ETHNOBOTANICAL KNOWLEDGE AND ECONOMIC DEVELOPMENT
A CASE STUDY FROM THE TSIMANE' AMERINDIANS, BOLIVIA

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BACKGROUND

- Ethnobotanical knowledge accumulated over generations but is now being loss[1,2].
- Preserving ethnobotanical knowledge matters to:
  - **Indigenous peoples** because it helps them protect their nutrition[3] and health[4] and manage their habitats[5,6];
  - **Science** because it contributes to research in medicine, agriculture, botany, zoology, and hydrology; and
  - **The Environment** because it contributes to ecological adaptation and might help design policies for conservation[7].
- Previous research has been unable to identify the causes of loss of ethnobotanical knowledge. Some researchers have linked the loss of ethnobotanical knowledge to the expansion of the market economy[8], whereas others have found persistence in ethnobotanical knowledge despite large socio-economic changes[9].
- The topic matters because if ethnobotanical knowledge vanishes with economic development, then economic development comes at the cost of losing humanity's heritage and diversity.

OBJECTIVES

1. Test how various forms of integration to the market economy affect individual levels of ethnobotanical knowledge: We hypothesize that only economic activities that take individuals out of their culture and environment will correlate with the loss of ethnobotanical knowledge.
2. Test a new method for measuring ethnobotanical knowledge based on the skill that drawn on ethnobotanical knowledge
3. Evaluate the correspondence between the measure of practical skills and conventional measures of theoretical ethnobotanical knowledge.

METHODS

Research took place between May 2002 and November 2003 among Tsimane', a foraging and farming society of ~8,000 people in ~100 villages in the Bolivian Amazon.

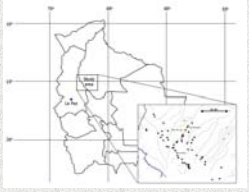

Figure1. Study area

The People

Tsimane' reached the middle of the 20th century in relative isolation, but are now in the early stages of continuous transition to a market economy. Tsimane' subsistence centers on hunting, fishing, and horticulture[10]. Tsimane' take part in the market economy in two ways. Some earn cash by selling forest and agricultural goods – activities that take them to the forest and keep them in their culture– but others earn cash by working as unskilled wage laborers for farmers and ranchers – activities that take them away from the forest and their culture.

Hunter-gatherers

and horticulturalists

- Tsimane' reportedly know 414 different species of wild plants, of which only 46 plants (11 %) had no recorded use. The remaining 368 plants had a total of 571 different uses.
- Tsimane' employ only about half of the uses of plants they know with important differences between settings[11].

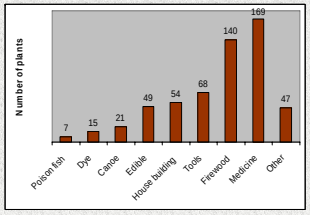

Figure 2: Uses of 414 wild and semi-cultivated plant species by the Tsimane'

Variables and Descriptive statistics

We interviewed all adults (>15 years of age) in 13 villages Tsimane' along the Maniqui river, for a total of 229 men and 247 women.

Variable	Definition	Mean	Std Dev.	Min	Max
Dependent					
Share of wage	Share of wage earnings in total yearly personal income	16	25	0	96
Share of sale	Share of earnings from sale of goods in total yearly personal income	22	23	0	92
Explanatory					
Knowledge	Agreement with the sample on uses of 21 randomly-selected plants	0.56	0.20	0.05	0.95
Skills	Score in a test of ability to make 18 objects from plants	4.1	1.82	0	10.1
Control					
Age	Age of participants, in years	34.4	15.02	15.0	90.3
Male	Sex of participant (male=1; female=0)	0.5	0.50	0	1
School grade	Maximum school grade attained	1.9	2.27	0	13
Writing	Ability to write his/her name (0=unable; 2=good)	0.7	0.88	0	2
Spanish	Fluency in spoken Spanish (0=no fluent; 1=fluent)	0.3	0.46	0	1
Village-to-town-distance	Kilometers from village to closest town	28.3	15.95	6	48

