POVERTY AND PARKS: INCOME RISK AND OTHER FACTORS AFFECTING PARK USE AND PERCEPTIONS IN POOR, RURAL SOUTH AFRICA

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Abstract: Using panel data from a poor rural village adjacent to a game reserve in South Africa, this paper presents a simultaneous probit analysis of incursions into the park to gather resources and perceptions of the park. Distance of arable land from the park appears to be critical in determining negative perceptions but the effect tails off within a relatively short distance of the park. Income risk is found to play a key role in determining use of the natural capital in the park. Policy options are discussed.

Keywords: Parks, Conservation, Simultaneous Probit, Resource Use, South Africa

I. Introduction

This paper presents a statistical analysis of the behavior and attitudes towards a large wildlife reserve in South Africa by neighboring poor rural villagers. Use of resources within the reserve by local villagers is modeled and then used to explain, along with other variables, whether or not these households have a positive or negative perception of the park.

How villagers use and perceive protected natural resources is a critical policy issue for South Africa and many other low-income economies. The abundance and diversity of flora and fauna in South Africa are two of its most significant assets. The current post-Apartheid government is currently deciding how to sustainably use these assets to decrease the poverty endemic to its countryside while preserving biodiversity for future generations.

While this is a subject of much debate, most parties agree that sustainable utilization will have to involve and benefit more those who live most closely with the resources in question. Many of the protected natural resource areas in South Africa are adjacent to former “homelands” or reserve areas for impoverished black South Africans. These rural villagers bear the brunt of some of the costs of protecting species in the reserve areas due to:

- Loss of land to the reserve areas,
- Loss of access to natural resources in the reserve areas around which local production was organized,
- Increased transportation costs due to the lack of access to the protected areas which often stand between rural villages and major transportation arteries,
- Continual crop damage, livestock loss, and even loss of human life due to proximity to heavy concentrations of large mammals, etc..

While some of the costs of the protected areas are concentrated on persons living in close geographical proximity to the areas, the benefits are far more diffuse. The preservation of species

within the parks has global as well as local benefits. South Africa has some of the most abundant stocks of large African mammals living in the wild in the world. These animals seem to have high “existence” values for many people in the world given donation levels to conservation organizations for them and expenditure on tourism centering on them.

These tourism revenues and conservation contributions are not necessarily going to the people living with the wildlife and may be spread to tour operators, the government, etc.. without necessarily trickling back down to local villagers. Bearing much of the costs and sometimes receiving few of the benefits, local villagers may have little stake in conservation. This could induce them to harvest more than is sustainable or otherwise misutilize park resources. Furthermore, even if by fences or fines villagers can be prevented from utilizing park resources, removal of utilization rights means villagers will not be able to use park resources in their risk management and wealth accumulation strategies. Given the poverty endemic to these areas, this is an important consideration for the post-apartheid South African government. Current government policy must then determine how best to “reconcentrate” the benefits of species conservation and involve local villagers in the decision-making process. A necessary input for policy is how villagers currently interact with the park and their perceptions of the park and the role it plays in their lives.

Although there is much new work on how Integrated Conservation and Development Programs (ICDPs) might hold the key to sustainable use around the world, there is still limited empirical analysis of these programs and on poverty and parks in general. The idea of closely involving local populations in resource management is still relatively new and many of the projects are still getting off the ground. Even baseline data on how protected natural resources are currently used is rather sparse.

We will attempt to provide some portion of this input using household and individual-level data collected from the a rural village in South Africa. We will call this village “Mpanzi”.

Mpanzi is located next to the northeastern border of Umfolozi-Hluhluwe game reserve in KwaZulu-Natal, South Africa. The next section of this paper discusses the formation and the park and the history of village-park interactions and government policy. The third section of the paper describes in some detail the village, the households and individuals within our sample, and how they interact with the park currently. The fourth section provides a regression analysis of household resource use and the interaction of that and other variables in producing a positive or negative perception of the park. We use OLS and Probit methods including simultaneous specifications where appropriate. The final section offers some conclusions about the direction of policy and future research.

II. History of Park Formation, Village-Park Interaction, and Government Policy

South Africa was one of the earliest establishers of protected areas for large mammals. The park discussed in this paper, Umfolozi-Hluhluwe game reserve in Southeastern South Africa in the province of KwaZulu-Natal, is the oldest park in Africa, established in 1895. Kruger National Park on the northeastern border with Zimbabwe and Mozambique was proposed in 1884 and created in 1898. It covers a huge area of some 20,000 sq.km. There are now 16 national public game reserves in the country and 6 more in KwaZulu-Natal plus many other protected areas where many species flourish. (Insert country map with parks highlighted)

The governance approach was one of “fences and fine” where local indigenous inhabitants were removed from the land and access was heavily restricted. There seems to have been little attempt historically to involve local people in park processes. These policies were remarkably successful in causing large mammal populations to rebound especially that of elephants.

Umfolozi-Hluhluwe park in KwaZulu-Natal was the site of the rebirth of the white rhino and has large numbers of most mammal species including even the very rare black rhino and cheetahs. It is run by the KwaZulu-Natal Nature Conservation Service (formerly Natal Parks Board) and is over 100km in length and 30km in width at points. Our data were collected from a

bordering community located approximately 70km from the Indian Ocean coastline and within a 2 hour drive of Swaziland.

Three of the four wards of the village border directly on the northeastern border of Umfolozi-Hluhluwe game reserve. The total length of the shared border is approximately 13 km. Much of the area directly adjacent to the fence line comprises arable and individually farmed plots of land. Some of the area adjacent is also used as common property grazing land or woodlands. There are also some housing settlement areas on or within 200m of the fenceline. Four of 80 households in our sample live in one of these areas. The total number of households in these areas is around 20.

