails a similar problem structure and trade-offs as CPF models. Our adaptation predicts how much production and what gains from an exchange are required to make the trip worthwhile, how opportunity costs affect production for a distant market rather than for home base consumption, and what transportation costs can be absorbed and the household still find exchange at a centrally placed market worthwhile. In the sections that follow, we use factors endogenous to households to predict when households should participate in exchange, either via barter or trade. These are the "producer-sellers" identified by Hirth (1998, p. 456) as "the primary suppliers and consumers of commodities exchanged in the marketplace." We follow with an empirical discussion of the socioecological factors observed by archaeologists and ethnographers to increase the likelihood of barter and trade in premodern economies. We hope to demonstrate that the framework we are proposing is suited to the systematic analysis of marketing origins by archaeologists.

A Central Place Model for Barter

We start with these simplifying assumptions: the household is the decision-making unit of importance to early market exchange (see Hirth 2010); households decide between producing for consumption, for exchange, or both, with a single, shared measure of value; travel and transport costs are a simple function of distance; production for exchange is a sufficiently modest portion of the household economy that we can estimate a constant opportunity cost independently of engagement in exchange; there is at least one commodity for each of two households that establishes between them a coincidence of needs; production of the commodity has a constant cost, i.e., there are no economies of scale at the household level; each participating household has complete information about the conditions affecting the exchange; costs and benefits can be assessed in a common currency such as time or kcals; consumption has steadily diminishing rate of return; and, initially, there are no nontravel transaction costs. We modify or relax some of these assumptions as we proceed. We presume that households decide to produce for their own use or for exchange with the objective of increasing value and more efficiently meeting their consumption needs (Hirth 2010).

We begin by imagining a household that can produce fish but not honey; in a nearby village, another household can produce honey but not fish. Each values to some degree the good that they cannot produce themselves but might obtain were they to meet and conclude an exchange. Considering earlier assumptions, we have two commodities, a coincidence of needs, diminishing marginal value, and an

occasion for a barter exchange, which we assume would be successful were a meeting to take place. *From the perspective of the fish-producing household, we ask: After satisfying its own need for fish, under what circumstances would this household decide to produce fish to gain honey by exchange?* We assume that the honey-producing household is making similar calculations and arriving at a positive assessment that exchange to gain fish would be valued for them as well. For exchange to occur, we require not just a coincidence of needs but also a potential coincidence of gains for each household.

Fish have diminishing marginal utility in *use value* (Fig. 1). The short-dashed, straight line placed tangent to the use value curve in Fig. 1 represents the opportunity cost to engaging in fish production, whether the fish are consumed at home or exchanged at a distance for honey. This line represents the rate-of-return margin at which fish production ceases in favor of other activities, be those related to leisure or to other work.

Fish also have diminishing marginal value in exchange, *assessed in terms of their ability to garner honey*. We formalize this as the exchange value curve in Fig. 1. This curve reflects the value of the honey gained by the production and marketing of fish. Since this gain in value is still derived from fish production, the same opportunity costs determine the margin for fish that are "consumed" as honey. However, since the honey-producing household is some distance away, fish produced for value in honey incur travel/transport costs to the location of the exchange. Travel and transportation costs are represented to the left of the vertical axis. The maximum distance our fish-producing householders will travel to the market depends on the

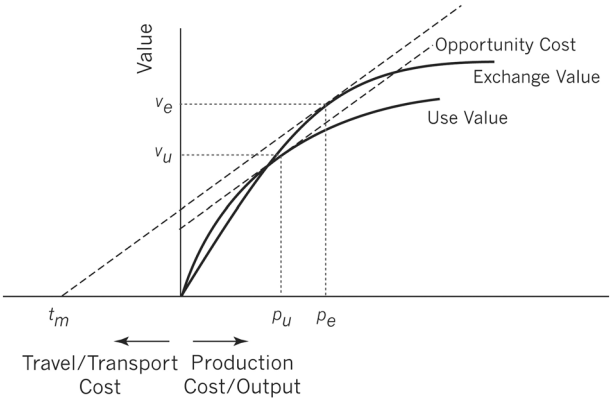
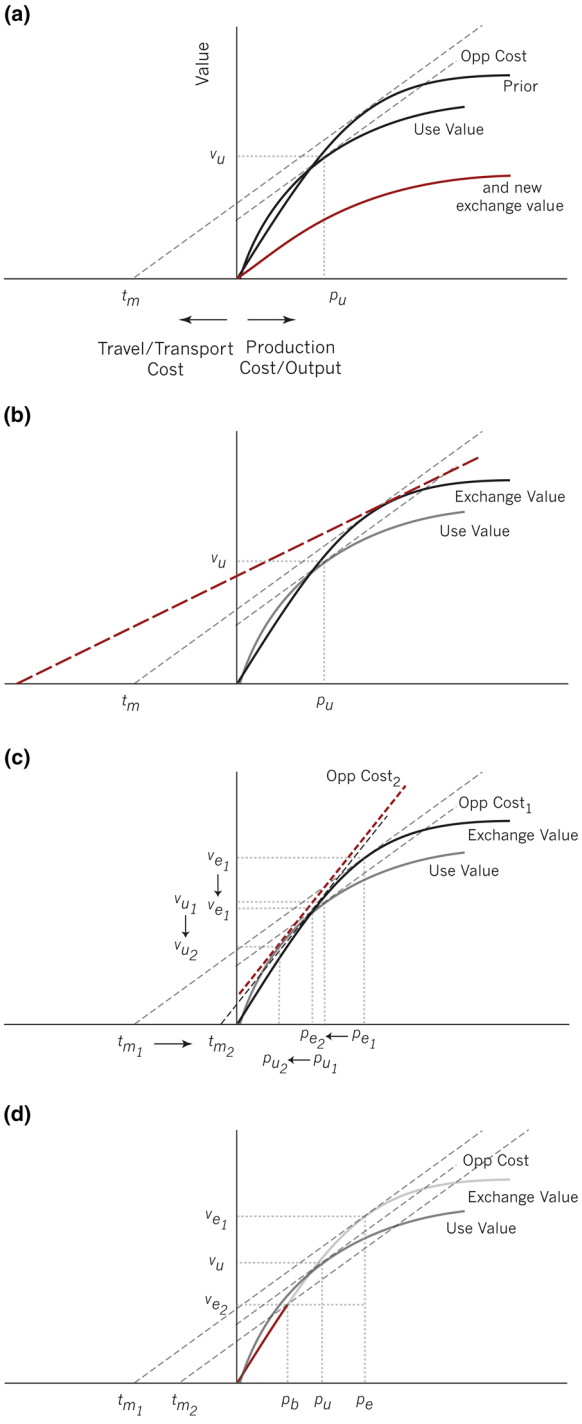


Fig. 1 Cost–benefit conditions for barter exchange. A single commodity has declining marginal value in use and, independently, in exchange (dark solid curves); production of this commodity has an opportunity cost (short-dashed line) set by the average value of other priority activities. Production for use is advantageous up to the level at which the slope of the tangent to the use curve matches that of the opportunity cost, resulting in production for use effort (p_u) and production for use value (v_u). A similar determination for production undertaken for exchange must be discounted by round-trip travel/transport costs. The black short-dashed line tangent to the exchange curve, of same slope as opportunity cost line, determines the maximum travel-transport cost, t_m, to market for which production for exchange will be advantageous. Including exchange, total production effort and output will be $p_u + p_e$ and total value obtained will be $v_u + v_e$


(a)
Value
Opp Cost
Prior
Use Value
and new
exchange value
v_u
t_m
p_u
Travel/Transport
Cost
Production
Cost/Output
(b)
Exchange Value
Use Value
v_u
t_m
p_u
(c)
Opp Cost$_2$
Opp Cost$_1$
Exchange Value
Use Value
v_{e_1}
v_{u_1} v_{e_1}
v_{u_2}
t_{m_1} t_{m_2}
p_{e_2} p_{e_1}
p_{u_2} p_{u_1}
(d)
Opp Cost
Exchange Value
Use Value
v_{e_1}
v_u
v_{e_2}
t_{m_1} t_{m_2}
p_b p_u p_e

◂**Fig. 2** Exploring model elements for barter exchange. Each of the four panels repeats Fig. 1, highlighting how the model is used to predict changes in production for use and exchange. The dark red line depicts the model element being treated as the predictor variable. (a) Exchange value declines from "prior" to "new exchange value" curve with increased transaction costs. If the value to be realized from exchange drops sufficiently that any line drawn tangent to the new curve has a slope less than the opportunity cost or causes the maximum travel distance to shrink below the distance to market, then exchange will be curtailed. Production for household use (p_u, v_u) is unaffected. (b) Distance to marketplace. If the distance (cost) of travel to market exceeds the maximum t_m, the rate of return on exchange is below the return on other opportunities. Production for exchange will not be pursued; household production for use is unaffected. (c) Opportunity costs rise. A steeper opportunity cost line ($OppCost_2$) "rolls" the tangent intersections counterclockwise down the two production curves, reducing both p_{u1} to p_{u2} and p_{e1} to p_{e2}. This also lessens the maximum travel costs consistent with participation in exchange from t_{m1} to t_{m2}. A decline in production opportunity costs has the opposite effects. (d) Exchange partner has limited product. A producer might arrive at market with p_e expecting to exchange for v_{e1}, but discover her potential partner has only v_{e2} worth of the desired commodity. The producer's effort will have a diminished but positive return (relative to opportunity costs) only if the travel costs are less than t_{m2}. If the producer's trip to market entailed costs greater than t_{m2} it presumably will not be repeated without assurances of finding an exchange partner with sufficient product. In the situation envisioned, the producer household gives up only p_b of its production effort in the transaction; $p_e - p_b$ would represent the maximum production effort loss if, for instance, the commodity is perishable

exchange value of commodities and the opportunity costs of doing something else with their time. The short-dashed line tangent to the exchange value curve (parallel to the opportunity cost line) establishes (at t_m) the maximum round-trip travel distance cost at which engaging in exchange remains worthwhile. If travel distances/costs are less than this maximum (between t_m and 0; for example), the rate of return from exchange is greater than the opportunity cost function and our fish-producing household gains from participating in exchange. If exchange entails travel costs greater than (to the left of) t_m, then high travel costs mean that the household's time is better spent in activities other than producing fish to exchange for honey.

