Public Investment Targeting in Rural Central America

Jeffrey Alwang[1] and Hans G.P. Jansen[2]

[1] Professor, Department of Agricultural and Applied Economics, Virginia Polytechnic Institute
[2] Research Fellow and Coordinator for Central America, International Food Policy Research Institute

Contributed paper prepared for presentation at the International Association of Agricultural Economists Conference, Gold Coast, Australia, August 12-18, 2006

Public Investment Targeting in Rural Central America

Abstract

This paper uses an asset-base framework to analyze the determinants of rural growth and poverty reduction for the three poorest countries in Central America: Guatemala, Honduras and Nicaragua. High inequalities in the distribution of productive assets in all three countries constrain how the poor share in the benefits of growth, even under appropriate policy regimes. Heterogeneous conditions require complementary analyses of spatial determinants of well-being, analysis of household-level assets, and how household livelihood strategies, conditioned on spatial attributes and asset bases, determine well-being outcomes. Using a combination of GIS mapping techniques and quantitative household analysis, we generate a description of rural territories that recognizes the differential effects of policies and asset bundles across space and households. We identify the asset combinations that matter most to raise household well-being and take advantage of poverty-reducing growth.

In all three countries, investments have generally been directed toward more favored areas. But area economic potential does not automatically translate into improved well-being for all households. We found a strong overlap between economic potential, poverty rates and poverty densities in Guatemala and Honduras but not in Nicaragua. This implies that while in Guatemala and Honduras public investments may be targeted toward the Western Altiplano and the hillside areas respectively, in Nicaragua high poverty rates but low poverty densities in the Atlantic zone, and somewhat lower poverty rates but high poverty densities near Managua and other urban centers in the Central and Pacific regions, present a trade-off which makes targeting decisions more complicated.

1. Introduction

Countries in Central America share problems of uneven economic growth and high poverty rates, particularly in rural areas. Most of the poor in Central America are found in rural areas and much of the rural population is poor. Agricultural growth has not been a strong engine of poverty reduction and absolute numbers of rural poor continue to increase in several countries. Historically stark inequalities in the distribution of productive assets among households and geographical areas in rural Central America are likely to constrain how the poor share in the benefits of growth, even under appropriate policy regimes. Policy makers need to understand the implications of differences in asset endowments across space and household groups for the design of policy: should places be targeted for investments to provide and strengthen location-specific assets? Or, should households be targeted with the hope of enhancing their economic mobility and allowing them to participate in the benefits of a liberalized economy?

In order to shed light on this question, we analyze the determinants of rural growth and sustainable poverty reduction for the three poorest countries in Central America: Guatemala, Honduras and Nicaragua. We generate a description of rural space that recognizes the differential effects of policies and asset bundles across space and households, combining geographical information systems (GIS) techniques and quantitative household analysis. We analyze how assets complement each other and how asset bases, income-earning strategies and well-being are inter-related. In this way we are able to make some important suggestions regarding the allocation of public investment resources.

2. Conceptual framework

Our conceptual framework is anchored to an *asset-base approach* (Siegel 2005, Rakodi 1999) which links a household's *assets* (its natural, human, physical, financial, social and location capital) with household behavior (the way in which households use their assets, reflected in their *livelihood strategies*) conditioned by the *context* (policies, institutions and risks) and resulting in certain *outcomes* (measures of household well-being). In the asset-base framework, the poor are "asset-poor," with limited or low-productivity assets.

Asset accumulation and livelihood strategies are important drivers of sustained improvements in well-being. Certain assets are effective only if combined with others; *asset complementarity* matters. For example, access to land may have different implications for well-being depending on its location relative to markets and other infrastructure, access to credit and inputs, and education of the land holder.

3. Methods and data

Implementation of the asset-base approach requires multiple, but complementary analytical techniques. We begin by examining the spatial distribution of assets and economic potential. Geo-referenced data are analyzed using GIS overlays to identify which areas are likely to be amenable to growth-oriented interventions and whether the poor are likely to benefit from such investments (Bigman and Fofack 2000, de Walle 1998). The exact analysis conducted in each case study depended on available data (Table 1) and the needs and conventions of the host government. For example, the analysis of area economic potential for Guatemala identified three areas of low, medium and high potential, while in Nicaragua, five zones of economic potential were identified.