Table 1. Descriptive statistics of the variables measured

RESULTS

Relation between ethnobotanical knowledge and skills

- The variable that proxies practical skills has a higher coefficient of variation than in the variable that proxies theoretical knowledge (cv of skills=0.44; cv of knowledge=0.36).
- Theoretical ethnobotanical knowledge and ethnobotanical skills correlate in a positive and statistically significant way, but the correlation coefficient is low (coeff=1.42; p=0.001; n=453).

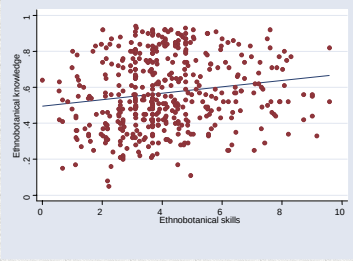

Figure 3. Regression of ethnobotanical knowledge versus skills

Effects of share of wage labor in income against ethnobotanical knowledge and skills

- An increase of one percent in the score of ethnobotanical skills correlates with a ~0.06% lower share of wage earnings in total personal income (p<0.001) (column [1]).
- Theoretical ethnobotanical knowledge did not correlate significantly with the share of wage earnings in total personal income (column [2]).

	Share of wage earnings		
Variable	**[1]**	**[2]**	**[3]**
Knowledge (log)		.02	.03
Skills (log)	-.06**		-.07**
Age	.001	-.001	.0003
Male	.19**	.18**	.18**
School grade	.03**	.03**	.03**
Writing	.01	.01	.01
Spanish	.09**	.09**	.10**
Village-to-town distance	-.004	-.002**	-.001
Regressions contain a constant and a set of binary variables for village of residency (not shown) and clustering by village. [1] does not include the variable knowledge. [2] does not includes the variable skills * p≤0.10; **p<0.01			

Table 2. Multivariate OLS regressions of the share of wage labor in total yearly personal income against ethnobotanical knowledge and skills (n=416)

Effects of share of sales in income against ethnobotanical knowledge and skills

- An increase of one percent in the score of ethnobotanical skills correlates with a ~0.06% higher share of sales in total personal income (p<0.001) (column [1]).
- An increase of one percent in the score of theoretical ethnobotanical knowledge also correlates with a ~0.06% higher share of sales in total personal income (p<0.1) (column [2]).

	Share of earnings from sale of goods		
Variable	**[1]**	**[2]**	**[3]**
Knowledge (log)		.06*	.05
Skills (log)	-.06**		.06**
Age	.001	.001	.001
Male	.04	.04	.03
School grade	-.01*	-.003**	-.01*
Writing	.005	-.01*	.002
Spanish	-.008	-.001	.002
Village-to-town distance	-.006**	.001	-.007**
Regressions contain a constant and a set of binary variables for village of residency (not shown) and clustering by village. [1] does not include the variable knowledge. [2] does not includes the variable skills * p≤0.10; **p<0.01			

Table 3. Multivariate OLS regressions of the share of earnings from sale in total yearly personal income against ethnobotanical knowledge and skills (n=416)

CONCLUSIONS

- The way one defines and measures ethnobotanical knowledge matters. We measured theoretical ethnobotanical knowledge and ethnobotanical skills and found only a weak correlation between the two variables.
- Participation in wage labor, an economic activity that take people out of their culture and that reduces their interaction with the environment, correlates with less ethnobotanical skills.
- Sale of forest or farm products, a market activity that does not take people out of their culture and that do not reduce their interaction with the environment, correlates with more ethnobotanical skills and with more theoretical ethnobotanical knowledge.
- Economic development and preservation of traditional ecological knowledge might be simultaneously achieved *only if* economic development takes place through activities that keep people in their habitat and their culture.

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