The total number of households who control or use resources near the park border is much higher though. The layout of Mpanzi is similar to many villages in Southern Africa with households controlling or using land in a variety places within the village. This provides some risk diversification as soil quality varies widely over relatively small areas and many production and other negative shocks may be highly localized e.g. pest infestation, hail storms, etc… Even rainfall may be significantly different across areas of the village. This is particularly true in Mpanzi because of widely varying elevation and a large total land area of 5700 ha and a 25km perimeter.

Households will typically have a field or two next to their home for which they hold individualized and semi-exclusive rights of usufruct (use)[1]. Households also typically have the right to exclusively use a couple or several fields some distance from the homestead. The spatial dispersion of these fields relative to one another is rather variable. A "typical household" may hold two fields in an area 30 minutes walking time from the house and another field in a different

[1] Although the community owns the land and sales are not permitted, as long as households continue to use the land, the community in the person of the chief will be unlikely to reallocate it to other members of the community.

agro-climatic micro-zone 2 hours walking time from the homestead and perhaps in the opposite direction from the first two fields. Insert map with spatial layout and distances.

The area adjacent to the park contains some of the best arable land in the area and as such contains fields for a large number of villagers, many of whose homesteads may be 3 or 4 kilometers away from the park. Thirty-one of eighty households in our sample have fields within one km of the park border. Some of the users of these fields may live as much as 5km from the border.

Although, or perhaps because, the history of the village and the park are so closely tied, their relationship is sometimes difficult. A major possible source of tension between the village and park has been the appropriation of land. Oral histories taken in the village suggest that villagers view the park as having been situated in part on land belonging to their community when it was first established at the turn of the century. What is now Umfolozi-Hluhluwe park was two parks until a decade ago. A major "corridor" was completed in the 1989 to expand the area and allow large mammals with extensive range needs more room to move. Much of the community sits on this corridor and its not clear how much the perceived land loss actually occurred at this time rather than at the original establishment of the park. Some interviewees expressed more concern about the quality than the quantity of land lost. The area known as Hlanzeni next to the park holds some of the best arable land in the village as well as medicinal and basket-weaving resources.

Restriction from the general area of the park may also be as important as number of hectares lost. The park contains a wide diversity of micro-habitats from which the villagers are now largely restricted de jure except for some monitored resources-for-work trips described below. Since an electric fence was added on the border in 1994, even casual non-gathering ventures must be more restricted. Of course had access been allowed, those habitats may have devolved

via poor enforcement of property rights into degraded bushland and no diversity of habitat would remain in any event.

The loss of land to the corridor and access to the fence and fines approach was accompanied by a loss of transportation route access. Mtubatuba is the nearest major town to Mpanzi at 55km to the south near the coast and adjacent to the major N2 paved highway artery. Since the corridor was added, residents of Mpanzi must now cross the rough graveled “corridor road” to reach Mtubatuba. This corridor road is a 17km stretch of unimproved road that does not connect with the paved roads within the park along which tourists travel to game view. The park is determined to keep speeds low to decrease the probability of animal-car accidents.

For the residents of Mpanzi who sit on the fence border, this corridor road lies considerably to their west and is reachable only after looping back up through the administrative center of another town. This route is unimproved and absolutely impassable during heavy rains and covers almost 20km before the corridor road is reached. The trip from Mpanzi to Mtubatuba takes over one hour even with a heavy vehicle in the best of circumstances. The waiting time and walking between taxi segments as well as the cost means few venture out more than once a month at most.

Due to lack of access to vehicles and the funds for admission fees, few villagers ever enter the park as tourists. Although many animals can be seen from corridor roads, the border, or loose in the village, some types of animals are rarely seen in these contexts or up close because of the particular variation in habitat even though they may be easily found in the park in general.

Despite the cultural importance of large mammals in the local area, those animals are not necessarily welcome in the village. After attacks by predators on humans in 1994, the border fence was electrified to reduce animal presence in the village. Even with the electrified fence, the incursion of animals from the park into the village remains problematic. Any large mammal can

usually find a way to force itself through a fence. There is currently no fencing technology short of concrete that will contain elephants or lions, etc…

Fortunately, fences are not the key reason most animals stay in the park. Because the parks habitat is so much more robust than that outside it due to degradation from the overgrazing of domestic livestock, most animals do not feel the need to leave in the times of plenty. The corridor road is not gated and though a herd of zebra and buffalo tend to congregate next to it, most of the animals do remain inside. Herds do not seem to migrate outside with any frequency.

Nonetheless, there are continual stray animals that do wander onto village lands. Incursions by hyena, jackal, antelope, and baboons seem to be most common based on our surveys of crop and livestock damage. Baboons are particularly problematic as they easily traverse the fence, are not very afraid of humans, range widely outside the fence and prey on both crops and small livestock like goats, sheep, and calves. The incidence of baboon damage on fields and at homes within a kilometer of the border was very high and much higher than elsewhere in the village.

Park policy is not to compensate for animal damage. Park officials told the authors that "this is Africa" and local people have dealt with animal damage for centuries and would do so whether the park was there or not. Baboons are common outside parks around the country and that does provide support for this rationale. But the difference in incidence in the different parts of village depending on proximity to the fence suggests that this rationale bears closer examination. Further, antelope and feline and canine predators are not common outside protected areas in general and the concentration of damage near park borders may be high.

In recognition of that there may indeed be special costs of living near parks, the Post-Apartheid government has shifted its approach, like many others in Southern Africa, from "fences and fines" to one of more inclusion. The hope is that if local communities are involved in decision-making and receive more of the benefits of conservation, they can be made partners in

the process. In fact the hope of the region's proponents of "Integrated Conservation and Development Programs" or "ICDPs" is that conservation can become a win-win proposition where sustainable utilization will enrich not just biodiversity but also local inhabitants. Redirected proceeds from ecotourism, controlled hunting and resource gathering can be used to build community infrastructure. In turn, because of their material interest in conservation, local inhabitants will help to reduce poaching of resources by themselves and outsiders.

