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2 A tale of two roads: Land tenure, poverty, and politics on

3 the Guatemalan frontier

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8 Abstract

9 Agricultural frontiers are hot spots forin the most dramatic land cover change in the history of humankind:
forest conversion to

10 agriculture. They are also areas of unusually rapid population growth and acute poverty, with scant
access to public services

11 and infrastructure. Although a large body of literature explores the determinants of land cover change on
the frontier, one issue

12 that has been largely unstudied is that of frontier political and socio-economic development. This paper
reports on data from 28

13 communities along an agricultural frontier in a core conservation zone of the Maya Biosphere Reserve
(MBR), where the predom-

14 inant land tenure systems at the community level appear to be related not only to land use, but also to
political organization and

15 human development indicators.

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18 1. Introduction

19 The Sierra de Lacando'n National Park (SLNP), a

20 core conservation zone of the MBR (Fig. 1), offers a un-

21 ique case study of land organization and political and

22 socio-economic development. Markedly different land

23 tenure patterns have emerged along the two main roads

24 adjacent to the park, the Ruta a Bethel and Ruta a Nar-

25 anjo. The land tenure pattern along the latter road con-

26 sists mainly of cooperatives and has experienced less

27 population growth, less deforestation, and superior hu-

28 man development than the former, which largely con-

29 sists of farm families squatting illegally on park land.

30 Given similar ecological endowments, settlement his-

31 tory, and market access, I speculate that differences in

32 political organization and human development between

33 the two regions may be partially attributed to the dis-

34 tinct land tenure regimes characteristic of the two re-

35 gions. Various authors have noted the importance of

36 legal land tenure, not only for sustainable agriculture,

37 but also for economic development in Latin America

38 in general (Vargas, 1999) and in Guatemala's Pete'n spe-

39 cifically in particular (per ejemplee.g., Kaimowitz, 1995; Katz, 1995;

40 Clark, 1996; Schwartz and Grunberg, 1998; Grunberg,

41 2000).

42 While scores of studies have documented farmer land

43 use practices contributing to forest clearing in the tro-

44 pics, few studies have examined factors contributing to

45 socio-economic well-being on the frontier. Focusing pri-

46 marily on land use, Moran et al. (2001), Rudel et al.

47 (2002), and Walker, 1999 describe evolutionary stages

48 of frontier development in which subsistence farming

49 ultimately yields to land consolidation, market-oriented

50 production, and attendant socio-economic development.
51 Among the few studies explicitly examining socio-eco-
52 nomic indicators among farm households, Murphy
53 and colleagues (1997) found that proximity to a road, le-
54 gal land tenure, farm size, access to credit, and cattle
55 ownership were associated with higher socio-economic
56 status. In the SLNP, these factors are interrelated. The
57 first farm households that settled the region claimed
58 the best land (most accessible to the road) and large

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59 farms. Farms along the road have been eligible for legal
60 land tenure, unlike farms inside the park. This study
61 compares differences between two distinct regions of
62 the SLNP relative to political and socio-economic devel-
63 opment. Data were obtained from interviews with com-
64 munity leaders and key informants in each of the 28
65 communities in, and adjacent to, the SLNP.
66 Agricultural frontiers are among the most dynamic as
67 well as sociologically and ecologically important areas
68 on the planet, ~~for~~ ^{it} is along agricultural frontiers where for-
69 est conversion to agriculture is responsible for most of
70 the deforestation on the planet (Myers, 1994; Achard
71 et al., 2002). This certainly appears to be the case in La-
72 tin America (Rudel and Roper, 1996; Carr and Bilsbor-
73 row, 2001). A host of interacting political, economic,
74 demographic, and ecological causes are thought to act
75 on deforestation across different scales (Geist and
76 Lambdin, 2001; Turner II et al., 2001). One proposed
77 causal factor of pertinence to this paper is land tenure
78 security (Southgate et al., 1990; Schneider, 1993; Mahar
79 and Schneider, 1994). Although this variable has been
80 examined in a ~~host~~ ^{multitude} of studies on land use and land cover
81 change, few studies of agricultural frontier regions have
82 investigated land tenure structures in relation to human
83 development outcomes such as political representation,
84 health care, and education (Murphy et al., 1997 is one
85 exception). Since such factors are hypothesized to also
86 link back to land use outcomes, research attention to this topic may also con-
87 tribute to a more complete understanding of how hu-
88 man development indicators may relate to

