Intergenerational Wealth Transmission and Inequality in Premodern Societies

Production Systems, Inheritance, and Inequality in Premodern Societies

Conclusions

by Eric Alden Smith, Monique Borgerhoff Mulder, Samuel Bowles, Michael Gurven, Tom Hertz, and Mary K. Shenk

CA+ Online-Only Supplement: Estimating the Inheritance of Wealth in Premodern Societies

Premodern human societies differ greatly in socioeconomic inequality. Despite much useful theorizing on the causes of these differences, individual-level quantitative data on wealth inequality is lacking. The papers in this special section provide the first comparable estimates of intergenerational wealth transmission and inequality in premodern societies, with data on more than 40 measures of embodied, material, and relational wealth from 21 premodern societies representing four production systems (hunter-gatherers, horticulturalists, pastoralists, and agriculturalists). Key findings include (1) the importance of material, embodied, and relational wealth differs significantly across production systems, with material wealth more important in pastoral and agricultural systems; (2) the degree of wealth transmission from parent to offspring is markedly higher for material wealth than embodied and relational wealth; (3) aggregate wealth is transmitted to a higher degree among pastoralists and agriculturalists; (4) the degree of inequality is greater for material wealth; and (5) the degree of intergenerational transmission of wealth is correlated with wealth inequality. Surprisingly, horticulturalists exhibit no greater wealth inequality or intergenerational wealth transmission than do hunter-gatherers, while pastoralists are very similar to agriculturalists. We discuss how these trends may have favored the emergence of institutionalized inequality, as intensified forms of production made material wealth transmission increasingly important.

The papers in this special section apply a uniform analytical approach to a diverse set of premodern societies, production systems, and wealth measures. The theoretical framework and methods are presented in the introductory paper, and the four empirical papers present and discuss the results for each of the production systems. Here we summarize the key findings and emergent patterns, assess what we have learned from this attempt to apply formal theory and consistent quantitative methods to understanding wealth transmission and inequality in premodern societies, and discuss possible avenues for further research.

These essays, and our project in general, offer three main contributions to comparative social science. First, we provide

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 0011-3204/2010/5101-0008$10.00. DOI: 10.1086/649029

data on a large number of societies, measuring many kinds of wealth in a consistent and rigorous fashion. Earlier comparative studies (e.g., Jorgensen 1980; Murdock 1981; Pryor 2005) have relied on qualitative ethnographic assessments of wealth variables at the societal level. Wealth transmission and inequality are typically indicated for a particular society using an ordinal scale, based on the ethnographer's impression rather than on actual measurements. Individual ethnographic studies of premodern wealth transmission (and comparable studies by historians and archaeologists) sometimes present quantitative data, but these are rarely comparable across societies. Recent studies by economic historians have provided valuable quantitative measures of inequality (if not intergenerational transmission of wealth) for many ancient state-organized agricultural and commercial societies (Milanovic, Lindert, and Williamson 2007) but not for the small-scale populations that we study here. By contrast, in this project we have employed a uniform set of methods to analyze quantitative individual-level data on multiple forms of wealth in a wide range of premodern production systems.

Second, this project systematically broadens the definition of wealth in ways appropriate to premodern, nonmonetized economies. As detailed in the preceding papers in this forum, we consider not only standard forms of material wealth such as land, livestock, and household goods but also various forms of embodied wealth (weight, strength, knowledge and skills, and reproductive success) as well as relational wealth (number of network links in various domains, such as exchange, alliance, and cooperative labor). This broader set of wealth measures should enhance our ability to develop an improved understanding of wealth transmission and inequality in premodern societies.

Third, we empirically document and analyze systematic links between production systems, intergenerational transmission of specific types of wealth, and varying degrees of inequality. It is to these linkages that we now turn.

Wealth Transmission

Wealth Classes

The introductory paper in this section (Bowles, Smith, and Borgerhoff Mulder 2010, in this issue) discusses our expectations concerning patterns of intergenerational wealth transmission. For reasons outlined there, we expect the degree of intergenerational transmission to differ markedly among our three wealth classes, with material wealth being more readily transmitted than embodied and relational wealth. Examination of the transmission coefficients (β's) for the three wealth classes, averaged across all production systems, reveals that this is the case: the average β for material wealth (0.37) is three times as great as that for embodied wealth ($\beta = 0.12$) and nearly twice as great as that for relational wealth ($\beta = 0.19$); these differences are both statistically significant ($P < .05$).