The quantitative analysis builds on the spatial analysis and, using household survey data, asks how household livelihood strategies and levels of well-being are determined within these heterogeneous rural areas. It begins by regressing household livelihood strategies on basic assets controlled by the household (see Table 2 for variables included in each country case). Subsequently we model the measure of household well-being as dependent on livelihood strategies and assets:

1) $L_j = f(X_j, Y_j, Z_j)$

2) $\ln W_j = f(X_j, Z_j, L^*_j)$

where L_j represents the livelihood strategy pursued by household j; W_j the welfare measure for household j; and X is the vector of household-specific assets that affects household welfare directly and indirectly through the choice of livelihood strategy; Y is the vector of household-specific assets that affects household welfare only indirectly through the choice of livelihood strategy; and Z is the vector of location assets. The Z-vector may contain regional dummy variables, and census segment-level, community-level or county-level means of variables (such as participation in social capital-building activities, and population density and change), and the l and w subscripts represent exogenous variable that affect livelihood and well-being directly. The function f(.) is a generic functional form and we use a multinomial logit model to estimate equation 1 since L_j is a polychotomous choice variable. We use a linear form to estimate equation 2 with OLS.

The variable L^* in equation 2 indicates that the livelihood choice is endogenously determined by unobserved factors, and we use predicted household livelihood class on the right hand side of equation 2; the exclusion restrictions denoted by the l and w subscripts on the Z variables are used for identification purposes. We also allow interactions between some asset variables, to measure the strength of asset complementarity or substitutability.

4. Results

4.1 Spatial analysis

GIS overlays were used to identify areas of high economic potential (for maps see Alwang et al. 2005). In each country, economic potential varies substantially over space, but is generally higher near major cities and lower in more remote areas. In Guatemala, higher potential zones are found along the South Coast (export agriculture), coffee growing areas of the Western Altiplano, near Guatemala City, and along the Salvadoran border. In Honduras, public investments have historically been skewed towards high growth potential areas, including the industrial valley near San Pedro Sula and areas dominated by export agriculture. Most other rural areas, the hillside areas in particular, have been largely bypassed by public investments. In Nicaragua, the map of economic potential reveals a strong spatial pattern, with high-potential areas located close to the main cities, particularly Managua, and in the Pacific Region with its good soils and infrastructure. Moving away from Managua, the Central Region contains high-potential coffee-producing areas with favorable agro-ecological conditions and good transportation access. The Atlantic Region has only limited economic potential, due both to poor access and low-quality soils.

The next step in the spatial analysis was to understand the relationship between area poverty and economic potential. Two measures of poverty are employed in the analysis: (i) the poverty *rate*, or the proportion of the population below the poverty line, and (ii) the poverty *density*, or the number of poor people per unit area. Conditions for rural growth are often absent in places where poverty rates are highest---but are frequently found in areas with high poverty densities, where population densities tend to be high, suggesting that the concentration of

investments in high potential areas may bypass those areas with the poorest of the poor, areas where poverty rates are high but population densities are low.

In Guatemala, the highest geographic correspondence between high poverty rate and high poverty density areas is found in the Western Altiplano which also has relatively high economic potential. Persistent high rates of poverty, however, show that this potential is not being realized---and the extent that it is being realized, the poor are not participating. Overlap between high-poverty rates and high poverty densities means that interventions will reach significant proportions of the rural poor, with minimum leakages to the non-poor. Some such interventions, however, can bypass the poor, especially indigenous peoples, if they do not address missing assets which may prevent the poor from taking advantage of economic opportunities.

In Nicaragua, a spatial mismatch is observed between areas of high rates of poverty (Atlantic Zone) and high densities of poverty: about half the extreme rural poor reside in the Central and Pacific regions in within four hours drive from Managua --- recognized as higher economic potential areas. The Central region alone has the highest share of rural people living in extreme poverty; almost two-thirds of Nicaragua's rural extreme poor live there. In all three countries, analysis at the household level is needed to help design investments that promote participation of the poor in economic opportunities, and to identify the role of specific assets in determining livelihood strategies and contributing to improved well-being.