In the post-apartheid era, all the South African parks boards have attempted to reach out to local communities in one fashion or another. An important part of this recently has been to implement local school programs on conservation. In the last couple of years, education programs have been introduced around the country, including at the Mpanzi high school in 1999.

At the time of survey, there were several formal mechanisms for the community to have input into park management. There were continuing communications for instance between park personnel and the iNkosi (chief) and the Mpanzi local community development officer. There was also a park ranger who worked with those local officials on issues surrounding damage claims, new tourism opportunities, new park rules, etc… There was also a community participation officer stationed in Mtubatuba, the closest town, who liased with all the communities bordering the park.

Community members outside the local leadership have fewer opportunities for meeting with park officials. This has been in part remedied by the employment of a local Zulu speaker who was assigned the local community participation officer for that side of the park. Many of his interactions however tended to occur with the local leadership although he did visit individuals within the community and had been at some local community meetings. Since local people may have little opportunity to affect village policy via the hereditary chieftanship, it is unfortunate that this mechanism has not been more affected. Women and the poorest of the poor who have

little ability to participate in village politics customarily may be particularly excluded from park management input.

Just as many people have limited opportunities for participation in park decision making, many people do not have much other formal involvement with the park. Only 6 of 80 households reported ever having a family member work as an employee of the park. This in fact translates into 6 people out of several hundred economically active persons in the sample, 3 of which are no longer employed there. It may be that bias in past employment practices under apartheid has led to this low number. It is unlikely that this is the only explanation.

One of the proposed benefits of Integrated-Conservation-and-Development programs is that local employment will increase. The numbers for Mpanzi show how unrealistic this may be. There are many, many communities bordering the park and even with active programs to recruit from the local population, population density is simply too high to hire more than a handful of people from each community. Even with expanded formal park activities, it is hard to see how these figures could change much.

The possibilities for more indirect employment of community labor may be greater. The park can use and market the products of village labor for instance. At the time of survey, the park had set up craft stands at a few of the park entrances for community members to use. At any given time, over 2/3 of our sample has someone making intricately woven and dyed baskets for sale to tourists and to some extent other rural villagers who live farther from the necessary raw materials. However, again because of the vast number of people living near the park, the local markets cannot handle all of the supply. The number of women actually working at the markets was no more than a few dozen, none from Mpanzi. At the time of survey, no one in our sample sold their baskets at the park at all. A white trader from Durban came monthly to buy the baskets and resell them to coastal tourists. The marketing margin is significant with villagers receiving between a third and a half of the retail price of the baskets in the Durban market.

Again, while the park has attempted to buy needed supplies locally where possible, principally crafts and fresh vegetables, the demand is far lower than potential supply and benefits only a lucky few.

Even though households may not receive many benefits from the use of their resources by the park, they may receive benefits from the use of the park's resources that will increase incentives for them to participate in conservation. The next section discusses the households of Mpanzi and their resource use to shed light on the prospects for the success of more community into park processes.

III. Data

The data were collected over 14 recall periods from August 1995 to January 1998 in four of five wards of Chief (iNkosi) Mpanzi. There were 523 households in those wards, 73 of which were chosen randomly[2]. The data in 1995 were originally collected under the auspices of President Mandela's Strauss Commission Rural Finance Inquiry. The Mpanzi site was one of several and the survey work was carried out by research team members from the University of Zululand under guidance from the University of Natal-Pietermaritzburg (UNP) and the Ohio State University in the US.

After the data were reviewed by researchers at UNP, the author was asked to return in May 1996 to resurvey the area and attempt to improve collection of certain types of missing and omitted data. This venture was successful and added 4 new recall periods as well as filled in missing data. The author returned to resurvey the area in June 1997 and the survey continued until January 1998 and added 9 recall periods. Monthly expenditure and consumption data were also collected for the first time. Over the sample period, there has been a small level of sample

[2] Via aerial orthographic mapping photos, grid mapping and randomization, 73 households[2] were originally selected for sampling. Using GPS systems, enumerators teams attempted to contact these 73 households. When a household was deemed to be abandoned, the homestead to the left was chosen instead.

attrition as households moved from the survey area or broke apart and reformed. Replacement households were added annually where this occurred and the total number of households ever interviewed grew to 80.

In addition to the survey data, considerable amounts of other quantitative data and qualitative data were collected. These include information on climate, soil, government and other public services, distances, prices and costs, informal lending, microenterprises, traditional healers, customary leader, land tenure, and village history.

Based on data collected elsewhere in the country, Mpanzi seems to have the average complement of poor rural village resources. There are some minimally maintained gravel road arteries that connect up to the main gravel roads out of the region and the beginnings of an electrical network and water standpipe system. There is very little formal commercial activity but there is a somewhat thriving informal sector. Schools are inadequate and placed far apart.

Nearly everyone in the village farms but under considerable challenges and not just from damage by park animals. Damage by loose livestock is also heavy and local property rights enforcement has been weak. Climatic and soil conditions are also not favorable. Rainfall is almost 700mm annually on average which is adequate for dryland maize, the principle staple food, but it is highly variable. Soils in the area tend to clay and sand mixtures and are rather acidic. The terrain is hilly and erosion a problem.

Most of the area has been deforested with an exception of a tightly controlled pine forest area held under community property and accessed only with permission of the iNkosi. Most other forest resources are thorn trees and bushes located on steep hillsides or valleys not farmed. Although there are an increasing number of water pumps being placed at strategic points around the village, many people still rely on riverine sources of water that are contaminated by animal and human waste and are unreliable in the dry season. The difference between the resources

available outside the park versus those in it is stark. This is part due simply to the relatively heavy population density outside the park.