Embodied wealth. The 23 estimates of the intergenerational transmission of embodied wealth average 0.12 but range widely (as detailed in the paper on each production system). The highest estimates are for body weight (average $\beta = 0.37$). Most of these estimates come from hunter-gatherer populations; given the widespread food sharing found in many of these populations, access to food is unlikely to account for much of the parent-offspring weight relationship, and genetic variation may play a role (see Smith et al. 2010, in this issue). In contrast, reproductive success (number of offspring surviving to age 5) generally has very low transmission coefficients; β is effectively 0 in three societies, has a maximum value of 0.21 (among Kipsigis, a highly polygynous society where landholdings strongly determine number of wives [Borgerhoff Mulder 1990]), and averages 0.09, similar to low correlations between parental and offspring fertility found in many predemographic transition populations (Murphy 2007). Our measure of reproductive success is, of course, also a measure of fitness, which is not expected to be highly heritable at or near evolutionary equilibrium (Fisher 1958), although certain populations show considerable additive genetic variance in key life-history traits such as fecundity (Pettay et al. 2005). In most cases, knowledge and skill, such as agricultural production among the Pimbwe, proficiency in subsistence tasks and cultural knowledge in the Tsimane, and foraging success among the Ache and Hadza, are only weakly transmitted from parents to offspring; the exception to this is hunting success among the Tsimane ($\beta = 0.38$).

Relational wealth. We have six estimates of relational wealth transmission. To the extent that these are representative, they indicate that intergenerational transmission for this wealth class is moderate, with β averaging 0.19 and ranging widely (0.04–0.34). We suspect that the transmission of relational wealth will depend entirely on the type of network involved. In societies with a high degree of status differentiation, including most with intensive agriculture, the options for improving one's network beyond that of one's parents would seem to be quite limited, whereas in a more "open" social field, an enterprising individual might generate a large network of allies unhampered by the limitations of one's parents in this respect. However, our sample of relational wealth measures is too small and varied to evaluate this argument.

Material wealth. The average β is 0.37 for 14 measures of material wealth, including agricultural and horticultural land, livestock, shares in sea mammal–hunting boats, and household goods. For agricultural land, the degree of transmission is substantial, averaging 0.53 across four populations. Livestock are also highly transmitted across generations in our four pastoral populations, with β's averaging 0.67. These estimates for material wealth transmission in premodern societies equal or exceed the intergenerational transmission of most forms of wealth in industrialized market economies (Charles and Hurst 2003). High transmission levels would

appear to reflect the greater degree to which access to material wealth can be controlled, interacting with cultural norms regarding property rights and inheritance, as discussed in our concluding section. Variability in transmission levels across types of material wealth is likely due to at least two factors. First, wealth types that are subject to economies of scale are likely to show higher β's than wealth types that do not produce increasing returns to investment (Borgerhoff Mulder et al. 2009). Thus we find that some of our highest β's are for livestock wealth, and in a population where both livestock and land are measured (Kipsigis), the β for livestock is almost double that for land. Second, if material wealth is associated with higher fertility (and thus more heirs), wealth will become diluted across generations (resulting in lower estimates of β).

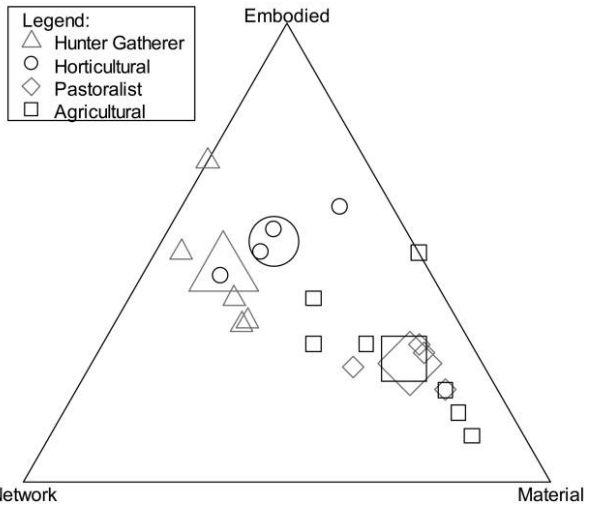

Figure 1. Relative importance of wealth classes (α) for individual populations, averaged for production systems. See text for explanation. The coordinates of each point in this ternary plot sum to 1; thus, the importance of material wealth for any population in the sample is given by the distance from the edge opposite the *Material* vertex, and so on. The larger symbols indicate the averages of each production system. A color version of this figure is available in the electronic edition.