The situation shown in Fig. 1 results in total production ($p_u + p_e$) and total value of ($v_u + v_e$). Exchange is undertaken because its rate of return is greater than the opportunity costs of spending the time in alternative activities. The model establishes that production for home use and/or for exchange will occur up to the point that the marginal value drops to those opportunity costs, setting the amount produced (p_u, p_e). Under the circumstances depicted, our production-optimizing household will produce fish for home consumption as well as for barter exchange at a round-trip travel cost up to t_m.

By modifying relationships represented in this graphic, we can generate hypotheses about the conditions under which home production for use, exchange, neither, or both (as in Fig. 1) would be the best option. We illustrate by focusing on the three elements critical to the model: the curves representing marginal value in use and exchange, the line representing opportunity cost, and the line representing travel cost.

Marginal Value in Use and Exchange

For instance, we could leave the travel and transport costs, and the value of fish for use, unchanged, while reducing the exchange value of honey to the

fish-producing household (Fig. 2a). Although production of fish for honey entails some value, neither any amount of exchange nor any shrinkage in the distance traveled offsets the opportunity costs. The household still produces (p_u) fish for home consumption, at value (v_u), but this situation produces a missing-market for barter. Conversely, imagine that elites require that all households pay tribute in honey, thus greatly elevating the value of the exchange curve for that commodity. In this case, our fish-producing household faces a politically inflated value in the commodity they are unable to produce themselves. Their best option is to produce fish to get honey so they can pay their taxes. This is exactly what happened with Aztec household production for exchange to acquire cotton with which to make tribute payments (Hirth 2016). Changes in the shape of the use and exchange value curves also could be used to demonstrate the effect on marketing decisions of economies of scale in production.

To account for transaction costs, separated from travel costs, we would subtract them from the value gained from exchange at market. A constant transaction cost, for instance a fixed fee for entering a marketplace, would simply drop the value of the exchange curve by the amount of value the fee represents. We also could represent transaction costs proportional to the amount of product a marketer buys or sells, which would change the shape of the curve. Key et al. (2000) explore in greater detail the different effects of fixed and proportional transaction costs to incentives that affect sellers' or buyers' market participation. High transaction costs reduce the likelihood that market participation is an optimal choice. Market institutions, from provision of weights and measures to mechanisms of dispute resolution, function to reduce transaction costs and thus barriers to exchange.

So far, our representation of a single, well-behaved curve for exchange implies that each of our two households correctly anticipates the rate of exchange and both take just the quantity of a good that optimizes the experience of its partner. The exchange balances perfectly and thus entails no inefficiencies such as a household returning home with part of its production. One possibility for marketing failure would be that the fish-producing household arrives with its perishable commodity and finds no barter partner, or a partner with too little honey to fully complete the exchange. The fishing household would loose all or some of the value associated with the effort invested in production and in travel (Fig. 2d). A coincidence of needs in the abstract may fail in practice. To avoid some of this loss, it appears that Aztec producers of spoilable commodities like fish, fruit, and meat would sell prepared food at market alongside unprepared counterparts "to prolong their use-life by cooking" (Hirth 2016, p. 68).

Finally, we began with the assumption that our fish-producing household desired honey but could not produce it, imposing on it a need it may not have developed and a production restriction it may not face. Nonseparable households may have developed few needs they are unable to meet endogenously. Similarly, we assume that if they are able to produce honey at a cost less than the maximum rate of return achieved through exchange depreciated by travel and transaction costs, they will do so endogenously.

Opportunity Costs

Greater opportunity costs to producing fish, represented by a steeper dashed line (Fig. 2c), lessen production of fish for use and exchange, as other activities assume higher priority, and they reduce the range of travel costs consistent with gainful barter of fish for honey. This effect might be seasonal, discouraging barter during periods of peak household labor demands, for instance, or more continuous if subsistence options have tight year-round production schedules. High opportunity costs might characterize households with restricted labor availability, higher dependency ratios, or access to less productive or more demanding agricultural land.

Opportunity costs may prevent exchange or they may determine the structural features of markets (where markets occur), such as their timing and which household member participates as the marketer. Opportunity costs also may promote exchange. Citing the Valley of Oaxaca (500–200 BC), Hirth (1998, p. 454) argues that household intensification to grow an irrigated second crop tightened seasonal production schedules, lessening "the amount of time available for normal household maintenance and self-sufficiency…" This change fostered a regional market system that provided some household goods for which it was no longer worthwhile for some households to produce endogenously. Conversely, Aztec households diversified household economic strategies to produce crafted items (for exchange) during downtimes in the agricultural cycle (Hirth 2016). Expansion into new and presumably quite rewarding production possibilities elevated intrahousehold opportunity costs of maintaining self-sufficiency.

Travel Costs

Travel costs can include time, energy, resources, and the dangers of journeying beyond familiar and perhaps safe countryside. All else equal, the greater the travel distance to the location of exchange, the lower the likelihood that barter will be gainful (Fig. 2b). Similarly, the higher the travel cost independent of distance—perhaps due to the weight or bulk of the load, the difficulty of the terrain and vegetation to be traversed, or dangers along the way—the lower the likelihood of marketing. The closer the market, the less value our household will need to gain from exchange to make the trip worthwhile. Likewise, when choosing between two markets of different distances, our efficiency-minded household will attend the closer, unless the farther market will produce an increase in value sufficient to make the longer trip worthwhile. A trip to a marketplace that fails to barter a *perishable* commodity is especially costly and requires that the marginal value of exchange be deflated accordingly. For items that are not perishable, we would account for an episode of barter failure by amortizing the travel costs of exchange failure over subsequent successes.

It is important to keep in mind that our model for barter exchange requires that all of the requisite conditions for the producers of fish also hold for the reciprocal circumstances of the producer of honey. Beyond a coincidence of needs, there

must be a *mutual coincidence of gainful advantage*, one surmounting the costs of travel, the transaction costs of doing business, and the opportunities for failure that might afflict either or both of the households. To further explore this requirement, we expand our examination of exchange to include multiple households in a value-setting market with money.

A Missing-Market Model for Trade

Figures 1 and 2 illustrate circumstances that facilitate or impede exchange by barter of a very basic form: two households, two complementary commodities, and no money. The barter model is useful in contemplating how exchange might arise from its absence among nonseparable or autarkic households. But, we have not yet addressed how market participation can become complex, widespread, and integral to household economies. We now illustrate an example in which there is an established market, composed of a subpopulation of households that determine its supply, demand, and value-setting features. To do this, we adapt the missing-markets model originating in development economics (Deere and de Janvry 1979; de Janvry et al. 1991; de Janvry and Sadoulet 2006). We ask: *What characteristics of the market and of a particular household either draw the household into this market or preclude its gainful participation?*

This case is less restrictive in that we assume money exists here, having moved from barter to trade. We also have eliminated or reduced some barriers to participation that afflicted our barter market, for instance, the coincidence of needs condition. If our fish producer finds no sellers of honey, she still can exchange (sell) her produce for money, to use in the purchase of another commodity or to carry home for a later exchange. We assume that this market has reduced transaction costs sufficiently that at least some part of the population of households participates. Finally, we fold travel and transportation into the general category of transaction costs.

We again consider a food commodity such as fish and examine a standard supply–demand representation of a value-setting market (Fig. 3). Rather than "price," we generalize by continuing to use the term value (a convention also adopted by Braswell 2010), represented by money. Each of our three households—H_1, H_2, and H_3—increases supply in response to the value to be gained by exchange, but we differentiate their supply functions to represent three levels of production cost, increasing from household 3 to household 1. Differences in production costs could reflect differential access to environmental inputs, the skill or quantity of endogenous labor, or differentiation by other production input factors. To start, we illustrate only one demand curve, assuming it to be shared by all households. The market determines a value (v^m) at which supply and demand balance, but participation in the market imposes transaction costs (s). Transaction costs reduce effective sale value to $v^s = v^m - s$, and they increase the effective purchase price to $v^p = v^m + s$. If the point of intersection between a household's supply and demand exists within the gray band between v^s and v^p, then the household will not participate in the market for that commodity.