4.2 Household quantitative analyses

We started our household-level analysis by grouping households into livelihood strategy categories[1] (table 3), followed by the estimation of an appropriate version of equation 1 using multinomial logit models. The predicted probabilities of adoption of each livelihood strategy are entered into the right-hand side of equation 2, which is estimated using OLS.

4.2.1 Determinants of livelihood strategies

The results of the multinomial model estimation generally support our asset-base approach as the fit was relatively good and the results are plausible. Because of space limitations, Table 4 presents the numerical results for Guatemala only, but our discussion below also reflects the results for the other two countries as found in Alwang et al. (2005). The variables included in each model were chosen based on availability within the data set, model misspecification tests, and consistency with the asset-base framework.

Human capital

Human capital has strong impacts on household livelihood choice. In Guatemala, better educated and non-indigenous households are more likely to pursue off-farm activities. In Honduras, better-educated households are more likely to adopt a remittances-based livelihood, while male-headed households and households with more migrating members are more likely to follow a diversified (but agro-based) livelihood strategy. The latter appears to represent one destination in a household's life cycle; as households become more mature and acquire more land and migrating adults, they seek and are able to diversify. In Nicaragua, male headship is associated with a higher likelihood of adopting off-farm based livelihoods.

[1] In the case of Nicaragua, we used the major source of household employment as a basis to classify households. In the cases of Guatemala and Honduras, we used factor and cluster analyses based on income-share boundaries (Guatemala) and time allocation and land use patterns (Honduras).

Natural capital

Natural capital has varied but important impacts on livelihood choices. In Nicaragua and Guatemala, increased land ownership is strongly associated with self-employment in agriculture. In Honduras, more land and access to titled land stimulates diversification. Improved soil quality is associated with a higher likelihood of adopting non-agricultural and wage agricultural strategies in Guatemala: increased productivity leads to surpluses, which in turn lead to demands for off-farm activities. More productive soils are also found in coffee-producing areas of Guatemala. In Honduras, fewer problems with water are associated with more off-farm work and less dependence on food staples.

Location-specific and social capital

In Guatemala and Nicaragua, geographical isolation is associated with lower likelihoods of working outside of agriculture. On the other hand, the results from Nicaragua show that access within the community to a paved road, controlling for degree of isolation, is associated with a higher likelihood of households selecting an agricultural wage and any non-agricultural strategy compared to agricultural self-employment. The results for Honduras show that higher population densities can stimulate households to pursue market production and move away from less remunerative livelihood strategies based on the sole production of food staples.

Community-level measures of social capital are associated with lower likelihoods of wage-agricultural and non-agricultural livelihoods in both Nicaragua and Guatemala. In Honduras, social capital helps households to pursue more diversified and remunerative livelihood strategies.

4.2.2 Determinants of household well-being

Our regression results for equation 2 (Table 5) show that livelihood strategies, individual assets as well as asset interactions all impact on rural household well-being, with subtle differences across countries.

Livelihood strategies

In Guatemala, rural households following a mixed livelihood strategy or one based on self employment outside agriculture have significantly higher well-being than households that depend on their own farm for most of their income. However, the difference in well-being between self-employed farmers (the comparison group) and wage-employed in agriculture was not statistically significant, suggesting that once the determinants of livelihood choice and asset ownership are controlled for, the choice itself has only a minor impact.

In Nicaragua, households adopting a self-employed agricultural strategy are significantly better off than wage agricultural workers, but worse off than those adopting a non-agricultural strategy. Even controlling for other assets, the livelihood choice in Nicaragua is a strong and significant determinant of household well-being. Relative to a strategy based on food staple production, households in Honduras that focus on livestock production livestock have higher well-being.