Comparison of Production Systems

Although wealth classes differ in the constraints and opportunities they present for intergenerational transmission, we also expect that the relative importance of these wealth classes will vary across production systems. Ethnographic evidence (some of it summarized in the preceding papers) suggests that hunter-gatherers and horticulturalists depend heavily on strength, knowledge, and social networks to be successful, while making little use of material resources that are not widely available. By contrast, the well-being of a herder or farmer depends heavily on the amount of stock or land under his or her command, and these forms of wealth are scarce (relative to demand), making material wealth a more important influence on livelihoods in these production systems.

We drew on the judgments of ethnographers participating in this project to quantify the importance of each wealth class in each population in the sample, a parameter we label α. This parameter indicates the expected percentage difference in household well-being associated with a 1% difference in amount of a given wealth class, holding other wealth classes constant at the average for that population and requiring these percentage effects to sum to 100%. The values of α—the relative importance of the three wealth classes (embodied, material, and relational)—for each of the 21 societies studied in this project, as well as averages for each production system, are shown in figure 1. They suggest that embodied and relational wealth are relatively important for foragers and horticulturalists, while material wealth is key in pastoral and agricultural populations.

These independently derived judgments are remarkably similar within production systems (see preceding papers for details). They are also consistent with broader ethnographic accounts of how different production systems function (e.g., Johnson and Earle 2000). Subjective judgments of α are, of course, only an interim solution but certainly far preferable to ignoring differences in the relative importance of wealth classes between populations and production systems. In addition, published data from eight agricultural populations in Africa and South Asia allowed a statistical estimate of the relative importance of material capital (a component of α) for agriculturalists. The average estimate of this parameter is 0.56, not significantly different from the average of the ethnographers' estimates for the eight agricultural populations in our project (0.59). And since the sum of α components from the three wealth classes must equal 1, this high value for material wealth importance implies modest values for relational and embodied wealth importance, consistent with our estimates as well.

We use the production system and wealth class α values to calculate weighted average transmission coefficient (β) values for the populations in each production system, as shown in the rightmost entry in each panel of figure 2. These calculations produce markedly different estimates for the four production systems. Specifically, intergenerational transmission of wealth is modest in both hunter-gatherer and horticultural systems (α-weighted average β's of 0.19 and 0.18, respectively) but quite substantial in agricultural (0.36) and pastoral systems (0.43). Indeed, when we compare the β for hunter-gatherers and horticulturalists averaged together with the joint average for agropastoralists, we find a large (0.21) and statistically significant ($P < .001$) difference.

Thus, a key empirical finding of this project is that horticulturalists and hunter-gatherers are quite similar in their patterns of wealth transmission: both transmit wealth at relatively low rates and emphasize embodied and relational wealth over material wealth. In contrast, pastoralists and intensive agriculturalists rely heavily on land, livestock, technology, and other forms of material wealth and transmit this at high rates. Although these findings are consistent with the