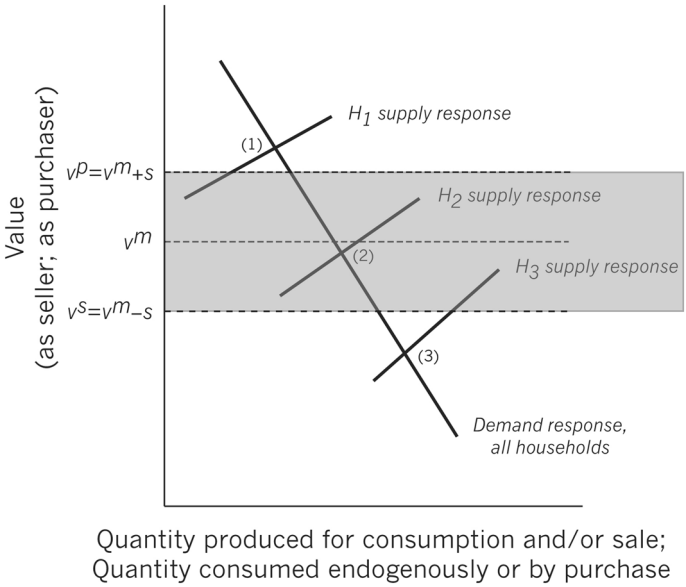


Fig. 3 Cost–benefit conditions for household participation in market-based trade. We assume a market with standard supply–demand dynamics for a particular commodity based in the value (costs, benefits; equivalent to price) as a function of quantity produced (supply) or consumed (demand). We represent the circumstances of three households (H_1, H_2, and H_3) differentiated by the endowments they bring to the general cost of supplying themselves or the market. H_3 produces at a lower cost level than H_2, which is lower than H_1. Each household nonetheless hypothetically is willing to increase its supply to the market based on value received (price), optimized at the intersection points 1, 2, and 3. For simplicity of illustration, we assume demand is the same across all households. We represent transaction costs by s and the market value (selling, purchasing price) in the absence of transaction costs by v^m. The *effective* selling value is the market price reduced by transaction costs, whereas the effective buying value is increased by transaction costs. The shaded area represents the zone of household shadow values for which either buying or selling is suboptimal, creating a missing–market

In this situation, H_3 and H_1 are market participants. H_3 can meet its own demand (point 3) at less than it would pay (v^p) in the market, and it can sell into the market at an advantage set by v^s. H_3 participates in the market to sell. H_1, by contrast, faces production costs at its demand level (point 1) well above the effective market value v^p and significantly above what it would get as a seller in the market, v^s. H_3 does not produce for itself but instead purchases from the market. H_2 has a supply–demand profile lying between the effective sales and purchase values (the gray band in Fig. 3). For H_2, the market is missing. The costs of production for H_2 are too high to sell at the effective sales value, v_s, and too low to make it worthwhile to buy at the effective purchase value, v^p. Neither selling nor buying recovers the transaction costs entailed in market participation. H_2 is a nonseparable household because its optimum is production for its own consumption, at a shadow value set by point 2. A shadow value (or "price") is a proxy value assigned in the case that a market value is undetermined or incompletely specified, an estimate of the value that would arise if the market were not compromised in any manner.

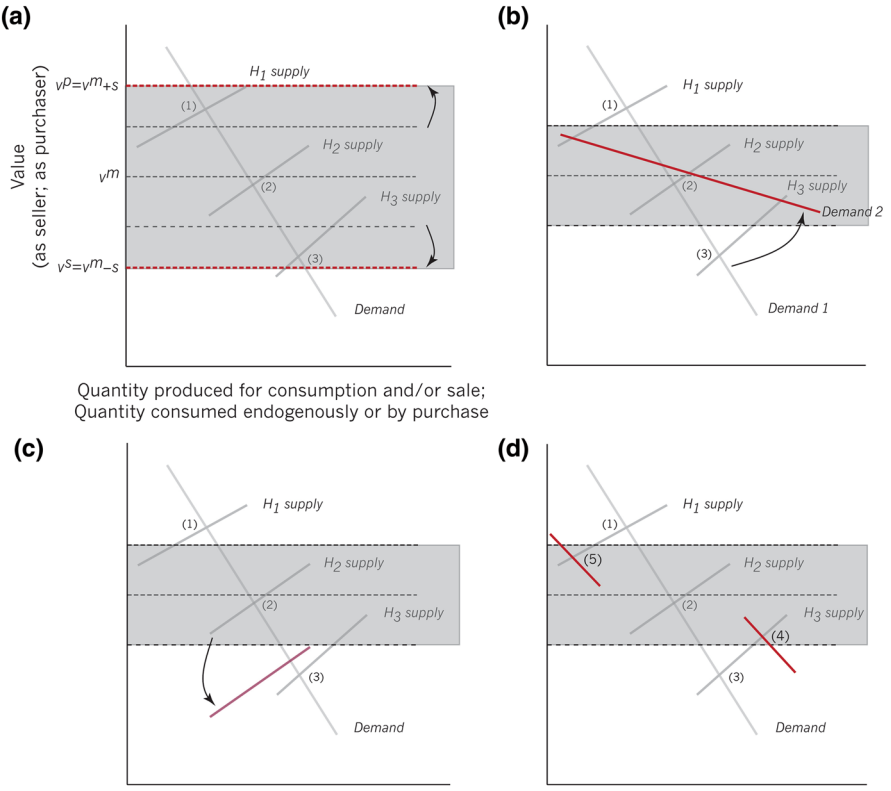


Fig. 4 Exploring model elements for cost–benefit conditions that increase or decrease the odds of household participation in market-based trade. Each of the four panels repeats Fig. 3, highlighting how the model is used to predict changes in production for use and exchange. The dark red line depicts the model element being treated as predictor variable. (a) Greater transaction costs exclude more households from market participation as sellers or as buyers. As shown, the change affects buyers and sellers to equal degree. (b) Elevated demand elasticity flattens the demand curve. Small changes in cost have a greater impact on demand, leading some market participants to drop out. The reverse will be true for commodities characterized by inelastic demand, those relatively insensitive to price. (c) Increased production efficiency (lower cost, H_2) can move households into market participation as sellers; relative loss in production efficiency potentially will have the reverse effect. (d) Households may have unique demand curves. Increase in H_3 demand, represented by the shift from point 3 to point 4, move this household from market participation as a seller to missing-market status. A similar change would affect market buyer H_1 if it were to reduce demand (point 1 to point 5)

Predictions about the degree to which markets for trade are missing or realized depends on how socioenvironmental circumstances shape and position the cost–benefit elements represented in Fig. 3. For a given market value, v^m, and transaction costs, s, greater differentiation of household production endowments will tend to push more households into the zones represented by H_1 and H_3, expanding market participation. Thus, a reduction in production costs can make it advantageous for an autarkic household to begin production for market trade (Fig. 4c). An increase in transaction costs, s, for a fixed distribution of production endowments has the opposite effect (Fig. 4a),

widening the gray band. Elimination of transactions costs would make all households with intersecting demand/supply curves market participants, eliminating nonseparability. A shift in the margin of the shaded missing-market band will move households adjacent to the boundary into or out of the market. Although we simplify transaction costs to a single value (s), in fact they may differ for buyer and seller, by household or by commodity, with predictable effects on participation. A large population of households with divergent supply–demand functions and transaction costs imply diverse patterns of market participation.

Households also may differ by their consumption needs and preferences, as a function of life cycle and dependency ratio, endogenous production opportunities, social status, and other factors (Fig. 4d). A market participant like household H_3 loses its sales advantage and is predicted to leave the market if its demand response increases sufficiently to move it within the missing-market band (point 3 to point 4). Similarly, the household depicted as H_1 could leave the market if its demand were reduced (point 1 to point 5). Households' market participation as seller or buyer reflects diversity in supply *and* demand characteristics.

As the demand elasticity of a commodity increases (consumption becomes more value sensitive), its demand curve flattens out in the neighborhood of the market price (Fig. 4b). All else equal, it is more likely to expand the population of households for which the market in that commodity is missing. Conversely, value insensitive commodities—salt might be an example (cf. Hein 2014)—that are relatively *in*elastic are characterized by a more vertical demand curve, increasing the odds of household market participation. Carballo (2013, p. 131) suggests that shell used for adornment in Teotihuacan would have had a relatively high elasticity as a commodity. Discussing barter exchange markets in the Andes, Stanish and Corben (2013, p. 425) note that household self-sufficiency promotes supply elasticity in basic commodities, and this tends to dampen fluctuations in exchange value, making these markets more reliable to participants. We add the observation that demand elasticity dampens the likelihood of market exchange if transaction costs are high.

Blanton (2013) has observed that elites often appear to lead the initial development of marketing exchange, and he offers the explanation that this is because their small numbers, group solidarity, common belief system, and social status make it easier for elites to overcome the impediment of market cooperation problems. We would add to this rationale the suggestion that, to the degree that elite status conveys wealth, elite consumption of material goods will be less sensitive to transaction costs. Wealth also might promote trade by inclining them to be less cost sensitive overall, making their demand curve less elastic (more vertical). Elites can afford to develop routine preferences for and purchase of items that would constitute a missing-market for the remainder of the population, an example indicating how elites might have catalyzed the initial development of marketing for economic as well as social reasons.

Conditions Facilitating or Impeding the Development of Market Exchange

A premise of our models, discussed more fully below, is that humans in premodern economies have the capacity to be entrepreneurial when it benefits them, that the presence or absence of markets is tied more to socioecological conditions than human cognition or behavioral proclivities. To this end, we have used models to explore the variables that would favor production for participation in local markets, either by barter or trade. We organize the following empirical discussion of these variables and associated predictions in light of archaeological, ethnohistoric, and ethnographic evidence, beginning with factors that affect use and exchange value as a function of production. We follow with transaction costs, opportunity costs, travel, and the role of money in trade. We draw mainly from recent archaeological analyses, with ethnographic materials included where they seem especially pertinent. Many of the available archaeological data on early markets and market origins come from the analysis of complex chiefdoms, probably because markets become easier to detect in that context. We anticipate that the factors we outline below will help point toward less visible, perhaps earlier, market contexts.

Heterogeneity of Environment and/or Production

We have predicted that nonseparable households are most likely to avail themselves of exchange opportunities when they can increase the value of commodities they produce by exchanging them for those they are unable to produce (Fig. 1). Closely packed geoenvironmental heterogeneity promotes this effect. Production heterogeneity also can arise independently of environment, if certain localities or social groups develop advantageous economies of scale or specialized guilds based on closely held technical knowledge or skill sets.