Human capital

Education of the household head (above four years) in Guatemala adds 9-15% to household well-being. The results for the Wisconsin sample in Honduras show a strong effect of education on household well-being (elasticity about .9). Household dependency has a strong negative impact on well-being (elasticity of between -.2 and -.3 depending on the country). In Guatemala, rural households headed by females are significantly better off (because of seasonal

migration) but in Nicaragua, male-headed households have higher well-being. The results from Guatemala also show the impacts of ethnicity in this historically divided nation. Indigenous rural households have mean levels of consumption that are about 30 percent lower than non-indigenous households. In Honduras, older household heads are associated with lower well-being (elasticity of -.59). Hillside households with more migrating members have higher levels of well-being.

Physical and natural assets

In Honduras, soil fertility has a strong and significant impact (elasticity of .4) on well-being in the hillside areas where most livelihood strategies are agriculture-based. Durable assets, business assets, livestock and land lead to higher well-being, but their effects differed substantially by country. The elasticity of well-being to durable assets ranged from .12 in Nicaragua to .35 in Guatemala. In Nicaragua, the well-being response to increased value of business assets is only .08, but .40 in the Honduran hillsides. Livestock ownership significantly affects well-being in all three countries but with low elasticities (< .1). More detailed analysis showed that in the eastern and northern areas of Guatemala, livestock ownership was a significant determinant of well-being, but its impact was more muted in other areas. Access to electricity also raises well-being, even in remote rural areas.

Land assets are positively associated with increased well-being in all three countries. The impact of land on household well-being depends critically on two factors: its location and its productivity.

Location-specific assets

Interactions between market access and landholdings were significant in Guatemala, suggesting that the benefits of larger landholdings are smaller as households become more

remote from infrastructure. The results confirm the negative influence of isolation on well-being for Guatemala (distance) and Honduras (roads). A significant negative coefficient for the interaction term for education and market access in Nicaragua suggests that households with higher levels of education are better able to take advantage of market access. However, findings from Honduras suggest that schooling and market access act as substitutes. Schooling also may also be able to compensate to a certain extent for the lack of access to land. The positive and significant coefficient of the ownland*credit variable confirms the widely held notion that land ownership facilitates credit access.

Social capital has a strong positive effect on household well-being in all three countries. Guatemalan and Nicaraguan households with higher than average participation in community organizations have significantly higher well-being. In Honduras, participation in agricultural organizations also increases well-being. Savings and loans organizations in the Honduran hillsides seem to focus on the poorest households that rely mostly on production of food staples for their livelihoods.

5. Conclusions and recommendations

Economic potential has a strong spatial pattern in all three countries but area economic potential does not automatically translate into improved well-being for all. Investments in Guatemala, Honduras and Nicaragua have generally been directed toward more favored areas and people outside these areas have been left behind.

We found a strong overlap between economic potential, poverty rates and poverty densities in Guatemala and Honduras but not in Nicaragua. In Guatemala, investments should be targeted toward the high-poverty density areas of the Western Altiplano, focused on providing missing assets to allow participation by disadvantaged groups such as indigenous households. In

Honduras, overlap between high poverty rates and high poverty densities in some hillside areas means that investments there should reach significant proportions of the country's rural poor. In Nicaragua regional tradeoffs exist: investments targeted toward high-potential areas have potential to benefit many poor people, but leakages to the non-poor are likely.

Asset bases are important determinants of household well-being and have both direct and indirect effects (through their impact on livelihood choice). Education and training have a strong positive effect on well-being in all countries, even in isolated rural areas. Impacts of education can be greater when migration and economic mobility are enhanced. Agriculture-related assets such as land and livestock had different effects on well-being depending on the country in question. For example, while both Nicaragua and Guatemala have a relatively small well-being/land elasticity, land ownership in Honduras has a much stronger direct effect on well-being. Location effects also vary between countries. In Guatemala and Honduras, market access has a strong positive effect on well-being, even controlling for the livelihood decision. Results for Honduras show that good market access may, to some degree, substitute for a lack of education, and also point towards the importance of land ownership for access to credit. In rural Nicaragua distance does not have a strong direct effect on well-being, but its effect is felt through interactions with other assets such as land and education. Distance from markets in Nicaragua makes land more important and education less important. Participation in organizations is associated with higher levels of well-being in all three countries.