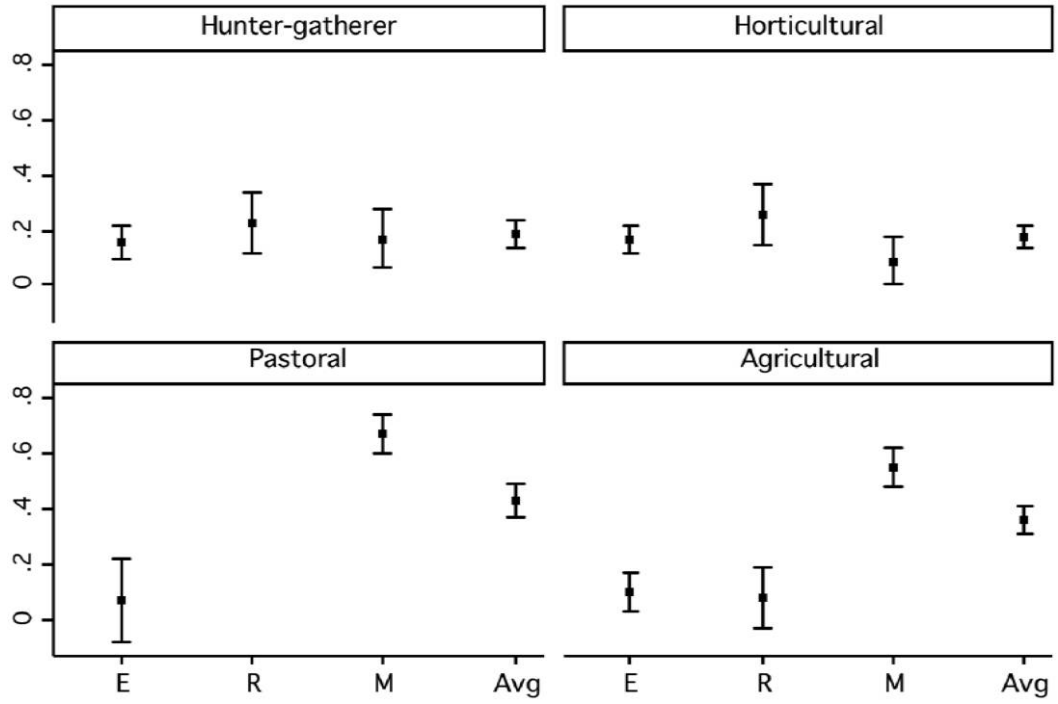

Figure 2. Estimated intergenerational wealth transmission (β) by production system and wealth class, including the importance of the (α)-weighted average for each system. Vertical bars indicate standard errors; α-weighted averages across wealth classes are calculated after weighting each wealth type/production system mean by the α values shown in figure 1. The β for Kipsigis cattle partners is used to estimate the pastoral/relational β as well as for calculating the pastoralist α-weighted average. E = embodied wealth; R = relational wealth; M = material wealth.

conventional wisdom regarding property in different production systems, this is the first time they have been demonstrated empirically using consistent methods on a set of fine-grained quantitative data from multiple populations. In addition, there are several novel aspects to our results.

First, the lack of substantive difference in α-weighted β averages of hunter-gatherer and horticultural populations implies that the greater degree of wealth transmission (and associated inequality) in agropastoral systems is not due to reliance on domesticated plants and animals per se, since horticulturalists also have such reliance. Rather, it likely is due to the more intensive forms of production and the elaboration of property rights associated with animal husbandry and intensive agriculture, an argument we return to in our concluding section.

Second, even the relatively small average β's found among forager and horticulturalist populations are not trivial; they imply that the luck of being born into the top (or bottom) of the wealth distribution confers quite significant advantages (or disadvantages). Specifically, our estimates imply that a child born into the highest wealth decile in hunter-gatherer and horticultural societies is more than three times as likely to end up in the top wealth decile as is a child born into the bottom wealth decile (for details of this calculation, see the CA+ online supplement "Estimating the Inheritance of Wealth in Premodern Societies" in the online edition of *Current Anthropology*). Yet this degree of intergenerational inertia is modest compared to that in pastoral and agricultural societies, where the child from the richest decile is about 16 times more likely to remain there than a child from the poorest decile. For comparison, the degree of intergenerational transmission of wealth in hunter-gatherer and horticultural populations is similar to the intergenerational transmission of monetary income in the Nordic social democratic countries of Denmark, Sweden, and Norway (where β averages 0.18), while the agricultural and pastoral societies are comparable to the United States and Italy (average $\beta = 0.43$), the advanced economies in which inequalities are transmitted most strongly across generations (Björklund and Jäntti 2009).

A third finding is that β for a particular wealth class varies across production systems. Thus, material wealth is weakly transmitted in foraging and horticultural populations ($\beta = 0.13$) but strongly transmitted in agricultural and pastoral populations ($\beta = 0.61$). Similarly, both relational and em-

bodied wealth are transmitted at twice the rate in hunter-gatherer and horticultural populations than in agricultural and pastoral populations (fig. 2), although neither of these differences is statistically significant. Further analysis of the α-weighted average β's shows that 45% of the large (namely, 0.21) and statistically significant difference ($P < .001$) between the average α-weighted β's of the two categories of production systems is accounted for by differences in the α's across the two pairs of production systems, holding the β for each class of wealth at its mean across all production systems. The remaining 62% is due to differences in the β's, holding each α at its mean across all four production systems (for details of this analysis, see the CA+ online supplement). This means that while transmission of a given wealth type is partially determined by its inherent features, transmission is also strongly affected by the production system in which it is embedded.

Finally, our comparative quantitative analysis shows that the more important a wealth class is in a particular production system (as estimated by α), the higher its degree of intergenerational transmission (β). This is clearest in the case of material wealth: in pastoral and agricultural societies, its average importance (α) is 0.60 and the average transmission coefficient (β) is 0.61, while in hunter-gatherer and horticultural populations, $\alpha = 0.18$ and $\beta = 0.13$. Similarly, embodied wealth is about twice as important in hunter-gatherer and horticultural societies as among pastoralists and agriculturalists, and the corresponding average β's are equally divergent (though not significantly so). In fact, the overall correlation between the production system– and wealth class–specific mean α's and β's is quite strong (fig. 3). This finding is consistent with the hypothesis that parents seek to enhance the success of their offspring by differentially transmitting to them the forms of wealth that are most important in that society (e.g., Hartung 1982; Holden, Sear, and Mace 2003). In effect, it appears that parents are making a particular effort to pass on to their offspring those forms of wealth that have the highest marginal value for enhancing well-being.