In prehistoric highland Mesoamerica household production in grain, fruit, crafts, pottery, and other goods passed through a "thriving system of interregional exchange and resource movement," representing a "rich entrepreneurial economy" (Hirth 2013, p. 85). Hirth notes that nearly 90% of communities lived within 30 km of a climatic–vegetation zone different from their own—a setting of high "ecological diversity [that] stimulated many peasant households and small-scale merchants to engage in trade, offering products from different environmental zones for sale in regional marketplaces as part of their normal domestic routine" (pp. 98–99).

Valley-dwelling, Middle Sedentary Hohokam villages in the North American Southwest engaged in lively barter markets with surrounding groups, in which upland game, wild plant foods, and raw stone for tool making flowed opposite lowland agricultural goods such as corn and cotton (Abbott 2010). Earthenware vessels circulating in this same exchange network were produced at specific sites near the Gila River. Pre–Aztec, Classic period (AD 200–900) residents of the relatively dry eastern portions of the Valley of Oaxaca, at densities above the local capacity to provide for their subsistence, appear to have exchanged crafts and products derived from their xeric biota (food, fiber, and alcohol) for calorie-dense maize from more

humid portions of the valley (Feinman and Nicholas 2010, pp. 95–96). Environmental differences between the Basin of Mexico and the Morelos Valley, immediately to the south and 1000 m lower in elevation, promoted exchange between these regions throughout the precolonial period (Smith 2010). Topic (2013) observes that microclimate zonation in the Andes similarly contributed to market participation in the prehispanic era.

Ethnography reinforces these observations. At the weekly market in Wulan Doni near Lamalera, Indonesia, women from coastal fishing villages meet women from nearby hill villages to exchange fish for maize. Each is incapable of producing the other's commodity and values it at predetermined exchange rates (Barnes and Barnes 1989). In precolonial Africa, at Cross River, Nigeria, trade was a robust component of household provisioning, facilitated by local money in the form of copper rods and wire (Latham 1986, p. 202). Yams produced in the north were exchanged southward for palm oil and westward for marine products and salt; the geographic localization of resource opportunities determined needs and patterns of resource movement through exchange. Craft production at Cross River also was locally specialized, depending on skills and resources available, and included "mats, baskets, ropes, nets, cloth made from the bark of the raffia palm, pottery, knives, hoes and other tools and implements" (p. 202). Latham's account of this "typical West African economy" (p. 201) makes evident the importance of geographic differentiation of production possibilities and advantages.

These examples feature environmental differentiation but do not diminish the importance of diversity in social valuation and division of labor. Utility and value have many dimensions; production specialization also can be generated by socially prescribed needs and preferences. At Fort Center, a Woodland period site in south central Florida, chipped stone tools unavailable locally were obtained through interregional exchange from northern Florida (Austin 2015). Their use was symbolic, associated with ritual and mortuary contexts; their enhanced value as items of exchange apparently was established by the mystique of their having come from a distance in the form of implements associated with revered ancestors and by their special physical properties of color and luster. Ritual stone moved south while shell, pumice, and sharks' teeth moved north. Lowered travel costs, the result of an intercommunity system of canals and waterways, may have facilitated transport and trade in the Okeechobee basin (Thompson 2016).

Likewise, a localized division of labor based in skilled craftwork can augment production differentiation that develops initially from environmental variations. Cashdan's (1987) work on trading relationships in rural Botswana illustrates the potential for interplay between these sources of comparative advantage. Increases in human and cattle density in this area led both to environmental and production heterogeneity, as ethnic groups became increasing associated with divergent habitats and the differential resource and labor advantages they provided. Both processes fostered the development of trade. In Ming China and Oaxaca, households engaged in market exchange from rich agricultural lands intensify the production of grains for consumption and sale while hinterland households extensify agriculture to engage in craft specialization and pastoralism (Blanton and Fargher 2010, p. 218).

Carballo (2013) draws attention to labor added value in the commercialized marketplace exchange of obsidian, lime, cotton, and ceramics in Teotihuacan. A premodern division of labor can motivate marketing independently of environmental heterogeneity: "…what we find in the Hohokam case is an advanced division of labor evident by transactions involving products that could have been, but were not, produced by self-sufficient households" (Abbott 2010, p. 72). Various lines of evidence drawn from an unusually large concentration of chert debitage from the Mid-to-Late Classic period site of Buena Vista del Cayo, Belize, point to a marketplace location for the late stage, high-skill finishing of bifaces from preforms worked elsewhere. These bifaces were not being produced in the households that consumed them (Heindel et al. 2012). In the only evolutionary model known to us addressing production heterogeneity based in division of labor, Nakahashi and Feldman (2014) find that larger group size and greater demands on the lifetime learning of skills needed for effective production lead to division of labor, a line of investigation worth pursuing with archaeological evidence. Jaeggi et al. (2016) document supply–demand forces in Tsimane exchange and note that they create the potential for specialization and division of labor in informal economies.

Transaction Costs

Transaction costs depress the net gain that can be realized from market exchange, lessening the likelihood of barter or trade (Figs. 2a and 4a). Davis (1966) concludes that the development of markets in medieval England was retarded for centuries due to the likelihood of being cheated, lack of universal weights and measures, and low population density entailing high coordination costs. North and Thomas (1970) contend that high transaction costs may have proved an insuperable barrier to market participation throughout most of history, although recent evidence from archaeology, ethnohistory, and ethnography provide sufficient counter examples to suggest that this view is too conservative. Uncertainty regarding product quality and price, and the trustworthiness of vendors, elevate the costs of exchange (McMillan 2002). Goetz (1992) and Jagwe (2011) show that better and more easily accessible information lowers transaction costs and increases the likelihood of market participation by small-scale sellers in sub-Saharan Africa. Reductions in linguistic barriers also can contribute to lower transaction costs. In addition to distinct tribal languages, traders in the 18th century lower Mississippi Valley probably spoke Mobilian, a lingua franca trade language, in order to participate effectively in cross-cultural, regional transactions (Drechsel 1983; Usner 1987).

A variety of social and institutional factors that mitigate transaction costs are associated with early exchange behavior. Offer (1997, p. 454) argues that human regard for other individuals fosters trust, and trust "economizes on the 'transaction costs' of monitoring, compliance, and enforcement." Social relationships and the trust they entail may be particularly important in facilitating barter exchange (Barnes and Barnes 1989; Blikololong 2010; Kranton 1996); together they decrease uncertainty and resources spent locating appropriate trade partners in market settings (Abdulai and Birachi 2008; McMillan 2002). In a more general assessment,

North (1977) argues that the socially embedded elements of exchange are better seen as means of controlling transaction costs than as noneconomic forces subverting marketing behavior. Ensminger (1992) demonstrates that Ormo markets in Kenya arose in the 19th and 20th centuries as a result of a decline in transaction costs. The standardization of weights and measures during this time was accompanied by the adoption of social institutions that made it less costly to complete transactions. The region's conversion to Islam and an increase in government services were elements in this process.

Quite specific arrangements for reducing transaction costs are known. Taxes paid by vendors at Aztec markets funded institutional regulation by elites and a police force to protect against thieves and ensure standard weights and measures (Hirth 2016, p. 75). McCarthy (1939a, p. 427, citing reports by Taplin 1879) describes the following intertribal custom attending to exchange between tribes located upstream along the Murray River, Australia, and those downstream, close to the sea. At birth, a child's umbilical cord is wrapped in feathers and sent to the father of a young child in the group for which trading is to be established. This ritual act binds the two children in a relationship of financial rectitude and silence in each others' presence, which, at adulthood, ensures they will be faithful agents of exchange on behalf of their respective groups, deterred by custom from engaging in any collusion for private advantage. People may be more disposed to be generous to out-group strangers and incentivize exchange by decreasing transaction costs when there is minimal access to nonlocal resources (Pisor and Gurven 2016).

Socially bound gifts and loans to favored clients and loyalty to sellers create mutual social obligations that reduce the uncertainties of market exchange, lessening transaction costs by underwriting expectations of fairness within trading partnerships (Belshaw 1965, pp. 56, 79). In the Hohokam case cited earlier, periodic ceremonial ballgames, "regulated by custom and propriety, constituted a mantel under which lively bargaining for utilitarian commodities could take place, even among parties who had no prior social relationship with one another" (Abbott 2010, p. 79). The local intercommunity markets and fairs of early medieval England and Scandinavia often were associated with churchyards. The regular assembly of large groups offered opportunities for Sunday trade (Sawyer 1986), while the churchyard setting presumably sanctioned the orderliness that lowered transaction costs. In the prehispanic Andes, centers of cults and pilgrimage like Chavín de Huántar played a similar role, drawing together aggregations of individuals from diverse ecological zones and long distances, carrying locally exotic materials (Burger 2013).

These examples suggest that repeating, institutionalized settings and their associated assemblies afford enhanced opportunities for the development of marketing, even if the nature of the institution was not explicitly or initially concerned with economic behavior. These may be more common and earlier than has been appreciated. For instance, Jackson (1991) addresses the quandary of the large (150 ha) Poverty Point site on the lower Mississippi River, which has been interpreted as an early complex chiefdom largely due to its size and the variety of exotic materials found there, but which is anomalously early for that form of political organization and larger than is reasonable for a sedentary, residential population of hunter-gatherers. Jackson proposes instead that Poverty Point was the site of a major, recurring,

intersocietal hunter-gatherer trade fair. Jackson cites ethnohistoric evidence on such fairs from North American, Australia, and elsewhere to show that they have the requisite attributes, such as the sizable assembly of hundreds to thousands of individuals, networks of enduring social partnership among otherwise distinct social groups, and timing during brief periods of flush resource availability, to establish the plausibility of his alternative interpretation of Point Poverty.