In conclusion, access to assets affects livelihood decisions, which in turn affect well-being outcomes. However, once the asset base is controlled for, the livelihood choice only has a small impact on household well-being., suggesting that the public sector should invest in assets, particularly human assets, and not necessarily in specific "sectors" of the economy.

References

Alwang, J., H.G.P. Jansen, P. Siegel, and F. Pichón, 2005. Geographic Space, Assets, Livelihoods and Well-Being in Rural Central America: Empirical Evidence from Guatemala, Honduras and Nicaragua. DSGD Discussion Paper, International Food Policy Research Institute (forthcoming).

Bigman, D., and H. Fofack, 2000. Geographical Targeting for Poverty Alleviation: An Introduction to the Special Issue. World Bank Economic Review 14(1): 129-45.

de Walle, D., 1998. Targeting Revisited. The World Bank Research Observer 13(2): 231--48.

Rakodi, C., 1999. A Capital Assets Framework for Analyzing Household Livelihood Strategies. Development Policy Review 17(3): 315--42.

Siegel, P.B., 2005. Using an Asset-Based Approach to Identify Drivers of Sustainable Rural Growth and Poverty Reduction in Central America: Conceptual Framework. Policy Research Working Paper Series No. WPS 3475. The World Bank.

Table 1. Data used

	Country		
Type of a nalysis	**Guatemala**	**Honduras**	**Nicaragua**
Spatial analysis	GIS of the Ministry of Agriculture. Population Census of 2002. WFP vulnerability assessment. ENCOVI household data.	GIS of the National System for Territorial Information and Ministry of Agriculture. 1988 and 2001 Population Censuses. WFP vulnerability assessment.	GIS of the Ministry of Agriculture and Forestry. Population Census and ENCOVI household data.
Quantitative household analysis	2000 ENCOVI household data. Census of Agriculture (2003). Population Censuses (1994, 2002).	Two rural household surveys: University of Wisconsin (hillsides and valleys, 2000) and IFPRI (hillsides, 2001).	1998 & 2001 ENCOVI household data. Population census and agricultural census data.

Table 2. Description of variables used in analysis of household livelihood strategies and well-being

Concept	Variable Name	Guatemala	Honduras	Nicaragua
Dependent Variable		**Log annual consumption per capita**	**Log annual income per capita**	**Log annual consumption per capita**
Natural assets	Natass1-5	5) Soil quality index	1) Average altitude of farmer's plots (in feet); 2) Annual rainfall in mm (Wisconsin households); 3) Summer rainfall in mm (natural log in income regressions); 4) Water deficit for maize during October-January in mm (IFPRI households); 5) Natural log of soil fertility (Jansen et al. 2005), IFPRI households	
	Land	Quantity of land, ha.	Quantity of land, manzana (mn, 1 mn = 0.7 ha)	Quantity of land, mn
	Ownland		Quantity owned, mn	
	Landtitle		% of owned land with title	
Human assets	Mhh	(=1 if male-headed)	(=1 if male-headed)	(=1 if male-headed)
	Hsize		Number of household members	
	Deprat	Dependency (=(children+elderly)/total)	Dependency (household members < 12 or > 70 yrs)/(members between 12 and 70 yrs)	Dependency (=(children+elderly)/total)
	Ed1, Ed2	(Ed1=1 if head has primary ed.; Ed2=1 if secondary ed.)	(Ed1= median years of schooling of household members > 7 yrs)	(Ed1=1 if head's education >4 years)
	Ethno	(=1 if family not indigenous)		
	Age		Household head's age in years (natural log in income regressions)	Head's age (years)
	Migrant		IFPRI households: average % of time that an adult lives and works outside the household. Wisconsin households: Total number of man-months spent outside the household by household members	
	Femadult		% of females (>12 yrs) in household	
	Training		(=1 if HH has received agricultural training)	
	Techass		(=1 if HH has received extension visits)	(=1 if technical assistance available in community)
Physical assets	Electricity	(=1 if household has access to electricity)		(=1 if household has access to electricity)
	Assets	Value durable assets (Q.)		Score of durable assets
	Busassets		Value of machinery, equipment and transportation (L.)	Score of business assets
	Livestock	Value of livestock (Q.)	Value of livestock (L.)	Value of livestock (C.)