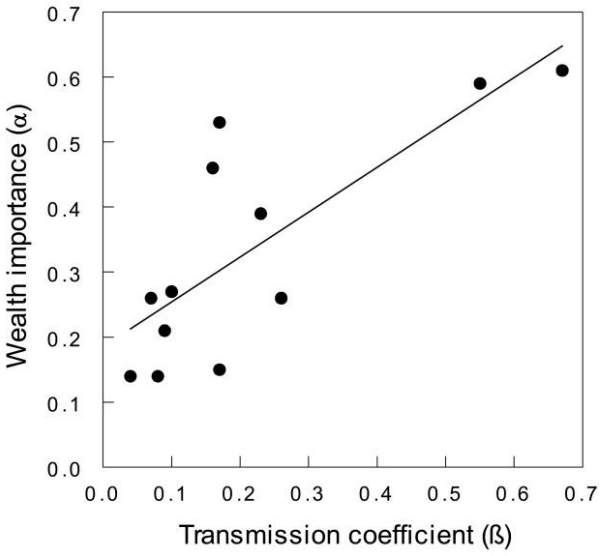

Figure 3. Relationship between the wealth class and production system averages of wealth importance (α) and intergenerational wealth transmission (β). The correlation is positive and significant; $r = 0.78$, $P < .01$.

Wealth Inequality

Are production systems in which wealth is more transmissible also more unequal? To answer this question, we have used the household-level data on various wealth measures in each population to estimate Gini coefficients, a widely used measure of inequality that generates values from 0 (equal wealth) to virtually 1 (all wealth held by a single household). The Ginis for each wealth measure are provided in the preceding papers in this special section; we use these to compute averages for each wealth class in each production system (fig. 4). To calculate an overall measure of wealth inequality for a given production system, we then weight the average inequality of each wealth class in that production system by its importance (α).

These estimates of overall wealth inequality (rightmost entry in each panel of fig. 4) exhibit the same pattern as the β transmission coefficients (fig. 2). Specifically, hunter-gatherer and horticultural populations both exhibit quite modest levels of inequality (α-weighted average Ginis of <0.2), while pastoral and agricultural societies are characterized by more substantial average Ginis (ca. 0.4–0.5). This pattern is due to several causes, but prominent among them is the higher degree of inequality in material wealth that is characteristic of all four production systems (fig. 4); this interacts with the greater importance of material wealth (α) in pastoral and agricultural populations to produce the higher aggregate inequality for these populations.

It is also very noteworthy that the degree of aggregate wealth inequality is no greater in horticultural than in hunter-gatherer populations and is correspondingly almost as high among pastoralists as among agriculturalists. The high Gini for pastoralists counters the commonly held although now contested view that pastoralists are egalitarian (Salzman 1998; Schneider 1979). As discussed by Borgerhoff Mulder et al. (2010, in this issue), the ideological emphasis on egalitarianism, generosity, and leveling mechanisms does not in the end produce an egalitarian distribution of wealth, particularly material wealth.

To put these figures in perspective, the Ginis for foragers and horticulturalists match the lowest values found for modern nations (Denmark's 0.25, Finland's 0.27), while the agropastoral Ginis are comparable to those found in the United States (0.41) and Venezuela (0.48; UNDP 2009; World Bank 2009).

It is worth noting that low Gini coefficients do not mean everyone is the same. Among the Ju/'hoansi, for example,