89 deforestation—the topic of the vast majority of research
90 in Latin American agricultural frontier regions.
91 Deforestation in the Latin American tropics is recog-
92 nized as a major environmental concern among interna-
93 tional government and non-government institutions.
94 These concerns must be shared with these institutions^[u2]
95 since much of the region's deforestation areas coincide
96 with some of the most socio-economically marginalized
97 places in Latin America. The growing number of fron-
98 tier farmers concentrated on lands with inadequate rain-
99 fall, poor soil conditions, and high erosion potential
100 constitute a large portion of the poorest 20% of the rural
101 population in developing countries. This is particularly
102 important in Latin America where small farmers suffer
103 more from geographical-land distribution inequity in compared edison to farmers
104 in other regions. Here, fully one-quarter of the poorest
105 20% occupy ecologically impoverished lands and more
106 have little or no land at all (Leonard et al., 1989).
107 The soil and woodland degradation unleashed by
108 deforestation on marginal lands has led to a chronic cy-
109 cle of underdevelopment in many rural areas of the hu-
110 mid tropics, where primary resource extraction is
111 necessary for subsistence. Indeed, settlers often colonize
112 along roads traversing oxidized, nutrient-leached soils,
113 unintended for agricultural development (Moran,
114 1983; Mahar, 1989; Almeida, 1992). Most frontier colo-
115 nists practice semi-subsistence, land extensive agricul-
116 ture that demands forest burning to fertilize nutrient-
117 impoverished soils. In many places, rapid forest elimina-
118 tion from shifting cultivation spurs soil erosion, the sed-
119 imentation of waterways (Southgate and Whitaker,
120 1992), nutrient cycle perturbation (Fearnside and Barb-
121 osa, 1998; Rasmussen, 1998), and soil impoverishment
122 (Ehui and Hertel, 1992; Lal, 1996)—all of which dimin-
123 ish small farmer capacities to maintain crop yields.
124 Frontier agricultural regions are plagued by a host of
125 problems for settler families, including poor infrastruc-
126 ture in the form of roads, and lack of access to water, public works,
127 schools, and health care (Murphy et al., 1997). It is
128 thought that colonists are pushed by poverty to the
129 frontier where capital, technological, market, and labor
130 constraints further their immiseration (Barbier, 1997).
131 This is particularly true for the majority of migrants
132 (or settlers) who, following the initial influx of colonists,
133 are left to select among lands of even poorer transportation ac-
134 cess or production quality (Almeida, 1992; Murphy
135 et al., 1997). While those colonists who are able to sur-
136 vive the first several years of settlement have sometimes
137 experienced wealth improvements, the first phase of
138 frontier colonization is generally characterised by
139 indebtedness and low yields (Schmink and Wood,
140 1993; Stewart, 1994; Walker, 1994; Murphy et al.,
141 1997). Often this is quickly followed by consolidation in the
142 hands of rural elites, resulting in an increase of both very large
143 and very small plots (Martine, 1990; Bilsborrow and
144 Pan, 2001), and the subsequent exodus among the poor farmers, of-

145 ten to another rural frontier (e.g., Barbier, 1997).

Fig. 1.

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146 Frontier colonists also suffer from ~~athe~~ concentration of
147 disease vectors present in tropical forests, unsanitary
148 conditions, and ~~thea~~ lack of health care (Schmink and
149 Wood, 1993; Dale, 1994; Stewart, 1994). Malaria runs
150 rampant in many humid frontier environments. For
151 example, claiming only 0.66% of Brazil's total popula-
152 tion in 1985, the Brazilian state of Rondonia (a frontier
153 region whose population grew 400% from 1970 to 1980)
154 suffered 42.1% of Brazil's documented malaria cases
155 (Martine, 1990). In addition to affecting quality of life,
156 health setbacks can also severely diminish labour capac-
157 ity (Henriques, 1988).

158 Yet settlers invariably claim that their present situa-
159 tion is better than their previous one (Dale, 1994; Mur-
160 phy et al., 1997). Given the tough conditions on the
161 frontier, this suggests migrant selectivity of those who,
162 shunning advantages offered in other destinations, desire
163 land on which to work and to own above all else[u3].

164 Frontiers are far from spatially homogenous and are
165 in rapid flux. Despite this, variability in indicators of hu-
166 man well-being, though less pronounced than in longer-
167 settled regions, is measurable. Place (location) matters
168 even at the micro-scale. While frontiers are characteristically poorer than
169 longer established regions, some places on the frontier
170 are worse-off than others, and this variability ~~has-exhibits~~ human
171 development and environmental implications. Follow-
172 ing a description of the research methodology and of
173 the SLNP, socio-economic differences within and be-
174 tween the communities of the Park along the Bethel
175 and Naranjo roads will be investigated with a focus on
176 land tenure regimes as a potentially key explanatory
177 factor.

