TECHNICAL COMMENT

CONSERVATION ECONOMICS

Comment on "Using ecological thresholds to evaluate the costs and benefits of set-asides in a biodiversity hotspot"

Christopher Finney

Banks-Leite *et al*. (Reports, 29 August 2014, p. 1041) conclude that a large-scale program to restore the Brazilian Atlantic Forest using payments for environmental services (PES) is economically feasible. They do not analyze transaction costs, which are quantified infrequently and incompletely in the literature. Transaction costs can exceed 20% of total project costs and should be included in future research.

Banks-Leite *et al*. assess the economic cost of a program to restore priority landscapes in the Brazilian Atlantic Forest to 30% forest cover (*1*). They include the costs of fieldwork and of payments for environmental services (PES), but not transaction costs. This reflects both the lack of reliable data on the Atlantic Forest and a broader gap in the PES literature. The authors conclude that such a program would be economically feasible. The economic logic of PES is compelling, but a clear understanding of transaction costs is needed before we can conclude that PES is cost-effective at either the pilot scale or the large scale the authors envision.

PES are a mechanism to internalize environmental externalities, an approach that can be more efficient than other policy instruments, first proposed by Coase (*2*). Coase emphasized the importance of transaction costs: PES can increase welfare only if the value of services gained by beneficiaries is greater than the combined value of the transaction cost and the opportunity cost to service providers. To illustrate, if a water utility saves US$6 per year in water-treatment costs for each acre of upstream forest conserved, and upstream ranchers have net profit of US$4 per year for the same acres, a contract in which the utility pays a rancher US$5 per acre conserved per year will benefit both parties, but if the transaction cost is US$3 per acre per year, there is no payment level that increases overall welfare.

The most complete review (*3*) to quantify transaction costs reports relatively high startup transaction costs (the equivalent of 10 years of PES payments in some cases) and much lower recurrent transaction costs (roughly equivalent to the annual payment amount in many cases). Even that study, however, reported insufficient data for at least 6 of 13 cases (*3*). This is true even of exemplary projects such as Vittel, where the transaction costs of public partners could not be quantified (*4*). Fonafifo, in Costa Rica, is the only large-scale PES program to have specified transaction costs in the literature: Government transaction costs are limited to 7% of total program cost, and landowners bear costs of 12 to 18% of PES (*5*).

Transaction costs have not been studied in PES projects in the Atlantic Forest, and even detailed economic analyses do not quantify transaction costs (*6*). The case studies used by Banks-Leite *et al*. provide very limited information on transaction costs (*7*). Gray literature on one case shows a transaction cost of 21% of total project cost, compared with PES of 23% (Table 1) (*8*), which comports broadly with the values reported in the literature but probably underestimates transaction costs incurred by project partners. Qualitatively, the chapters on carbon (*9*) and water (*10*) from Guedes and Seehusen cite high transaction costs as an important challenge. Overall, transaction costs for PES in the Atlantic Forest are not well understood, but they are not trivial.

Transaction costs may be a particularly important barrier to scaling up pilot projects, as envisioned by Banks-Leite *et al*. This is because small projects can obscure economic inefficiencies in three ways that are less likely to apply to large-scale projects.

First, many PES projects involve several funders, intermediaries, and service providers. The projects cited by Banks-Leite *et al*. report a mean of 4.9 partner agencies, not including contractors (*7*). In these arrangements, individual actors bear only part of the transaction cost, so they may not reject the program even if total transaction costs exceed the benefits received by service users, as the theory posits. In effect, the existence of a project says little about the underlying economics. Large-scale arrangements may also distribute transaction costs, but the associated policy analysis must include all transaction costs.

Second, outside actors often subsidize pilot projects, masking transaction costs. For example, several water-related cases are supported by international donors, which are not service users. If the economic viability of the PES system depends on subsidies, and the subsidies themselves are not scalable, the PES approach is confined to the pilot project scale.

Third, pilot projects sometimes explicitly disavow efficiency goals, in the name of creating scalable models. This assumes that per-unit transaction costs fall in larger projects, which has not been tested. Some costs—property-by-property monitoring for example—may be stubbornly resistant to efficiencies of scale.

In addressing the question of the feasibility of PES as a large-scale conservation approach for

Table 1. Reported costs of the Conservador das Águas Extrema project (*7*).

Classification	Item	Cost (Brazilian real, R$)	Percentage of total cost
Transaction	Project construction	20,000	1
	General assessment	36,000	2
	Management	170,000	8
	Property mapping	70,000	3
	Monitoring	150,000	7
	Subtotal	**446,000**	**21**
Fieldwork	Forest restoration	667,000	31
	Fencing	276,000	13
	Soil conservation	293,000	13
	Subtotal	**1,236,000**	**57**
PES	PES	490,000	23
	Subtotal	**490,000**	**23**
Total		**2,172,000**	**100**

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Brazil's Atlantic Forest, several unanswered questions deserve attention:

1) What are the full transaction costs of existing PES initiatives?

2) Costa Rica's Fonafifo, which operates at scale, reports transaction costs of 19 to 25% of total project costs. Can economies of scale substantially reduce transaction costs in the Atlantic Forest?

3) Some authors point to the newness of PES as a source of high transaction costs. Can identifying and disseminating good practices reduce start-up transaction costs?

4) Other conservation mechanisms also have transaction costs. How do those differ from PES transaction costs?

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