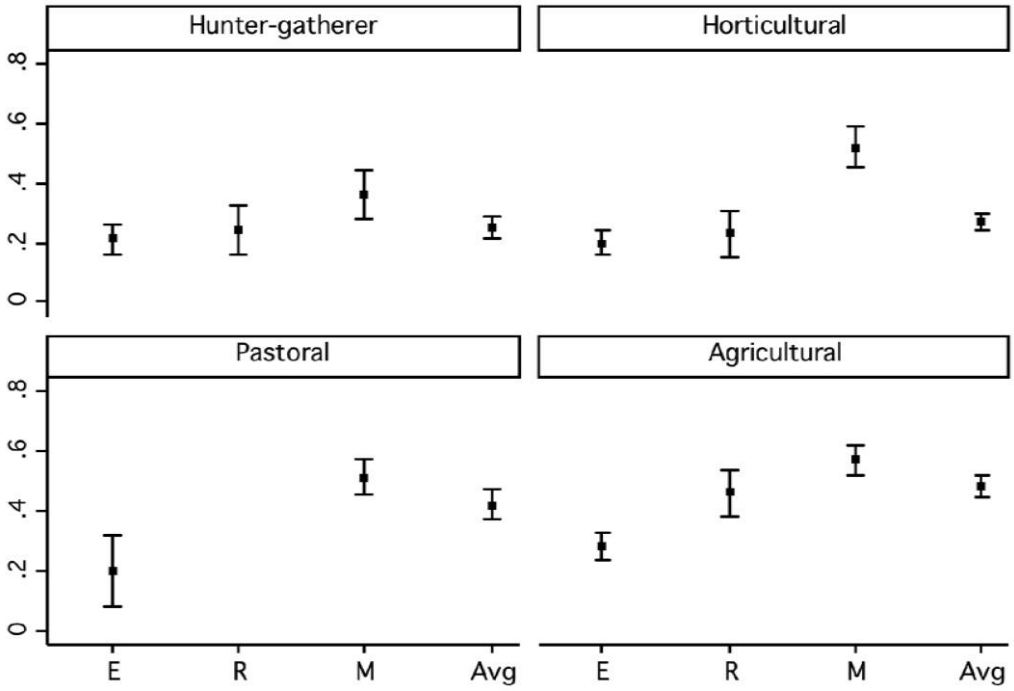

Figure 4. Extent of wealth inequality (Gini coefficients) by production system and wealth class. Vertical bars indicate standard errors; the α-weighted averages for each production system are calculated after weighting each wealth type/production system mean by the α values shown in figure 1. The Gini coefficient for Kipsigis cattle partners is used to estimate the pastoral/relational Gini as well as for calculating the pastoralist α-weighted average. E = embodied wealth; R = relational wealth; M = material wealth.

equality does not mean sameness, and there is a great emphasis on groups having members with very different skills. If one person in a group excels in one niche such as music, healing, or a certain technique of hunting, others will give him or her space and seek recognition in different areas; if one person tries something new and succeeds, there is very little direct imitation (Polly Wiessner, personal communication).

There is a reasonably strong correlation between intergenerational wealth transmission (β's) and wealth inequality (Gini coefficients) for the full set of wealth measures (fig. 5). This is consistent with the arguments linking transmission rates with inequality presented in the lead paper for this section (Bowles, Smith, and Borgerhoff Mulder 2010). It is important to remember that the predicted association between intergenerational transmission and inequality will be attenuated unless the wealth shocks to which individuals are exposed differ across systems. The β-Gini association shown in figure 5 suggests that variation in the magnitude and impact of shocks averages out across our sample of 21 production systems and 43 wealth types. Because we lack empirical data on the magnitude and impact of shocks, and the smaller sample sizes for each production system made the averaging assumption problematic, we did not investigate these relationships within production systems.

Conclusions and Prospects

Summary of Key Findings

The set of papers in this special section advance an explanation of variation in inequality across societies in terms of differential intergenerational transmission of their most important kinds of wealth. They provide theoretical and empirical reasons to support a series of linked claims: (1) the importance of material, embodied, and relational wealth differs significantly across production systems, with material wealth more important in pastoral and agricultural systems; (2) the degree of wealth transmission differs markedly by wealth type, with material wealth more highly transmitted than embodied and relational; as a result, (3) aggregate wealth is transmitted to a higher degree in pastoral and agricultural populations; (4) the degree of inequality is greater for material wealth than for embodied or relational wealth; and (5) the

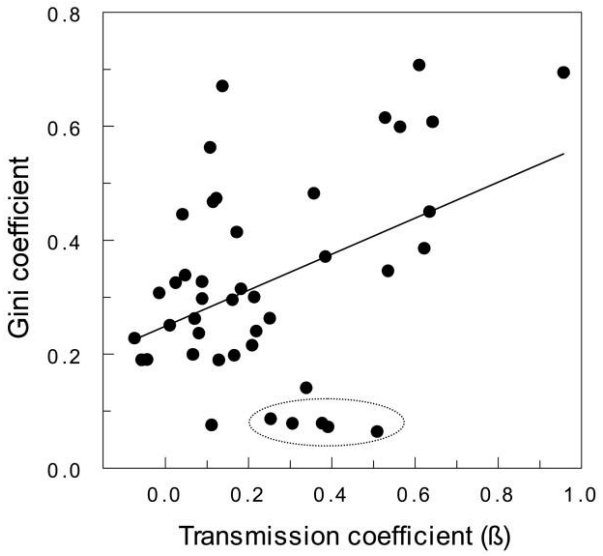

Figure 5. Relationship between inequality (Gini coefficients) and intergenerational transmission (β's) for all wealth measures. Correlation is positive and significant; $r = 0.41$, $P < .01$. The dashed oval contains the points for body weight, which deviate from the overall trend.