Households in Mpanzi, like others in South Africa, are heavily dominated by small children and the elderly. People in peak years of economic productivity, especially men, tend to migrate to urban and mining areas in search of formal employment. Typical family size is 7 to 9 persons with one elderly person and two adult females age 18-60. There is little else typical about South African rural households where the legacy of apartheid and enforced spatial separation and the region's history of polygamy has led to wide variation in family constitution.

There is also considerable stratification along wealth lines in the village. Those who retire from relatively successful careers in the cities and start micro-enterprises or who have white collar jobs in local schools or hospitals or have a migrant who does, have wealth portfolios that include valuable financial assets, significant consumer durables, and vehicles and mechanized farming equipment. Most of the people, the middle 20 to 80% of residents, have considerably less. A typical household might have a few consumer durables and pieces of non-mechanized farming equipment, a few heads of livestock, and R50 to R100 in cash savings at several points in the year. The poorest 20% of the population will have a one room mud house with no more than a chair or two, probably no livestock or farming equipment beyond a hoe, and perhaps R20 in cash savings a few times a year. Table 1 below list statistics for the rand value of assets held by wealth terciles within Mpanzi.

Table 1

Wealth Tercile		Productive Land[3]	Less Productive Land	Agricultural assets	Productive assets	Financial assets	Livestock
Poor	Average	1386	530	10	330	43	235

[3] The productivity of land was based on soil information collected by agricultural extension agents and self-evaluation by the households.

Middle	Median	500	252	0	0	0	106
	Average	2408	643	201	1662	433	2889
Rich	Median	808	48	0	0	85	1808
	Average	3478	829	1787	7769	4348	16493
	Median	2284	600	400	900	749	15006

Income was recorded for individual members of the household and household income is defined as total contribution to the household over a month including the value of in-kind contributions.[4] These in-kind contributions are usually groceries but at certain times of the year in-kind contributions may also include consumer durables, clothing, and even productive assets.

When we consider only cash and groceries actually remitted, the median and average income is roughly R400-R500. Using the expanded definition including in-kind transfers, median (average) income for the poor, middle class, and rich respectively is R712 (R792), R834 (R1109), and R1525 (R1786). If our sample was larger, quintiles would be the most informative breakdown of wealth groups with much starker differences between the top 20% and bottom 20% of the sample in terms of income. The bottom 20% for instance receives barely R200 per month which amounts to 1 80kg bag of grain, 5kg of beans, some sugar and other very basic groceries. To provide further perspective, it is worth noting that R1500 per month is the government-set level at which all households below it are eligible for the governments' land reform program aimed at the poor. In that sense, nearly our entire sample (~80%) is "poor".

Households struggle with income not just because it is low on average but also because it is very variable. Households must undertake a variety of activities to diversify away some of this

[4] In keeping with our treatment of asset values above, in the case of "decision makers" (as identified by the household), all of their cash income, not just the actual physical transfer is treated as income. This is because we assume (and this accords with observation) that held-back amounts are actually being used in support of the family as well e.g. in the form of investments or loan payments on goods for the households. There is some potential to overestimate this contribution because non-negligible amounts may be used only for that person. Since most migrants receive in-kind payments from employers for self-maintenance away from home e.g. housing and meals and since this seemed to accord with actual observation, we nonetheless preferred this rule over other possible sharing rule assumptions.

income risk and rural households may not be appropriately characterized by the appellation of "farmer." Nearly all households in the village and all of the households in our sample do undertake some form of agricultural activity during the year. Most families plant maize supplemented by perhaps one other field crop and a vegetable garden. Despite the prevalence of agricultural activity, it accounts on average for only 20% of rural income. This figure includes the value of home consumption as most households market few if any of their crops.

Given an estimated formal unemployment rate of 45% (RSA 1997) at the time of the survey, getting and keeping a job is difficult for much of the population. Those in our sample covered the spectrum of chronically to intermittently unemployed. To supplement wage and agricultural income, particularly during times of unemployment, many turn to micro-enterprises. Only a handful of households in our sample never participated in a micro-enterprise activity. Given the low wealth levels discussed above and the myriad credit, output and insurance market failures endemic to rural South Africa, most of the activities are low-capital in nature and neither require nor produce much financial activity. Those that most households can access include: basket weaving; rug weaving; wood gathering; reed gathering; temporary farm labor; water selling; hawking home-grown garden vegetables; hawking home-made cooked food outside of gathering places and schools. The average remuneration per month for these activities ranges from R30-R50. Households switch in and out these activities depending on household needs, labor availability, seasonality, etc…

Other activities require more capital of several kinds e.g. financial, physical, human, etc… These activities tend to also occur more regularly provided the family does not receive a large adverse shock. They include: hawking items bought from wholesalers; producing and selling white fryer hens; performing traditional healing services and selling herbal medicines; providing taxi or tractor or other type of transport and motorized agricultural services; prostitution; growing and selling marijuana; milling maize; setting up an informal shop at one's homestead typically

selling fuel or refrigerated foods. These activities usually earn at least R100 per month and some like taxi and healing services may yield several thousand rand per month. All these activities are however subject to the health and crime risks and income from them may be still be highly variable.

What is striking about both lists is the extent to which even these non-agricultural activities rely on the local resource base. This is particularly true for those accessible to the poor where the resource base becomes an important part of their safety net. Given the relatively low and variable cash incomes of many rural households and the poor infrastructure, they are often forced to turn to exploitation of natural resources to satisfy their fuel, medical, water, and food needs as well as for cash income generation.

Although a few households bought wood and water from their neighbors, most relied on family labor to collect these natural resources. As noted above, these resources may be located some distance from the homestead and several hours each day is typically spent in their collection. The average value of home wood use was R50 or one-tenth of the typical monthly budget. Medicinal herbs, greens for food, and wild animals for meat are also an important part of natural resource collection.