178 2. Research methodology

179 Data for the study were obtained from interviews I
180 conducted in 1998 with community leaders such as alcal-
181 des auxiliares (locally elected official representing the
182 municipal mayor), members of comite's de pro-mejoram-
183 iento (similar to town councilmen), teachers, and health
184 promoters in each of the 28 communities within and
185 adjacent to the SLNP (6 located along the Bethel Road,
186 the remaining 22 along the Naranjo Road) (Fig. 2). Five

187 of the six communities in the Bethel area used in this
188 analysis are cooperatives. The 22 communities along
189 the Naranjo Road are comprised mainly of squatter
190 farm families. The few farmers with some claim to legal
191 title to their land among the communities of the Nar-
192 anjo region have farms on the northeastern side of the
193 Naranjo road, which is considered part of the buffer
194 zone of the Maya Biosphere Reserve (MBR). Informa-
195 tion was gathered during fieldwork in 1998 and a fol-
196 low-up visit in 2000.

197 Political and economic data gathered from the inter-
198 views feature information on local political and institu-
199 tional organizations, including community and regional
200 politics, and the role of conservation and development
201 organizations in the area. Socio-economic data encom-
202 pass development and living standard indicators such
203 as access to, and quality of, education and health care,
204 physical characteristics of homes, and the availability
205 of electricity, energy for cooking, and water.

206 The undertaking of community interviews permitted
207 coverage of the entire SLNP region, which ~~would not~~
~~208 have been at the time was not feasible possible~~ at the household level ~~with my bud-~~
~~209 getary constraints~~. It also allowed for a broader and ri-
210 cher context within which to situation a subsequent sampling of household data ~~could be~~
~~211 situated~~. Moreover, interviews with community leaders
212 led to valuable changes in the substance and language
213 used in household surveys, data for which are reported
214 in Carr (2004), and to develop trust with informants,
215 ~~which greatly~~ enhanced the accuracy and reliability of
216 the data (Carr, in press).

217 3. The Sierra de Lacando'n National Park
218 UNESCO, with heightened concern over the region's
219 rapid, human-induced ecological change and working
220 jointly with a host of institutes from donor nations,
221 established the MBR in 1989. Occupying nearly 60%
222 of Peten and 20% of national territory, the MBR forms
223 the heart of the Selva Maya (the largest lowland tropical
224 forest in Central America). The MBR also serves as a
225 pan-continental biological bridge, a cardinal repository
226 of biodiversity and archeological sites, including Ti-
227 kal—the remains of the magnificent ancient Mayan city
228 (The Nature Conservancy, 1997).

229 Established in 1990 as one of four core zones (areas of
230 strict conservation) within the MBR, the SLNP is the
231 second largest national park in Guatemala (Fig. 1).
232 More than 10% of its forest canopy has been eliminated
233 since 1990, the era during which ~~time~~ most of the park's 3000
234 families settled in the area (Carr, 1999; Sader et al.,
235 2000).

Fig. 2. Sierra de Lacando'n National Park.

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236 The historical course of population settlement in the
237 SLNP bifurcates along its two channels of colonization,
238 the Road to Naranjo and the Road to Bethel. The
239 Bethel Road region was settled in the 1960s and 1970s
240 when the Guatemalan government was sponsoring colo-
241 nization in Pete'n. The Naranjo region was populated in
242 the 1980s and 1990s when the government was taking
243 the opposite tack, attempting instead to prevent further
244 settlement in the MBR.

245 Running northwest along the park's core zone, an
246 open-access situation along the ~~Ruta a~~ Naranjo Road has fos-
247 tered haphazard settlement (USAID/Guatemala, 1990).

248 More than 40 farming communities have sprung up
249 pell-mell along the road in recent years. Farms on the
250 western side of the Naranjo road are located within
251 the SLNP and therefore are not recognized by the na-
252 tional government and are officially ineligible for public
253 works and other government investments. Colonists hail
254 from diverse regions of Guatemala and include Ladino
255 (Spanish-speakers of mixed Spanish-Indigenous des-
256 cent) and indigenous families.

257 Conversely, most communities along the Bethel Road
258 consist of agricultural and agro-forestry cooperatives.
259 Internal codes of land use and communal and familial
260 land rights were established in accordance with MBR
261 restrictions and in the spirit of environmentally benign
262 development. Consequently, these communities have
263 cleared approximately half the forest, per capita, than
264 their Naranjo road neighbors. Squatter farms^[u4], however,
265 were not the category of farms responsible for the greatest forest
266 clearing; rather, the farms with the greatest extent of
267 cleared forest were privately owned parcels, as access
268 to credit led many of these farmers to purchase cattle
269 (Carr, 1999).

