Heterogeneous wealth dynamics: On the roles of risk and ability

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Herd dynamics of Boran Pastoralists

Contemporary policy debates are rife with discussions of “poverty traps” which describe structural features of the state of poverty that cause it to persist. Different factors may give rise to different types of poverty traps: there may be groups within a population for whom there exists a unique equilibrium associated with persistent poverty and others who face multiple equilibria and thus face wealth dynamics conditioned by their starting positions. As the policy implications of the different poverty-trap generating mechanisms are markedly different, it is important to identify the causal mechanisms behind apparent poverty traps. The research described in this brief investigates the wealth dynamics of Boran pastoralists in southern Ethiopia and highlights the role that poor weather and herder-specific ability to cope with such shocks play in conditioning wealth dynamics. Building on recent evidence of nonlinear herd dynamics consistent with the hypothesis of poverty traps, the authors find that Boran pastoralists with low ability converge towards poverty regardless of the herd size with which they start with, while those of higher ability exhibit multiple wealth equilibria.

Data

Several data sets, all based on Boran pastoralist households drawn from 4 communities in southern Ethiopia (Arero, Mega, Negelle and Yabello), were utilized. The first data set involved a recall exercise among sample households that allowed for the construction of reliable panel data reflecting 17 years of herd histories. The second data set, collected from different households in the same four communities, consists of household data collected every three months, March 2000 - June 2002, and then annually each September-October starting in 2003. The data include detailed information on household composition, migration histories, changes in herds, shocks, etc.

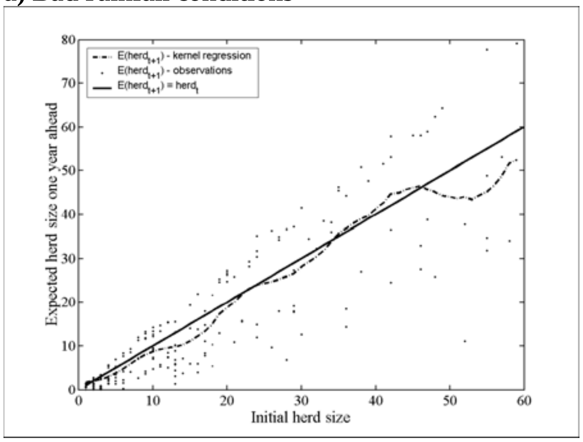
Using this same set of households, the third data set consists of subjective expectations of herd dynamics that collected in the following way: the authors started by randomly selecting four hypothetical initial herd sizes for each respondent, one size within each range of previously estimated herd dynamics. Conditional on their seasonal rainfall expectation (good, normal, or bad), the authors then elicited each respondent’s subjective, one-year-ahead herd size distribution.

Expected Herd Dynamics

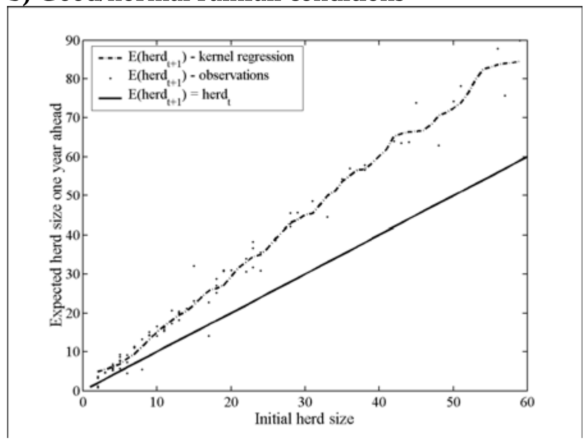
Figure 1 below presents the scatter plot and kernel regressions (smoothed continuous version of the scatter plot) relating the one year ahead expected herd size and the initial herd size, conditional on rainfall expectations (bad vs good/normal). The difference is striking and shows that under good or normal climactic conditions, herders expect herds to grow no matter the initial herd size. Under bad conditions, however, expected (negative) growth is dependent on the initial herd size.

Figure 1: Expected herd dynamics conditional on rainfall conditions

a) Bad rainfall conditions



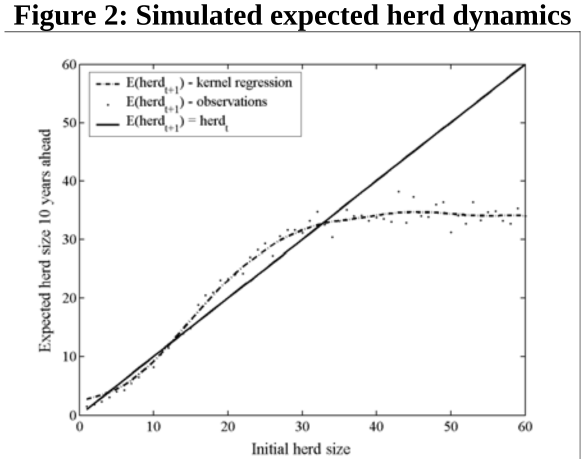
b) Good/normal rainfall conditions



The dispersion around the expected values is also much bigger under bad rainfall conditions than in a good or normal year: if this is due to differences in individual herding ability, it would seem that ability matters most when times are tough.

Based on this year-ahead expectations conditional on rainfall, and using data on the actual rainfall (from the period 1991-2001) the authors simulate the expected 10-year ahead herd dynamics. These results, presented in Figure 2, are remarkably similar to the dynamics revealed by actual herd history data collected amongst households in the area, both in the general shape of the curve as well as in the location of the different equilibria This suggests that Boran pastoralists have a remarkably accurate understanding of the nature of how their herds evolve, including the implied existence of poverty traps. That is, they expect that someone with a small herd - below approximately 12 cattle - will not accumulate wealth, but will instead collapse towards a destitute, sedentarized equilibrium with just one animal.