Table 2 (contd')

Concept	Variable Name	Guatemala	Honduras	Nicaragua
Dependent Variable		**Log annual consumption per capita**	**Log annual income per capita**	**Log annual consumption per capita**
Location assets (all variables defined at local level)	Distance	Distance (in travel time to nearest post office)	IFPRI households : Market access (index of travel time to nearest market, natural log of index in income models) Wisconsin households: Distance to daily market in km	Distance (travel time to nearest health center)
	Popdens	No people/km^2	Population density at community level	
	Roads	Quality-adjusted roads/km^2	Road density at community level (=km of roads/km^2)	(=1 if community has access to paved road)
	Capdist		Distance between community and county capital or capital of another county (if closer), in km; Wisconsin households only	
	Popgr	Inter-censal population growth rate		
	Litrate	Literacy rate		
	Orent	Percentage of owners/renters in municipio		
	Perrate	Percentage of land devoted to perennial production		
	Proden	Agricultural producers/land in production		
	Region	Dummy variables		Dummy variables
Social capital	Socap	Mean municipio participation in social, political and other committees	Various dummy variables representing household participation in community, agricultural, savings and loan, and external organizations: Socap1: participation in agricultural organizations Socap2: participation in community organizations Socap3: participation in savings and loans organizations Socap4: participation in external organizations	Mean municipio participation in social, political and other committees
Financial capital	Credit		Dummy variable (=1 if household has access to any form of credit)	
Livelihood strategy		See Table 3		
Interactions		Ed1*Distance; Land*Distance	Land*Credit; natural log of Land*Distance; Land*Ed1; Ed1*Distance; Ownland*Natass5 (IFPRI households only)	Ed1*Distance; Land*Distance; Land*Ed1

Table 3: Rural livelihood strategies in Guatemala, Honduras and Nicaragua

Livelihood strategy (LS)	LS1	LS2	LS3	LS4	LS5	LS6	LS7
Guatemala	Self-employed in agriculture	Wage-employed in agriculture	Mixed agriculture	Mixed agriculture & non-agriculture	Mixed non-agriculture	Non-agriculture wage employment	*Non-agriculture self employment*
% of sample	*15.2*	*12.7*	*10.6*	*12.6*	*26.9*	*16.1*	6.0
Honduras (IFPRI sample)	Livestock producers	Coffee producers	Food staple production	Food staple production & farm workers	Food staples, livestock & off-farm work	Tree producers	*Vegetable producers*
% of sample	*15.6*	*7.4*	*18.1*	*22.6*	*30.9*	*3.2*	2.1
Honduras (Wisconsin)	Diversifiers	Food staples & farm workers	Livestock	Coffee	Own business	Remittances, other	
% of sample	*13.5*	*26.1*	*11.5*	*28.4*	*6.8*	*10.7*	
Nicaragua	Self-employment in agriculture	Agricultural wage	Self-employment outside agriculture	Wage employment outside agriculture	Remittances, other		
% of sample	*19.2*	*29.8*	*16.0*	*21.0*	*13.9*		

Table 4. Guatemala: Multinomial logit model (Livelihood strategy # 1—self-employment in agriculture—is comparison group)