270 In addition to potentially affecting land use, commu-
271 nity infrastructure, and human development indicators,
272 it is possible that the distinct land tenure regimes be-
273 tween the two regions plays a role ~~concerning~~ in differences the variation witnessed in pop-
274 ulation change (Carr, 2000). The population of the 28
275 communities with farms in the SLNP almost doubled
276 to approximately 17,000 people from 1993 to 1998
277 (Carr, 2000). Population grew more rapidly due to both
278 higher in-migration and natural population growth
279 (high fertility) along the Naranjo Road (Carr, 2000).

280 ~~Relative-To discuss briefly~~ te local fertility rates ~~natural population growth~~, the total fertility
281 rate in the SLNP greatly exceeds the national rate, and even outstrips the

282 national rural rate, which at 6.1 births per woman is the
283 highest in Central America (Carr, 1999). Colonists mi-
284 grated from various regions of the country, with the
285 departments of the southeast comprising the most repre-
286 sented areas of origin, followed by the Pacific Coast, and
287 the Verapaces (Carr, 2000). Approximately two-thirds
288 of the migrants are Ladino. Q'eqchi' Maya from Alta
289 and Baja Verapaz represent the largest indigenous group
290 in the area. The park's communities are primarily di-
291 vided between Catholics and Evangelicals, with agnos-
292 tics comprising a minority fraction (Carr, 2000).
293 Since the SLNP is a core conservation zone of the
294 MBR, and settlement in the park is illegal, policy invest-
295 ments in the area have focused on forest conservation
296 primarily, with human development a secondary con-
297 cern. Various non-government organizations (NGOs)
298 work on practices encouraging more intensive land uses ~~land intensification~~ and promoting forest conservation.

299 Land tenure for farmers in the buffer zone of the park
300 has been a priority of only one NGO: CARE[us]. If some
301 of the differences between the two regions reported here
302 are attributable to differences in land titling, this policy
303 change could prove to be one effective strategy to im-
304 prove community infrastructure, quality of life, and pos-
305 sibly to mitigate population growth and farm impact on
306 the environment. The following section presents results
307 from interviews with community leaders and key infor-
308 mants in the SLNP. The first part examines the role of
309 politics and NGOs among the communities in the Park,
310 followed by a discussion of socio-economic indicators.

311 4. Results

312 4.1. Politics and NGOs

313 As in early Amazonia settlement frontiers-in (e.g.,
314 Bunker, 1984), frontier settlers in the SLNP have begun
315 to develop their own political systems in lieu of a strong
316 governmental and non-governmental institutional pres-
317 ence. The Naranjo Road communities lag their Bethel
318 Road neighbours relative to the development of political
319 representation and the insertion of national and interna-
320 tional economic development institutions. This differ-
321 ence is evident in the relative percentage of towns in
322 the two regions that benefit from external political rep-
323 resentation from locally elected town leaders, vigilance[us],
324 agriculture and forestry committees, and the presence
325 of women's clubs. These indicators are among the few
326 quantitatively measurable variables of political and
327 institutional development at the community-level in
328 the region. While an in-depth ethnographic analysis of
329 power relations, their development, and their negotia-
330 tion is beyond the scope of this paper, I will briefly de-
331 scribe the differences in these indicators between the
332 two regions.

333 In place of formal political representation (and the
334 attendant benefits of government-sponsored public
335 works) for the majority of communities located within
336 the SLNP, area communities have galvanized forces at

337 the community and regional level to assert their needs
338 through a host of informal organizations (Table 1). At
339 the community level, mirroring politics in migrant origin
340 areas, each community appoints an alcalde auxiliar by
341 vote. Since only the larger political units, municipios,
342 have alcaldes (mayors), towns appoint alcaldes auxili-

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343 ares to lead community decision-making and to formu-
344 late and promote an agenda for community develop-
345 ment. Town members also select a comité de pro-
346 mejoramiento (similar to a town council), which serves
347 as counsel to the alcalde auxiliar in levying decisions,
348 both judicial and legislative. The Bethel area communi-
349 ties had slightly greater political representation from
350 alcaldes auxiliares and comité de pro-mejoramiento than
351 the Naranjo region communities.

352 Women are largely excluded from the community
353 and regional political process. One exception is La Un-
354 ión Maya Itza[u7], a community of refugees who returned to
355 Guatemala from Mexico in 1996. In this community, the
356 assistant alcalde auxiliar was a young Maya woman.

357 Usually, however, women's concerns are voiced in com-
358 ites de mujeres, or women's committees. Issues broached
359 in women's meetings may be petitioned to the comité de
360 pro-mejoramiento. While common among the communi-
361 ties along the Bethel Road, these women-based commit-
362 tees were largely absent among the communities of the
363 ~~Putu~~-Naranjo Road.