As noted above, many of the natural resources in the village are highly degraded or depleted. With resources in relative abundance in the neighboring park, many poorer villagers turn there for resource access. While the park does not use many of the village outputs, it does offer the possibility of supplying village inputs. There are several formal mechanisms for the villagers to use the resources of the park to supplement the natural resources available to them outside the park. While living in the village over the period from July 1997 to January 1998, we became aware of the critical role the park plays in the local economy in both a positive and negative sense. As we learned more about crop damage and property rights issues, we became aware of strong feelings among residents towards the park. In September 1997, we added

questions about park use and perceptions to the monthly survey instruments to attempt to put some structure on our observations. These questions were answered by 73 of the 80 households in our sample.

According to our survey, one much-appreciated park program is the sale of meat and hides of culled animals to local communities members at prices about 1/10 of local prices for meat. The hides are used in customary ceremonies and religious observances but it is the meat that may be most desirable. The principle source of protein in local diets is beans and those are not even available on a daily basis for some. The sales are unfortunately infrequent as park officials cull only when absolutely necessary to maintain habitat.

The access to medicinal herbs in the park is also highly valued. There is a special committee on the gathering of medicinal herbs that comprises important traditional healers from the area as well as park officials. Ways to implement sustainable utilization are under much discussion and traditional healers are often able to harvest herbs within park boundaries.

The park has other resource gathering programs for roofing thatch grass and wood. The schemes tend to follow a resources-for-work program. During the winter season, women meet several times at the locked park personnel access gate at Hlanzeni in Mpanzi on the northeastern park border and are transported in a trailer to somewhere in the park. The women work on local clearing and maintenance projects in the morning and then are allowed time to gather resources while an armed game guard stands watch to protect them from predators.

These resources are then used by the villagers for their own fuel or roofing needs but they may also be sold. All of the women who collected these grasses sold a substantial portion of them, receiving about R400 on average for the season. These grasses are available outside the park but are scarce and subject to over-exploitation. This is then a relatively remunerative project for the women. However, the women expressed concerns to the author that they had to provide so much work for a resource that, had the park not been there, they believe they could have

gathered for free. A park official has pointed out though, that these resources might have been overexploited had the park not been there and might not be available at all in the counterfactual.

Although there are some opportunities to use park resources that are approved by the park, local people also engage in unregulated use of park resources as well. Given the frequency of animals crossing the fence, people do not even need to enter the park to harvest park resources. Game showed up on a consumption surveys with surprising frequency. When people tending cows or crops near the fence spotted stray ungulates, word quickly spread and someone inevitably was spotted carrying the animal out to their home by the end of the day. This kind of opportunistic poaching may not be particularly problematic for conservation goals. Most years where there is far more forage in the park than outside, the majority of ungulates stay inside the park where they do not need to compete with the large number of cattle and goats in the local villages.

What may be more problematic in the long run is evidence of some more systematic poaching. Some of our respondents worked for other members of the community who ran tanning shops. These shops acquired the animals and prepared the hides and other offtake for marketing within Zululand and beyond. The largest shop we found was an oversize house containing dozens of hides and other materials from giraffe, zebra, jackal, various antelope, etc… The numbers we saw and the amount of continual activity made it unlikely that all of these animal products were legally obtained. We saw no ivory or evidence of rhino or elephant poaching anywhere in the village but we did see possible evidence of large cat poaching.

Since this activity provides a number of local jobs and certainly is highly remunerative for the leaders of activity, the park may have a difficult time ending it by fiat. Where one shop is shut down, another may pop up. Its possible the park may have to more aggressively pursue its goal of increasing rewards for conservation and involvement in it in the village.

Several other observations we made did not bode well for park management either. At the time of survey, a committee was formed to make a plan to tear down the fence along the Hlanzeni border and invade the land for farming. There were also suggestions that taxi drivers should begin using the service road that began there through the park. Many residents also stated they secretly feared their traditional leadership was hatching plans to sell more of their Hlanzeni land to the park. Several village leaders did in fact suggest that they were approaching the park about setting up a Zulu "cultural" village at the Hlanzeni service gate for tourists. Although there are some spots along the fence that are thorn bush groves where this might be a reasonable use of the land and would require only adding another gate (there is a border perimeter road), the area proposed is the best arable land in the village and is farmed now by many different households. This may not be the best form of a Integrated-Conservation-and-Development program to pursue.

The next section presents a regression analysis that may shed light on how well current initiatives are working and what are the possibilities for successfully extending them.

IV. Regression Analysis

This section examines how the villagers perceive the park. Survey respondents were asked whether they generally had a positive perception of the park, a negative perception of the park, or were largely indifferent to it.[5] This is not the usual data collected by economists but we sought it at the time to assess how serious and widespread village threats against the park were. Several patterns emerged that are explored below as we attempt to relate these perceptions to a variety of household characteristics and experiences that may influence this perception.

Our initial model for how the perception of the park relates to household-level variables is:

$$Like = \beta_0 + \beta_1 Meters + \beta_2 Car + \beta_3 Work + \beta_4 AvgLiv + \beta_5 Educ + \beta_6 Gender + \beta_7 Age + \beta_8 Leader + \beta_9 Trips + \varepsilon$$

[5] The interviews were conducted in Zulu and this is more or less the translation of the question into English which is somewhat imprecise.

The dependent variable is ordinal ranking and this thus becomes a qualtitative response model. We may view the observed information as standing in for an underlying latent variable process that generates a continuous variable that measures the strength of the preference for or against the park. We may observe “Like” when people’s preferences for the park exceed some critical positive threshold and “Dislike” when they fall below another negative threshold. “Indifference” occurs in the space in between the two thresholds.