Lowered transaction costs also may develop top-down. Norms aimed to balance self-interest and social regard for cooperation, established initially among socially homogeneous elites, may have been extended to the broader population of ethnically diverse commoners, enhancing the functionality of utilitarian markets and providing avenues for elite governance of market behavior (Blanton 2013). Gutiérrez (2013) documents how the extensive system of tribute—paid sometimes in labor but often in goods such as gold, cloth, warrior costumes and shields, rubber, or consumables—stimulated an equally widespread system of market exchanges through which households converted what they were able to produce into the particular goods being required of them by the authorities. Gutiérrez (2013, p. 158) speculates that this colonial system of "working the tribute" was precolonial as well as postcolonial. Tribute demands stimulated regional specialization in production, per our earlier point about geoenvironmental differentiation, while geographic expansion of Aztec administration stabilized exchange rates and units of measurement, and reduced the risks of transporting goods across the empire (Gutiérrez 2013, pp. 141–142), thereby facilitating commercial market activity.

Opportunity Costs

Opportunity costs to participation in marketing are an underappreciated element of the origins of exchange behavior. Demands of intensive agriculture on household labor (Netting 1993) can restrict marketing opportunities to seasonal respites in production schedules. Producing for consumption or producing for sale are always in competition with one another, at least for Andean Indians (Mayer 2005). The Zande resisted colonial pressure to produce cotton for sale as it coincided with the planting season of a key subsistence crop (de Schlippe 1956). Conversely, seasonal downtime in agricultural cycles also creates opportunities for value-added craft production of the type emphasized by Carballo (2013) and Hirth (2016).

If household production tasks are allocated by age or sex, some household members may have much lower opportunity costs associated with market participation. It also is possible that labor-scheduling bottlenecks may have pushed households to procure through exchange the commodities whose endogenous production is compromised by opportunity costs (Blanton and Fargher 2010, p. 213). For instance, opportunities for agricultural production intensification through irrigation and second cropping in the Valley of Oaxaca may have placed sufficient demands on family labor that households turned to markets for the provisions they no longer found it valuable to produce themselves (Hirth 1998, p. 454).

Travel

Limited transportation capacity figures prominently in the case against premodern exchange. If marketing is determined by net benefit, only high value and highly portable commodities would move very far (Rhode 2011; fig. 1), despite the observation that humans have been ingenious in devising ways to decrease transportation costs using waterways and boats, pack animals from dogs to camelids and horses, and eventually bicycles and motorized vehicles. The beginning of the Columbian exchange was dependent on the discovery of seasonal wind patterns capable of effectively propelling transoceanic shipping (Crosby 1999). Economic central place theory (Christaller 1966), used by archaeologists to predict the locations of marketplaces (e.g., Blanton 1996; Feinman and Garraty 2010; Hodder and Orton 1976; Johnson 1972), builds on such observations to assume that minimization of transportation costs drives settlement patterns.

Examining the multiethnic frontier economy of the lower Mississippi Valley in the 18th century, Usner (1987, p. 180) observed that: "to facilitate their trade with the French, some [Indian] villages relocated closer to the coast and planted larger volumes of grain. The Houmas… abandoned their town several miles east of the Mississippi, and settled downriver along the west bank near Bayou Lafourche, where they became reliable suppliers of food to both travelers and settlers." Phrased in terms of our first model (Fig. 1), production for exchange was sufficiently attractive that Native Americans relocated their villages and fields to minimize transportation costs while also expanding agricultural output to accommodate new trade opportunities.

Where markets are too costly to access, individuals will not produce for them (Minten and Barrett 2008; Stifel and Minten 2008; Stifel et al. 2003); they are missing. Phrased in terms of our model for trade, when s increases, the gray band widens and more households are excluded from market participation (Fig. 4a). Ugandan coffee producers are more likely to travel to market when the market is close by and when they have a large quantity to sell (Fafchamps and Hill 2005). Proximity to a road through the Yasuni National Park is positively associated with bush-meat harvests of spider monkeys for sale at market (Franzen 2006). The association of Hohokam barter markets with periodic ceremonial ballgames concentrated buyers and sellers and multiplied incentives to travel, lessening transportation costs (Abbott 2010, p. 68). When travel costs decrease, participation in exchange grows (Omiti et al. 2009).

Stanish and Coben (2013) argue that high transportation costs in the premodern world mean that the potential supply of surplus commodities is less important than transaction costs in determining whether or not there will be exchange. Processing and design for efficient transportation grew in importance as bulky material items moved into market exchange. In Classic period Teotihuacan, utilitarian obsidian tools, lime for food processing and plastering, cotton, and ceramics are thought to have circulated widely through periodic commercial markets centered on barrios. Carballo (2013) notes that lime likely was processed to quicklime near its source to reduce bulk. The widely distributed Thin Orange ceramic bowls were designed to standardized dimensions in a shape that facilitated compact stacking for transport.

Figures 1 and 2 provide a precise conceptual basis for evaluating this proposition in particular cases.

Transportation constraints are important, but growing evidence of exchange even in bulkier commodities hint they may have sometimes been overstated. In Mesoamerica, for instance, 16th century ethnohistoric sources describe porters carrying loads of 40–70 kg; intermediate-range exchange routinely moved heavy staple goods like maize, fruit, cotton, and ceramics distances of 50 to 150 km, despite what (Hirth 2013) describes as a poor transportation infrastructure. The weights are greater and distances longer than commonly associated with routine movements of staple resources in prehistory, but Hirth documents that they are not exceptional. The materials reaching the precolonial North American trade fairs documented in Jackson (1991) may have arrived on dogs capable of carrying loads of 16 to 23 kg, sometimes more, in packs or by travois. Such capacities are documented in numerous ethnohistoric accounts (examples in Wheat et al. 1972, pp. 117–122) and by experiment (Henderson 1994).

Exchange and Money

It is not always clear in examples of early exchange-based markets if transactions are instances of barter or trade. The terms are used imprecisely and the distinction can be ambiguous in practice. Some commodities likely functioned as consumables *and* as money or media of exchange, an overlap difficult to detect from archaeological evidence. Commodities that are promising as early money in staple exchange would feature easy quantification, high value, uniform and readily observable quality, durability, portability, and divisibility. Examples are many: raw cotton and cotton thread or other textiles (Abbott 2010, p. 71); beads made from jade debitage (Kovacevich 2013, p. 271); tributary cloth (Gutiérrez 2013); copper rods or wires (Latham 1986, pp. 204–206); shell beads, suspended ornaments, greenstone beads, cacao beans, and cotton mantles (Masson and Freidel 2013, p. 220); obsidian, textiles, and compact processed foodstuffs such as *chuño* and *charki* (freeze dried potatoes and meat, respectively) (Stanish and Coben 2013, p. 428); cacao, shell, textiles, and metals (Hirth 2013, p. 91, 2016; Tokovinine and Beliaev 2013, p. 169); cacao beans, cotton textiles, copper axes, and quills filled with gold (Nichols 2013, p. 51); and *Olivella* shell (Rosenthal 2011). The apparent counterfeiting of cacao pods used as a money in Aztec marketplaces (see Feinman and Garraty 2010, p. 168) offers intriguing if somewhat indirect evidence that entrepreneurial gain was a motivating factor in market participation.

Such dual-function commodities—material items that can be consumed or held, and which are easily transported for their exchange value—suggest routes of evolution from barter to trade. Commodity monies have liquidity not characteristic of the more bulky or perishable forms of production; they can function to sharply reduce the transaction costs of exchange in the absence of a formal currency. Functioning as money, they increase the ability to complete indirect exchanges, should a coincidence of needs fail to materialize (Melitz 1974). They lower transportation costs and

reduce the risk entailed in seeking but failing to exchange perishable goods, should a partner willing to barter for a desired commodity not be found.

Old and New World evidence makes it clear that formal currencies are not necessary for market exchange in the ancient world (Hirth and Pillsbury 2013a, p. 17). However, exchange markets are more likely if at least some of the goods entering them can act as commodity monies. In prehistoric California, money functioned to ease exchange between neighboring groups lacking overarching political organization or shared language (Bettinger 2015). We note as well that negotiation over value does not require a physical money as such; it can be the equivalent of an entry in a book of account or something equally abstract (Belshaw 1965, pp. 85–89). Long-standing human experience with the mental accounting dynamics required of intra-group reciprocity has equipped us with this capacity (see below). Debt relationships may also function as accounting systems when money is nonexistent.

Population Density

Nearly all of the factors that promote the evolutionary development of barter- or trade-based markets are likely to be enhanced in their effect by increased population density. As conceptualized by the ideal free distribution model, population growth and settlement in heterogeneous environments begins in the highest ranking habitat and eventually spills over into lower ranked habitats in a dynamic that equalizes the declining, density-dependent suitability or economic prospects in occupied areas (Codding and Jones 2013; Moritz et al. 2014; Winterhalder et al. 2010). This process has two economic consequences that increase the likelihood of exchange: population growth ensures spread into habitats with divergent productive potentials; and the equalization of suitability in occupied habitats means that all households experience the same level of declining opportunity costs to engagement in exchange. The first dynamic establishes that there likely will be ecologically advantageous exchange opportunities; the second enhances the likelihood that a household from a particular habitat seeking an exchange partner will find a willing counterpart from another habitat.