364 Other community groups include forestry, agricul-
365 tural and vigilance committees. Forestry committees
366 oversee labor, land, and capital allocations to forestry
367 cooperatives, which are located only among the Bethel
368 region communities. Agricultural committees consult
369 on solutions to agricultural problems and share success-
370 ful farming techniques. Vigilance committees safeguard
371 community regulations and report infractions of them.
372 Only one Naranjo area community had an agricultural
373 committee compared to one-third of the Bethel commu-
374 nities. One-third of the Bethel communities also had vig-
375 ilance committees compared to none among the
376 Naranjo region. These groups decide strategies to safe-
377 guard the integrity of landholdings, crops, and forest
378 products on community lands from ~~outside-external~~ (and (occa-
379 sionally) internal threats. As illegal logging in the park

380 from Mexican and Guatemalan nationals is a constant
 381 threat, the presence of these committees among the for-
 382 estry cooperatives of Bethel is of greater urgency than
 383 for the Naranjo-area communities, whose primary re-
 384 source is the ubiquitous maize.

385 In both regions, and particularly within Bethel, the
 386 presence of NGOs is much greater than that of govern-
 387 ment organizations (Table 2). There are an estimated 40
 388 or more NGOs operating out of the departmental capi-
 389 tal “metropolitan” area of Santa Elena-San Benito-Flo-
 390 res. Several of them work in the SLNP, including Centro
 391 Maya, The Nature Conservancy, Defensores de la Nat-
 392 uraleza, CARE, and Guacamaya. These NGOs promote
 393 selective timber and non-timber forest extraction, agri-
 394 cultural intensification techniques, land tenure for buffer
 395 zone farms, and park conservation. Fundacio’n Guaca-
 396 maya and Fundacio’n para el Apoyo Te’cnico en Proyec-
 397 tos (FUNDATEP) support health care services and
 398 sanitation projects. Health services providers are grossly
 399 understaffed and promoters reach each community only
 400 sporadically. Lastly, due to its status as a community of
 401 returned refugees, several national and international
 402 organizations are involved with land use and develop-
 403 ment in La Unio’n Maya Itza’, including the UN High
 404 Commissioner on Refugees (UNHCR). While all of
 405 these NGOs operate along the Bethel Road, Centro
 406 Maya, FUNDATEP, and the UNHCR are absent along
 407 the Naranjo Road.

408 Place (location) matters not only between the two re-
 409 gions but also within them. In both regions, communi-
 410 ties situated along the road enjoy greater assistance
 411 than those within the park. Indeed, institutions re-
 412 mained uncertain even of the location and size of two

Table 1

Community political and community organizations

Mayor (%) Town council (%) Women’s group (%) Vigilance (%) Agriculture (%) Forestry (%)

Total Ruta a Bethel (n = 6) 83 83 67 33 33 33

Total Ruta a Naranjo (n = 22) 77 77 5 0 5 5

Total (n = 28) 77 77 17 7 10 10

Data from interviews in 28 communities in 1998.

Table 2

NGOs and GOs working in the Sierra de Lacandon area

Alto Comisionado de las Naciones UN High Commissioner on Refugees. Helps returning refugees in La

Unidas para Refugiados (ACNUR) Unio’n Maya Itza’

Centre Maya Supports sustainable forestry and agriculture, mainly among Bethel Rd. cooperatives

Fundacio’n Guacamaya A health organization with coverage of the municipio of La Libertad subsidized by the
 national Public Health and Social Assistance Ministry (MSPAS)

The Nature Conservancy (TNC) Supports park conservation and community relocations

Defensores de la Naturaleza “Defenders of Nature.” Main NGO in charge of the protection of the SLNP

CARE Promotes land titling efforts along the Naranjo road

Consejo Nacional de Areas Protegidas (CONAP) “National Council on Protected Areas.” Part of the Executive branch of
 the

Guatemalan government

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413 small communities within the park until I visited them in
414 the spring of 1998. It is interesting to note the lack of
415 awareness among community leaders to the presence
416 of certain organizations. For example, CONAP is the
417 de jure party responsible for promoting and enforcing
418 rules regarding park conservation in all of the communi-
419 ties in the SLNP area, yet its presence remained un-
420 known to leaders in several remote communities
421 (based on continued contact with informants from
422 NGOs in Pete'n I doubt this is the case today).
423 Both the development of internal politics and the
424 presence of external agencies appear more robust among
425 the Bethel Road. Cooperatives are legally recognized
426 and are eligible for government aid and credit. Since
427 each individual's actions are more likely to impact the
428 whole community, the cooperative structure may also
429 promote the development of community-level political
430 organizations. The greater development of such internal
431 structures, in turn, may facilitate the success of NGOs.
432 With limited resources, NGOs may be betting that
433 investments in these communities have a higher proba-
434 bility of success as defined by adoption of programs
435 and the efficiency of their implementation.