	LS 2: Agricultural wage employment			LS 3: Mixed agriculture			LS 4: Mixed			LS 5: Mixed non-agriculture			LS 6: Non-agricultural wage			LS 7: Non-agricultural self		
Variable	**Est.**	**Std. error**	**p-val**	**Est.**	**Std. error**	**p-val**	**Est.**	**Std. error**	**p-val**	**Est.**	**Std. error**	**p-val**	**Est.**	**Std. error**	**p-val**	**Est.**	**Std. error**	**p-val**
Intercept	-10.068	4.609	0.03	-18.362	2.176	0	0.899	3.246	0.78	0.942	3.120	0.76	3.657	4.012	0.36	1.377	3.314	0.68
deprat	-0.082	0.068	0.23	-0.017	0.070	0.81	-0.004	0.065	0.95	0.066	0.057	0.25	**-0.159**	0.086	0.06	**-0.222**	0.073	0.00
mhh	-0.049	0.244	0.84	0.255	0.282	0.37	**-0.542**	0.229	0.02	**-1.620**	0.194	0	**-1.064**	0.250	0	**-0.534**	0.234	0.02
ed1	**0.240**	0.138	0.08	-0.016	0.145	0.91	0.088	0.139	0.53	**0.481**	0.123	0	**0.681**	0.175	0	**0.972**	0.145	0
ed2	0.261	0.513	0.61	0.494	0.516	0.34	0.040	0.534	0.94	**1.563**	0.402	0	**1.918**	0.452	0	**2.443**	0.407	0
ethno	0.130	0.182	0.48	-0.211	0.199	0.29	-0.172	0.181	0.34	**0.416**	0.162	0.01	0.367	0.230	0.11	**0.860**	0.185	0
elect	-0.037	0.148	0.80	-0.116	0.160	0.47	**0.261**	0.148	0.08	**0.837**	0.130	0	**1.134**	0.193	0	**1.080**	0.159	0
land	**-0.049**	0.018	0.01	0.001	0.003	0.78	0.001	0.003	0.75	-0.002	0.004	0.48	**-0.048**	0.025	0.05	**-0.138**	0.035	0
natass1	**0.753**	0.155	0	0.082	0.149	0.58	0.236	0.146	0.11	**0.536**	0.129	0	**0.704**	0.195	0	**0.563**	0.161	0
distance	**-0.002**	0.001	0.07	**-0.002**	0.001	0.08	**-0.002**	0.001	0.08	**-0.003**	0.001	0	**-0.006**	0.002	0.00	**-0.006**	0.001	0
popdens	-0.001	0.001	0.2	-0.001	0.001	0.22	0.000	0.001	0.59	-0.001	0.001	0.35	0.000	0.001	0.75	-0.001	0.001	0.34
popgr	**-0.031**	0.006	0	**-0.011**	0.006	0.08	-0.009	0.006	0.12	-0.018	0.005	0.00	**-0.026**	0.009	0.00	-0.009	0.007	0.17
litrate	1.024	0.857	0.23	-0.933	0.844	0.27	**2.359**	0.813	0.00	-0.032	0.728	0.96	**-4.068**	1.117	0	-0.362	0.886	0.68
roads	1.308	1.222	0.28	2.078	1.286	0.11	0.697	1.205	0.56	1.117	1.057	0.291	1.430	1.373	0.30	1.653	1.152	0.15
perrate	**1.519**	0.410	0	**0.741**	0.447	0.10	0.206	0.414	0.62	-0.199	0.376	0.60	0.609	0.529	0.25	0.490	0.423	0.25
orent	**13.107**	3.267	0	0.766	2.234	0.73	-0.947	1.526	0.54	2.504	1.754	0.15	0.390	2.433	0.87	1.096	1.857	0.56
proden	**0.518**	0.291	0.08	0.255	0.292	0.38	0.069	0.275	0.8	0.066	0.057	0.25	**1.281**	0.285	0	**1.162**	0.256	0
socap	**-0.138**	0.045	0.00	0.020	0.044	0.65	-0.027	0.043	0.53	0.008	0.037	0.83	**-0.118**	0.056	0.04	-0.048	0.044	0.28
Diagnostics of fit	**Mean pred. prob.**	**Act. prop.**	**% Diff.**	**Mean pred. prob.**	**Act. prop.**	**% Diff.**	**Mean pred. prob.**	**Act. prop.**	**% Diff.**	**Mean pred. prob.**	**Act. prop.**	**% Diff.**	**Mean pred. prob.**	**Act. prop.**	**% Diff.**	**Mean pred. prob.**	**Act. prop.**	**% Diff.**
	0.126	0.125	0.2	0.122	0.123	1.0	0.122	0.123	1.0	0.272	0.272	0.1	0.064	0.063	0.6	0.152	0.162	6.6

Note: Regional dummy variable results not shown (but were included in model).