Greater population density implies reduced distance to a marketplace, lessening travel and transportation costs. The thriving precolonial, staple markets of the Afikpo, Ibo-speaking peoples of Nigeria, were located within a day's walk (5 to 15 miles) of one another. Vendors or consumers could reach a market on multiple days of the week. Vigorous trade was facilitated by a population density of over 400 persons per mi^2 (Ottenberg and Ottenberg 1962). A concentration of population likewise elevates the odds of finding one or more trading partners offering advantageous quantities for exchange (Davis 1966) or, in a heterogeneous market, a willing partner having the desired commodity (Kranton 1996). Greater population density increases the diversity of productive skills and aptitudes of market participants and thus the likelihood of specialized production (Davis 1966; Nakahashi and Feldman 2014).

Cashdan (1987) describes for the Botletli River region of Botswana how increases in human and cattle density led both to environmental and production heterogeneity, as ethnic groups became increasingly associated with divergent habitats and the

differential resource and labor advantages they provided. Both processes fostered the development of trade. Even ephemeral increases in population density, such as at ritual events, create incentives to participate in market exchange (examples above and in Abbott 2010; Jackson 1991). Corresponding increases in sociopolitical complexity could lead to increased infrastructure like road construction and standardized weights and measures (Fleisher 2010).

Spontaneous, dyadic exchange entails high transaction costs, but as barter markets grow along with population density in size and number of vendors, they encompass a greater variety of goods, reduce uncertainty, and minimize the possibility of lost time and effort (Hirth 2010, p. 236). Markets require a "concentration of potential consumers" (Hirth and Pillsbury 2013a, p. 15; Ofek 2001, pp. 45, 133, passim). Although population is not itself a variable in our model, it is implicated in multiple and perhaps multiplicative ways in the variables that are included. Archaeologists strongly disagree on whether or not population size is a primary cause of the evolution of social complexity (Henrich et al. 2016; Vaesen et al. 2016a, b). The proposal we make here avoids core elements of that debate by giving population density an indirect effect with two specific properties: the action of population density is path dependent and works through other variables like geoenvironmental differentiation and transportation costs; and most likely, more than one of these other variables must align to produce significant changes in social evolution toward marketing.

Ubiquity

Precolonial trade was pervasive in Australia (McCarthy 1939a, b, c), and by some accounts in Africa as well (Latham 1986; Curtin 1984, cited in McCloskey 1997). Similar examples can be cited for societies in Mesoamerica (Hirth 2016; Hirth and Pillsbury 2013b), California and the Great Basin (Hughes 2011a), and elsewhere (Chapman 1980; Garraty and Stark 2010). Premodern societies long held to have little or no market activity—in which commodity movements have been interpreted solely as administrative redistribution or displacement stimulated by elites—are now being reappraised for evidence of exchange-based marketing. Among the Maya, Masson and Freidel (2013) find evidence for commercialized exchange of staple and wealth goods, before and after the Terminal Classic period collapse. The relative value of maize rose when there were shortfalls, long-distance transport was evident (pp. 218–219), and nonlocal goods were ubiquitous in commoner households (p. 220). Trade and multiple types of traveling traders during the Classic period are documented in ethnohistoric sources and Maya texts and imagery (Tokovinine and Beliaev 2013).

Lacking archaeological or ethnohistoric evidence for money or a standardized system of weights and measures, and with scant mention of marketing in the Spanish chronicles, scholars of prehispanic Andean societies have argued against nonelite exchange and markets in Tawantinsuyu (Murra 1985) or earlier societies of the region. This now appears to be partially incorrect (Mayer 2013), as exotic goods most likely obtained through barter are found in residential neighborhoods near ceremonial centers such as Chavín de Huántar, and "localized exchange for

subsistence goods almost certainly continued to occur between households or villages" (Burger 2013, p. 320). In the southern Andes of the Tiwanaku era, transportation internodes—passes, water holes, and auspicious camping sites—document multidirectional and locally shaped flows of staple goods among small communities in patterns not consistent with elite control (Nielsen 2013). The subsequent Inka administration likely was more successful in controlling trade in a restricted sphere of elite items like gold and silver, fine cloth, drugs, and weapons than in the exchange of staples, which included ceramics, lithics, wood and cane for bows and arrows and other tools, feathers, textiles, shell, coca leaves, fish, maize, *chaña*, and probably a number of perishable goods (Nielsen 2013, p. 414).

According to Stanish and Coben (2013, pp. 425–431; also Dillehay 2013), vigorous trade supported by extensive barter markets flourished throughout the Andes. Proximity to marketplaces, familiarity with goods and their value, the support of kinship and social organization, and closely packed ecological zonation (Thomas and Winterhalder 1976; Topic 2013) reduced transaction costs, lowering marketing barriers. Equivalencies were relatively stable because they were socially habituated, but they also responded to supply and demand. Gain was realized less by varying prices to generate a profit than by expanding a socially secure network to include greater numbers of reliable exchange partners.

The potential richness of prehistoric barter markets also is evident for the Hohokam. Excavations of Palo Verde households have exposed caches of meat, hides, sinew, manos and metates, obsidian, carved stone, turquoise, and shell projectiles in quantities well beyond household needs (Abbott 2010, p. 69). The Aztec site of Otumba features six distinct zones of household craft production in domestic workshops for obsidian, lapidary, groundstone tools, maguey fiber, spinning, and ceramics, the products of which were exchanged through barter or traded locally and far afield (Nichols 2013). Elite goods from the Indian Ocean trade networks that flourished from AD 1000 to 1500 passed through the hands of Swahili merchants along the eastern African coast and found their way through market exchange into local nonelite households in towns near the coastal ports (Fleisher 2010). It appears that humans have the capacity to engage in exchange across many ecological, social, and political contexts.

Market Origins Theory

In Archaeology

To contextualize our models, we begin by exploring the theoretical perspectives associated with the examples we muster to support our arguments. Generally, archaeological theories on the origins of marketing behavior and markets fall into two clusters: *top-down* and *bottom-up* scenarios. These categories have generous, ill-defined, and partially overlapping boundaries; although recent proposals mix the two approaches, they are useful nonetheless.

Top-down explanations tend to assign primary causal influence to noneconomic factors emanating from elites and/or the institutions of complex social formations.

As summarized in Oka and Kusimba's comprehensive historical review (2008, p. 340, italics original; see also Garraty 2010), the top-down approach posits "the subordination of trade and exchange to *necessity*, *social process,* and *political economy*…" Top-down theories generally align with the primitivist/substantivist rather than formalist/modernist side of economic anthropology debates about premodern economies (Feinman and Garraty 2010); they appeal to authors inspired by the work of Polanyi and Wittfogel (see Golitko and Feinman 2015, pp. 206–208). Theories based in administrative redistribution developed by Polanyi's followers (e.g., Dalton, Fried, and Sahlins), and neoevolutionary models (e.g., Service) fall into the same tradition of presuming that producing households are, or uniformly seek to be, self-sufficient, and the wide movement of materials came about through policies devised by overarching political authorities (see Feinman and Garraty 2010, pp. 174–175). As an example, the Sabloff–Rathje model for long-distance movement of goods under the Classic period Maya postulated the dominance of political redistribution controlled by political elites (see Masson and Freidel 2013, p. 201).

While documentation of some degree of political regulation of marketing in preindustrial states is commonplace, the idea that virtually all trade in preindustrial states was centrally administrated by authorities "may be one whose time has come and gone" (Isaac 2013, p. 439). Empirical cases more consistent with bottom-up explanations are a good part of the reason. Bottom-up theories tend to assign the key causal role to small-scale social units like households, and developmental processes like production intensification. Bottom-up theory is more economic than political in character, having been stimulated by fieldwork focused on production specialization and household archaeology (Feinman 2013, p. 455).

Work by Hirth (1998) is a prominent example. Bottom-up approaches acknowledge that elites may play a role in initiating or supervising markets; they may, for instance, prescribe exchange rates but still be only partially determinative of marketing behavior. "Although elites provided administrative supervision, most marketplaces operated independently of direct political control at Spanish contact" Hirth (1998, p. 452). Or, "…[a]lthough marketplaces were supervised and regulated by specific rulers, economic transactions were not subject to direct social or political control" (p. 455). Feinman (2013) describes the shift underway in Mesoamerican archaeology from redistributive, top-down, state command interpretations of archaic exchange to a more dynamic, household-based understanding, one attentive to exchange diversity and empirical evidence for profit-oriented marketing. He argues that a similar reformulation of research effort would benefit Mediterranean archaeology.

Empirical examples substantiate the bottom-up approach. Abbott (2010, p. 72) describes participants in the periodic ceremonial ballgame markets of the Hohokam (AD 1000–1070) as self-sufficient households, whose exchange was based in a division of labor sensitive to supply and demand and unaffected by social standing or direct political control. Golitko and Feinman (2015) use network analysis to trace obsidian movement throughout Mesoamerica for the period 900 BC to AD 1520. The resulting patterns indicate that the economy—as represented by the distribution of this key commodity—was based in household production for exchange. Obsidian exchange integrated dispersed communities through regional marketing networks.

Marketing networks were historically dynamic in that they became less centralized and more highly commercialized over time. In another bottom-up example, already mentioned in our discussion of opportunity costs, the introduction of irrigation and second cropping in the Valley of Oaxaca may have placed sufficient demands on family labor that households turned to markets for the provisions they no longer found it a worthwhile use of their time to produce themselves (Hirth 1998).