436 4.2. Socio-economic indicators

437 4.2.1. Economic earnings

438 The greater involvement of NGOs has helped boost
439 economic revenues among participant cooperatives.
440 Agro-forestry programs promoted in the Bethel Area
441 by Centro Maya have led to notably higher income for
442 cooperative members than their squatter farmer Nar-
443 anjo neighbors who depend on maize for their primary
444 source of revenue. One acre of forest selectively har-
445 vested for timber provides several times the value of a
446 year's corn harvest on the same parcel of land (Gretzinger,
447 1998). Indeed, most of the predominantly maize farmers
448 of the Naranjo Road are in debt or earn no more than
449 several hundred dollars annually (Carr, 1999). However,
450 NGO programs do not always act primarily in the best
451 interest of locals, in some cases even blaming farmers for
452 ecological degradation (Sundberg, 1998).
453 Earnings data were collected at the household level
454 presented in Carr (2004). In a measure of basic assets,
455 most families had only a radio, few had a horse or bur-
456 ro, and only a handful of the 279 households inter-
457 viewed had an automobile or chainsaw. Local
458 commercial "middlemen" and ranchers formed the rural

459 aristocracy. Middlemen usually owned a large truck to
460 transport maize from the local farmers to Guatemala
461 City. These men also frequently owned small stores
462 and served as the local bankers, lending money to farm-
463 ers in exchange for a portion of their harvest. Typically,
464 a larger community on the road had one or two local
465 middlemen while smaller communities usually had none,
466 depending on the larger communities for this service.
467 The other predominant type of entrepreneur in the re-
468 gion was the chainsaw owner. Usually one or two own-
469 ers per community worked as day laborers felling trees
470 on farmers' plots. Among the majority of small farmers,
471 money was made selling agricultural produce (predomi-
472 nantly maize) working on neighbor's plots during plant-
473 ing or harvest seasons, or working on ranchers' farms
474 clearing forest, weeds, or building fences. Wages aver-
475 aged 25 Quetzales¹ per day, approximately \$3 US.
476 Farmers rarely made more than 1000 Quetzales (approx-
477 imately \$150 US) per month when averaged over the year, and
478 many are in the red at the end of the year from debt to
479 middlemen. Earnings are highly variable. A good maize
480 harvest on a typical plot of several hectares could yield
481 up to a thousand dollars or more, but more frequently
482 droughts, plagues s of infestations, and fires claim much of
483 a farmer's harvests. This extremely low level of income
484 marked by severe annual variability is typical of farm
485 households in emerging agricultural frontiers (for exam-
486 ple, the Ecuadorian Amazon in the 1980s; see Murphy
487 et al., 1999).

488 4.2.2. Health

489 The park's inhabitants suffer from a dearth of health
490 care. Similar to frontier regions in Brazil and elsewhere,
491 malaria is pervasive and intestinal infections are com-
492 mon, especially in children (Table 3). Although I did
493 not specifically research magnitude or frequency of ill-
494 nesses, all but a handful of informants claimed to have
495 been infected with malaria at some time, and people
496 complained that virtually all infants become seriously
497 ill with gastrointestinal infections at least once and usu-
498 ally several times during infancy. As a result, infant
499 mortality is exceptionally high, with most women losing
500 one or more children during their lifetime.

501 The great reliance on maize means that some diarrhea
502 cases may be related to pellagra, a disease induced by
503 niacin deficiency. Anecdotally, it did appear that some people had
504 modest levels of skin inflammation, the primary symp-
505 tom of pellegra, but it is difficult to determine if diarrhea
506 resulted from an unrelated bacterial infection and if skin
507 inflammation was from sun overexposure or rashes from
508 other sources., though this is of course far from conclusive. Pellegra incidence is surely much
lower

509 than it might be due to the widespread practice of nixta-
510 malization, alkali processing which changes the nutri-
511 tional quality of maize by increasing the bio-
512 availability of niacin and glutelin.

513 Acute scarcity of health centers and professional

514 medical attention plagues the region. Only seven com-
515 munities have rudimentary health centers, but even these
516 are only irregularly attended by visiting health care
517 workers (Table 3). Most communities have promotores

¹ The Quetzal is the national monetary unit of Guatemala and its
national bird. At the time of interviews in 1998, one dollar traded for
seven Quetzales.

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518 de salud. Promotores are volunteer health workers whose
519 training comes from personal experience, apprenticeship
520 under past promotores, and, in some cases, from partic-
521 ipation in a brief training workshop. Midwives (comad-
522 ronas) are also present in most communities. These
523 women volunteers usually have not participated in any
524 formal training for attending births, but rather have
525 learned their trade from elder comadronas in the
526 community.