Table 5. Determinants of well-being (structural model results), with livelihood strategies included

	Guatemala		Honduras				Nicaragua	
Dependent variable	**Log annual consumption per capita**		**Log annual income per capita**				**Log annual consumption per capita**	
			IFPRI households		**Wisconsin households**			
Explanatory variables	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**
intercept	8.604	30.72	7.449	2.77	7.273	1.69	7.573	55.97
Livelihood Strategies								
LS 1 [1)]			0.074	0.13	-0.299	-0.42		
LS 2 [1)]	0.263	1.54	0.637	1.13			**-1.006**	-5.16
LS 3 [1)]	0.511	1.35			**1.454**	1.94	**0.868**	5.04
LS 4 [1)]	**0.754**	2.32	0.263	0.50	-0.240	-0.42	**0.720**	4.59
LS 5 [1)]	0.343	1.46	0.133	0.31	1.944	1.42	**1.031**	3.88
LS 6 [1)]	-0.265	-0.83			-0.182	-0.20		
LS 7 [1)]	**0.634**	2.73						
Natass1								
Natass2					0.785	1.50		
Natass3			-0.364	-1.33	**-0.617**	-1.86		
Natass4			-0.001	-0.91				
Natass5	**0.057**	3.23	**0.387**	1.93				
deprat	**-0.192**	-20.29	**-0.181**	-2.17	-0.114	-0.88	**-0.774**	-8.63
mhh	**-0.244**	-5.36					**-0.172**	-4.07
hsize			-0.011	-0.45	-0.033	-1.52		
ed1	**0.065**	2.57	0.045	1.00	**0.181**	3.65	0.029	0.77
ed2	**0.388**	7.04						
ethno	**0.246**	10.2						
age			-0.159	-0.85	**-0.593**	-2.30		
migrant			**0.941**	2.06	0.003	0.27		
femadult			-0.453	-1.12	-0.008	-1.57		
training			-0.001	-0.01				
techass			0.087	0.43				
electricity	**0.219**	7.38					-0.007	-0.14
assets	**0.000**	15.46						
busassets			**0.000**	2.38	0.000	0.19		
livestock	**0.000**	9.21	0.000	0.96	**0.000**	2.77	0.000	3.31
credit								

Table 5 (contd')

	Guatemala		Honduras				Nicaragua	
Dependent variable	**Log annual consumption per capita**		**Log annual income per capita**				**Log annual consumption per capita**	
			IFPRI households		**Wisconsin households**			
Explanatory variables	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**
land	0.002	1.75					**0.002**	1.85
ownland			-0.002	-0.16	**0.016**	2.91		
landtitle								
distance	**0.000**	-2.54	-0.162	-1.19	**-0.006**	-1.70	0.001	1.37
popdens	**0.000**	-2.61						
roads			0.007	0.17	**0.080**	2.23		
popgrowth								
capdist					0.000	0.03		
socap	**0.017**	2.65					0.105	0.45
socap1			-0.063	-0.28	**0.433**	1.93		
socap2			-0.007	-0.06	-0.059	-0.45		
socap3			**-0.410**	-1.97	0.015	0.04		
socap4			-0.002	-0.01	0.213	0.72		
ed1*distance	0.000	1.44	**0.007**	1.91	**0.001**	1.79	**-0.001**	-2.45
ownland*credit			0.002	0.22	**0.008**	2.42		
land*distance	0.000	-1.66	0.036	0.51	0.061	0.98	0.000	0.86
land*ed1			-0.001	-0.62	**-0.002**	-4.36	0.001	1.14
ownland*soil			0.000	0.78				
N	3852		315		525		1347	
R^2	0.447		0.254		0.345		0.349	

[1)] See Table 3 for livelihood strategies. Regional dummy variables not shown for Guatemala and Nicaragua.