Blanton and Fargher's (2010) comparative analysis of 30 premodern states draws on multivariate correlations to suggests that a mix of top-down and bottom-up factors are important to the degree of commercialization they exhibit. Associations between measures of political provision of public goods and bureaucratization, and the degree of commercialization in the economy, point to top-down influences. However, Blanton and Fargher also describe bottom-up exceptions. In medieval England and Tokugawa Japan, markets developed well ahead of state influences. State administration in the Aztec Triple Alliance came about as a means of promoting and manipulating already existing markets. Antimarket state policies in Ming China failed to forestall the development of markets (pp. 216–217). "[M]arket development appears to have been to some degree a "bottom-up" process not resulting directly from state action but rather reflecting in part the actions of ordinary households" (Blanton and Fargher 2010, p. 217, see also Stark and Ossa 2010, p. 126).

Bottom-up approaches in archaeology typically are more recent and, as evident in these examples, more open to multicausal or "multiscalar" (Feinman and Nicholas 2010) analysis. For instance, Blanton and Fargher (2016, pp. 82–96) suggest an interactive process linking top-down and bottom-up mechanisms. Rudimentary but "restricted" marketplaces fostered by elites came about because they were embedded in a limited and known social sphere, thus minimizing the impediment of cooperation problems. Over time, these markets developed supporting institutions that allowed them to "open up" to a more diverse population of participants, including commoners. Ritual, liminal, or sacred definition of marketing spaces and marketplace management by agents underwritten by elites sanctioned peaceful and fair bargaining among this more diverse pool of nonelite participants. Once markets opened to nonelite participation, bottom-up processes came into play. Carballo and Feinman (2016) likewise emphasize the roll of solutions to cooperation and collective action problems in the development markets, especially in situations in which it is necessary to provide public goods such as open-access roads, marketplace maintenance, and institutional support for fair market treatment.

To explore bottom-up approaches more explicitly from the perspective of decision makers, be they individuals or households, we now turn to behavioral ecology. Since individual-level (bottom-up) marketing behavior can be contingent on top-down processes, we will never fully disentangle the two perspectives. However, we can use the two approaches as foils to examine our own thinking on market origins.

In Human Behavioral Ecology

The top-down models that until recently have dominated this literature typically have shared assumptions with substantivist-oriented economic anthropologists (e.g.,

Chayanov 1977; Sahlins 1972). To emphasize this point, we characterize what we call the *standard substantivist scenario*.

First, the nonelite producers, whether hunter-gatherers, horticulturalists, or agriculturalists, preferred a conservative self-sufficiency resulting in household autarky; they were not temperamentally or cognitively predisposed to the economic self-interest, social discipline, or mental accounting required of barter or trade that was sensitive to supply and demand. Second, the initial development of exchange by the wider producing population required external, elite-imposed economic incentives and the provision of supporting sociocultural rules and institutions. Third, widespread population engagement in exchange through barter and trade is a relatively late development, coming after sociopolitical changes gave rise to politically stratified societies in which elites, already engaged in wealth exchange among themselves, instituted centralized redistribution that engaged producers in surplus production and orchestrated the incentives and institutional marketplace designs that overcame the persistent self-sufficiency of households and reluctant self-interest of their occupants. In general terms, top-down theories that have embraced this scenario view economic processes and development as subsidiary to sociopolitical processes and developments, at least until the rupture that generated 18th century market capitalism.

The human behavioral ecology (HBE) approach that we advocate here aligns for the most part with the bottom-up cluster of theories; it gives reason to doubt key elements of the standard substantivist scenario. HBE theoretical basics are covered elsewhere (Smith and Winterhalder 1992; Winterhalder and Smith 1992), freeing us to highlight points specifically important to the origins and persistence of barter and trade. We do so by means of contrasts with the three-point characterization of top-down models defined in stylized terms just above.

We begin from the presumption that market exchange via barter or trade is based on ancient human dispositions and cognitive skills that evolved in the socioenvironmental context of food transfers in small-scale hunter-gatherer groups. Routine transfers of material goods within coresident human groups are addressed by a large literature that identifies a variety of evolutionary causes, ranging from tolerated theft, to reciprocity and risk minimization, to acquisition of prestige and its benefits through costly signaling (Gurven et al. 2004; Jaeggi and Gurven 2013; Jaeggi and van Schaik 2011; Winterhalder 1997; Ziker and Schnegg 2005). Close analysis of transfer patterns among the Tsimane document that they are affected by contingent exchange reflecting patterns of supply and demand (Jaeggi et al. 2016).

We consider intragroup transfers important as the dispositional foundations to extragroup barter and trade; a sufficient reason to think Adam Smith was correct about our *capacity* to be entrepreneurial when the situation makes it advantageous to be so (Muller 1993). The mix of motivations that underlie within-group food transfers has preadapted humans to have the cognitive tools of a trader. We come to barter and trade with out-group individuals as creatures adept at balancing self-interest with respect for the basic social conventions that make stable social engagements like exchange possible. Ostrom (1998, p. 2; see also Liebersohn 2011; Offer 1997; Stanish and Coben 2013) summarizes from the perspective of institutional economics: “Our evolutionary heritage has hardwired us to be boundedly self–seeking at the

same time that we are capable of learning heuristics and norms, such as reciprocity, that help achieve successful collective action." This presumption underwrites our claim that the absence or presence of barter and trade in later human prehistory is a matter of socioenvironmental conditions more than of human capacity or dispositions. For this reason, our HBE models focus on the conditions most likely to offer incentives to exchange and thus facilitate marketing development.

Consistent with this perspective, we would not weigh as heavily as do Blanton and Fargher (2016, pp. 72–74) the argument that, absent externally instituted norms, bartering over commodities in early markets is inefficient because neither value nor fairness were self-evident. Blanton (2013, p. 27) argues that the earliest potential participants in markets had not yet developed or might not be able to expect the "requisite moral capacity to distinguish between self-interest and moral obligation to others." Thus, to get established, markets required imposition of a distinct "value sphere" (p. 28), without which "uncertainty and opportunism" (p. 25) would dominate. Human behavioral ecology suggests that humans came to the origins of barter and trade with quite refined capacities for judging socially acceptable degrees of self-interest, and what is or is not to their own or others' benefit, short and long term. Balancing discernment of self-interest and other-directedness in the disposition of material goods—the "calculative agency" discussed by Garraty (2010, p. 7)—was nothing new but rather a capacity and practice already pervasive in human social behavior and cultural evolution (Richerson and Boyd 2001).

This is not to diminish the role of conditions and especially transaction costs of all kinds, which likely have been serious hurdles. Institutionalization by elites or others of marketing norms that would reduce transaction costs likely was a key factor in the development of marketing (Garraty 2010; North 1977). Nonetheless, a challenge to the first premise of the standard substantivist scenario opens up to investigation virtually all claims entailed in the second and third premises. We no longer are bound to see social stratification and the associated elites as a necessary precondition for the development of barter and trade (premise #2). Systems of tribute and redistribution need not always predate marketing (premise #3). Significant development of exchange may have been quite early, and specifically quite early in relation to the evolution of social complexity; it may well have been a pervasive feature in the social life of particular societies prior to social stratification and political centralization. It follows that economic developments, rather than being late and causally epiphenomenal to sociopolitical factors, may instead have been important early catalysts of sociopolitical changes. More generally, we cannot follow the substantivist premise that in premodern societies the economic was uniformly subordinate to the political.

Human behavioral ecology theory is promising as an element in this expansion of perspective because it moves anthropology beyond a narrowly substantivist interpretation of premodern economies. As is evident in the models and literature reviewed above, HBE is not closed off to top-down factors; rejection of key substantivist elements of traditional top-down models does not negate the potential importance of top-down causation in complex societies. Elites, for instance, may well have solved coordination problems in the construction of public goods facilitating trade, such as efficient transportation networks.

Nonetheless, assessing the effectiveness of a transportation network—and indeed the merits of any top-down hypothesis—requires we also understand how the change affected household-level incentives to expand production and engage in exchange. Put differently, the household models that we have described are somewhat agnostic about the *source* of a key independent variable, but they do suggest that we be insistent that, whether top-down or bottom-up in inspiration, a full theory must grapple with household-level economic processes. Markets have group-level properties such as spatial patterning, external management, cultural norms, and the problems and solutions to cooperation problems. But they also feature individual-level decisions concerning production for exchange. We are a significant distance from integrating these macro- and microlevels (Garraty 2010, pp. 27–28).

Caveats

Analyses using human behavioral ecology and related models entail purposeful simplification (Winterhalder 2002), which we acknowledge here by describing aspects of market origins that we have neglected. First, we have assumed that households participate in markets to maximize their gain in value. Exchange and participation in markets, however, may be sought for a variety of other reasons. Risk reduction can be achieved by trade that averages over regions asynchronously afflicted by resource shortfalls (Ellis 1988; Goland 1993; Winterhalder 1990). Archaeologists have begun to address this shortfall of classic central place foraging models (Lupo 2007). Eerkens (2011) notes that pots were moved in the Owens Valley among zones known to be asynchronous in their susceptibility to drought, suggesting not exchange but adaptive household relocation to avoid resource shortfalls. Analyzing bifaces made from nonlocal and local chert in the late Middle Archaic site of Black Earth (midwestern United States), Morrow and Jefferies (1989) find little to differentiate their reduction strategies or uses, thus their apparent value. This suggests that the nonlocal materials were acquired directly and incidental to other activities rather than through more costly means such as trade or special purpose procurement. Exchange also might be used to acquire commodities not available locally to store them, perhaps in the form of commodity monies. Entertainment and opportunities to socialize and gather information presumably also influence decisions to participate in markets; congregation allows marketers to meet kin and friends, look for marriage partners, seek enhanced status, or enjoy a break in household routine. Markets also are opportunities for thievery and no doubt attracted some individuals seeking gain and possibly status on that basis.