degree of intergenerational transmission of wealth is correlated with the degree of inequality of wealth, both within populations (e.g., by wealth measure or wealth class) and across them (e.g., by production system). We thus conclude that over the long run wealth inequality was minor in hunter-gatherers and horticulturalists, at least in part because the modest degree of transmission of the most important kinds of wealth—embodied and relational—limited the accumulation of inequalities from generation to generation. By contrast, in the pastoral and agricultural production systems that displaced many forager and horticultural populations during the Holocene, the high α-weighted β's for material wealth supported substantial levels of persistent (transgenerational) inequality.

Prospects

This project on intergenerational wealth transmission in premodern societies, summarized in this paper and detailed in the preceding four papers on specific populations and production systems, explores new ground in ecological-economic anthropology and comparative economics. Like any exploratory research, it raises more questions than it answers, and it calls out for extension, replication, and critical evaluation. In this final section, we briefly raise some likely directions for such future work.

Wealth complementarity. Much of our analysis turns on the differences in transmission rates (β) and importance (α) between categories of wealth (embodied, material, and relational). However, this does not imply that the levels of each type of wealth held by an individual are uncorrelated or that these wealth classes affect household well-being independently. The Cobb-Douglas production function that underpins our use of α parameters defines aggregate wealth as a weighted product of the levels of each wealth class (the weights being the α's), and as a result, the wealth classes are complements. This means that the marginal product of each type of wealth varies positively with the amount of other types of wealth; for example, an increase in the size of one's herd contributes more to one's aggregate wealth if one is healthy than if one is not. The complementarity of wealth types provides one (among many) reasons to expect the distinct wealth levels to be positively correlated, so that, for example, successful hunters might have both greater reproductive success and larger sharing networks. Further research is called for to explore such complementarities and their role in fostering inequality.

Relational wealth. One of our three wealth classes, relational wealth, accounts for only six (14%) of our 43 wealth measures. This mirrors the underrepresentation of quantitative measures of relational capital in the anthropological literature. Clearly, we need much more data on relational wealth and its ecological and social context. As noted above, we suspect that the transmissibility of relational wealth will depend both on the specific kind of network involved and on the degree of status differentiation in a given society.

Partible inheritance. Wealth types necessarily vary in the extent to which they are partible or impartible, which raises two issues, one concerning estimation of β and another concerning inequality. With regard to the first, specifically, the effects of primogeniture versus an equal wealth division on measuring β, we need to consider potential sample biases and possible associations between wealth and number of inheritors. At one extreme, if all noninheriting sons exit the population, and if there is no correlation between wealth and number of sons, then the β estimate will not be biased. But if rich parents have more sons on average, and they all inherit parental wealth and remain in the population, then β will be overestimated. If only the disinherited sons of the poor emigrate (because disinherited sons of the rich have alternative sources of wealth), then β will be underestimated (because we have overstated the wealth of poor sons by missing those who immigrate). There are, of course, many other combinations, all of which require a more nuanced analysis.

With regard to the implications for inequality, partibility of inheritance may be crucial. Impartible inheritance generates greater variance in second-generation wealth than does partible inheritance, variance that may be important for developing and maintaining inequality. Indeed, a focus on partibility and impartibility may suggest new research questions we do not have room to address here (Paul Leslie, personal communication). For example, do intrafamily inequalities in the transmission of material, somatic, and relational wealth

reinforce one another, or is intergenerational transmission deployed strategically to compensate for such inequalities?

Pastoralism and agriculture. The similarity of pastoralists to agriculturalists in wealth transmission and inequality measures could be due to the fact that several of the pastoralists studied in this project are transhumant pastoralists, and many engage in some farming (as is typical of lower-latitude pastoralists). However, it should be noted that less intensive forms of cultivation, as reflected in the data on horticulturalists, exhibit a very different pattern that emphasizes embodied wealth (especially somatic wealth) and relational wealth over material wealth (figs. 1, 2; see also Gurven et al. 2010, in this issue). Our findings suggest an alternative interpretation for the pastoralist-agriculturalist similarity in wealth and inequality measures, namely, that their primary reliance on certain forms of material wealth is part of a fundamental shift in wealth accumulation and intergenerational transmission, with one result being increased inequality. This is consistent with previous work suggesting that wealth transmission and inheritance may motivate restricted fertility even among high-fertility traditional pastoralists (Luttbeg, Borgerhoff Mulder, and Mangel 2000; Mace 2000). More broadly, this suggests that pastoralists and agriculturalists may reflect two versions of an economic and productive strategy emphasizing material wealth coupled with household or lineage property rights; depending on the regional ecology and competition with other populations, some emphasize pastoralism and others intensive agriculture.