As a practical matter, the perception variable may also be collapsed into a simple zero-one variable by assigning “indifferent” responses to either the positive or negative perceptions. Which one chooses should probably depend on what is of more policy interest e.g. “what increases the probability of a positive (negative) response?” In any event, appropriate regression techniques include forms of probit or logit regressions.

The village was fairly evenly split in responses with 24 reporting a positive perception, 21 a negative perception, and 28 reporting indifference. The positive responses came largely from people who believed they benefited from park resource programs or the potential for employment at the park although several cited only an appreciation for protecting the biodiversity integral to their customary religious culture and kinship relations. The latter tended to be those who were not in close proximity to the park.

Those who expressed a negative perception of the park were frequently those who lived or farmed nearest to it and resented the frequency of animal damage and inability to freely use the resources near them. Several people also expressed frustration at feeling excluded from park management. Those who were indifferent were largely those whose land and houses were far from the park. This suggests that the effects of the park decrease rather rapidly over distance from the park.

This is in line with the limited information about perceptions of parks in Africa published elsewhere. Specialized surveys were conducted in Botswana, Northern South Africa, Tanzania,

and Zimbabwe by various authors and all found that while people appreciated the idea of species preservation, they often dislike the implementation by park officials (Mordi 1991, MacGregor 1997). Our survey was not refined enough to distinguish between perceptions of park officials and the park itself but it was clear that many people were ambivalent about the park.

Because the damage to crops from park animals seems to be source of tension between the park and the villagers, "Dist" or a measure of crop distance from the border is included as an independent variable. This is not completely straightforward to measure for several reasons. The border has a concave kink in it so we chose the closest border when a field lay in a triangle between two borders. Although the two areas of the park may have different animal concentrations such that the farther border is the more critical point in the view of the household, this is not likely to be too common.

A more difficult issue is that our measurements of the locations of fields were taken from the house to the field. This was usually measured in minutes of walking time from the house by our enumerators who went to each field to take precise measurements of its area. The location of the fields was roughly mapped by us so we could find them again but translating that location to the aerial map to translate the distance into meters is somewhat imprecise. Most measurements are probably only precise within 200 meters or so.

A further difficulty is that, as noted above, households have multiple fields often in several locations. For households that live near the iKantolo (town hall) for instance, many have fields next to the park and fields on the opposite side of their house away from the park. As result we constructed and tried several measures of distance. They include: the simple average of crop distances; a weighted average of crop distances where the weights are the proportion of total household field area; the number of fields less than 500m from the park border; the number of fields less than 1000m from the park border. The latter measure corresponded well to the fields that actually experienced crop damages over the survey period or were assigned a high

probability of receiving such damages from park animals by the household. It also performed the best in the regression analyses.

The average value of livestock (AvgLiv) was also included as an independent variable since households with more livestock may be more likely to experience livestock damage incidents. They may also begrudge the park the grazing lands removed to construct the corridor more. It is also true though that is a strong indicator of wealth that may have a more unpredictable effect on the sign of the coefficient. Wealthier households may be better able to tolerate damage than the poor and so may feel less strongly about it or they may feel more entitled to park resources and more frustrated at their lack of access. Whether or not the household owns a car (Car) was also included. This is also a measure of wealth but more importantly bears on the effect of the corridor's construction of the ease and cost of transportation to the nearby town.

The perception response was elicited not from the household but from a representative of it, usually a resident head of household. As such we include the education (Educ), gender (Gender) and age (Age) of the respondent in the regression. More educated people may have greater understanding of the why conservation goals are set in the manner in which they are. Older persons may have stronger feelings about land dispossession and previous park policies. Finally, women may have less voice in park policies and therefore different perceptions of them than men. They may feel less ownership of the park or more complacent about the lack thereof. They also may deal more directly on a day-to-day basis with resource use issues though and feel more positively about access to them.

Whether or not a household has a member who works (Work) in the park was included for obvious reasons. People who work in the park may feel more ownership in it. The same might be true for members of the community leadership (Leader) who are able to more directly participate in its management and goal setting.

Persons who participate in the resources-for-work program may have systematically different feelings for the park than those that don't. They may either resent having to work for the resources or be grateful for access. The number of trips (Trip) may however be endogeneous since it a decision made by the household in every period. As such, we will use a simultaneous specification that avoids simultaneity bias. We specify the regression for the Number of Trips as:

$$Trip = \beta_0 + \beta_1 HsDis + \beta_2 AvgInc + \beta_3 VarInc + \beta_4 AvgFem + \beta_5 Healer + \varepsilon$$

Although we have 14 periods of information on these variables, here we only explore a collapsed version of the data because it needs to relate to the perceptions variable for which we have but one observation. A companion paper looks at resource use over time and contains a fuller analysis of the problem.

We have not included "Like" as a regressor in the Trips regression which may be viewed as problematic. People may be more likely to make resource-gathering trips if they enjoy the park. Then both "Like" and "Trips" would depend on each other. Our view was that this was an unnecessary complication because of the high rate of unemployment and the lack of income generation opportunities within the village. Regardless of whether people like the park, if they live closely enough and have sufficient labor, they do send people to gather resources in it. A number of the resource gatherers did not like the park in fact.

We do include what we view as more determinate measures such as the distance of their homestead from the park gate. Many households in the village live too far away to reach the park gate on foot in less than a few hours walking. If they took taxis, they would be unlikely to make it to the gate on time to be picked up and would also be earning very little net per day if anything after they paid for the taxi. We would then expect the number of trips to decline with distance of the homestead from the park.

We would expect the number of trips to increase with increases in female labor supply. Except for unregulated park use or gathering of medicinal herbs by male healers, men were not observed to participate in resource gathering. As such we calculated the average number of economically active females (AvgFem) in the household over the survey period. Given the structure of rural households discussed above, this is a good proxy for household labor supply in any event.