Next, by assuming households are the fundamental unit, we have modeled market exchange as a bottom-up rather than top-down process, although the latter certainly occurs (e.g., Gutiérrez 2013 on the Aztecs). Our approach follows Hirth (2010, p. 235, 2016, p. 25), who argues that households are the fundamental units of production, for their own provisioning of staples as well as for exchange. Household-up processes are responsible at least in part for market formation in China, Nupe, Java, England, and Japan (Blanton and Fargher 2010, p. 217). However, evidence of obsidian exchange in the gulf lowlands of Mexico suggests a mix of top-down

and bottom-up forces (Stark and Ossa 2010). Market integration and reach shifted between local and regional emphases with political developments and the maneuvering of elites in other cases (Minc 2009; Smith 2010). Unser (1987), Cashdan (1987), and Jackson (1991) provide (ethno)historically detailed accounts of exchange in settings reminiscent of those almost certain to have occurred many times in prehistory, for example, the Holocene movement of agropastoralists into hunter-gatherer Europe (see Svizzero 2015a, b). These sources remind us that there is much to learn about the primary and secondary origins of barter and trade from the historical study of colonial settings that emphasize both bottom-up and top-down causes of market participation. We also foresee the possibility of applying behavioral ecology models based in agency and self-interested behavior to top-down analysis focused on the roles of elites and managers.

The central place structure of our model implies an additional question: Why would our model household not more simply use a *logistic foray* to pick up complementary resources from adjacent ecological zones, a situation modeled by Zeanah (2000). The answer is that they probably would, if desired resources were easily obtained from a nearby habitat that was not, or was only scantly, occupied. Otherwise, residents of that habitat may resist, if they themselves use the resource or if they perceive an advantage of supplying it in exchange for something they otherwise would not be able to produce themselves. "The advantage of the marketplace was that it allowed households to bundle their provisioning activities into a single trip," reducing the time and distance of provisioning activities (Hirth 2016, p. 278). Crowding and circumscription elevate the effective environmental differentiation in heterogeneous habitats, further evidence that population density lurks in the background of multiple factors that promote exchange.

We also assume that these household-based models focus on private goods, which means that we do not take up some of the cooperation and collective action dilemmas associated with division of labor and participation in the growth of institutions devoted to provision of public goods like open-access roads or marketplace infrastructure. These issues are more extensively discussed by Blanton, Carballo, Fargher, and Feinman (Blanton 2013; Blanton and Fargher 2016; Carballo and Feinman 2016).

We likewise focus on material goods, not the broader array of commodities that might have been subject to early exchange. There as yet appears to be no evidence of ancient markets for capital; those for land and labor appear to be rudimentary or sparse, whereas markets for commodities abound (Isaac 2013). Why we see these patterns is not yet clear. However, as behavioral ecologists, we presume that a major part of the answer lies in the best-choice decisions made by households about production, exchange, and market participation. Along with division of labor (Nakahashi and Feldman 2014), this is an important area for future research.

We use evolutionary ecology theory to inform our models; however, the models themselves are not evolutionary in the sense that we make case-specific or general predictions about specific steps in the progression from no markets to market exchange. Rather, we use behavioral ecology models to identify conditions that would favor or disfavor household-level participation in exchange, in primary or secondary contexts. We are less interested in what came first than in the factors must

we examine to understand the process. Archaeological, ethnohistory, and history will be the sources of empirical cases that show actual chronological development of marketing and marketplaces.

Finally, release from the antimarket mentality (Cook 1968) nurtured by substantivism invites exploration of the diverse forms markets and market participation may take, even within a particular society, and the varied problems they pose to analysis (Mayer 2013, p. 313; Stark and Garraty 2010, pp. 36, 56). Justly famous in anthropology is the spectacular Kula system (Malinowski 1920, 1921), in which nonutilitarian but deeply ceremonial arm shells and necklaces flowed from partner to partner in opposite directions around a circuit of some 18 widely separated Western Pacific Island communities. While the ritual prescriptions that guided the Kula partners in their pursuit of esteem received the most attention, it is important to note that others participated in Kula expeditions for the purpose of utilitarian barter in nonceremonial goods, food, and material items described by Malinowski as "articles of minor value, but of great utility" (1920, p. 105). In a game-theory simulation of the coevolution of these systems, Ziegler (2012) argues that the ceremonial and utilitarian aspects jointly are necessary for the system to function: the economic advantages of the utilitarian barter between villagers provides incentives to initiate and expand the development of the system, and the parallel ceremonial exchanges of the Kula partners ensure that trade was peaceful and they instilled trust in delayed trading relationships conducted over great distances. Analyzing iconographic imagery from Preclassic Izapa (Chiapas, Mexico) that often was interpreted as depicting mythic passage, Guernsey (2016) notes that they also show evidence of production, transport, and trade. Echoing Adam Smith's claim that division of labor and marketplace trade foster a cooperative, benevolent social order (Muller 1993), Usner (1987, p. 171) reminds us that in the lower Mississippi Valley, the "exchange of material goods represented political reciprocity between autonomous groups, while absence of trade was synonymous with war." These analyses highlight the complexity of markets and the potential for analyses that address the mutual implications of the economic and sociocultural elements in the evolution of exchange.

Conclusions

"Archaeologists need two things: better models of the domestic economy that accurately reflect household-level economic strategies and good historical and archaeological data to test them" (Hirth 2010, p. 242). Models developed in human behavioral ecology and development economics can shed light on the origins of market exchange by addressing the first of these needs. That is the substance of our argument in this paper. Human behavioral ecology also may aid in the second need (see below), although it is being addressed on multiple fronts by the development and deployment of archaeological methods to identify premodern exchange and marketing (Feinman and Garraty 2010, pp. 176–178; Feinman and Nicholas 2010; Glascock 2002; Minc 2006; Stark and Garraty 2010). Glascock (2002) and Hughes (2011b) present brief archaeological histories, and Blanton and Fargher (2016) provide an archaeological, ethnohistoric, and ethnographic overview of anthropological

studies of markets and marketing. Enhanced methods must be matched to a greater openness to the possibilities of prehistoric marketing where it has not yet been identified and expanded perspectives on how it might have occurred. With respect to the latter, Mayer (2013, p. 312) notes that marketing may have been overlooked in prehistory because it often was an activity of women; Stanish and Coben (2013, p. 421) suggest that gender may have influenced acceptance of Murra's (1972) nonmarket redistribution model of Andean exchange and the corresponding neglect of Rostworowski's (1981) evidence for markets.

Feinman and Garraty (2010, pp. 176–178) discuss six approaches being developed to detect marketing activity in the archaeological record, the first four of which were set out by Hirth (1998). By name and brief description they are *contextual* (e.g., inference based on necessity to provisioning an urban center), *spatial* (e.g., geographic central place theory), *configurational* (site layout and residues suggesting a marketplace), *distributional* (dispersion pattern of goods among households), *production–distribution* (distribution of goods relative to localized centers of production), and their own *multiscalar* approach (consideration of evidence from household to regional levels of analysis). To this set, we would add the *household economy* approach, acknowledging that it is closely related to the household distributional approach of Hirth (1998). Based on the models we have presented, there is a clear set of factors and conditions that foster or suppress the likelihood of household production for exchange, over and above that for consumption. Some of these are endogenous to the household, such as labor availability and its opportunity costs, and some are extraneous, e.g., transaction costs. As is typical for the other approaches listed above, household economy does not offer a definitive assessment of the presence or absence of market exchange. It is the case nonetheless that we can use household economy models to identify rather specifically the conditions that affect the *odds* of marketing.

We have presented two formal models and then mobilized archaeological and ethnographic evidence to suggest that the variables they incorporate are found routinely in cases where prehistoric marketing has been argued to be present. Our analysis is household-level, bottom-up (Hirth 2010, pp. 231–232) in form and seeks to develop theoretical guidance that is missing for the most part from anthropology and archaeology because of the long-standing influence of substantivism on these fields (Feinman and Garraty 2010, pp. 172–174; Feinman and Nicholas 2010, p. 85). With Golitko and Feinman (2015, p. 238), we get results challenging the "substantivist tradition of economic thought that has generated basic assumptions about ancient economies worldwide, emphasizing household agrarian production for local consumption, political control of distribution, and stable structure over long periods of time during the deeper past."

We find that several factors—environmental heterogeneity in production possibilities, social minimization of transaction costs, auspicious intrahousehold opportunity costs, efficient transport, goods characterized by low elasticity, the presence of commodity money—most likely must be present in combination to make marketplace exchange attractive to nonseparable or autarkic households. Relatively high population density enhances the potency of many of these factors and aligns them in the causal direction of promoting marketing. Our models point toward multicausality as

the default perspective on this problem (see also Blanton and Fargher 2010; Rhode 2011); they provide archaeologists a mechanistically sufficient framework of variables for analyzing the household-level origins and persistence of barter and trade in prehistory. By the variety and dynamism of the input factors they incorporate, the models give further impetus to the suggestion that marketing was diverse and historically dynamic.

Although we address origins in precapitalist societies, elements of our analysis also may apply to missing-market situations within what otherwise are contemporary commoditized, price-setting markets. Food deserts occur when poor, urban residents may not be able to pay the travel or opportunity costs to get to grocery stores outside their neighborhoods (Azuma et al. 2010). Convenience stores take advantage of the cost–benefit calculations discussed here by increasing prices in response to the difficulties customers face in seeking to travel to distant but less expensive outlets. Local, modern but extramarket economies based on barter are another example, and they are common when households lack money-generating incomes (Cellarius 2000). The circumstances are quite different but many of the trade-offs are the same as those at play in the prehistoric origins of market exchange by barter and trade.

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