Figure 2: Simulated expected herd dynamics

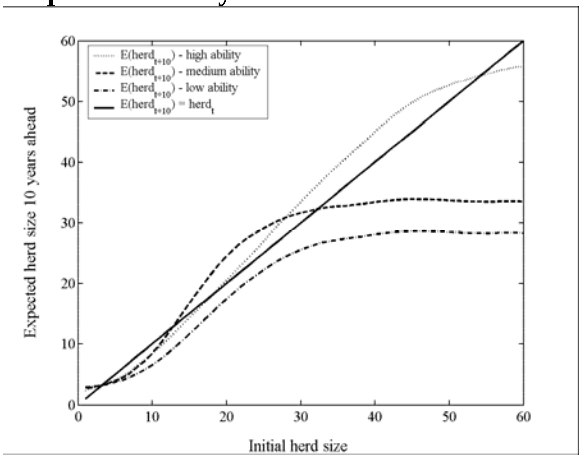


Ability and Expected Herd Dynamics

The considerable interhousehold dispersion of beliefs about herd dynamics under adverse states of nature (see Figure 1a) suggests that herder-specific characteristics, perhaps especially unobserved husbandry skills, play a central role in conditioning herd dynamics. The authors investigate this hypothesis through a two-step process: first, they use panel data on actual herd size for these households, collected in the period 2000-03 as part of the PARIMA project, to estimate individual herder ability. After dividing the sample into three sub-samples based on herder ability - low, medium and high - they then again simulate the 10-year ahead expected herd size conditional on ability.

Figure 3 is the analogue of Figure 2 for each of the three ability classes. The results suggest that herd dynamics indeed differ across herder ability. In particular, low ability herders face a unique dynamic equilibrium at a low welfare level, giving rise to a different sort of poverty trap than that faced by medium and high ability herders, who expect to accumulate wealth if (and only if) they start with an adequate herd size.

Figure 3: Expected herd dynamics conditioned on herder ability



Expected growth, inequality and the efficacy of post-drought herd restocking

When the authors take into consideration the role individual difference in herder ability plays in shaping herd dynamics, they find that both average herd size and wealth inequality increase over time, as low ability herders collapse into destitution while higher ability herders are able to maintain or even grow their herds. The natural dynamic of the system is thus towards polarization between viable herders and stockless pastoralists. These different subpopulations require different forms of support.

This raises natural questions about existing interventions that do not take herd dynamics and herder ability into account, such as herd restocking, perhaps the most common form of post-drought assistance provided to pastoralists in the region. The authors simulate household herd dynamics under three alternative (equal cost) restocking intervention designs. In the first, which roughly mirrors current practice in the region, the poorest households with livestock are given animals to boost their herd to five cattle. In the second scenario, stock transfers are targeted not to the poorest first but rather in order to maximize expected herd growth from the transfer, assuming there exists no effective mechanism to elicit herder ability. Finally, a third option again targets transfers so as to maximize asset growth, but now assuming one can accurately identify herders by ability group. The results (Table1, below) reveal a tradeoff between the number of beneficiaries, the size of the average transfer and the ex ante wealth of beneficiaries, with scenario 1 providing fewer animals to more and poorer recipients, scenario 3 providing more animals to fewer and wealthier beneficiaries, and scenario 2 lying between these two.

Table 1: Expected effects of restocking under different targeting assumptions

	Scenario	Number	Average Transfer	Average herd size (2003)	Expected herd size (2013)		Expected gains from transfer
					w/ transfer	w/out transfer	
1	Beneficiaries	17	2.12	2.88	4.06	2.71	1.35
	Non- Beneficiaries	80	0	14.86	12.05	12.05	-
2	Beneficiaries	13	2.69	12.54	14.63	11.48	3.15
	Non- Beneficiaries	84	0	12.80	10.25	10.25	-
3	Beneficiaries	9	4.00	13.22	24.15	15.26	8.89
	Non- Beneficiaries	88	0	12.72	14.54	14.54	-

As one would expect based on the estimated growth dynamics in the system, restocking targeted to the lower levels of wealth fails to promote growth among the poor, suffering a -4.4% compound annual return on investment in transfer resources, given expected herd losses below the critical herd size threshold. The growth-promoting impacts of herd restocking become more satisfactory in the other two scenarios. Under scenarios 2 and 3, the average net returns to this policy after 10 years are 17% and 122%, respectively, showing that the growth payoff to identification of a reliable mechanism for identifying herding ability is potentially considerable since herder skill seems to matter a great deal to herd dynamics.

Conclusion and Policy Implications

This research shows that southern Ethiopian Boran pastoralists understand the nature of herd dynamics revealed by herd history data. Moreover, their responses enable us to unpack the herd history data highlighting that the mechanisms that trap people into poverty are diverse. Specifically, even among a homogeneous population with only one livelihood option – livestock herding – differences in structurally important factors, i.e. herding ability, can critically affect wealth trajectories.

The policy consequences of these results are important. For those of low herding ability, livestock transfers – e.g., through restocking projects – seem an unwise investment. Identifying herders' unobserved ability may be difficult, and may require community-based targeting methods to take advantage of local information unavailable to central governments and external donors and NGO's. For higher ability herders, the results suggest a need for safety net programs that safeguard minimum herd sizes – e.g., through water point improvements, veterinary treatments, supplemental feed deliveries – or provide restocking to at least the critical threshold necessary to resume herd growth.

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