Since the resource gathering is highly arduous and time-consuming, its possible that it acts a safety net use of labor time, an activity of last resort. This idea is explored more fully in another paper (Despins 2000c) where we find this likely to be true. We expect the number of trips to decrease with an increase in average income (AvgInc) and increase with an increase in income variability (AvgVar). The latter is measured as average of the per-period deviation from average income. These variables are calculated of the survey period and include all non-resource gathering income.

Finally, certain kinds of traditional healers use herbs extensively for which the park is nearest source. Although healers can also buy from others, we would expect the number of trips to increase if someone is a healer versus if someone is not.

The descriptive statistics for these variables are shown below. With respect to the preference regression, it is worth noting what the mean respondent looks like. Since “Gender” was coded as one if the respondent was female, our average respondent was a 50 year old woman with only two years of formal education. This is a representative picture of the de facto decision-maker in most households and information about their preferences should be policy-relevant.

All of the variables relating to income and wealth vary widely. Average income appears high but so is its standard deviation and the average of the variance of income (measured as the standard deviation each period from the household long-term average). The standard deviation of

the value of livestock income is also high. The average figure works out to about 6 cows per household. The median for all of these variables is substantially lower.

Because of the spread of the village over a relatively large land area, the distance variables also vary widely. Average House distance is almost 4 km but its standard deviation is high. The number of fields less than 1 km (1000m) from the park border also varies considerably but on average households have 1.22 fields near the border. Thirty-one of seventy-three households have at least one within that distance.

Table 2

Variable	Mean	Std. Dev	Number in Sample (73 households)
Like	1.04	.79	24=like, 21=dislike
Work	N/A	N/A	6=work in park
AvgLiv	R9413.73	R10297.18	N/A
Car	N/A	N/A	8=have owned car
Cleader	N/A	N/A	17=are member of or have family connection to community leadership
Dist (FldThou[6])	1.22 fields less than 100m from park border	1.87	31=have at least one field within that distance
Gender	.88	.33	N/A
Age	50.34 years	15.42	N/A
Education	2.04 years	2.98	N/A
Trips	1.68 times	3.92	N/A

[6] This is the measurement of distance that performed most strongly in all of the regressions and is the only reported below.

HsDis	3725.87m	1490.76	N/A
AvgFem	2.36	1.36	N/A
AvgInc	1345.78	1205.22	N/A
AvgVar	597.46	806.32	N/A
Healer	N/A	N/A	9=traditional healer

The simplest way to proceed is to use OLS to predict the effect of the independent variables on the dependent variables, “like” and “trips”. Since the number of trips is a continuous variable, if it is not endogenenous, this is a correct way to proceed. However, since preferences are only observed as limited ordinal ranking, OLS regression may provide only a weak approximation to the true relationship. What we want to know about each independent variable is how changes in it, change the probability of observing “like” versus “dislike.” Since OLS coefficients are not restricted, we may find that they predict probabilities of occurrence greater than 1, an impossibility.

Probit and Logit methods do not have this problem and so we estimate them as well to compare with the OLS results. We use both unordered and ordered versions depending on whether we collapse the ranking of preferences into a zero-one variable or not. We also estimate two-stage least squares and a two-stage probit method to deal appropriately with the possible endogeneity of the number of trips.

Listed in the table below, the results are all strikingly similar for the non-simultaneous specification where we use the observed number of resource gathering trips.

Table 3

Coef-ficients of the Variables	*OLS: Like, ordered*	*OLS: Like+ Indiff,*	*OLS: Like- Indiff*	*Logit: Like+ Indiff*	*Probit: Like+ Indiff*	*Logit: Like- Indiff*	*Probit: Like- Indiff*	*Ordered Logit: Like*	*Ordered Probit: Like*
Constant	.71	.58	.13	.265	.255	-2.169	-1.33	N/A	N/A
FldThou	**-.13***	**-.0881***	**-.04**	**-.5***	**-.2867***	-.24	-.14	**-.42***	**-.23***
Car	.3	.11	.197	.4	.207	1.165	.65255	1.018	.57
Work	-.13	.0755	**-.21***	.56	.278	-21.16	-6.347	-.328	-.22
AvgLiv (R1000)	**-.07***	**.07***	**-.07***	**-.07***	**-.04***	**-.07***	**-.04***	**-.07***	**-.04***
Educ	-.0044	-.0088	.0044	-.027	-.016	.017*	.01	-.03	-.013
Gender	**.65***	**.27***	**.39***	**1.789***	**1.06***	**2.39***	**1.38***	**1.88***	**1.149***
Age	-.0002	.0006	-.0008	.0015	-.002	-.005	-.0015	-.004	-.0017
Leader	**.52***	**.289***	**.228***	**2.468***	**1.465***	**1.34***	**.789***	**1.64***	**.96***
Trips	.0074	-.003	.01	-.032	-.018	.05	.029	.02	.012

* indicates statistical significance at 5% or less.

In all of the regressions but one, only the coefficients for the number of fields less than a 1000m from the park gate, the average value of livestock held, the gender of the respondent, and whether the household is connected to the community leadership are statistically different from zero at the 10% significance level. The first three variables are significant at the 3% or less level in fact.

The sign on the coefficient for the number of fields less than a 1000m from the park gate is negative and significant nearly everywhere. This suggests that those who do have fields close

to the park border are more likely to actively dislike the park[7]. The amount of crop damage due to wild animals is perceived to be different than that which would occur in its absence. This weakens the case for the park to claim that wild animal damage at least from baboons occurs equally everywhere. Clearly the villagers perceive heightened risk from living near the park and our own damage data bears this out.

We may also interpret the negative sign on the coefficient for R1000 average value of livestock in the same way. The more livestock you own, the less likely you are to like the park and more likely you are to actively dislike the park. It should be noted that this is also a wealth measure and we could also interpret the coefficient as suggesting the more wealthy one is, the more likely one is to dislike the park. This interpretation of the variable does not lead an easy intuitive explanation of the sign of the coefficient. Regardless of the interpretation, the fact that wealthy livestock owners are more likely to dislike the park may be important to the park as wealthy villagers may be more able to organize against the park.