527 The ratio of health promoters to people and the per-
528 centage of communities with health centers were notably
529 higher among the Bethel communities. This may be due
530 to the desire of NGOs, such as Centro Maya, which maintains a ~~it~~ a con-
531 stant presence in the area, to ensure at least minimal
532 health care for their own workers as well as for commu-
533 nity members. Although Centro Maya does not provide
534 or promote health care, the strong presence of this NGO
535 among the Bethel communities enhances information
536 diffusion on how to train locals as promoters and may
537 empower community members to demand improved
538 health care. As a refugee community, La Unio'n Maya
539 Itza' is the only community in the park with an occa-
540 sional resident doctor. On shifts of several weeks, several
541 times a year, these doctors are subsidized by the UN and
542 their presence may provide improved care for neighbor-
543 ing communities in the Bethel area. In the case of an
544 emergency, residents from neighboring communities
545 can visit this doctor rather than traveling more than
546 100 km to the nearest hospital.

547 4.2.3. Education

548 As small-farm agriculture in the SLNP scarcely pro-
549 vides subsistence, few resources are mustered for high-
550 er-order needs such as education. Few children attend
551 school regularly in the SLNP communities. Four com-
552 munities had no school at the time interviews were con-
553 ducted, while four others had no teachers (Table 3).

554 Because schools in the area are unlikely to offer educa-
555 tion beyond third grade, and because many children
556 do not go to school even when classes are offered, the
557 school attendance rate in the SLNP communities is low-
558 er than the national rural rate of 26% (Instituto Nac-
559 ional de Estadística, 1999). Where children were
560 attending classes, they enjoyed few resources other than
561 several shared pens and notepads.

562 The government does not recognize communities lo-
563 cated inside the park, and those adjacent to the park
564 are not a high priority on government funding agendas.
565 In the case of park communities, no property taxes are
566 paid and no government investment is returned, hence
567 the lack of government-funded schools. Children's edu-
568 cation in communities in the park's predominantly
569 indigenous interior (i.e, those within the "core zone"
570 as shown in green in Fig. 2) depends on the few volun-
571 teers with sufficient ~~acumen-skills~~ to teach basic reading and
572 writing skills, but few adults are able to provide such
573 services. Even if they did have time away from the long
574 hours invested in farming for household survival, only
575 half the adults have ever attended school, and only a
576 handful achieved a level higher than third grade (Carr,
577 1999).

578 One community exception in the region, La Unio'n
579 Maya Itza', supports several voluntary teachers. As refu-
580 gees in Mexico, residents of this community were ex-
581 posed to much better access to education during exile.
582 These diverse Maya groups, speaking more than a dozen
583 native tongues, galvanized forces while in Mexico to
584 provide for their children. Today, unlike other commu-
585 nities, many young adults in this community are pri-
586 mary school graduates, and some have even attended
587 secondary school.

588 Largely as a result of La Unio'n Maya Itza', but also
589 due to ample coverage in other communities, the Bethel
590 area enjoyed notably ~~greater-higher~~ teacher-to-population ra-
591 tios and no Bethel community was without a school or
592 without at least one grade-school teacher. ~~While As a result~~
593 ~~of low educational achievement, illiteracy is far from not uniform universal~~
594 ~~within the Bethel region, the Bethel communities, however, nonetheless~~ re-
595 ported considerably higher literacy than the Naranjo
596 communities, some of which had no schools, or had
597 schools but no teachers. The exceptional example of
598 La Unio'n Maya Itza' aside, legal recognition implicit
599 in a cooperative appears to facilitate better education
600 access and quality among the Bethel communities.

601 4.2.4. The farm homestead

602 Materials used for household construction represent
603 one of the few variations among households relative to
604 material manifestations of development. Household
605 building materials therefore serve as a good proxy for

Table 3

Socio-economic indicators

Health care Education House composition

People per

health

promoter
Health
centers per
community
Primary
schools per
community
Number of teachers
per community
Literacy Walls of
branches
Roofs of
Guano Palm
Latrines
Total Ruta a Bethel (n = 6) 130 60% 1.0 5.4 83% 80% 83% 48%
Total Ruta a Naranjo (n = 22) 273 17% 0.8 1.7 69% 78% 87% 9%
Total (n = 28) 227 25% 0.9 2.4 70% 79% 89% 16%
Data from interviews in 28 communities in 1998.
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606 economic development in the absence of other measures.
607 Nearly all the houses in the region were constructed
608 from materials extracted from the forest (Table 3). How-
609 ever, as with other development indicators reported
610 here, differences are evident both between the two roads
611 and within the two regions based on distance to the
612 road. For example, while “guano” palm leaf roofs are
613 ubiquitous (see Fig. 3) for homes located inside the
614 park, some of the houses on the roadside have metal
615 roofs (la lámina de zinc) because of donations made by
616 NGOs and greater personal wealth. With few excep-
617 tions—again these exceptions will be found along the
618 road in longer-settled and more financially able house-
619 holds in the Naranjo area or among the Bethel commu-
620 nities—house floors consist of packed earth. Lastly, with
621 the exception of the Bethel cooperatives, few homes en-
622 joy even simple sanitation, such as outhouses.
623 Few homes have electricity. Kerosene lamps and fires
624 provide lighting at night. Food is prepared with wood
625 from the forest or from farmland in fallow. The latter
626 option is more common because recently fallow fields
627 on the frontier are often strewn with a clutter of un-
628 burned branches remaining from initial clearings.
629 Water is collected in a communal well or is carried
630 from the closest water source. Women and children
631 may spend several hours a day lugging buckets of water
632 on their head from the nearest river, stream, or pond.
633 Some households were located as far as 7 km from water