Emergence of institutionalized inequality. Our finding that the overall intergenerational transmission of wealth is no greater in horticultural than in hunter-gatherer populations is provocative. It suggests that, contrary to the many models of the emergence of institutionalized inequality, the domestication of plants and animals per se may not have been sufficient. Instead, persistent inequality may have depended on subsequent developments associated with intensified forms of cultivation and animal husbandry represented by agriculture and pastoral livelihoods. Among these developments, we would argue that increased economic defensibility is critical. Economic defensibility refers to sufficient density and spatiotemporal predictability of resources to repay the costs of territoriality—that is, the defense of property by individuals or kin groups (Cashdan 1992; Dyson-Hudson and Smith 1978). Horticulturalists rely on domesticates, but this production system is characterized by abundance of land relative to labor and, hence, low payoffs to defending property rights at the household level (Harrell 1997). Only when land becomes scarce enough can it repay the social and economic costs of excluding some members of one's group in order to retain long-term control of arable land. This scarcity in turn drives technological and ecological investment such as plowing, irrigation, and terracing, which increase the incentive for control and transmission to descendants.

If plant and animal domestication is not sufficient to stimulate institutionalized inequality, it is also not always necessary. Ethnographers and archaeologists have long noted the existence in various times and places of hierarchical hunter-gatherer societies with marked inequalities in wealth and status (Arnold 1996; Hayden 1994; Kelly 1995; Price and Brown 1985)—cases that are an embarrassment for simplistic correlations of subsistence mode and sociopolitical factors. Although extant hunter-gatherer populations do not include any hierarchical systems and therefore none could be included in our sample populations, the ethnography leaves little doubt that if their β's and Ginis could be measured, they would be substantial. The best-described examples of such hierarchical foragers are the various societies of the North Pacific Rim, from Aleut to Coast Salish. Most focused their subsistence production on rich marine resources, particularly salmon runs; and again, the density and spatiotemporal predictability (hence, economic defensibility) of key resources, enhanced in this case by fish traps and extensive storage, would reward the defense and intergenerational transmission of property rights, favoring the emergence of persistent inequality.

The egalitarian ethos of most hunter-gatherer societies in the ethnographic record (Boehm 2000) and the limited wealth inequalities in our hunter-gatherer estimates are consistent with the view that, at least prior to some 20,000 years ago, economic inequalities between families were quite limited. Although scattered evidence of economic inequality predates the Holocene (Formicola 2007; Pettitt and Bader 2000; Soffer 1989; Vanhaeren and d'Errico 2005), the Holocene saw the emergence of permanent inequality in many populations, eventually culminating in the rise of class societies and the hierarchical ancient states (Ames 2007; Carneiro 1970; Price 1995; Wright 1978). Our model and accompanying empirical evidence suggest that the modest degree of intergenerational transmission of hunter-gatherers' most important kinds of wealth—embodied and relational—limited the accumulation of inequalities from generation to generation. In contrast, the new forms of wealth that resulted from the domestication of plants and animals were highly heritable, as discussed above. As a result, where economic institutions and social norms permitted intergenerational transmission, the inequalities of one generation could be reproduced in the next, accounting (at least in part) for the fact that the pastoral and agricultural production systems that replaced many forager and horticultural societies supported substantial levels of persistent inequality.

In sum, our findings resonate with the argument that controlling access to economically defensible resources such as intensively worked land *or other scarce resource-producing sites* (e.g., salmon streams, livestock herds, trade routes) is a potent contributor to the emergence and persistence of high levels of inequality (Boone 1992). Whatever the fate of this particular argument, we believe rigorous analysis of this and other accounts of the emergence and dynamics of institutionalized inequality in human societies will benefit from use of system-

atic quantitative measures of individual-level wealth transmission such as the ones developed in this project. In addition, theory building and improved understanding of these critical issues will require greater integration of economic and evolutionary approaches, a goal to which we have made a modest contribution here.

Acknowledgments

Financial support for this research was provided by the Behavioral Sciences Program of the Santa Fe Institute and the U.S. National Science Foundation. We are grateful to Patrizio Piraino and Suresh Naidu for help with the figures and to Adrian Bell and Bret Beheim for quantitative support. Finally, we thank the other participants in this project for the sustained intellectual, relational, and material contributions they have made.

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