Community leaders, controlling for some signals of wealth such as car and livestock ownership, are more likely to like the park. Given that they seem to have greater input into park operation than the average villager, this may not be surprising. It will be helpful to the park in future projects to have the support of the community leadership but if the difference in results between community leaders and average villagers is involvement levels, the park may do well to attempt more inclusivity. That community leaders are more likely to like the park does not mean they all do and may certainly mean that its true only because many villagers do not.

The final statistically significant coefficient is that for gender and its large and positive. Women are more likely to actively like the park. Why this should be the case is not entirely clear. Women are more likely to be uninvolved in decision making which might suggest the

[7] The probit and logit coefficients are not themselves the likelihood of the dependent variable equaling one (Like). The relationship is more complicated and the calculations are available from the author. The sign is of immediate importance here and does indicate direction of likelihood if not its level.

opposite result. On the other hand, women may perceive that it is well-managed and preserves the resources like reeds, thatch grass, wood, etc.. which impact their lives more directly even if that access is limited. Since we have so few men as respondents, if many of them dislike the park, the gender coefficient could come through strongly. It could be that men who are used to participating in village management may resent their perceived exclusion from park management more strongly. The result also may, of course, simply represent preferences for which there is no immediate economic explanation.

Number of trips does not appear to be a factor in any of the specifications. We did run the simultaneous specifications of 2SLS and 2S-Probit but with little change in result. Number of trips never had a significant coefficient and only the variables noted above did. The results are available from the author. The OLS regression predicting the number of trips made itself though was very interesting and confirms our hypothesis about the relationship between poverty and resource dependence. For every R1000 of average income, households make 1.6 fewer trips to the park. For every R1000 of deviation from average income, households make 1.3 more trips. This is line with evidence from Botswana and Zimbabwe (Mordi 1991, Cavendish 2000) and suggests more analysis of this issue is needed.

Household female labor supply and distance from the park do not enter the regression significantly. This may be because we are only imperfectly measuring those variables. The companion paper that includes additional measures and tracks the trips over time may be more instructive. Finally, being a traditional healer significantly increases the number of trips in part because they go more frequently because the resources they harvest are available year-round.

Table 4

Variable	**Coefficient**
Constant	3.19*

Distance of the Household (1000m)	.2
Average Income (R1000)	-1.6*
Variance of Income (R1000)	1.3*
Average of Number of Adult Females	-.12
Traditional Healer in Household	6.98*

* indicates statistical significance at the 5% or less level

V. Conclusion

The above analysis suggests that there were several possible sources of tension between the park and the village at the time of survey. The park is rich in the resources that many of the villagers rely upon in difficult times. It also generates externalities in the form on concentrated animal damage and reduced transportation access. If, like in the case of poaching, the park fails in its aim to restrict access, this may be problematic for conservation goals. If, on the other hand, the park is successful in restricting access, this may be problematic for household survival and enrichment strategies.

Although the park does seem to be successful in recruiting community leaders to support its conservation objectives, it may be less successful in gaining more broad-based support with current structures. Since the time of survey, the park has taken several steps to overcome this problem. Park management was informed of the specific tensions within the Mpanzi community with respect to the park and took some action to remedy the situation. They opened more basket marketing areas and some women from the village have been able to participate. They also held some local meetings and began the high school education program. Medicinal herb planting by traditional healers was also encouraged. The park was so pleased with in fact with the change in the situation that they awarded the first annual KwaZulu-Natal Nature Conservation Service (KZNNCS) Individual Award to Mpanzi's iNkosi (Chief) Mpanzi for his contribution to promoting community involvement in conservation.

The park, like others in the region, has also just instituted a small levy on visitors to KZNNCS parks that will go directly to local communities. Several projects have already been designated for funding. On October 17, 2000 the ZNNCS also inaugurated a new system of local boards to "facilitate an integrated management approach between KwaZulu-Natal wildlife protected areas and their surrounding communities (KZNNCS, 2000)" in accordance with the KZN Nature Conservation Management Act of 1997. One of four pilot boards will operate for Umfolozi-Hluhluwe game reserve. The boards will consist of members appointed by the regional minister of Agricultural and Environmental affairs and include:

- IzinKosi and other members of the local traditional leadership
- Regional tourism parties
- Commercial (white) farmers
- Local business
- Regional and town councils
- Environmental NGOs and other special interests, and
- Park personnel

While this is a break from the past in terms of the park bureaucracy formalizing a mechanism for outside input, the list of possible participants may indicate the break has not been sharp enough. All of the possible parties except the traditional leadership are likely to be white interests from outside the rural villages next to the park. Further, there is no guarantee that even the traditional leadership will be effective in representing the interests of the villagers. Traditional leaders are not democratically elected, they are difficult to remove from office, and may systematically exclude input from women and other members of the community. Further, the local boards can only recommend actions to the Parks board and have little recourse if they are ignored. The community levy seems more promising but the projects currently approved are

only 5 in number and 4 of them are small tourist activities within the province's parks that may benefit only a handful.

What may work better is to shift the locus of tourist activities closer to the borders of parks. If tourist camps are located several kilometers within the park, local communities may have little access beyond that controlled by the park to the markets created by the tourists. Right now, tourists zip through the communities on the other side of the park from Mpanzi, check in to their accommodations and largely check out of the local economy. Increasing the quality of local transportation routes may also prove to be critical to positive community-park interactions.

Further democratization of the participation, more widely beneficial community projects, increased access to park resources, and mitigation of animal damages may be necessary before the interests of the community come in line with those of the park. Until that time, little change in poverty or poaching is likely to occur.