634 sources. However, Bethel households are never more
635 than 10 km from the mighty Usumacinta River or one
636 of its stream tributaries, whereas Naranjo communities
637 rely on less reliable wells and seasonally fluctuating
638 ponds.

639 In addition to the immense labor invested in this
640 chore, water sources are often polluted, scarce, and
641 overused. Clothes are washed in the same water that is
642 used for household consumption. In the case of a pond,
643 this water becomes increasingly saturated with surfac-
644 tants over time. In the case of a river or stream, the pol-
645 lutants produced by communities upstream (including
646 detergent, herbicides, and human waste) contaminate
647 the drinking water of downstream consumers. Human
648 waste infiltrating streams is particularly problematic
649 among the more scarce water sources of the Naranjo re-
650 gion where only a fraction of the Naranjo homes have
651 latrines, compared to nearly half the homes in the Bethel
652 region. Although the quality of home construction is
653 similarly rudimentary in both regions, the large differ-
654 ence in proportion of homes with latrines indicates
655 greater incipient home improvements among the Bethel
656 communities.

657 Another indicator of development is the number of
658 homes with satellite dishes and televisions. Among
659 Bethel communities, several small businesses that serve
660 as community stores, restaurants, bars, general meeting
661 places, and a handful of homes had recently installed sa-
662 tellite dishes in anticipation of the 2000 World Cup soc-
663 cer tournament. Conversely, only in the largest towns
664 along the Naranjo Road were businesses catering to soc-
665 cer fans able to invest in such a luxury. Such differences
666 in home and business improvements between the two re-
667 gions is indicative of the greater income produced
668 among the cooperative communities. This income de-
669 pends on cooperation in business ventures such as tim-
670 ber harvesting, which yield more revenue than the
671 pervasive small farm maize harvesting of the Naranjo
672 region. Such ventures, in turn, are predicated on the
673 cooperative structure and nurtured by NGOs which ap-
674 pear to be particularly attracted to investment in these
675 communities.

676 5. Conclusion

677 The tale of two roads is one of cooperatives and
678 squatters. Life in the SLNP is difficult, but regional var-
679 iability in human development indicators and commu-
680 nity infrastructure is salient. Differences may be
681 partially explained by political, social, and economic
682 factors related to the distinct land tenure regimes in
683 the two regions. Cooperatives are legally recognized by
684 the government and are therefore eligible to receive
685 tax aid and bank credit. Organizationally, the coopera-
686 tive organization encourages NGOs to work with com-
687 munity members since an investment in the community
688 is more likely to benefit all residents. Similarly, cooper-
689 ative members are accustomed to sacrificing personal

690 needs for the good of the community, decreasing the
691 chance that NGO efforts will be derailed by individual
692 interests.

693 In addition to the increased human well-being indica-
694 tors discussed in this paper, previous work reported that
695 the population of these cooperative communities grew
696 more slowly and the average household cleared less for-
697 est than their Naranjo neighbors. Cooperative commu-
698 nities also offered their residents advantages in
699 political representation and organization, as well as Fig. 3. Farm houses in the SLNP_s interior.

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700 infrastructure in the form of health care, education, and
701 home improvements. Although governments do not
702 want settlements within the MBR, allowing squatters
703 to remain without land title appears to be an untenable
704 solution for human development and conservation
705 interests.

706 The extraordinary poverty and underdevelopment
707 pervasive in frontier regions alongside variations within
708 these conditions have been little examined. More re-
709 search is needed to go beyond the modest scope of this
710 paper. Case studies from diverse locations and with larger
711 sample sizes are necessary before we can begin to discuss
712 the generalizability of findings, but the potential benefits
713 of such research are rich. To the extent that land security
714 and land systems promoting cooperation are found to
715 be implicated in improving human welfare and stem-
716 ming deforestation, conservation and development ef-
717 forts may harmoniously promote compatible outcomes.

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